TR-7844-1

CONNECTICUT YANKEE
NRC-SEP TOPIC III-1, QUALITY GROUP CLASSIFICATION OF COMPONENTS AND SYSTEMS
HADDAM NECK PLANT

DETAILED RESPONSES TO DRAFT SER DATED AUGUST 12, 1982

MARCH 3, 1994

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INTRODUCTION

The USNRC draft safety evaluation of Systematic Evaluation Program Topic III-1 for Connecticut Yankee listed 8 areas which required more information in order to complete evaluation. These areas are listed below and the requested information is provided in the body of this report.

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- Radiography Requirements
- Pressure Vessel Fatigue Analysis
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1.0 FRACTURE TOUGHNESS

In Section V of the August 12, 1982 Draft SER it was noted that of the 87 components listed, insufficient information was provided for 51 items. Northeast Utilities has reviewed Table 5-1 of the Franklin Research Center (FRC) Technical Evaluation Report No. C5257-435 and is providing the following information to complete the evaluation of these components for fracture toughness. Only those components listed in the draft SER as requiring further information are included here.

COMPONENT REACTOR COOLANT SYSTEM	REASON FOR EXEMPTION(1)
Pressurizer	Exemption not required. Impact tests were performed per Westinghouse Specification 675209.
Interconnecting Piping of Systems that Form Part of Reactor Coolant Pressure Boundary (RCPB)	8e
Pressurizer Surge and Spray	8e
Piping 3/4 Inches and Smaller Within RCPB	8e
Pressurizer Relief Discharge Piping Upstream of Safety Valves	8e
Pressurizer Safety and Relief Valves	8e
Power Operated Relief Valves	8e
Block Valves	8e
Other Valves Within Quality Group A Portions of RCPB	8e
Other Valves Within Quality Group B Portions of RCPB	8e

SAFETY INJECTION SYSTEM	REASON FOR EXEMPTION(1)
High and Low Pressure Safety Injection Pumps	8e
Accumulators	Does not exist at Connecticut Yankee
Boron Tank	Does not exist at Connecticut Yankee
Boron Injection Recirculation Pump	Does not exist at Connecticut Yankee
Interconnecting Piping and Valves Required to Perform Recirculation Function	Does not exist at Connecticut Yankee

CONTAINMENT SPRAY SYSTEM	REASON FOR EXEMPTION(1)
Pumps	Does not exist at Connecticut Yankee
Heat Exchanger - Tube Side	Does not exist at Connecticut Yankee
Heat Exchanger - Shell Side	Does not exist at Connecticut Yankee
Spray Nozzles	8a & 8f
Interconnecting Piping and Valves Required to Perform Spray Function	8a & 8f
Spray Chemical Storage Tank	Does not exist at Connecticut Yankee
Chemical Storage Test Pump	Does not exist at Connecticut Yankee
Interconnecting Piping and Valves Required to Perform Test Function	Does not exist at Connecticut Yankee

CHEMICAL AND VOLUME CONTROL SYSTEM	REASON FOR EXEMPTION(1)
Drain Cooler Heat Exchanger - Shell Side	8a
Reactor Coolant Filter	8e
Non-Regenerative Heat Exchanger - Shell Side	8a
Seal Water Heat Exchanger - Shell Side	8a
Boric Acid Strainer	8e

RESIDUAL HEAT REMOVAL SYSTEM	REASON FOR EXEMPTION(1)
Heat Exchanger - Shield Side	8a
Pumps	8a [See ND-2311(b)(5) of Section III]

COMPONENT COOLING SYSTEM	REASON FOR EXEMPTION(1)
Heat Exchanger - Shell Side	8a
Surge Tank	8a
Interconnecting Piping and Valves Required to Service Quality Groups B and C System Components	8a

SERVICE WATER SYSTEM	REASON FOR EXEMPTION(1)
Pumps	8a [See ND-2311(b)(5) of Section III]
Strainers	8a [See ND-2311(b)(5) of Section III]
Interconnecting Piping and Valves Required to Service Quality Group C System Components	8a

MAIN STEAM SYSTEM	REASON FOR EXEMPTION(1)
Interconnecting Piping and Valves Comprising Main Steam Lines Extending from the Secondary Side of the Steam Generator up to and Including the Outermost Containment Isolation Valve In Each Main Steam Line and Connected Piping up to and Including the First Valve that is Normally Closed or Capable of Automatic Closure During All Modes of Normal Reactor Operation	8a & 8h (See Evaluation 1-1)
Relief Valves	Does not exist at Connecticut Yankee
Safety Valves (16)	8h (See Evaluation 1-1)
Piping and Valves from Steam Generators To and Including Blow-off Valve TV-1312-1 through 4 and 506, 515, 522 and 529. Piping from Valves PICV-1206A, B to Auxiliary Feed Pumps Including Valves SV-1216A, B	8d

FEEDWATER SYSTEM	REASON FOR EXEMPTION(1)
Interconnecting Piping and Valves Comprising Feedwater Lines Extending From the Secondary Side of the Steam Generators Up To and Including the Outermost Containment Isolation Valves in each Feedwater Line and Connected Piping up to and Including the First Valve that is Normally Closed or Capable of Automatic Closure During All Modes of Normal Reactor Operation	8a & 8h (See Evaluation 1-2)

AUXILIARY FEED SYSTEM	REASON FOR EXEMPTION(1)
Pumps	8d
Demineralizer Storage Tank	8f
Piping and Valves From and Including Valves 156-1 through 156-4, 182 and Main Feed Valves MOV-11, 12, 13, 14 and 135-1 through 135-4 to Steam Generators	8a and Evaluation 1-2
Piping and Valves to Section of Auxiliary Feed System Pumps from Demineralizer Water Storage Tank	Some 10" by DWST and 8a
Piping and Valves from Pump Discharge to Valve 156-1 through 156-4 and 182	8d and 8a

CONTAINMENT PURGE SYSTEM	REASON FOR EXEMPTION(1)
Interconnecting Piping and Valves that Form an Extension of the Containment Boundary Up To and Including Outermost Containment Isolation Valve	8a

CONTAINMENT ISOLATION SYSTEM	REASON FOR EXEMPTION(1)
Interconnecting Piping and Valves of the RCPB that Penetrate the Containment Up To and Including the Outermost Containment Isolation Valve	8e for both Class A and Class B
Interconnecting Piping and Valves of Quality Groups B, C or D Systems that Penetrate the Containment From the First Isolation Valve Inside Containment Up To and Including the Outermost Containment Isolation Valve	8a and 8e

Notes:

(1) The reasons for exemption listed as 8a, 8d, etc. are those used in the FRC Report 5257-435 Table A4-5 Section II for Class 1, 2 & 3 Components.

Evaluation 1-1 - Main Steam Piping and Valves

The main steam piping material is as follows:

< 30 inch is ASTM A106 Grade B

≥ 30 inch is ASTM A155 Grade C55

All main steam piping 12 inches and under is exempt as a result of the wall thickness being less than 5/8 inch.

The normal service temperature for the main steam system is 490°F at power. Although the T_{NDT} for the main steam piping material is not available, the fact that the lowest service temperature during normal operation of the plant is 490°F provides assurance that nonductile failure would not occur since the main steam piping material is ductile at this temperature.

Evaluation 1-2 - Feedwater and Auxiliary Feedwater Piping and Valves

The feedwater piping material that has a wall thickness greater than 5/8 inch is ASTM A106 Grade B. Although the T_{NDT} for the feedwater piping material is not available, the normal service temperature for piping material that has a wall thickness greater than 5/8 inch is 415°F to 425°F during normal plant operation, a temperature which provides assurance that nonductile failure would not occur since the feedwater piping material is ductile at this temperature.

Conclusion

Based on the above, it is concluded that the original plant design criteria imposed fracture toughness requirements for piping, valves, vessels and pumps which compare favorably to that which is identified in ASME Section III 1977 with 1978 Addenda and no further action is required.

2.0 Radiography Requirements

The August 12, 1982 draft SER requested that information related to the radiography requirements imposed on a number of components be provided. Northeast Utilities has reviewed the FRC Report C5257-435 and is providing the following information to complete the evaluation of these components for radiography requirements. Only those components listed in the draft SER as requiring further information are included here.

2.1 Radiography Requirements for Pressure Vessels

a) The draft SER requests radiography requirements imposed on Class 1 Vessels not designated as primary vessels for which Case 1273N was not invoked. The vessels of concern are listed in Table 4-2(a) of FRC Report C5257-435.

1) The Pressurizer was purchased to Westinghouse Specification No. 675209. This specification classifies the Pressurizer as a Primary vessel in accordance with Case 1270N of Section VIII and imposes the radiographic requirements of Case 1273N of Section VIII.

2) The Drain Cooler Heat Exchanger - Tube Side was purchased to Westinghouse Specification No. 675276. This specification required radiography of circumferential welds in accordance with paragraph UW-51 of Section VIII. Tube to tubesheet welds were dye penetrant inspected.

Conclusion

Based on the above, it is concluded that the radiography requirements of the original plant design criteria for Class 1 vessels satisfy the requirements of ASME Section III, 1977 with 1978 Addenda.

b) The draft SER requests radiography requirements imposed on Class 2 vessels for which Case 1273N of Section VIII was not invoked and with welded thickness less than 1 1/2 inches. The vessels of concern are listed in Table 4-2(b) of FRC Report C5257-435.

(1) The Regenerative Heat Exchanger was purchased to Westinghouse Specification No. 675256. This specification imposes Case 1273N which requires 100 percent radiography of all pressure containing welds. In addition all tubes were ultrasonically examined prior to bending, all forging were ultrasonically examined and the root pass and final pass of all pressurizing containing welds were subjected to liquid penetrant inspection.

(2) The Drain Cooler Heat Exchanger - Shell Side is discussed in Section 2.1 (a)2 above. The Westinghouse specification required radiography of circumferential shell welds in accordance with Paragraph UW 51 of Section VIII.

(3) The Reactor Coolant Filter was purchased to Westinghouse Specification No. 675272. This specification required liquid penetrant of the final pass and back face of all pressure containing welds.

(4) The Volume Control Tank was purchased to Westinghouse Specification No. 675220. This Specification classifies the tank as a secondary vessel in accordance with Case 1270N of Section VIII and requires full radiography of all welded joints in accordance with paragraph UW-2 of Section VIII.

(5) The Non-Regenerative Heat Exchanger - Tube Side was purchased to Westinghouse Specification No. 676170. This specification required compliance with the rules of Section III for Class C vessels and required that all tubes be ultrasonically examined in accordance with paragraph N-324.3 prior to bending, all plate material be ultrasonically examined in accordance with paragraph N-321 and all welds shall be radiographed in accordance with paragraph N-624.

(6) The Seal Water Injection Filter was purchased to Westinghouse Specification No. 6/6130. This specification required that all welds within the main shell be radiographed in accordance with paragraph UW-2 of Section VIII. In addition, the final pass and back pass of all stainless steel pressure containing welds were liquid penetrant inspected.

(7) The Seal Water Heat Exchanger - Tube Side was purchased to Westinghouse Specification No. 675275. This specification classified the heat exchanger as a Secondary vessel in accordance with Case 1270N of Section VIII and also imposed the requirements of Case 1273N. Ultrasonic examination was required for the tubes and tubesheet.

(8) The Residual Heat Removal Heat Exchanger - Tube side was purchased to Westinghouse Specification No. 676037. This specification classified the heat exchanger as a Secondary vessel in accordance with Case 1270N of Section VIII and also imposed the requirements of Case 1273N. Ultrasonic examination was required for the tubes and tubesheet.

Conclusion

Based on the above, it is concluded that the radiography requirements of the original plant design criteria for Class 2 Vessels satisfy the requirements of ASME Section III, 1977 with 1978 Addenda except for the Reactor Coolant Filter which is a low pressure (200 psig) low temperature (250°F) design component. The Reactor Coolant Filter was subjected to liquid penetrant examination and a Section VIII hydrostatic test of 1 1/2 times design pressure. It is concluded that the Reactor Coolant Filter compares favorably to the Section III, 1977 with 1978 Addenda requirements.

c) The SER request radiography requirements imposed on Class 3 vessels for which Case 1273N of Section VIII was not invoked and with welded thickness less than 1 1/2 inches. The vessels of concern are listed in Table 4-2(c) of FRC Report C5257-435.

(1) The Non-Regenerative Heat Exchanger - Shell Side is discussed in Section 2.1 (b) (5) above. The Westinghouse specification required radiography of all welds in accordance with paragraph N-624 of Section III.

(2) The Seal Water Heat Exchanger - Shell Side is discussed in Section 2.1(b) (7) above. The Westinghouse specification imposed the requirements of Case 1273N.

(3) The Boric Acid Tank was purchased to Stone & Webster Specification No. CYS-780. This specification required spot radiography of all welds in accordance with Section VIII.

(4) The Boric Acid Filter was purchased to Westinghouse Specification No. 676131. This specification required radiography of all weld joints within the main shell in accordance with paragraph UW-2 of Section VIII.

(5) The Boric Acid Strainer - This strainer is a small casting with 2 inch IPS socket welded inlet and outlet connections and a bolted cover. The maximum diameter of the casting is 5 1/4 inches with a nominal wall thickness of approximately 1/2 inch. This Class 3 piping component would not require radiographic examination in accordance with ASME, Section III 1977, 1978 Addenda requirements per the FRC report, page A-95, item 1 under Welding Requirements.

(6) The Mixed Bid Demineralizer was purchased to Westinghouse Specification No. 675282. This specification required radiography of all welded joints in accordance with paragraph UW-2 of Section VIII. In addition, the root and final pass of all pressure containing welds were liquid penetrant examined.

(7) The Residual Heat Removal Heat Exchanger - Shell Side is discussed in Section 2.1(b) (8) above. The Westinghouse specification imposed the requirements of Case 1273N.

(8) The Component Cooling System Heat Exchanger was purchased to Westinghouse Specification No. 675278.

This specification classifies the heat exchanger as a secondary vessel in accordance with Case 1270N of Section VIII and requires spot radiography as follows:

One exposure at all points of starting and stopping the arc, when automatic welding is used.

One exposure at each junction of longitudinal and circumferential welds.

At least one additional exposure on each longitudinal seam in each course.

When seamless shells are used, at least one exposure shall be made on each circumferential seam.

9) The Surge Tank was purchased to Westinghouse Specification No. 675216. This specification classifies the tank as a Secondary vessel in accordance with Case 1270N of Section VIII and requires liquid penetrant examination of root pass and final pass of all welds as well as magnetic particle examination of all completed welds.

10) The Spent Fuel Pit Heat Exchanger - This heat exchanger is shown on American Heat Reclaiming Corp. Drawing No. PHE-341. The heat exchanger was constructed and stamped in accordance with ASME BPVC Section III, Class 3 - 1974 and therefore satisfies current Code examination requirements.

11) The Spent Fuel Pit Filter - This filter is shown on Commercial Filters Drawing No. Y-18752. The filter was constructed in accordance with ASME BPVC Section III, Class C, 1968 and therefore satisfies current Code examination requirements.

Conclusion

The majority of the welds in Class 3 vessels have been subjected to radiography. Also liquid penetrant examination of tubes, tubesheets and root pass and final pass of many welds (including those subject to radiography) was required. Further, for those vessels not subjected to radiography, Subsection C of Section VIII required that the allowable stresses be reduced by 80 percent and a joint efficiency factor of 0.7 must be used in design calculations for butt welded joints. Based on the above, Northeast Utilities concludes that the original plant design requirements for radiography of Class 3 Vessels compares favorably to ASME Section III, 1977 with 1978 Addenda and no further action is required.

2.2 Radiography Requirements for Piping

The SER requests radiography requirements imposed on Class 1 and 2 piping designed only to B31.1-1955.

Westinghouse Specification No. 675212 for the reactor coolant system piping imposed B31.1 including Code Case N-7 which required full radiography. Therefore this piping satisfies the requirements of ASME Section III 1977, with 1978 Addenda.

Radiography inspection requirements for stainless steel, carbon steel and alloy steel piping were performed in accordance with the requirements of specifications CYS-579, 579A, 1550 and 1550A.

These specifications required the following inspections as a minimum.

Stainless Steel Piping

1) Reactor Coolant Piping Butt Welds (main coolant loops)

   - One intermediate complete circumference radiograph when not less than 3/8" in depth of weld has been deposited and not more than 1/3 of total weld thickness has been deposited.

   - Full radiography of all finished welds.

2) All primary stainless steel piping systems designed for 1,000 psi or greater, 3 in. diameter and larger (excluding reactor coolant piping).

   - Full radiography of all finished welds.

3) All primary stainless steel piping systems designed for 1,000 psi or greater, less than 3 in. diameter, and all primary plant stainless steel piping systems designed for less than 1,000 psi in all sizes (excluding schedule 10S).

   - Radiograph at least 20 percent of each welder's work. Any welder not passing inspection was to have 100 percent of his work radiographed.

Carbon Steel Piping

1) Main Steam Field Butt Welds

   - 100 percent radiography of all welds between the steam generators and the non-return valves.

   - Radiograph 20 percent of all other field welds.

2) Feedwater Field Butt Welds

- 100 percent radiography of all feedwater piping field welds inside containment.

- Radiograph 20 percent of all other field welds.

Alloy Piping

At least 20 percent radiography of all shop and field welds (excluding schedule 10S).

Adding to the above inspection criteria is the fact that much of the subject piping is part of the CY Inservice Inspection Program and is therefore subject to periodic weld examinations. Also the subject piping has operated satisfactorily for 26 years and is considered to have relatively low normal operating stress levels.

Based on this, it is concluded that the radiography requirements for piping designed to B31.1 compare favorably to ASME Section III 1977, with 1978 Addenda.

2.3 Radiography Requirements for Valves

The SER requests radiography requirements imposed on Class 1 and 2 Valves which were designed only to B31.1-1955. A review of FRC report C5257-435 indicates a number of Code designations that are missing or improperly specified. In order to provide sufficient information for review, Northeast Utilities is providing the following information on Class 1 and 2 valves at Connecticut Yankee.

a) Manual Globe, Gate and self actuating Check Valves for all safety systems were purchased in accordance with Westinghouse Specification No. 675316. This specification requires radiography in accordance with B31.1 Case N-10 for all cast stainless steel valve bodies carrying radioactive fluids at a pressure greater than 200 PSIG or a temperature greater than 200F. All other valve bodies were subjected to liquid penetrant examination. All valves were hydrostatically tested in accordance with MSS SP-61 with the additional requirement that the test pressure be maintained for at least 30 minutes.

b) Motor operated valves for the Safety Injection, Reactor Coolant, Chemical and Volume Control and Auxiliary Coolant Systems were purchased in accordance with Westinghouse Specification No. 675226. This specification required radiography in accordance with B31.1 Case N-10 for all cast stainless steel bodies, bonnets and discs. All carbon steel cast bodies, bonnets and disc for valves designated as 600#, ASA B16.5 and over were radiographed in accordance with the requirements of paragraph UA-80(a), Appendix VII, Section VIII of the ASME BPVC. All valves were hydrostatically tested in accordance with ASA B16.5 with the additional requirement that the test pressure be maintained for at least 30 minutes.

c) Auxiliary relief valves for the Safety Injection Sampling, Auxiliary Coolant and the Chemical and Volume Control systems were purchased in accordance with Westinghouse Specification 676144. This specification required radiography in accordance with ASA B31.1 Case N-10 for all stainless steel cast bodies, bonnet and caps carrying radioactive fluids at a pressure greater than 200 PSIG or

a temperature greater than 200F. All other valves carrying radioactive fluids were subjected to liquid penetrant examination. All valves were hydrostatically tested in accordance with ASA B16.5 with the additional requirement that the test pressure be maintained for at least 30 minutes.

d) Reactor Coolant Loop Stop Valves were purchased in accordance with Westinghouse Specification No. 675174. This specification imposes the requirements of Case N-10 of B31.1 on all stainless steel castings utilized for body, bonnet and disc. In addition wrought material used for seat rings (main and back seat) and discs were subjected to ultrasonic testing.

e) Reactor Coolant, Auxiliary Coolant, and Chemical and Volume Control system air operated valves were purchased in accordance with Westinghouse Specification No. 676143. This specification requires radiography in accordance with B31.1 Case N-10 for all cast stainless steel valve parts carrying radioactive fluid at a pressure greater than 200 PSIG or a temperature greater than 212F. All other valves were subjected to liquid penetrant examination in accordance with Section VIII, Appendix VIII. All valves were hydrostatically tested in accordance with B16.5 with the additional requirement that the test pressure be maintained for at least 30 minutes.

f) Solenoid - Pilot Operated Relief Valves were purchased in accordance with Westinghouse Specification No. 676337. This specification requires liquid penetrant examination of pressure containing forgings, castings, finished welds, hardsurfacing and machined surfaces in accordance with Section VIII, Appendix VIII.

g) Valves purchased to the following Stone & Webster Specifications required radiography in accordance with Case N-10 of B31.1 of stainless steel castings for valves having a 300# ASA pressure rating or higher.

S&W Specification No.	Valves
CYS-2142	2 1/2 to 6 inch gate, globe and check
CYS-2078	2 inch and smaller gate, globe and check
CYS-2169	Motor operated valves

Conclusion

In addition to the original inspection and hydrostatic test requirements imposed by the valve purchase specifications, periodic testing and inservice inspection during the 26 years of Connecticut Yankee Operation adds to the assurance that the subject valves will perform their intended safety function satisfactorly. Based on the above, Northeast Utilities concludes that the intent of ASME Section III 1977, with 1978 Addenda has been met and no additional radiography of valves is warranted.

2.4 Radiography Requirements for Pumps

The SER requests radiography requirements imposed on specific Class 1 and 2 pumps. The FRC report, C5257-435, refers to a Containment Spray System pump in Table 4-2(b). This pump does not exist at Connecticut Yankee. All other pumps listed in Tables 4-2(a) and 4-2(b) are discussed in the following.

a) Class 1 Reactor Coolant Pumps - These pumps were purchased in accordance with Westinghouse Specification No. 675237. This specification required radiography of all pressure containing and strength welds in accordance with

paragraphs P65 and P95 of ASME BPVC Section I and Case 1273N of Section VIII. In addition, examination requirements for stainless steel castings satisfied B31.1, Case N-10 and carbon steel castings satisfied UA 80 (b) of Section VIII.

b) Class 2 High Pressure Safety Injection pumps - These pumps were purchased in accordance with Westinghouse Specification No. 675315. This specification requires radiography of all welded joints in accordance with paragraph UW-51 of Section VIII. All stainless steel material used for pressure containment and wetted parts are required to be liquid penetrant inspected.

c) Class 2 Charging Pumps - These pumps were purchased in accordance with Westinghouse Specification No. 675252. This specification requires ultrasonic examination of steel casting material used for pressure containment and of shaft material. Liquid penetrant examination of wetted surfaces not subject to ultrasonic examination is also required. All welds are required to be radiographed in accordance with paragraph UW-51 of Section VIII.

d) Class 2 Residual Heat Removal Pumps - These pumps were purchased in accordance with Westinghouse Specification No. 675254. This specification requires that all stainless steel material used for pressure containment and wetted parts be liquid penetrant examined. In addition all welds are required to be radiographed in accordance with paragraph UW-51 of Section VIII.

Conclusion

In addition to the original inspection requirements imposed by pump purchase specifications, periodic testing and inservice inspection and maintenance during the 26 years of Connecticut Yankee operation adds to the assurance that the subject pumps will perform their intended safety function satisfactorily. Based on the above, Northeast Utilities concludes that ASME Section III, 1977, 1978 Addenda has been satisifed and additional radiography of pumps is warranted.

3.0 PRESSURE VESSEL FATIGUE

The SER requests demonstration of compliance with the ASME Section III 1977, 1978 Addenda fatigue analysis requirements for pressure vessels.

3.1 Reactor Pressure Vessel - Westinghouse Specification No. 675195 requires that a complete detailed stress analysis of the reactor vessel be performed including fatigue in accordance with Document PB 151987, Tentative Structural Design Basis for Reactor Pressure Vessels and Directly Associated Components. A complete list of transients and number of occurrences is provided as well as plots of load versus time.

3.2 Steam Generator - Westinghouse Specification No. 675194 requires that the calculation of stresses and fatigue evaluation be performed in accordance with the Tentative Structural Design Basis for Reactor Pressure Vessels and Directly Associated Components. A complete list of transients and number of occurrences is provided as well as plots of load versus time.

3.3 Pressurizer - Westinghouse Specification No. 675209 requires the calculation of stresses and fatigue evaluation be performed in accordance with the Tentative Structural Design Basis for Reactor Pressure Vessels and Directly Associated Components. A complete list of transients and number of occurrences is provided as well as plots of load versus time.

3.4 Conclusion - Since the Tentative Structural Design Basis was the document utilized to develop the design rules for what currently appears in the Class 1 vessel portion of Section III, paragraph NB-3200, Northeast Utilities concludes that the fatigue analysis requirements of ASME Section III, 1977, 1978 Addenda have been complied with for these vessels.

4.0 ASA B31.1, 1955 PIPING CODE CASES

The SER requests that the Code cases invoked for piping designed to ASA B31.1 - 1955 be provided.

The Reactor Coolant system hot and cold legs, pressurizer surge line and interconnecting piping that form part of the reactor coolant pressure boundary invoked Code Case N-7. For all other piping, no Code Cases were invoked.

5.0 VALVES

The SER requests that information be provided, on a sample basis, regarding the design of valves in order to evaluate if they meet current ASME Code body shape and pressure - temperature rating requirements. The following information is submitted.

5.1 Valves purchased to Westinghouse Specifications - These specifications required design of pressure containing parts in accordance with ASA B16.5 or ASME BPVC Section VIII. The specifications are specific with respect to items such as seat rings, back seating, body-bonnet connections and disc type. A sample review of valve drawings indicates that the body shape rules are in general agreement with the requirements of Code body shape rules. This is not unexpected since the ASME Section III body shape rules were developed utilizing the experience of valve manufacturers such as those who supplied valves to the Connecticut Yankee project.

5.2 Valves Purchased to Stone & Webster Specifications - These specifications required design of pressure containing parts in accordance with ASA B16.5. The specifications are specific with respect to items such as body-bonnet connections, stuffing boxes, back seats and valve body to pipe transitions. A sample review of valve drawings indicates that body shape rules are in general agreement with the requirements of ASME Section III body shape rules.

5.3 For pressure - temperature ratings the major concerns are related to some stainless steel materials for which radiography was not performed since current B16.34 ratings are less than those provided in B16.5 - 1961. However, when the radiography, ultrasonic and liquid penetrant requirements of B16.34 are satisfied the B16.34 special class ratings are applicable which

essentially eliminates major differences in pressure-temperature ratings between the two standards. A review of Section 2.3, Radiography - Valves, indicates that examination requirements essentially in compliance with B16.34 have been satisfied. Therefore major differences in pressure-temperature ratings are not anticipated.

A detail review of pressure - temperature ratings differences between B16.5 and B16.34 for the safety related valves indicates that some stainless steel valves at Connecticut Yankee have lower pressure ratings at temperature under B16.34 than B16.5. However, the worst case is a difference of only 4.5 percent (1550 psi vs. 1480 psi) for a 900# rated valve at 650F. The hydrostatic test pressure to which these 900# valves were subjected was 3250 psig and the Westinghouse Specifications required that this pressure be maintained for 30 minutes.

5.4 Conclusion - Based on satisfying the B16.34 examination requirements the initial hydrostatic test pressure to which the valves were subjected, the 26 years of Connecticut Yankee operation during which periodic testing and inservice inspection was performed, Northeast Utilities concludes that the intent of body shape rules and pressure-temperature ratings of ASME Section III 1977, 1978 Addenda has been satisfied.

6.0 PUMPS

The SER requests that information should be provided on a sample of 8 pumps related to the manufacturer's standards utilized for the pumps. In addition, compliance with current fatigue analysis requirements of the reactor coolant pumps should be determined.

6.1 Reactor Coolant Pump Fatigue Analysis

These pumps were purchased to Westinghouse Specification No. 675237. This specification requires that a low cycle fatigue evaluation be performed on the casing and nozzles in accordance with the Tentative Structural Design Basis for Reactor Pressure Vessels and Directly Associated Components. A complete list of transients and number of occurrences is provided as well as a plot of load versus time. The specification requirements satisfy ASME Section III 1977, 1978 Addenda fatigue analysis requirements.

6.2 Manufacturer's Standards

The following table provides standards and Codes provided in the equipment specifications as being applicable to the design, fabrication, inspection, testing and cleaning of the 8 listed pumps.

Pump	Applicable Codes and Standards
Reactor Coolant	1. ASA B16.5
	2. ASME BPVC, Section VIII
	3. Tentative Structural Design Basis
	4. NEMA Standard MG1-1963
	5. Hydraulic Institute Standards
	6. ASA B31.1, Case N-10
	7. NRL Report NO. 5831
	8. ASME BPVC, Section IX

Pump	Applicable Codes and Standards
Reactor Coolant (Cont'd)	9. ASME BPVC, Section I 10. West. MTS 80165 11. West. MTS 80291 12. West. MTS 80224 13. ASTM Standards
Spent Fuel Pit	1. ASA B16.5 2. NEMA Standard MG1-1963 3. Hydraulic Institute Standards 4. ASTM Standards
Boric Acid Transfer	1. ASA B16.5 2. Hydraulic Institute Standards 3. NEMA Standard MG1-1963 4. ASTM Standards
Component Cooling	1. ASA B16.5 2. NEMA Standard MG1-1963 3. Hydraulic Institute Standards 4. ASTM Standards
Safety Injection	1. ASA B16.5 2. ASME BPVC, Section VIII 3. ASME BPVC, Section IX 4. ASTM Standards 5. Hydraulic Institute Standards 6. NEMA Standard MG1-1963 7. ASA B31.1 Cases N-10 8. West. MTS-80165

Pump	Applicable Codes and Standards
Centrifugal Charging	1. ASA B16.5
	2. ASME BPVC, Section VIII
	3. ASME BPVC, Section IX
	4. ASTM Standards
	5. Hydraulic Institute Standards
	6. NEMA Standard MG1-1963
	7. ASA B31.1, Case N-10
	8. West. MTS-80165
	9. West. MTS-80291
Positive Displacement Charging	1. ASA B16.5
	2. ASME BPVC, Section VIII
	3. ASME BPVC, Section III
	4. NEMA Standard MG1-1963
	5. ASTM Standards
	6. Hydraulic Institute Standards
	7. West. MTS-80165
Residual Heat Removal	1. ASA B16.5
	2. ASME BPVC Section VIII
	3. ASME BPVC Section IX
	4. ASME BPVC Section III
	5. ASTM Standards
	6. Hydraulic Institute Standards
	7. NEMA Standard MG1-1963
	8. ASA B31.1, Case N-10
	9. West. MTS-80291

7.0 STORAGE TANKS

The SER requests details on the specifications or design Code used for construction of the demineralizer, refueling water, boron injection, boron injection recirculation, and spray chemical storage tanks. The following information is provided in response to that request.

7.1 The above tanks were purchased to Stone & Webster Specification No. CYS-780

7.1.1 The General Design requirements for Welded Storage Tanks contained in CYS-780 require that all vertical and horizontal shell joints be double butt welded.

7.1.2 The Welding Requirements contained in CYS-780 require that, as a minimum, spot radiography be performed on all arc welded butt joints.

7.2 The Boron Waste Storage Tanks and the Boric Acid Tank were constructed in accordance with ASME BPVC Section VIII, 1962.

7.3 The Demineralized Water Storage Tank, Primary Water Storage Tank, Test Tank - Waste Disposal and the Refueling Cavity Water Storage Tank were constructed to ASA B96.

7.4 The material specified for individual tanks was as follows:

Tank	Material Specification
Demmineralized Water Storage	
Shell	SB-209 GR 20A-0
Heads	SB-209 GR 20A-0
Primary Water Storage	
Shell	SB-209 GR20A-0
Heads	SB-209 GR20A-0

Tank	Material Specification
Test Tank-Waste Disposal	
Shell	SB-209 GR20A-0
Heads	SB-209 GR20A-0
Liner	Reinforced Synthetic Rubber
Refueling Cavity Water Storage	
Shell	SB-209 GR20A-0
Heads	SB-209 GR20A-0
Boron Waste Storage	
Shell	SA-264 Clad Steel Plate Composed of A-201 GRA Steel with A-240 GRS, Type 304 Cladding
Heads	
Boric Acid Tank	
Shell	SA-240 GRS, Type 304 S.S.
Heads	SA-240 GRS, Type 304 S.S.

7.5 The Boron Waste Storage Tanks, Refueling Cavity Water Storage Tank and the Boric Acid Tank are designed to withstand an earthquake load of 0.5g in the horizontal direction or 0.17g in the vertical direction.

7.6 All tanks listed were designed to a wind load of 25 PSF and a snow load of 40 PSF.

7.7 A spray chemical storage tank does not exist at CY.

8.0 MISSING INFORMATION

The August 21, 1982 SER requests information which is incomplete or missing from the Tables in Section 4 of FRC Report No. C5257-435.

8.1 General

Northeast Utilities has provided in Tables 8-2(b) and 8-2(c) those items listed in Tables 4-2(b) and 4-2(c) of the FRC report which did not have a Code specified, for which Northeast Utilities has found a different Code specified than FRC, or those items requiring further explanation. In Table 8-2(a), Northeast Utilities has provided a complete listing of all items shown on Table 4-2(a) of the FRC report. The information provided in Tables 8-2(a), (b) and (c) also responds to the SER request for clarifications of notes, 3, 4, 6 and 7 in Table 4-1 of the FRC report.

TABLE 8-2(a)

QUALITY GROUP A COMPONENTS
CODE ASME III - CLASS 1

PRESSURE VESSELS	CODE
Pressurizer	ASME BPVC VIII, 1962 Code Cases 1270N and 1273N Tentative Structural Design Basis
Drain Cooler Heater Exchanger - Tube Side	ASME BPVC VIII, 1962 Code Case 1270N

PIPING	CODE
Reactor Coolant Systems Piping: Hot and Cold Legs	ASA B31.1, 1955 Code Case N-7
Interconnecting Piping of Systems That Form Part of Reactor Coolant Pressure Boundary	ASA B31.1, 1955 Code Case N-7
Pressurizer Surge Piping	ASA B31.1, 1955 Code Case N-7
All Other Piping on Table 4-2(a)	ASA B31.1, 1955

PUMPS	CODE
Reactor Coolant Pumps	ASME BPVC Sections I, VIII and IX, 1962 and Case 1275N ASA B31.1, 1995 and Case N-10 ASA B16.5, 1961 Tentative Structural Design Basis

VALVES	CODE
Pressurizer Safety Valves	ASME BPVC Section I, 1962 and Case 1271N ASA B16.5, 1961

TABLE 8-2(a)
(Cont'd)

QUALITY GROUP A COMPONENTS
CODE ASME III - CLASS 1

VALVES	CODE
Pilot-Operated Relief Valves	ASA B16.5, 1961 ASME BPVC Section II, VIII and IX, 1962 plus Addenda ASA-B31.1, 1955 and Case N-10
Block Valves	ASA B16.5, 1961 ASME BPVC Sections VIII and IX, 1962 ASA B31.1, 1955 and Case N-10
Other Valves Within Quality Group A Portions of RCPB	ASA B16.5, 1961 ASME BPVC Sections VIII and IX, 1962 ASA B31.1, 1955 and Case N-10 ASME BPVC, Section III for Seismic Stress Limits
Letdown Valves and Letdown Isolation Valves in Loop 1	ASA B16.5, 1961 ASME BPVC Sections VIII and IX, 1962 ASA B31.1, 1955 and Case N-10 ASME BPVC, Section III for Seismic Stress Limits
Valves from Pump Discharge To and Including Valves 399 and 296	ASA B16.5, 1961 ASA B31.1, 1955 and Case N-10 ASME BPVC Section VIII, 1962 ASA B16.11, 1946 MSS-SP-66
Sampling System Valves	ASA B16.5, 1961 ASA B31.1, 1955 and Case N-10 ASME BPVC Section VIII, 1962 ASA B16.11, 1946 MSS-SP-66
Interconnecting Valves of the Reactor Coolant, Pressure Boundary that Penetrates the Containment Up to and Including the Outermost Containment Isolation Valves	ASA B16.5, 1961 ASA B31.1, 1955 and Case N-10 ASME BPVC Sections VIII and IX 1962 ASME BPVC Section III for Seismic Stress Limits on MOV

TABLE 8-2(b)

QUALITY GROUP B COMPONENTS
CODE: ASME III - CLASS 2

Under Table 8-2(b) only those items provided on Table 4-2(b) of FRC Report C5257-435 which do not have a Code specified, the items for which Northeast Utilities has found a different Code specified than FRC, or those items which require further explanation are listed.

PRESSURE VESSELS	CODE
Accumulators	Does Not Exist at Connecticut Yankee
Containment Spray System Heat Exchanger - Tube Side	Does Not Exist at Connecticut Yankee
Drain Cooler Heat Exchanger - Shell Side	See Table 8-2(a)
Reactor Coolant Filter	ASME BPVC Section VIII, 1962 and Case 1270N
Non-Regenerative Heat Exchanger - Tube Side	ASME BPVC Section III, Class C Nuclear Vessel
Residual Heat Removal Heat Exchanger	ASME BPVC Section VIII, 1962 and Cases 1270N and 1273N

PIPING	CODE
All Piping Listed on Table 4-2(b) of FRC Report C5257-435	ASA B31.1, 1955

TABLE 8-2(b)
(Cont'd)

QUALITY GROUP B COMPONENTS
CODE: ASME III - CLASS 2

PUMPS	CODE
High and Low Pressure Safety Injection Pumps	ASA B16.5 ASME BPVC Sections VIII and IX, 1962
Containment Spray System Pumps	Do Not Exist at Connecticut Yankee
Charging Pumps	ASA B16.5 ASME BPVC Sections VIII and IX, 1962
Residual Heat Removal Pumps	ASA B16.5 ASME BPVC Sections III, VIII and IX

VALVES	CODE
Other Valves Within Quality Group B Portions of RCPB	ASA B31.1, 1955 and Case N-10 ASME BPVC Sections VIII and IX, 1962
Interconnecting Valves Required to Perform Safety Injection Function	ASA B31.1, 1955 and Case N-10 ASME BPVC, Sections VIII and IX 1962
Valves From Pump Discharge to Containment Isolation Valves 399 and 296	ASA B31.1, 1955 and Case N-10 ASME BPVC Sections VIII and IX, 1962
Valves from Pump Discharge via Reactor Coolant Pumps and from TV-1847 to Seal Water Heat Exchanger	ASA B31.1, 1955 and Case N-10 ASME BPVC Sections VIII and IX, 1962
Valves Downstream of Letdown Isolation Valves to Volume Control Tank (VCT) and Other Valves of the VCT (CVCS)	ASA B31.1, 1955 and Case N-10 ASME BPVC Sections VIII and IX, 1962
Sampling System Valves	ASA B31.1, 1955 and Case N-10 ASME BPVC Sections VIII and IX, 1962

TABLE 8-2(b)
(Cont'd)

QUALITY GROUP B COMPONENTS
CODE: ASME III - CLASS 2

VALVES	CODE
Interconnecting Valves Required to Perform Residual Heat Removal Function	ASA B31.1, 1955 and Case N-10 ASME BPVC Section VIII and IX, 1962
Interconnecting Valves Comprising Feedwater Lines Extending From the Secondary Side of the Steam Generators up to and Including the Outermost Containment Isolation Valve in Each Feedwater Line Including The First Valve That is Normally Closed or Capable of Automatic Closure During All Modes of Normal Reactor Operation	ASA B16.5 ASA B31.1, 1955
Valves From and Including Valves 156-1 through 156-4, 182 and Main Feed Valves MOV-11, 12, 13, 14 and 135-1 through 135-4 to Steam Generators	ASA B16.5 ASA B31.1, 1955
Interconnecting Valves That Form an Extension of the Containment Boundary up to and Including the Outermost Containment Isolation Valve	ASA B16.5 ASA B31.1, 1955
Interconnecting Valves of the Reactor Coolant Pressure Boundary That Penetrant the Containment up to and Including the Outermost Containment Isolation Valve	ASA B16.5 ASA B31.1, 1955 and Case N-10
Interconnecting Valves of Quality Groups B, C, or D System That Penetrant the Containment From the First Isolation Valve Inside Containment up to and Including the Outermost Containment Isolation Valve (CIS)	ASA B16.5 ASA B31.1, 1955

STORAGE TANKS	CODE
Refueling Water Storage Tanks (SIS)	ASA B96, 1967
Boron Injection Tank	Does not exist at Connecticut Yankee

TABLE 8-2(c)

QUALITY GROUP C COMPONENTS
CODE: ASME III-CLASS 3

Under Table 8-2(c) only those items provided on Table 4-2(c) of FRC Report C5257-435 which do not have a Code specified, those items for which Northeast Utilities has found a different Code specified than FRC, or those items which require further explanation are listed.

PRESSURE VESSELS	CODE
Containment Spray System Heat Exchanger - Shell Side	Does Not Exist at Connecticut Yankee
Non-Regenerative Heat Exchanger - Shell Side	See Table 8-2(b)
Seal Water Heat Exchanger - Shell Side	BPVC Section VIII, 1962 and Cases 1270N and 1273N
Residual Heat Removal System Heat Exchanger - Shell Side	ASME BPVC Section VIII, 1962 and Cases 1270N and 1273N
Service Water System Strainers	ASA B16.5
Spent Fuel Pit Heat Exchanger	ASME BPVC Section III, 1974, Class 3
Spent Fuel Pit Filter	ASME BPVC Section III, 1968, Class C

PIPING	CODE
Interconnecting Piping Required to Perform Recirculation Function	ASA B31.1, 1955
Interconnecting Piping Required to Perform Test Function	ASA B31.1, 1955
Boric Acid Blender	See Storage Tanks
Boric Acid Tank Connecting Piping	ASA B31.1, 1955

TABLE 8-2(c)
(Cont'd)

QUALITY GROUP C COMPONENTS
CODE: ASME III-CLASS 3

PUMPS	CODE
Boron Injection Recirculation Pump	Does not exist at Connecticut Yankee
Chemical Storage Test Pump	Does not exist at Connecticut Yankee
Boric Acid Transfer Pumps	ASA B16.5 NEMA Standard MG1-1963 Hydraulic Institute Standards
Component Cooling System Pumps	ASA B16.5 NEMA Standard MG1-1963 Hydraulic Institute Standards
Service Water System Pumps	ASA - B16.5 Standards Nat'l Assoc. of Vertical Turbine Pump Mfgs. ASME Power Test Code for Centrifugal Pumps
Pumps - Turbine Driven	Hydraulic Institute Standards ASA B16.5 ASME Power Test Code for Centrifugal Pumps
Spent Fuel Pit Pumps	ASA B16.5 NEMA Standard MG1-1963 Hydraulic Institute Standards

VALVES	CODE
Interconnecting Valves Required to Perform Recirculation Function	ASA B31.1, 1955
Interconnecting Valves Required to Perform Test Function	ASA B31.1, 1955
Boric Acid Tank Connecting Valves	ASA B31.1, 1955 and Code Case N-10

TABLE 8-2(c)
(Cont'd)

QUALITY GROUP C COMPONENTS
CODE: ASME III-CLASS 3

STORAGE TANKS	CODE
Boron Injection Recirculation Tank (SIS)	Does not exist at Connecticut Yankee
Spray Chemical Storage Tank (CSS)	Does not exist at Connecticut Yankee
Demineralizer Water Storage Tank (AFS)	USAS B96.1, 1967
Boric Acid Tank	ASME BPVC Section VIII, 1962