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TECHNICAL EVALUATION REPORT
FIRST INTERVAL INSERVICE INSPECTION PROGRAM
SUSQUEHANNA STEAM ELECTRIC STATION UNIT 2

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CONTENTS

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1. INTRODUCTION

Section 50.55a of 10 CFR Part 50 defines the requirements for the Inservice Inspection (ISI) program for light-water-cooled nuclear power facilities. Incorporated by reference in this regulation is Section XI of the Boiler and Pressure Vessel Code published by the American Society of Mechanical Engineers (ASME), which provides the basis for implementing inservice inspection.*

Two types of inspections are required: (1) a preservice inspection conducted before commercial operation to establish a baseline and (2) periodic inservice inspections conducted during 10-year intervals that normally start from the date of commercial operation. Separate plans for completing preservice inspection and each 10-year inservice inspection must be formulated and submitted to the U.S. Nuclear Regulatory Commission (NRC). The plan for each 10-year interval must be submitted at least six months before the start of the interval.

During the initial 10-year interval, inservice inspection examinations normally will comply with the requirements in the latest edition and addenda of Section XI incorporated in the regulation on the date 12 months before the date of issuance of the operating license. The effective Code for the first interval for Susquehanna SES Unit-2, which began February 12, 1985, is the 1980 Edition with addenda through Winter 1981.

Section 2 of this report evaluates the ISI Plan developed by the licensee, Pennsylvania Power and Light (PP&L), for Susquehanna SES Unit-2 for (a) compliance with this edition of Section XI, (b) compliance with ISI-related commitments identified during the NRC's review before granting an operating license, (c) acceptability of examination sample, and (d) exclusion criteria.

Based on the date Susquehanna 2's construction permit was issued (November 2, 1973), the plant's Class 1 and 2 components (including supports) were to be designed and provided with access to enable performance of inservice examinations and tests and to meet the preservice examination requirements of the 1971 Edition of the Code with Addenda through the

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*Specific inservice test programs for pumps and valves (IST programs) are being evaluated in other reports.

Summer of 1972 (10 CFR 50.55a(g)(2)). The current revision to 10 CFR 50.55a recognizes that the requirements of Section XI may not be practical to implement because of limitations of design, geometry, and materials of construction of components and systems that were designed to the older Code. The regulation therefore permits exceptions to impractical examination or testing requirements to be requested. Relief from these requirements may be granted, provided the health and safety of the public are not endangered, giving due consideration to the burden placed on the licensee if the requirements were imposed. Section 3 of this report evaluates requests for relief dealing with inservice examinations of components and with system pressure tests.

The current regulation also provides that ISI Programs may meet the requirements of subsequent Section XI Code editions and addenda, incorporated by reference in the Regulation, subject to approval by the NRC. Portions of such editions or addenda may be used, provided all related requirements of the respective editions or addenda are met. These instances are addressed on a case-by-case basis in Section 3 of this report. Likewise, Section XI provides that certain components and systems may be exempted from its requirements. In some instances, however, these exemptions are not acceptable to NRC or are acceptable only with restrictions. As appropriate, these instances are also discussed in Section 3 of this report.

NRC allowed use of Code Cases N-234 and N-235 for preservice inspection June 28, 1980.(1) The Preservice Inspection (PSI) Program for Susquehanna Unit 2, a boiling water reactor designed by General Electric, was submitted as attachments to letters of January 27, 1981,(2) June 16, 1981,(3) and April 23, 1982.(4) Other letters concerning PSI were issued August 8, 1982,(5) August 2, 1983,(6) November 1, 1983,(7) and December 21, 1983.(8) The PSI Program was evaluated by the staff in the Supplemental Safety Evaluation Report (SSER) issued March 22, 1984.(9) PP&L agreed to abide by certain augmented Preservice and Inservice license conditions in letters of September 15, 1981,(10) December 29, 1981,(11) and May 3, 1982,(12) and the Final Safety Analysis Report (FSAR) Section 6.6.8.(13) A letter of February 28, 1985,(14) transmitted the First Interval ISI Program. A request for additional information was sent to the licensee February 4, 1986,(15) and PP&L responded August 12, 1986.(16) References 14 and 16 provided the basis for this report.

2. EVALUATION OF INSERVICE INSPECTION PLAN

2.1 Introduction

The approach being taken in this evaluation is to review the applicable program documents to determine the adequacy of their response to Code requirements and any license conditions pertinent to ISI activities. The rest of this section describes the submittals reviewed, the basic requirements of the effective Code and the appropriate preservice inspection commitments. The results of the review are then described. Finally, conclusions and recommendations are given.

2.2 Documents Evaluated

A chronology of documents on Susquehanna Unit 2 is given in Section 1 of this report. Those documents that impact this evaluation are (1) the latest revision of the Inservice Inspection Program submitted by PP&L February 28, 1985,[14] and the response to the staff request for additional information dated August 12, 1986;[16] (2) references 10 through 12 and portions of the Susquehanna Unit 2 FSAR;[13] and (3) portions of the SSER.[9]

2.3 Summary of Requirements

The requirements on which this review is focused include the following:

(1) Compliance with Applicable Code Editions. The Inservice Inspection Program shall be based on the Code editions defined in 10 CFR 50.55a(g)(4) and 10 CFR 50.55a(b). The licensee for Susquehanna Unit 2 has written the program to the 1980 Edition with addenda through the Winter of 1981. These Code requirements are summarized in 2.3.1 below and detailed Code requirements are given in Appendix A. The 1974 Edition, Summer 1975 Addenda is to be used for selecting Class 2 welds in systems providing the functions of residual heat removal, emergency core cooling, and containment heat removal. This is a requirement of 10 CFR 50.55a(b)(2)(iv)(A).

(2) Acceptability of the Examination Sample. Inservice volumetric, surface, and visual examinations shall be performed on ASME Code Class 1, 2, and 3 components and their supports using sampling schedules described in Section XI of the ASME Code and 10 CFR 50.55a(b). Sample size designations are identified as part of the Code requirements given in Appendix A.

(3) Exclusion Criteria. The criteria used to exclude components from examination shall be consistent with IWB-1220, IWC-1220, IWD-1220, and 10 CFR 50.55a(b).

(4) PSI Commitments. The Inservice Inspection Program should address all license conditions, qualified acceptance conditions, and other ISI-related commitments prescribed by the Safety Evaluation Report, its supplements, or by NUREG requirements.

2.3.1 Code Requirements

The following requirements are summarized from the 1980 Edition of Section XI with Addenda through Winter 1981. Many requirements call for inspection of all areas while other requirements are based on criteria such as representative percentage, components examined under other categories, material thickness, location relative to other welds or discontinuities, and component function and construction. For detailed requirements, see Appendix A of this report or the Code itself.

2.3.1.1 Class 1 Requirements. The following Class 1 components are to be examined in the first interval in accordance with Table IWB-2500-1:

(1) Pressure Retaining Welds in the Reactor Vessel

(2) Pressure Retaining Partial Penetration Welds in Vessels Other than Reactor Vessels

(3) Full Penetration Welds of Nozzles in Vessels (Inspection Program B)

(4) Pressure Retaining Partial Penetration Welds in Vessels

(5) Pressure Retaining Dissimilar Metal Welds

(6) Pressure Retaining Bolting, Greater than 2 in. Diameter

(7) Pressure Retaining Bolting, 2 in. and Less in Diameter

(8) Integral Attachments for Vessels

(9) Pressure Retaining Welds in Piping

(10) Integral Attachments for Piping, Pumps, and Valves

(11) Pump Casings and Valve Bodies, including Pressure Retaining Welds

(12) Interior of Reactor Vessel, including Integrally Welded Core Support Structures, Interior Attachments, and Removable Core Support Structures

(13) Pressure Retaining Welds in Control Rod Housings

(14) All Pressure Retaining Components - Pressure Tests

(15) Steam Generator Tubing.

2.3.1.2 Class 2 Requirements. The following Class 2 components are to be examined in the first interval in accordance with Table IWC-2500-1:

(1) Pressure Retaining Welds in Pressure Vessels

(2) Pressure Retaining Nozzle Welds in Vessels

(3) Integral Attachments for Vessels, Piping, Pumps, and Valves

(4) Pressure Retaining Bolting Greater than 2 in. Diameter

(5) Pressure Retaining Welds in Piping

(6) Pressure Retaining Welds in Pumps and Valves

(7) All Pressure Retaining Components - Pressure Tests.

2.3.1.3 Class 3 Requirements. The following Class 3 reactor-connected and associated systems are to be examined in the first interval in accordance with IWD-2500-1:

(1) Systems in Support of Reactor Shutdown Function

(2) Systems in Support of Emergency Core Cooling, Containment Heat Removal, Atmosphere Cleanup, and Reactor Residual Heat Removal

(3) Systems in Support of Residual Heat Removal from Spent Fuel Storage Pool.

2.3.1.4 Component Supports. The following component supports are to be examined in the first interval in accordance with IWF-2500-1:

(1) Plate and Shell Type Supports

(2) Linear Type Supports

(3) Component Standard Supports.

2.3.2 Preservice Inspection Commitments

In References 10 through 13, PP&L committed to augmented preservice and inservice examinations needed to comply with NUREG-0803 (integrity of BWR scram system piping),[17] NUREG-0313 (material selection and processing guidelines for BWR coolant pressure boundary piping),[18] and NUREG-0619 (BWR feedwater nozzle and control rod drive return line nozzle cracking).[19]

2.4 Compliance with Requirements

2.4.1 Applicable Code Edition

PP&L has developed and implemented an Inservice Inspection Program using the 1980 Edition through Winter 1981 Addenda of Section XI, ASME Code subject to the limitations and modifications listed in Section 50.55a(b) of 10 CFR Part 50. The latest edition and addenda of the Code incorporated in 50.55a(b) on the date 12 months before the date of issuance of the operating license on March 23, 1984,* was the 1980 Edition through Winter 1981 Addenda.

2.4.2 Code Requirements

The first interval program of record (exclusive of pump and valve testing) is contained in Revision 0 submitted on February 28, 1985.[14] The program, including its attachments, was reviewed and determined to be acceptable. We have determined the following:

The Inservice Inspection Program for Susquehanna Steam Electric Station Unit 2 ISI-T-206, Rev. 0[14] identifies appropriate Code classes for each component of the power plant.

The design of the Code Class 1 components of the reactor coolant pressure boundary in Susquehanna incorporates provisions for access for inservice examination in accordance with Section XI of the ASME Code. Methods have been developed to facilitate the remote examination of most areas of the reactor vessel not readily accessible to examination personnel. Some design and access provisions could not be met and specific requests for relief were submitted and are evaluated in Section 3 of this report. SAIC's technical evaluation has not identified any practical method by which Susquehanna Unit 2 can meet all the specific inservice inspection requirements of Section XI of the ASME Code. Thus, relief has been recommended where appropriate.

Examination instructions and procedures, including diagrams or system drawings identifying the extent of areas of components subject to examination, have been prepared. They are listed in the ISI program component tables, cross-referenced to weld and hanger isometrics and component identification drawings, and marked on Pipe and Instrument Drawings (P&IDs).

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*NUREG-0871[20] and NUREG-0020[21] give a full power license date of June 28, 1984. (The applicable Code edition is the same regardless of the March or June date.)

Examinations and tests are to be performed and evaluated and the results recorded providing a basis for evaluation and comparison with the results of subsequent examinations as required by Code.

Visual, surface, and volumetric examinations are defined as specified by Code.

Exemptions from examination meet Code specifications IWB-1220, IWC-1220, IWD-1220, IWC-5222(d), and IWC-5223(d).

The inspection intervals identified by the Inservice Inspection Program[14] comply with IWA-2420, IWB-2412, and IWC-2412 Program B. System pressure tests are performed to IWA-5000 and replacements to IWA-7000.

Examination requirements, methods, acceptance standards, inspection intervals, deferrals, the selection of items to be examined, the number of items to be examined, and the examination fraction of each weld inspected meet the requirements of Tables IWB-2500-1, IWC-2500-1, IWD-2500-1, and IWF-2500-2, or relief from Code as noted below has been requested and acceptable alternatives provided.

The licensee is required by 10 CFR 50.55a(b)(2)(iv) to use the 1974 Edition, Summer 1975 Addenda to select Class 2 welds in systems providing the functions of residual heat removal, emergency core cooling, and containment heat removal. He has the option to use this Code version to determine the extent of examination for other Category C-F Class 2 pipe welds and for Category B-J Class 1 pipe welds. In Section 2 of his program, the licensee has committed to using the 1974 S75 Code for Class 2 pipe welds in the three required systems.

2.4.3 License Conditions

Additional augmented examinations needed to comply with the requirements in References 17 through 19 (see Section 2.3.2) have been appended to the Inservice Inspection program for Susquehanna Unit 2 ISI-T-207.0.[14] The components to be examined and examination procedures, including diagrams or system drawings identifying the extent of areas of components subject to examination, have been prepared. They are listed in component tables, cross-referenced to weld and hanger isometrics and component identification drawings, and marked on Pipe and Instrument Drawings (P&IDs).

2.5 Conclusions and Recommendations

Based on the foregoing, we have determined that the ISI program proposed by Pennsylvania Power and Light Company for Susquehanna Unit 2 for the first 120-month inspection interval meets the applicable Code.

Specific requests for relief are addressed in the following section.

3. REQUESTS FOR RELIEF FROM ASME CODE SECTION XI EXAMINATION REQUIREMENTS

The licensee requested relief from specific inservice requirements for Susquehanna Unit 2 in the Inservice Inspection program submitted as PP&L Procedure ISI-T-207, Rev. 0,[14] which was issued with a letter of February 28, 1985. The program included nine relief requests. The following sections evaluate these pending relief requests.

Where relief is recommended in the following report section, it is done so on the assumption that the proposed alternative examination and all applicable Code examinations for which relief has not been requested will be performed on the subject component. Where additional examinations beyond proposed alternatives and Code requirements are deemed necessary, these are included as conditions for recommending relief.

The material included in the paragraphs titled Code Relief Request, Proposed Alternative Examination, and Licensee's Basis for Requesting Relief is quoted directly from the relief request except for minor editorial changes such as removing references to figures and tables not included in this report.

3.1 CLASS 1 COMPONENTS

Subsections IWA and IWB of the Code govern the examination of Class 1 piping and components. Specific requirements are given in Table IWB-2500-1.

3.1.1 Reactor Vessel

3.1.1.1 Relief Request 2RR-9, Circumferential and Longitudinal Reactor Shell Weld Examination, Category B-A, Items B1.11 and B1.12

Code Requirement

All pressure-retaining circumferential and longitudinal shell welds in the reactor vessel shall be volumetrically examined in accordance with Figures IWB-2500-1 and -2 over essentially 100% of their lengths during the first inspection interval. Examinations may be performed at or near the end of the interval.

Code Relief Request

PP&L requests a partial relief from the Section XI examination requirements for weld seams AD, BK, and BM due to plant design.

Proposed Alternative Examination

The remote automated equipment has been modified to accommodate a special 45-degree wedge to increase examination coverage on weld AD (80% coverage of weld AD includes an additional scan with the special 45-degree wedge). No alternative examination provisions can be specified for welds BK and BM.

Licensee's Basis for Requesting Relief

An RPV insulation support steel ring girder is located from approximately 8.25 to 10 inches above weld AD, thereby limiting the available scan path for inspection of weld AD and precluding access to portions of welds BK and BM. Due to obstruction, approximately 20% of weld AD and 78% of welds BK and BM cannot be examined by manual or remote automatic inspection techniques.

The justification for requesting relief from ASME Section XI requirements is as follows:

(1) Plant modification to provide adequate access for the inspection is impractical and imposes undue hardship in the form of extensive plant modification and ALARA exposure.

(2) The accessible areas of the weld and required examination volume shall be examined to provide evidence of continued integrity.

(3) A Class 1 system leakage test is required each refueling outage; system hydrotest is required each inspection interval.

Evaluation

The RPV insulation support steel ring girder limits the available inspection scan path of weld AD to about 80% of the weld length using a special 45-degree wedge. It also limits the available inspection scan path of welds BK and BM to 22% of the length of each weld. One hundred percent of circumferential welds AA, AB, AC, AE, AF, and longitudinal welds BA, BB, BC, BD, BE, BF, BG, BH, BJ, BL, BN, and BP can be examined. Thus, 97% of the total length of all circumferential welds and 89% of the total length of all longitudinal welds can be examined. The examination of the reactor shell welds to the extent practical provides significant evidence of the structural integrity of reactor vessel welds. Also the Class 1 system leakage test required each refueling outage and system hydrotest required each inspection interval give assurance that the system remains safe since they would provide initial evidence of seepage from a through-wall perforation.

The inability to examine a small percentage of the total length of the shell welds (and any resulting impact on safety assurance) is not sufficient justification for increased ALARA exposure, cost of plant downtime, and cost of modifying the insulation support steel ring girder.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, adherence to the Code requirements is impractical. It is further concluded that the proposed examination will provide necessary assurance of structural reliability during this interval. Therefore, relief is recommended as requested.

References

Reference 14.

3.1.1.2 Relief Request 2RR-5, Class 1, Full Penetration Welds of Nozzles in Vessels, Category B-D, Item B3.90

Code Requirements

All nozzle-to-vessel welds in the reactor vessel shall be volumetrically examined in accordance with Figure IWB-2500-7(a) through (d) during the first interval of operation. The nozzle-to-vessel weld and adjacent areas of the nozzel and vessel are included. At least 25% but not more than 50% (credited) of the nozzles shall be examined by the end of the first inspection period and the remainder by the end of the inspection interval. If examinations are conducted from inside the component and the nozzle weld is examined by straight beam ultrasonic method from the nozzle bore, the remaining examinations required to be conducted from the shell may be performed at or near the end of each inspection interval.

Code Relief Request

Relief is requested from volumetrically examining 100% of the required volume of feedwater inlet nozzles N4A and N4D.

Proposed Alternative Examination

The areas identified will be manually examined to the extent possible. Additionally, these nozzles will be visually examined each refueling outage during the leakage tests and each interval during the hydrostatic pressure test.

Licensee's Basis for Requesting Relief

Susquehanna Unit-2 has two feedwater inlet nozzles, N4A and N4D, which cannot be completely examined. The close proximity of nozzles N11A and N11B to the subject feedwater nozzles precludes complete examination of the nozzle-to-vessel weld. The spacing of 4.5 in. between the nozzles does not permit automatic examination of approximately 60 degrees of the subject welds.

The basis for this relief request is predicated upon the following:

(1) The excluded area represents only 16.67 percent of the seam, the remainder can be completely examined.

(2) The four remaining nozzles of the same configuration and service can be completely examined.

Evaluation

Two welds are not completely accessible. As noted, 83.33 percent of each weld can be examined using automated equipment. In response to questions, the licensee has indicated that 50 to 60% of the area missed can be manually examined (or about 8.34%). Thus, about 92% of each weld can be examined, which is essentially a full evaluation of each weld. All the other nozzles will be tested as required. Visual examination during system leakage testing and during the hydrostatic pressure testing would give added assurance of the integrity of nozzles N4A and N4D since it would provide initial evidence of seepage from a through-wall perforation.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, adherence to the Code requirements is impractical. It is further concluded that the proposed examination will provide necessary assurance of structural reliability during this interval. Therefore, relief is recommended as requested.

References

Reference 14.

3.1.2 Piping Pressure Boundary

3.1.2.1 Relief Request 2RR-8, Class 1 Pressure Retaining Welds in Piping Examination Selection, Category B-J, Items B9.10, B9.20, B9.30, and B9.40 (Items B4.5, B4.6, B4.7, and B4.8 of 74S75)

Code Requirement

Pursuant to 10 CFR 50.55a(b)(2)(ii), PP&L has chosen to use the 1974 Edition, Summer 1975 Addenda for Class 1 weld selection. This Code version requires examination of longitudinal and circumerential welds and base metal for one wall thickness beyond the edge of the weld. Longitudinal welds shall be examined for at least 1 ft from the intersection with the edge of the circumferential weld selected for examination. For pipe branch connections, the areas shall include the weld metal, the base metal for one pipe wall thickness beyond the edge of the weld on the main pipe run, and at least 2 in. of the base metal along the branch run.

The examinations performed during each inspection interval shall cover all of the area of 25% of the circumferential joints including the adjoining 1 ft sections of longitudinal joints and 25% of the pipe branch connection joints. A different 25% is to be examined each interval.

The 1980 W81 Code requires a volumetric and surface examination in accordance with Figure IWB-2500-8 of longitudinal and circumferential welds in pipes 4 in. or larger. For pipes smaller than 4 in., only a surface examination is required. For branch connection welds in pipe 4 in. or larger, a surface and volumetric examination is required in accordance with Figures IWB-2500-9, -10, and -11. For pipes smaller than 4 in., only a surface examination is required. For socket welds, a surface examination in accordance with Figure IWB-2500-8 is required.

Code Relief Request

Relief is requested from the requirements of Tables IWB-2500 and IWB-2600 of the 1974 Summer 1975 Code in the following areas:

(1) It is unclear whether inspection schedule requirements are to be taken from the 1974 Edition through and including the Summer 1975 Addenda or later editions, and

(2) Table IWB-2600 specifies examination methods which have since been changed in later Code editions and addenda to methods more appropriate for the component being examined (e.g., ultrasonic examination vs. surface examination for small pipe welds and thin wall pipe).

Proposed Alternative Examination

(1) Class 1 welds will be selected based on the following focused selection guidelines. The welds initially selected will be reexamined during subsequent inspection intervals.

(a) terminal ends in pipe or branch runs connected to the reactor vessel (pipe-to-safe end welds);
(b) terminal ends at the reactor coolant pump;
(c) terminal ends at containment penetrations;
(d) terminal ends at pipe support anchors;
(e) welds with a cumulative usage factor greater than 0.4;
(f) welds with the highest stress intensity ratio.

It is important to note that this is guidance and not mandatory weld selection criteria. Deviations from these guidelines may be necessary to avoid selecting the same corresponding weld on each loop of a multiple loop system, and to avoid selecting numerous welds adjacent to one another. In addition, welds that are inaccessible and/or are of such design that meaningful ultrasonic data is not possible will not be selected.

(2) Class 1 welds will be examined per the examination requirements found in Examination Category B-J, of Table IWB-2500-1, of the 1980 Edition with Winter 1981 Addenda.

Specifically, the selections were based on the following criteria:

(1) The extent of examination/schedule was determined from the 1974 Edition, Summer 1975 Addenda of the Code. That is, "25% of the circumferential joints, including the adjoining... longitudinal joints and 25% of... branch connection joints" were selected for examination over the ten-year interval.

(2) The number of welds to be examined were determined on a per system basis using totals per item number within Category B-J.

(3) Weld totals do not include dissimilar metal weld joints. These welds are included for examination under Code Category B-F, Item numbers B5.130 and B5.140.

(4) Longitudinal seam welds were selected concurrent with the selection of an intersecting circumferential weld.

(5) Requirements other than extent and schedule, such as examination methods and examination requirements, were specified per Table IWB-2500-1 of the 1980 Edition, Winter 1981 Addenda of the Code.

Licensee's Basis for Requesting Relief

(1) Since 10 CFR 50.55a(b)(2)(ii) does not specifically reference the use of paragraph IWB-2420(c), it is uncertain what requirements are to be applied. Relief is being requested to utilize the provisions of Table IWB-2500-1, Note #2 of the 1980 Edition through and including the Winter 1981 Addenda. This note states that the welds initially selected for examination during the first interval shall be reexamined during subsequent intervals.

Reexamination of the same welds, combined with a focused weld selection (whereby welds are selected that have a higher probability of failure than others) is more likely to detect incipient generic defects.

In addition, examination of the same welds each inspection interval permits meaningful data trending not possible when different welds are being examined each interval.

(2) By utilizing the Class 1 weld examination methods from the 1980 Edition through and including the Winter 1981 Addenda, a more conservative overall approach is taken.

The only exception is for piping greater than 1 in. NPS and less than 4 in. NPS where a surface examination is specified as opposed to a volumetric examination. Attempting to perform volumetric examinations on these welds is impractical due to weld configuration and/or wall thickness.

All other examination methods are either more conservative or the same between the two Code years.

PP&L chose the 1974 Edition, Summer 1975 Addenda of the Code for selection of Class 1 Category B-J welds which basically requires examination of a random 25% sample of welds. To technically enhance this random selection, PP&L utilized the guidelines for weld selection as provided. This criteria was modeled after that provided in the 1980 Edition, Winter 1981 Addenda of the Code, with some added flexibility to allow for inaccessible welds and skews in the sample toward one type of weld at the cost of excluding others. Examples of this include the selection of an alternate weld if a certain weld meeting the criteria is totally inaccessible for examination or in systems with multiple similar design terminal ends (e.g., 12 pipe-to-safe end welds in the Reactor Recirculation System) and only a sample of terminal ends is selected.

These guidelines are not an exception to the 1974 Edition, Summer 1975 Addenda; the guidelines were established to provide a more technically based "random" selection.

Reference 14 provides a listing of all Category B-J welds selected for examination this interval and indicates the potential for relief based on PSI examination results. This is not a formal request for relief. Examination methods and requirements have changed significantly from the PSI Code (1974 Edition, Summer 1975 Addenda) to the ISI Code (1980 Edition, Winter 1981 Addenda); therefore, a quantitative assessment of examination coverage is best obtained during actual performance of the examination. Actual relief requests will be submitted throughout the interval.

Evaluation

When the option to determine the extent of examination using the 1974 Edition, Summer 1975 Addenda (10 CFR 50.55a(b)(2)(ii)) is exercised, the extent of examination should be taken from Table IWB-2600 and the schedule from IWB-2420(c). Requirements other than extent and schedule are to be taken from Table IWB-2500-1 of the applicable Code version (here, the 1980 Edition, Winter 1981 Addenda).

PP&L has stated its intention to use the 1974 Summer 1975 Code for selection of Category B-J welds. A review of the proposed program indicates that the licensee is in full compliance with the 1974 Summer 1975 Code for this, the first interval. Reference 14 provides a listing of all Category B-J welds selected for examination this interval and indicates the potential for relief based on PSI examination results. Although this list provides preliminary information, it appears that few welds will require relief requests. The licensee has committed to provide relief requests for all welds found impractical to examine this interval.

The licensee has stated that the weld sample initially selected for examination will be reexamined over the life of the plant, which is contrary to the requirements of IWB-2420(c) in the 1974 Summer 1975 Code. The 1980 Edition, Winter 1981 Code allows a focused weld selection and reexamination of the same welds over the life of the plant. However, the licensee's proposed selection criteria differs from the 1980 Winter 1981 Code in two important aspects: the licensee does not propose to examine all required terminal ends as required by Note 1(a) of Table IWB-2500-1 and has replaced the criteria of Note 1(b)(1) with criterion (f). Criterion (f) states that the welds with the highest stress intensity ratio will be examined. The licensee does not state what method will be used to determine stress ratios. It is therefore not clear that the licensee's proposed focused selection will provide necessary assurance of structural integrity if the same welds are reexamined over the life of the plant.

Since the licensee is meeting the requirements for extent of examination from the 1974 Summer 1975 Code for this interval, relief is not necessary. However, relief will have to be requested and justification provided in subsequent intervals if PP&L still does not intend to examine a different weld sample as required by IWB-2420(c) in the 1974 Summer 1975 Code.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that the licensee is meeting the 1974 summer 1975 Code requirements for this interval for Category B-J welds. Therefore, relief is not necessary and should not be granted. As acknowledged by the licensee, he will need to submit specific relief requests for all welds found impractical to examine this interval.

References

References 14 and 16.

3.1.3 Pump Pressure Boundary

3.1.3.1 Relief Request 2RR-1, Class 1 Reactor Recirculation Pump Internals, Category B-L-2, Item B12.20

Code Requirement

The internal surfaces of at least one pump in each group performing similar functions in the system (e.g., recirculating coolant pumps) shall be visually examined (VT-3) during each inspection interval. The examination may be performed on the same pump selected for volumetric examination of welds. The examinations may be performed at or near the end of the inspection interval.

Code Relief Request

Relief is requested from the visual examination of the internal surfaces of the reactor recirculation pump at the pressure boundary.

Proposed Alternative Examination

It is not felt that the visual examination required by Code each ten-year interval is warranted. However, as standard maintenance practice dictates, when a recirculation pump is disassembled for maintenance, a VT-3 examination of the internal casing pressure boundary surfaces will be performed. The pump maintenance procedure will address the need for this examination while the pump is disassembled.

Licensee's Basis for Requesting Relief

The basis for this relief request is predicated on the following two points:

(1) The hardships associated with pump disassembly far exceeds the beneficial safety improvements that might be achieved by such an examination, and

(2) the structural integrity afforded by the pump casing material utilized will not significantly degrade over the lifetime of the pump.

It is expected that approximately 1000 man-hours and 50 man-rem exposure would be required to disassemble, inspect, and reassemble one pump. Performing this visual examination under adverse conditions such as high dose rate (30-40 R/hr) and poor as-cast surface condition, realistically, provides little additional information as to the pump casing integrity.

The recirculation pump casing material, cast stainless steel (ASTM A351-CF-8), is widely used in the nuclear industry and has performed extremely well. The presence of some delta ferrite (typically 5% or more) imparts substantially increased resistance to intergranular stress corrosion cracking. The delta ferrite also results in improved pitting corrosion resistance in chloride containing environments.

PP&L feels that adequate safety margins are inherent in the basic pump design and that the health and safety of the public will not be adversely affected by performing the visual examination of the pump internal pressure boundary surfaces only when the pumps are required to be disassembled for maintenance.

Evaluation

The visual examination is to determine whether unanticipated severe degradation of the casing is occurring due to phenomena such as erosion, corrosion, or cracking. However, previous experience during examinations of pumps at other plants has not shown any significant degradation of casings.

The disassembly of reactor recirculation pumps to the degree necessary to inspect the internal pressure retaining surfaces is a major effort, involving large personnel exposures and the generation of large amounts of radioactive waste. In view of the effort required to disassemble a pump, the information returned from visual examination of its internal surfaces would be marginal.

The licensee has committed to the concept of visual examination if a pump is disassembled for maintenance. Meanwhile, severe degradation of the pump internal surfaces would be detected through monitoring of pressure and flow as required by IWP.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, adherence to the Code requirements is

impractical. It is further concluded that the proposed examination will provide necessary assurance of structural reliability during this interval. Therefore, relief is recommended as requested.

References

Reference 14.

3.1.4 Valve Pressure Boundary

3.1.4.1 Relief Request 2RR-2 Class 1 Valves Exceeding 4 Inches Nominal Pipe Size, Category B-M-2, Item B12.50

Code Requirement

The internal surfaces of at least one valve in each group of valves that exceed 4-inch diameter with the same construction design (e.g., globe, gate, or check valve) and manufacturing method that perform similar functions in the system (e.g., containment isolation and system overpressure protection) shall be visually examined (VT-3) during each inspection interval. The examination may be performed on the same valve selected for volumetric examination of welds. The examinations may be performed at or near the end of the inspection interval.

Code Relief Request

Relief is requested from the visual examination of the internal surfaces at the pressure boundary of Class 1 valves exceeding 4-inch diameter nominal pipe size.

Proposed Alternative Examination

When a valve within a particular valve grouping is disassembled for maintenance purposes, the internal pressure boundary surface of that valve body will be examined to meet the Section XI requirement for that group of valves. The valve maintenance procedure will address the need for this examination.

Licensee's Basis for Requesting Relief

The Susquehanna Unit 2 Class 1 systems contain 57 valves which are greater than 4 inch nominal pipe size. These valves vary in size, design, and manufacturer but are all manufactured from either cast or forged stainless steel or carbon steel. None of the valve bodies are welded.

The requirement to disassemble primary system valves for the sole purpose of performing a visual examination of the internal pressure boundary surfaces has only a very small potential of increasing plant safety margins and a very disproportionate impact on expenditures of plant manpower and radiation exposure.

Performing these visual examinations on poor as-cast surfaces provides little additional information as to the valve body integrity.

Since these examinations must be performed whether or not the valves have to be disassembled for maintenance, this requirement is considered impractical.

For approximately 20% of these valves, the reactor vessel core must be completely unloaded and the vessel drained to permit disassembly for examination.

The performance of both carbon and stainless cast and forged valve bodies has been excellent in all BWR applications. Based on this experience and both industry and regulatory acceptance of these alloys, continued excellent service performance is anticipated.

A more practical approach that would essentially provide an equivalent sampling program and significantly reduced radiation exposure to plant personnel is to inspect the internal pressure boundary of only those valves that require disassembly for maintenance purposes. This would still provide a reasonable sampling of primary system valves and give adequate assurance that the integrity of these components is being maintained.

Evaluation

The disassembly of large valves to the degree necessary to examine the internal pressure retaining surfaces is a major effort involving large personnel exposures. To do this disassembly solely to perform a visual examination of the internal body is impractical.

The licensee has committed to visually examining the valve if it is disassembled for maintenance. The visual examination specified is to determine whether anticipated severe degradation of the body is occurring due to phenomena such as erosion or corrosion.

Visual examinations for leakage during the system pressure tests (IWA-5000) conducted in accordance with the requirements for Category B-P will provide confidence in the integrity of the valve bodies since they would provide initial evidence of seepage from a through-wall perforation.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the valves discussed above, adherence to the Code requirements is impractical. It is further concluded that the proposed examination will provide necessary assurance of structural reliability during this interval. Therefore, relief is recommended as requested.

References

Reference 14.

3.2 CLASS 2 COMPONENTS

Subsections IWA and IWC of the Code govern the examination of Class 2 piping and components. Specific requirements are given in Table IWC-2500-1.

3.2.1 Piping Pressure Boundary

3.2.1.1 Relief Request 2RR-3, Class 2 Pipe Welds, Category C-F, Items C5.10, C5.20, and C5.31 (Categories C-F and C-G, Items C2.1, C2.2, and C2.3 in 74S75)

Code Requirements

Pursuant to 10 CFR 50.55a(b)(2)(iv)(B), PP&L has elected to use the 1974 Edition, Summer 1975 Addenda to determine the extent of examination for all Class 2 piping.

74S75, Category C-F, Items C2.1, C2.2, and C2.3:

The following pressure-retaining weld areas in piping, pumps, and valves in systems circulating reactor coolant shall be volumetrically examined over 100% of their lengths:

(a) circumferential butt welds at structural discontinuities,

(b) circumferential butt welds in piping within 3 pipe diameters of the centerline of rigid pipe achors, or anchors at the penetration of the primary reactor containment, or at rigidly anchored components,

(c) longitudinal weld joints in pipe fittings (i.e., in tees, elbows, and reducers),

(d) branch connection weld joints,

(e) pump casing and valve body weld joints.

This includes the weld metal and base metal for one wall thickness beyond the edge of the weld.

74S75, Category C-G, Items C2.1, C2.2, and C2.3:

For systems circulating other than reactor coolant, the corresponding requirements are the same as for Category C-F except the areas selected shall be a representative 50% sampling among the total number of welds covered by (a) to (e) above.

74S75, IWC-1220, Exempted Components:

The following components may be exempted from the examination requirements of IWC-2520:

(a) Components in systems where both the design pressure and temperature are equal to or less than 275 psig and 200°F, respectively.
(b) Components in systems or portions of systems, other than emergency core cooling systems, which do not function during normal reactor operation.
(c) Components which perform an emergency core cooling function, provided the control of the chemistry* of the contained fluid is verified by periodic sampling and test.
(d) Component connections, piping, and associated valves, and vessels (and their supports), that are 4 in. nominal pipe size and smaller.

74S75 IWC-2411, Nondestructive Examination:

(e) The required examinations assigned to the components in each stream of the system shall be completed by the end of the service lifetime, but divided among the number of inspection intervals.

80W81, Category C-F, Items C5.10, C5.20, and C5.31:

One hundred percent of each circumferential weld over 1/2 in. nominal wall thickness shall be surface and volumetrically examined in accordance with Figure IWC-2500-7 during each inspection interval. Longitudinal welds over 1/2 in. nominal wall thickness are to be surface and volumetrically examined in accordance with Figure IWC-2500-7 (2.5t at the intersecting circumferential weld) during each inspection interval. Circumferential and longitudinal welds 1/2 in. or less require only a surface examination. One-hundred percent of each circumferential branch connection weld over 4 in. nominal wall thickness shall be surface examined in accordance with IWC-2500-9 through -13.

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*The control of fluid chemistry is intended to minimize corrosive effects, particularly stress corrosion.

80W81, IWC-1220, Components Exempt From Examination:

The following components shall be exempted from the inservice examination requirements of IWC-2500.

(a) Components of systems or portions of systems that during normal plant operating conditions are not required to operate or perform a system function but remain flooded under static conditions at a pressure of at least 80% of the pressure that the component or system will be subjected to when required to operate.

(b) Components of systems or portions of systems, other than Residual Heat Removal Systems and Emergency Core Cooling Systems, that are not required to operate above a pressure of 275 psig (1900 kPa) or above a temperature of 200°F (93°C).

(c) Component connections (including nozzles in vessels and pumps), piping and associated valves, and vessels and their attachments that are 4 in. nominal pipe size and smaller.

80W81, IWC-2420, Successive Inspections:

(a) The sequence of component examinations established during the first inspection interval shall be repeated during each successive inspection interval, to the extent practical.

Code Relief Request

Relief is requested from the following Code requirements:

(1) Paragraph IWC-1220 in the 1974 Edition through and including the Summer 1975 Addenda of ASME Section XI defines the components that may be exempted from the examination requirements of IWC-2520.

(2) Paragraph IWC-2411(e) in the 1974 Edition through and including the Summer 1975 Addenda of ASME Section XI indicates that the required examinations assigned to the components in each stream of the system shall be completed by the end of the service lifetime.

In lieu of the above, PP&L proposes to upgrade these specific Code sections to the corresponding Code requirements found in the 1980 Edition through and including the Winter 1981 Addenda of ASME Section XI.

Proposed Alternative Examination

To facilitate preparation/implementation of the ISI program for Class 2 welds, the extent of examination for all Class 2 welds, both inside and outside of the RHR, ECCS, and CHR systems was determined in accordance with the 1974 Edition, Summer 1975 Addenda of the Code. The selection basis is illustrated below:

(1) The exemption criteria, IWC-1220, for ISI Class 2 pressure retaining piping welds will be taken from ASME Section XI, 1980 Edition through and including the Winter 1981 Addenda.

(2) The extent of examination for ISI Class 2 piping welds is defined such that the welds initially selected for examination during the first inspection interval shall be reexamined during each subsequent inspection interval.

(3) Weld Quantity Determination: The quantity of Class 2 welds to be examined in the first 10-year interval is determined by application of the following steps:

(a) Determine which portions of Class 2 systems are single stream vs. multiple stream (piping lines of the same size, geometry, and function that perform redundant functions).

(b) For multiple streams, the average number of welds per stream is the "equivalent of one loop."

(c) In systems which circulate reactor coolant, 25% of the welds on a single stream or the equivalent of one loop shall be selected for examination in accordance with the guidance provided in (2).

(d) In systems which circulate other than reactor coolant, 12.5% of the welds on a single stream or the equivalent of one loop shall be selected for examination in accordance with the guidance provided in (2).

Pipe-to-pipe welds that are at structural discontinuities and dissimilar metal pipe-to-pipe welds shall be included in the weld total. All other pipe-to-pipe welds shall not be included.

(4) Specific Weld Selection Guidance: Once the quantity of welds is determined, specific weld selections will be made from among the following:

(a) Welds at locations where the stresses under the loadings resulting from Normal and Upset plant conditions as calculated by the sum of Eqs. (9) and (10) in NC-3652 exceed $0.8\ (1.2S_n + S(A))$;

(b) Each type of terminal end in each system will be selected. In the Core Spray System, for example, there is a total of eight terminal ends corresponding to the suction and discharge attachment welds on each pump. Examining all eight terminal ends would be redundant and skew the examination sample to those particular welds. A more meaningful examination program would result from selecting one pump suction and one pump discharge terminal end for examination.

Terminal ends are identified at system anchor points, vessel and pump connections, and containment penetrations.

(c) All dissimilar metal welds will be selected.

(d) Additional welds at structural discontinuities will be selected to achieve the required percentages identified in Section (1). These random welds shall be the higher stress welds that remain to be selected which are not located adjacent to welds selected under a, b, and c above.

Examinations will be performed per the examination requirements of Table IWB-2500-1, Examination Category C-F of the 1980 Code Edition through and including the Winter 1981 Addenda, excluding footnote 1.

Licensee's Basis for Requesting Relief

(1) Certain exemption criteria in ASME Section XI, 1974 Edition through and including the Summer 1975 Addenda paragraph IWC-1220, do not have a sound technical basis. More recent Edition and Addenda of the Code provide updated exemption criteria. PP&L will exempt ISI Class 2 pressure retaining welds based on the exemption criteria provided in the proposed alternative section of this relief request.

(2) ASME Section XI, 1977 Edition through and including the Summer 1978 Addenda to the present (Summer 1983 Addenda) has incorporated requirements for focused weld selection. The purpose of focused weld selection is to examine a group of welds most likely to develop indications. This group of welds is examined during the first interval and reexamined during subsequent intervals. The requirement of paragraph IWC-2411(e), 74S75, is impractical because the superior technical approach of focused weld selection cannot be implemented. Per IWC-2411(e), 74S75, a different group of welds must be examined each interval.

Reference 14 provides a listing of all Class 2 welds selected for examination this interval and indicates the potential for relief based on PSI examination results. This is not a formal request for relief. Examination methods and requirements have been revised significantly from the PSI Code (1974 Edition, Summer 1975 Addenda) to the ISI Code (1980 Edition, Winter 1981 Addenda); therefore, a quantitative assessment of examination coverage is best obtained during actual performance of the examination. Actual relief requests will be submitted throughout the interval.

Evaluation

The regulation (10 CFR 50.55a(b)(2)(iv)(A)) is specific in its requirement that the extent of examination of Category C-F welds in the Residual Heat Removal (RHR) system, the Emergency Core Cooling (ECC) system, and the Containment Heat Removal (CHR) system shall be determined by the requirements of Paragraph IWC-1220, Table IWC-2520, Categories C-F and C-G, and Paragraph IWC-2411 in the 1974 Edition, Summer 1975 Code. The regulation offers the option for C-F welds outside those systems (10 CFR 50.55a(b)(2)(iv)(B)). When the option to determine the extent of examination of piping welds outside the three required systems using the 1974 Summer 1975 Code is exercised, the extent of examination should be taken from Table IWC-2520 and schedule from IWC-2411(e). Requirements other than extent and schedule are to be taken from Table IWC-2500-1 of the applicable Code version (here, the 1980 Edition, Winter 1981 Addenda).

PP&L has stated its intention to use the 1974 Summer 1975 Code for selection of Category C-F welds. A review of the proposed program indicates that the licensee is in full compliance with the 1974 Summer 1975 Code for C-F welds inside and outside of the three required systems in this, the first interval. Reference 14 provides a listing of all Category C-F welds selected for examination this interval and indicates the potential for relief based on PSI examination results. Although this list provides preliminary information, it appears that few welds will require relief requests. The licensee has committed to provide relief requests for all welds found impractical to examine this interval.

The licensee has stated that the weld sample initially selected for examination will be reexamined over the life of the plant, which is contrary to the requirements of IWC-2411(e) in the 1974 Summer 1975 Code. The 1980 Edition, Winter 1981 Code allows a focused weld selection and reexamination of the same welds over the life of the plant. However, the licensee's proposed selection criteria differs from the 1980 Winter 1981 Code in two important aspects: all terminal ends will not be examined as required by Note 1(b), nor will 50% of all main steam system welds be examined as required by

Note 1(d)(3) for BWRs. It is therefore not clear that the licensee's proposed focused selection will provide necessary assurance of structural integrity if the same welds are reexamined over the life of the plant.

Since the licensee is meeting the requirements for extent of examination from the 1974 Summer 1975 Code for this interval, relief is not necessary. However, relief will have to be requested and justification provided in subsequent intervals if PP&L still does not intend to examine a different weld sample as required by IWC-2411(e) in the 1974 Summer 1975 Code.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that the licensee is meeting the 1974 Summer 1975 Code requirements in this interval for Category C-F welds. Therefore, relief is not necessary and should not be granted. As acknowledged by the licensee, he will need to submit specific relief requests for all welds found impractical to examine this interval.

References

References 14 and 16.

3.2.2 Pump Pressure Boundary

3.2.2.1 Relief Request 2RR-4, Class 2 Pressure Retaining Welds in Core Spray and RHR Pumps, Category C-G, Item C6.10

Code Requirement

One hundred percent of all pump casing welds in each piping run examined under Examination Category C-F shall be surface examined in accordance with Figure IWC-2500-8 during each inspection interval. For multiple pumps of similar design, size, function, and service in a system, only one pump among each group of multiple pumps is required to be examined. The examination may be performed from either the inside or the outside surface.

Code Relief Request

Relief is requested from the examination requirements for the discharge elbow-to-sleeve forging weld and the discharge elbow-to-bottom plate flange weld, and the pump casing welds located below floor elevation 645 ft 0 in.

Proposed Alternative Examination

Those welds on the subject pumps made accessible during pump motor removal or pump disassembly as required for maintenance purposes will be visually (VT-3) examined.

Licensee's Basis for Requesting Relief

Susquehanna Unit 2 has four core spray pumps and four residual heat removal pumps. The primary functions of these pumps are decay heat removal, suppression pool heat removal, and emergency core cooling.

Both the discharge elbow-to-sleeve forging and the discharge elbow-to-bottom plant flange weld are located within the pump casing, thus they are not accessible without removal of the pump motors. Failure of either weld would cause the discharge water to be circulated back to the suction water.

The pump casing welds located below floor elevation 645 ft 0 in. are surrounded by concrete and the pump casing is flooded with water, thus they are not accessible.

The hardships associated with pump motor removal and/or pump disassembly far exceed any beneficial safety improvements that might be achieved by such an examination.

These pumps are subject to testing under IWP. Since each pump is subject to a quarterly test for pressure differential and flow, any loss of integrity of the subject welds would be detected by these tests.

Additionally, the statistical significance to the inspection sampling program will be negligible due to the small number of welds involved.

Evaluation

Since the welds joining the discharge elbows to the sleeve forging and to the bottom plant flange are located within the pump casing, they are within the pressure boundary and examination is not required.

The pump casing welds located below floor elevation 645 ft. 0 in. are surrounded by concrete and the pump casing is flooded with water; thus they are not accessible to external examination. If at any time these pumps are disassembled for maintenance, the inner surfaces of the casing welds can be examined as proposed.

Each pump is subject to a quarterly test for pressure differential and flow as required by IWP; any loss of integrity of the subject welds would be detected by these tests.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the pumps discussed above, it is not necessary to grant relief for the discharge elbow welds because they are located within the pressure boundary.

It is concluded that for the pump casing welds discussed above, adherence to the Code requirements is impractical. It is further concluded that the proposed examination will provide necessary assurance of structural reliability during this interval. Therefore, relief is recommended as requested.

References

Reference 14.

3.3 CLASS 3 COMPONENTS

No relief requests.

3.4 COMPONENT SUPPORTS

3.4.1 Relief Request 2RR-6, Non-Snubber Exemption and Selection Criteria Definition: IWF-1230, IWF-2510

Code Requirements

IWF-1230 Supports Exempt from Examination and Test:

In the course of preparation.

IWF-2510 Supports Selected for Examination:

(a) Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, and IWD during the first inspection interval.

(b) For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

Code Relief Request

The purpose of this relief request is to define the exemptions and selection criteria for component supports that PP&L plans to implement in its first ten-year interval. This request does not pertain to snubber functional testing (IWF-5000).

(1) Exemption. Each subsection of the Code contains a subarticle on the components within the respective class that are exempt from examination. In subsection IWF (component support examination), subarticle IWF-1230 is reserved for the description of support exemptions. This subarticle is still in the course of preparation in the 1980 Edition through and including Winter 1981 and the 1983 Edition. Therefore, it is the utility's responsibility to develop exemption criteria that provide a degree of safety and reliability commensurate with the other subsections of the Code.

(2) Selection Criteria. Examining pipe supports on a statistical sampling basis is being requested to achieve a representative cross-section of all Class 1, 2, and 3 systems, all support types (e.g., snubber, spring, rigid, anchor) and all plant environments. Statistical sampling provides a high degree of confidence in the integrity of all the supports.

Proposed Alternative Examination

(1) Exemption

Component supports shall be exempt from the VT-3 and VT-4 examination requirements as follows:

(a) Class 1 and 2 components which are exempt from surface and volumetric examination in accordance with IWB-1220 and IWC-1220, respectively, of the Code.

(b) Class 3 components which are 4 inch nominal pipe size and smaller in accordance with IWD-1220.1 of the Code.

The component supports exempt from VT-3 and VT-4 examination will not be completely neglected. A visual examination (VT-2) is required on all Class 1, 2, and 3 systems concurrent with a pressure test. This test and associated examination is conducted at a minimum of once every period. During one of these tests in the ten-year interval, the associated VT-2 examination will include the requirement to verify that all accessible supports on these lines are intact; that is, properly connected from the point of pipe or component attachment to the building structure. The inspection record for this examination will be on system or isometric basis as will the pressure test record as opposed to a support-by-support basis as required for non-exempt support.

(2) Selection Criteria

The selection criteria for the Class 1, 2, and 3 pipe supports which are not exempt from examination is based on statistical sampling. The sampling plan used is a single sample, hypergeometric distribution which provides 95% confidence that a support population which contains 10% or more unacceptable supports will be rejected (95/90 hypothesis). Sampling will be performed completely each period.

All non-exempt supports will be separated into four populations. These populations will consist of snubber supports, spring type supports, rigid supports, and anchor supports. A sample that

corresponds with the population size for each type will be re-examined completely during a period, with a sample of different supports within each type to be examined in successive periods.

If the number of defective supports exceeds the maximum allowed, additional examinations are required in accordance with the sampling plan appropriate for the population size. For these additional examinations, the population will be based on the number of supports in the system associated with the defective support unless the defect is discovered on a spring- or snubber-type device. In this case, the population shall be based on the total of the respective type.

In the event that a second generation of additional examinations are necessary, it will be performed in accordance with Subarticle IWF-2430(b) of the Code.

Licensee's Basis for Requesting Relief

(1) Exemption

ASME Code Interpretation XI-1-79-14 states that "it is the intent of Section XI to exempt from examination supports of Class 2 piping and components that are exempt from examination, as in IWC-1220." In IWC-1220, the intent of the word "examination" is limited to volumetric and surface examination only. The specific Class 2 interpretation provided in the Code has been extended to include Class 1 and 3 supports also.

(2) Selection Criteria

A sampling plan is designed to penalize the plant that has supports in poor condition while not penalizing those plants with supports in good to excellent condition. This is the same philosophy that forms the basis of the snubber functional test frequently found in the plant Technical Specifications.

Evaluation

The exemption criteria proposed are in agreement with exemption criteria for Class 1, 2, and 3 systems that these supports serve. That is what the Code requires.

The selection criteria are designed to statistically evaluate the reliability of system supports providing a 95% confidence that a support population which contains 10% or more unacceptable supports will be rejected (95/90 hypothesis).

Since the Code selection criteria for supports are not specific, the licensee has elected to develop specific selection criteria. The licensee has not stated what percentage of each of the four populations of supports will be selected from Class 1, 2, and 3 systems. The selection criteria should assure that a statistical sample be examined for each of the four populations of non-exempt supports in Class 1 systems, for each of the four populations of non-exempt supports in Class 2 systems, and for each of the four populations of non-exempt supports in Class 3 systems. With this addition, the proposed support selection criteria will provide necessary assurance of structural reliability during this interval.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that

(a) the proposed exemption criteria conforms with Code and no relief from Code is required, and

(b) the proposed selection criteria will provide necessary assurance of structural reliability during this interval if the licensee assures that a statistical sample be examined for each of the four populations of non-exempt supports in Class 1 systems, for each of the four populations of non-exempt supports in Class 2 systems, and for each of the four populations of non-exempt supports in Class 3 systems. This support selection criteria should be documented in the ISI examination report. With this addition, relief is recommended.

References

Reference 14.

3.4.2 Relief Request 2RR-7, Snubber Testing Program, IWF-5300 and IWF-5400

Code Requirements

IWF 5300: Inservice Tests for Snubbers 50 kips (22,680 kg) or Greater

In the course of preparation.

IWF-5400: Inservice Tests for Snubbers less than 50 kips (22,680 kg)

(a) Inservice tests shall be performed during normal system operation or plant outages,

(b) A representative sample* of 10% of the total number of nonexempt snubbers whose rating is less than 50 kips shall be tested each inspection period. Each representative sample shall consist of previously untested snubbers. After all non-exempt snubbers in the plant have been tested, the test shall be repeated taking the same snubbers (or their replacements) in the same sequence as in the original tests. These tests shall verify that:

(1) during low velocity displacement, the specified maximum drag or free movement force will initiate motion of the snubber rod in both tension and compression;

(2) activation (restraining action) is achieved within the specified range of velocity or acceleration in both tension and compression;

(3) snubber bleed, or release rate, where required, is within the specified range in compression or tension. For units specifically required not to displace under continuous load, the ability of the snubber to withstand load without displacement shall be demonstrated.

(c) Snubbers that fail the inservice tests of (b) shall be repaired in accordance with IWF-4000 and retested. An additional sample of 10% of the total number of snubbers shall also be tested at that time. Additional sample testing shall be continued until all units within the sample have met the requirements of (b).

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*A representative sample shall include snubbers from various locations taking into consideration service and environment.

(d) Components whose supports fail the test requirement of (b)(1) shall be evaluated to ensure that the supported component has not been impaired.

(e) Inspection and test results shall be recorded for each snubber.

Code Relief Request

PP&L requests relief from the Section XI inservice testing requirements in IWF-5300 and IWF-5400.

Proposed Alternative Examination

The functional testing requirements of Technical Specification 3/4.7.4 will be implemented in lieu of the Code requirements of IWF-5300 and IWF-5400. VT-3 and VT-4 examinations will be performed in accordance with Section XI.

Licensee's Basis for Requesting Relief

The snubber inservice testing requirements in IWF-5300 and IWF-5400 of Section XI are not complete and PP&L has already implemented a comprehensive snubber testing program. PP&L's snubber testing program is defined in the Plant Technical Specifications, Section 3/4.7.4.

Evaluation

A review of the plant Technical Specifications[22] cited indicated that:

(1) snubbers found faulty or inoperable are to be repaired or replaced within 72 hours of discovery,
(2) snubbers are to be initially inspected between 4 and 10 months after the plant becomes operable,
(3) a specific schedule varying from 31 days to 18 months has been established for the examination of each type of snubber,
(4) at least 10% of the total of each type of snubber will be functionally tested either in place or in a bench test. For each snubber type that does not meet the functional test acceptance criteria an additional 10% of that type of snubber will be functionally tested until no more failures are found or until all snubbers of that type have been functionally tested or sampling statistics establish 95% reliability,

(5) visual inspection criteria, transient event inspection, and functional tests have been established,
(6) acceptance criteria including statistical sampling and analysis have been established,
(7) failure analyses criteria have been established,
(8) functional testing of replaced or repaired snubbers have been established, and
(9) a snubber service life replacement program has been established.

The Plant Technical Specifications make no distinction between the testing of snubbers with a capacity of 50 kips or greater and those with capacities of less that 50 kips. The examination procedures presented cover all snubbers, not just those with ratings less than 50 kips. The Code requires that 10% of all snubbers with capacities less that 50 kips be tested. If, in the testing of snubbers, the licensee were to ensure that at least 10% of all snubbers with ratings less that 50 kips are examined, the program would be more definitive than that required by Code. The mode by which snubbers are selected for examination is statistical rather than random. Statistical accept and reject curves are used in the analysis. Visual and functional tests are more specific than that required by Code. The functional testing of repaired/replaced snubbers is conducted in addition to the examination of a statistically selected sample. If a statistical sample of snubbers proves the unacceptability of the class of snubbers tested, then an engineering evaluation of that group is conducted. Since there is no reason the licensee should not be able to meet the Code's criterion, relief is not necessary.

Conclusions and Recommendations

Based on the above evaluation, there is no reason the licensee's snubber examination should not be able to comply with Code, and no relief is required. The licensee should ensure that at least 10% of all snubbers with ratings less than 50 kips are examined.

References

References 14 and 22.

3.5 PRESSURE TESTS

No relief requests.

3.6 GENERAL

No relief requests.

5. REFERENCES

1. Letter, B. J. Youngblood (NRC) to N. W. Curtis (PP&L), June 28, 1980; grants requests to use ASME Code cases.

2. Letter PLA-619, N. W. Curtis (PP&L) to B. J. Youngblood (NRC), Susquehanna Steam Electric Station Unit Inservice Inspection Plan for NRC Submittal, January 27, 1981; initial ISI program.

3. Letter PLA-846, N. W. Curtis (PP&L) to A. Schwencer (NRC), June 16, 1981; Susquehanna PSI Rev. 1 attached.

4. Letter PLA-1063, N. W. Curtis (PP&L) to A. Schwencer (NRC), April 23, 1982; response to FSAR questions and PSI relief requests.

5. Letter PLA-1228, N. W. Curtis (PP&L) to A. Schwencer (NRC), August 8, 1982; preservice inspection relief requests.

6. Letter PLA-1770, N. W. Curtis (PP&L) to A. Schwencer (NRC), August 2, 1983; Unit 2 Preservice Inspection Program.

7. Letter PLA-1934, N. W. Curtis (PP&L) to A. Schwencer (NRC), November 1, 1983; Preservice Inspection Report information.

8. Letter PLA-2004, N. W. Curtis (PP&L) to A. Schwencer (NRC), December 21, 1983; additional preservice inspection information.

9. Letter, W. V. Johnson (NRC) to J. M. Novak (NRC), March 22, 1984; Supplemental Safety Evaluation Report, Review of PSI Program.

10. Letter PLA-927, J. R. Calhoun (PP&L) to A. Schwencer (NRC), September 15, 1981; response to NUREG-0313.

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APPENDIX A

Requirements of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Code, 1980 Edition with Addenda through Winter 1981

A.1 CLASS 1 REQUIREMENTS

A.1.1 CATEGORY B-A, PRESSURE-RETAINING WELDS IN REACTOR VESSEL

A.1.1.1 Shell Welds; Item B1.10

A.1.1.1.1 Circumferential and Longitudinal Welds, Items B1.11 and B1.12

All pressure-retaining circumferential and longitudinal shell welds in the reactor vessel shall be volumetrically examined in accordance with Figures IWB-2500-1 and -2 over essentially 100% of their lengths during the first inspection interval. Examinations may be performed at or near the end of the interval.

A.1.1.2 Head Welds, Item B1.20

A.1.1.2.1 Circumferential and Meridional Head Welds, Items B1.21 and B1.22

All pressure-retaining circumferential and meridional head welds in the reactor vessel head shall be volumetrically examined in accordance with Figure IWB-2500-3 over the accessible portion up to 100% of the weld length during the first inspection interval. The bottom head welds may be examined at or near the end of the interval.

A.1.1.3 Shell-to-Flange Weld, Item B1.30

Essentially 100% of the length of the shell-to-flange weld shall be volumetrically examined in accordance with Figure IWB-2500-4 during the first inspection interval. If partial examinations are conducted from the flange face, the remaining examination required to be conducted from the vessel wall may be performed at or near the end of each inspection interval. The examination of the shell-to-flange weld may be performed during the first and third inspection periods in conjunction with the nozzle examinations of Examination Category B-D (Program B). At least 50% of shell-to-flange weld shall be examined by the end of the first inspection period, and the remainder by the end of the third inspection period.

A.1.1.4 Head-to-Flange Weld, Item B1.40

Essentially 100% of the length of the head-to-flange weld shall be volumetrically examined in accordance with Figure IWB-2500-5 during the first inspection interval. If partial examinations are conducted from the flange face, the remaining examination required to be conducted from the vessel wall may be performed at or near the end of each inspection interval.

A.1.1.5 Repair Welds, Item B1.50

A.1.1.5.1 Repair Welds in the Beltline Region, Item B1.51

All base metal weld repair areas in the beltline region where repair depth exceeds 10% nominal of the vessel wall shall be volumetrically examined in accordance with Figures IWB-2500-1 and -2 during the first inspection interval. Examinations may be performed at or near the end of the interval. The beltline region extends for the length of the vessel thermal shield, or in the absence of a thermal shield, the effective length of reactor fuel elements. If the location of the repair is not positively and accurately known, then the individual shell plate, forging, or shell course containing the repair shall be included.

A.1.2 CATEGORY B-B, PRESSURE-RETAINING WELDS IN VESSELS OTHER THAN REACTOR VESSELS

A.1.2.1 Shell-to-Head Welds in the Pressurizer, Item B2.10

A.1.2.1.1 Circumferential Shell-to-Head Welds, Item B2.11

All circumferential shell-to-head welds in the pressurizer as shown in Figure IWB-2500-20(a) shall be volumetrically examined in accordance with Figure IWB-2500-1 over essentially 100% of their length during the first inspection interval.

A.1.2.1.2 Longitudinal Shell Weld, Item B2.12

One foot of all longitudinal shell welds in the pressurizer intersecting the examined circumferential shell-to-head weld as shown in Figure IWB-2500-20(a) shall be volumetrically examined in accordance with Figure IWB-2500-2 during the first inspection interval.

A.1.2.2 Head Welds in Pressurizer Vessels, Item B2.20

A.1.2.2.1 Circumferential and Meridional Head Welds, Items B2.21 and B2.22

All circumferential and meridional head welds in the pressurizer shall be volumetrically examined in accordance with Figure IWB-2500-3 over essentially 100% of their lengths during the first inspection interval.

A.1.2.3 Head Welds in the Primary Side of the Steam Generators; Item B2.30

A.1.2.3.1 Circumferential and Meridional Head Welds, Items B2.31 and B2.32

All circumferential and meridional head welds in the primary side of the steam generators as shown in Figure IWB-2500-20(c) shall be volumetrically examined in accordance with Figure IWB-2500-3 over essentially 100% of their length during the first inspection interval.

A.1.2.4 Tubesheet-to-Head Weld; Item B2.40

The tubesheet-to-head weld in the primary side of the steam generators shall be volumetrically examined in accordance with Figure IWB-2500-6 over essentially 100% of its length during the first inspection interval.

A.1.2.5 Head Welds in the Primary Side of the Heat Exchangers; Item B2.50

A.1.2.5.1 Circumferential Welds, Items B2.51 and B2.52

All circumferential and meridional head welds in the primary side of the heat exchangers as shown in Figure IWB-2500-20(e) shall be volumetrically examined in accordance with Figures IWB-2500-1 and -3 for circumferential welds and Figure IWB-2500-3 for meridional welds over essentially 100% of their length during the first inspection interval.

A.1.2.5.2 Longitudinal Welds, Item B2.53

One foot of all longitudinal welds in the primary side of the heat exchangers intersecting the examined circumferential tubesheet-to-shell weld as shown in Figure IWB-2500-20(g) shall be volumetrically examined in accordance with Figure IWB-2500-2 during the first inspection interval.

A.1.2.6 Tubesheet-to-Shell (or Head) Welds; Items B2.60 and B2.61

The tubesheet-to-shell (or head) welds as shown in Figures IWB-2500-20(e) and IWB-2500-20(g) shall be volumetrically examined in accordance with Figure IWB-2500-6 over essentially 100% of their length during the first interval.

A.1.3 CATEGORY B-D, FULL PENETRATION WELDS OF NOZZLES IN VESSELS (INSPECTION PROGRAM B)

A.1.3.1 Reactor Vessel Nozzle-to-Vessel Welds; Items B3.90 and B3.100

All nozzle-to-vessel welds and inside radius sections in the reactor vessel shall be volumetrically examined in accordance with Figures IWB-2500-7(a) through (d) during the first interval of operation. Examinations shall include nozzles with full penetration welds to vessel shell (or head) and integrally cast nozzles, but exclude manways and handholes either welded to or integrally cast in vessel. At least 25% but not more than 50% (credited) of the nozzles shall be examined by the end of the first inspection period and the remainder by the end of the inspection interval. If examinations are conducted from inside the component and the nozzle weld is examined by straight beam ultrasonic method from the nozzle bore, the remaining examinations required to be conducted from the shell may be performed at or near the end of each inspection interval.

A.1.3.2 Pressurizer Nozzle-to-Vessel Welds, Items B3.110 and B3.120

All nozzle-to-vessel welds and inside radius sections in the pressurizer shall be volumetrically examined in accordance with Figures IWB-2500-7(a) through (d) during the first interval of operation. Examinations shall include nozzles with full penetration welds to vessel shell (or head) and integrally cast nozzles, but excludes manways and handholes either welded to or integrally cast in vessel. At least 25% but not more than 50% (credited) of the nozzles shall be examined by the end of the first inspection period and the remainder by the end of the inspection interval.

A.1.3.3 Steam Generator Nozzle-to-Vessel Welds, Items B3.130 and B3.140

All nozzle-to-vessel welds and inside radius sections in the primary side of the steam generator shall be volumetrically examined in accordance with Figures IWB-2500-7(a) through (d) during the first interval of operation. Examinations shall include nozzles with full penetration welds to vessel shell (or head) and integrally cast nozzles, but excludes manways and handholes either welded to or integrally cast in vessel. At least 25% but not more than 50% (credited) of the nozzles shall be examined by the end of the first inspection period and the remainder by the end of the inspection interval.

A.1.3.4 Heat Exchanger Nozzle-to-Vessel Welds, Items B3.150 and B3.160

All nozzle-to-vessel welds and inside radius sections in the primary side of the heat exchanger shall be volumetrically examined in accordance with Figures IWB-2500-7(a) through (d) during the first interval of operation. Examinations shall include nozzles with full penetration welds to vessel shell (or head) and integrally cast nozzles, but excludes manways and handholes either welded to or integrally cast in vessel. At least 25% but not more than 50% (credited) of the nozzles shall be examined by the end of the first inspection period and the remainder by the end of the inspection interval.

A.1.4 CATEGORY B-E, PRESSURE-RETAINING PARTIAL PENETRATION WELDS IN VESSELS

A.1.4.1 Reactor Vessel Partial Penetration Welds, Item B4.10

A.1.4.1.1 Vessel Nozzles, Item B4.11

The external surfaces of partial penetration welds on 25% of reactor vessel nozzles shall be visually examined (VT-2) during the first inspection interval. The examinations shall cumulatively cover the specified percentage among each group of penetrations of comparable size and function.

A.1.4.1.2 Control Rod Drive Nozzles, Item B4.12

The external surfaces of partial penetration welds on 25% of the control rod drive nozzles shall be visually examined (VT-2) during the first inspection interval. The examinations shall cumulatively cover the specified percentage among each group of penetrations of comparable size and function.

A.1.4.1.3 Instrumentation Nozzles, Item B4.13

The external surfaces of partial penetration welds on 25% of the instrumentation nozzles shall be visually examined (VT-2) during the first inspection interval. The examinations shall cumulatively cover the specified percentage among each group of penetrations of comparable size and function.

A.1.4.2 Heater Penetration Welds on the Pressurizer, Item B4.20

The external surfaces of 25% of the heater penetration welds on the pressurizer shall be visually examined (VT-2) during the first inspection interval. The examinations shall cumulatively cover the specified percentage among each group of penetrations of comparable size and function.

A.1.5 CATEGORY B-F, PRESSURE-RETAINING DISSIMILAR METAL WELDS

A.1.5.1 Reactor Vessel Nozzle-to-Safe End Butt Welds, Item B5.10

All nozzle-to-safe end butt welds in nominal pipe size 4 in. and greater in the reactor vessel shall be surface and volumetrically examined in accordance with Figure IWB-2500-8 during the first inspection interval. The examinations may be performed coincident with the vessel nozzle examinations required by Examination Category B-D. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steels, (b) carbon or low alloy steels to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.2 Reactor Vessel Nozzle-to-Safe End Butt Welds, Item B5.20

The surfaces of all nozzle-to-safe end butt welds in nominal pipe size less than 4 in. in the reactor vessel shall be examined in accordance with Figure IWB-2500-8 during the first inspection interval. The examinations may be performed coincident with the vessel nozzle examinations required by Examination Category B-D. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steels, (b) carbon or low alloy steels to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.3 Reactor Vessel Nozzle-to-Safe End Socket Welds, Item B5.30

The surfaces of all nozzle-to-safe end socket welds in the reactor vessel shall be examined in accordance with Figure IWB-2500-8 during the first inspection interval. The examinations may be performed coincident with the vessel nozzle examinations required by Examination Category B-D. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steels, (b) carbon or low alloy steels to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.4 Pressurizer Nozzle-to-Safe End Butt Welds, Item B5.40

All nozzle-to-safe end butt welds in nominal pipe size 4 in. and greater in the pressurizer shall be surface and volumetrically examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.5 Pressurizer Nozzle-to-Safe End Butt Welds, Item B5.50

The surfaces of all nozzle-to-safe end butt welds in nominal pipe size less than 4 in. in the pressurizer shall be examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal

welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.6 Pressurizer Nozzle-to-Safe End Socket Welds, Item B5.60

The surfaces of all nozzle-to-safe end socket welds in the pressurizer shall be examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.7 Steam Generator Nozzle-to-Safe End Butt Welds, Item B5.70

All nozzle-to-safe end butt welds in nominal pipe size 4 in. and greater the steam generator shall be surface and volumetrically examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.8 Steam Generator Nozzle-to-Safe End Butt Welds, Item B5.80

The surfaces of all nozzle-to-safe end butt welds in nominal pipe size less than 4 in. in the steam generator shall be examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.9 Steam Generator Nozzle-to-Safe End Socket Welds, Item B5.90

The surfaces of all nozzle-to-safe end socket welds in the steam generator shall be examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.10 Heat Exchanger Nozzle-to-Safe End Butt Welds, Item B5.100

All nozzle-to-safe end butt welds in nominal pipe size 4 in. and greater the heat exchangers shall be surface and volumetrically examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.11 Heat Exchanger Nozzle-to-Safe End Butt Welds, Item B5.110

All nozzle-to-safe end butt welds in nominal pipe size less than 4 in. in the heat exchangers shall be surface and volumetrically examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.12 Heat Exchanger Nozzle-to-Safe End Socket Welds, Item B5.120

All nozzle-to-safe end socket welds in the heat exchangers shall be surface and volumetrically examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.13 Piping Safe End Butt Welds, Item B5.130

All dissimilar metal safe end butt welds in piping 4 in. and greater shall be surface and volumetrically examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.14 Piping Safe End Butt Welds, Item B5.140

All dissimilar metal safe end butt welds in piping less than 4 in. shall be surface and volumetrically examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.5.15 Piping Safe End Socket Welds, Item B5.150

All dissimilar metal safe end socket welds in piping shall be surface and volumetrically examined in accordance with Figure IWB-2500-8 during the first inspection interval. Dissimilar metal welds between combinations of (a) carbon or low alloy steels to high alloy steel, (b) carbon or low alloy steel to high nickel alloys, and (c) high alloy steel to high nickel alloys are included.

A.1.6 CATEGORY B-G-1, PRESSURE-RETAINING BOLTING LARGER THAN 2 INCHES IN DIAMETER

A.1.6.1 Reactor Closure Head Nuts, Item B6.10

The surfaces of all reactor closure head nuts larger than 2 in. in diameter shall be examined during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. Examinations may be performed at or near the end of the inspection interval.

A.1.6.2 Reactor Closure Studs, in Place, Items B6.20 and B6.30

All closure studs in the reactor vessel larger than 2 in. in diameter shall be volumetrically examined in accordance with Figure IWB-2500-12 during the first inspection interval. A surface examination is also required when the studs are removed. Examinations may be performed at or near the end of the inspection interval.

A.1.6.3 Threads in the Flange in the Reactor Vessel, Item B6.40

All threads in the flange in the reactor vessel shall be volumetrically examined in accordance with IWB-2500-12 during the first inspection interval. Examination includes threads in base metal and is required only when the connection is disassembled. Examinations may be performed at or near the end of the inspection interval.

A.1.6.4 Reactor Closure Washers and Bushings, Item B6.50

The surfaces of all closure washers and bushings on bolting larger than 2 in. in diameter in the reactor vessel shall be visually examined (VT-1) during the first inspection interval. Bushings in base material of flanges are required to be examined only when the connections are disassembled; bushings may be examined in place. The examinations may be performed at or near the end of the inspection interval.

A.1.6.5 Pressurizer Bolts, Studs, and Flange Surfaces, Items B6.60 and B6.70

All bolts and studs larger than 2 in. in diameter in the pressurizer shall be volumetrically examined in accordance with IWB-2500-12 during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. The flange surfaces shall also be visually examined (VT-1) when the connection is disassembled. The examination includes 1 in. of the annular surface surrounding each stud. Examinations may be performed at or near the end of the inspection interval.

A.1.6.6 Pressurizer Nuts, Bushings, and Washers, Item B6.80

The surfaces of all nuts, bushings, and washers on bolting larger than 2 in. in diameter shall be visually examined (VT-1) during the first inspection interval. Bushings in the base material of flanges are required to be examined only when the connections are disassembled; bushings may be inspected in place. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. Examinations may be performed at or near the end of the inspection interval.

A.1.6.7 Bolts, Studs, and Flange Surfaces in Steam Generators, Items B6.90 and B6.100

All bolts and studs larger than 2 in. in diameter in steam generators shall be volumetrically examined in accordance with IWB-2500-12 during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. The flange surfaces shall also be visually examined (VT-1) when the connection is disassembled. The examination includes 1 in. of the annular surface surrounding each stud. Examinations may be performed at or near the end of the inspection interval.

A.1 6.8 Nuts, Bushings, and Washers in Steam Generators, Item B6.110

The surfaces of all nuts, bushings, and washers on bolting larger than 2 in. in diameter in steam generators shall be visually examined (VT-1) during the first inspection interval. Bushings in the base material of flanges are required to be examined only when the connections are disassembled; bushings may be inspected in place. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. Examinations may be performed at or near the end of the inspection interval.

A.1.6.9 Bolts, Studs, and Flange Surfaces in Heat Exchangers, Items B6.120 and B6.130

All bolts and studs larger than 2 in. in diameter in heat exchangers shall be volumetrically examined in accordance with IWB-2500-12 during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. The flange surfaces shall also be visually examined (VT-1) when the connection is disassembled. The examination includes 1 in. of the annular surface surrounding each stud. Examinations may be performed at or near the end of the inspection interval. Examinations are limited to bolts and studs on components selected for examination under Examination Categories B-B, B-J, B-L-1, and B-M-1, as applicable.

A.1.6.10 Nuts, Bushings, and Washers in Heat Exchangers, Item B6.140

The surfaces of all nuts, bushings, and washers on bolting larger than 2 in. in diameter in heat exchangers shall be visually examined (VT-1) during the first inspection interval. Bushings in the base material of flanges are required to be examined only when the connections are disassembled; bushings may be inspected in place. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. Examinations may be performed at or near the end of the inspection interval. Examinations are limited to bolts and studs on components selected for examination under Examination Categories B-B, B-J, B-L-1, and B-M-1, as applicable.

A.1.6.11 Bolts, Studs, and Flange Surfaces in Piping, Items B6.150 and B6.160

All bolts and studs larger than 2 in. in diameter in piping shall be volumetrically examined in accordance with IWB-2500-12 during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. The flange surfaces shall also be visually examined (VT-1) when the connection is disassembled. The examination includes 1 in. of the annular surface surrounding each stud. Examinations may be performed at or near the end of the inspection interval. Examinations are limited to bolts and studs on components selected for examination under Examination Categories B-B, B-J, B-L-1, and B-M-1, as applicable.

A.1.6.12 Nuts, Bushings, and Washers in Piping, Item B6.170

The surfaces of all nuts, bushings, and washers on bolting larger than 2 in. in diameter in piping shall be visually examined (VT-1) during the first inspection interval. Bushings in the base material of flanges are required to be examined only when the connections are disassembled; bushings may be inspected in place. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. Examinations may be performed at or near the end of the inspection interval. Examinations are limited to bolts and studs on components selected for examination under Examination Categories B-B, B-J, B-L-1, and B-M-1, as applicable.

A.1.6.13 Bolts, Studs, and Flange Surfaces in Pumps, Items B6.180 and B6.190

All bolts and studs larger than 2 in. in diameter in pumps shall be volumetrically examined in accordance with IWB-2500-12 during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. The flange surfaces shall also be visually examined (VT-1) when the connection is disassembled. The examination includes 1 in. of the annular surface surrounding each stud. Examinations may be performed at or near

the end of the inspection interval. Examinations are limited to bolts and studs on components selected for examination under Examination Categories B-B, B-J, B-L-1, and B-M-1, as applicable.

A.1.6.14 Nuts, Bushings, and Washers in Pumps, Item B6.200

The surfaces of all nuts, bushings, and washers in bolting larger than 2 in. in diameter in pumps shall be visually examined (VT-1) during the first inspection interval. Bushings in the base material of flanges are required to be examined only when the connections are disassembled; bushings may be inspected in place. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. Examinations may be performed at or near the end of the inspection interval. Examinations are limited to bolts and studs on components selected for examination under Examination Categories B-B, B-J, B-L-1, and B-M-1, as applicable.

A.1.6.15 Bolts, Studs, and Flange Surfaces in Valves, Items B6.210 and B6.220

All bolts and studs larger than 2 in. in diameter in valves shall be volumetrically examined in accordance with IWB-2500-12 during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. The flange surfaces shall also be visually examined (VT-1) when the connection is disassembled. The examination includes 1 in. of the annular surface surrounding each stud. Examinations may be performed at or near the end of the inspection interval. Examinations are limited to bolts and studs on components selected for examination under Examination Categories B-B, B-J, B-L-1, and B-M-1, as applicable.

A.1.6.16 Nuts, Bushings, and Washers in Valves, Item B6.230

The surfaces of all nuts, bushings, and washers on bolting larger than 2 in. in diameter in valves shall be visually examined (VT-1) during the first inspection interval. Bushings in the base material of flanges are required to be examined only when the connections are disassembled, but bushings may be inspected in place. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed. Examinations may be performed at or near the end of the inspection interval. Examinations are limited to bolts and studs on components selected for examination under Examination Categories B-B, B-J, B-L-1, and B-M-1, as applicable.

A.1.7 CATEGORY B-G-2, PRESSURE-RETAINING BOLTING 2 INCHES AND SMALLER IN DIAMETER

A.1.7.1 Bolts, Studs, and Nuts in Reactor Vessel, Item B7.10

The surfaces of all bolts, studs, and nuts 2 in. or less in diameter in the reactor vessel shall be visually examined (VT-1) during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed.

A.1.7.2 Bolts, Studs, and Nuts in Pressurizer, Item B7.20

The surfaces of all bolts, studs, and nuts 2 in. or less in diameter in the pressurizer shall be visually examined (VT-1) during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed.

A.1.7.3 Bolts, Studs, and Nuts in Steam Generators, Item B7.30

The surfaces of all bolts, studs, and nuts 2 in. or less in diameter in the steam generators shall be visually examined (VT-1) during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed.

A.1.7.4 Bolts, Studs, and Nuts in Heat Exchangers, Item B7.40

The surfaces of all bolts, studs, and nuts 2 in. or less in diameter in the heat exchangers shall be visually examined (VT-1) during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed.

A.1.7.5 Bolts, Studs, and Nuts in Piping, Item B7.50

The surfaces of all bolts, studs, and nuts 2 in. or less in diameter in piping shall be visually examined (VT-1) during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed.

A.1.7.6 Bolts, Studs, and Nuts in Pumps, Item B7.60

The surfaces of all bolts, studs, and nuts 2 in. or less in diameter in pumps shall be visually examined (VT-1) during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed.

A.1.7.7 Bolts, Studs, and Nuts in Valves, Item B7.70

The surfaces of all bolts, studs, and nuts 2 in. or less in diameter in valves shall be visually examined (VT-1) during the first inspection interval. Bolting may be examined (a) in place under tension, (b) when the connection is disassembled, or (c) when the bolting is removed.

A.1.7.8 Bolts, Studs, and Nuts in Control Rod Drive Housings, Item B7.80

The surfaces of all bolts, studs, and nuts 2 in. or less in diameter in control rod drive housings shall be visually examined (VT-1) during the first inspection interval when disassembled.

A.1.8 CATEGORY B-H, VESSEL SUPPORTS

A.1.8.1 Integrally Welded Attachments in Reactor Vessel, Item B8.10

The attachment weld joining the reactor vessel support to the pressure-retaining membrane of the reactor vessel where the support base material design thickness is 5/8 in. or greater shall be surface or volumetrically examined, as applicable, in accordance with Figures IWB-2500-13, -14, and -15 during the first inspection interval. Weld buildups on nozzles that serve as supports are excluded. The examination includes essentially 100% of the length of the weld to the reactor vessel and the integral attachment weld to a cast or forged integral attachment to the reactor vessel, as applicable. One hundred percent of the welding of each lug on the vessel is included in the examination.

A.1.8.2 Integrally Welded Attachments in Pressurizer, Item B8.20

The attachment weld joining the pressurizer vessel support to the pressure-retaining membrane of the reactor vessel where the support base material design thickness is 5/8 in. or greater shall be surface or volumetrically examined, as applicable, in accordance with Figures IWB-2500-13, -14, and -15 during the first inspection interval. Weld buildups on nozzles that serve as supports are excluded. The examination includes essentially 100% of the length of the weld to the pressurizer and the integral attachment weld to a cast or forged integral attachment to the pressurizer, as applicable. One hundred percent of the welding of each lug on the vessel is included in the examination.

A.1.8.3 Integrally Welded Attachments in Steam Generators, Item B8.30

The attachment weld joining the steam generator support to the pressure-retaining membrane of the generator where the support base material design thickness is 5/8 in. or greater shall be surface or volumetrically examined, as applicable, in accordance with Figures IWB-2500-13, -14, and -15 during the first inspection interval. Weld buildups on nozzles that serve as supports are excluded. The examination includes essentially 100% of the length of the weld to the steam generator and the integral attachment weld to a cast or forged integral attachment to the steam generator, as applicable. One hundred percent of the welding of each lug on the vessel is included in the examination. The examination is limited to the attachment weld on one steam generator.

A.1.8.4 Integrally Welded Attachments in Heat Exchangers, Item B8.40

The attachment weld joining the heat exchanger support to the pressure-retaining membrane of the heat exchanger where the support base material design thickness is 5/8 in. or greater shall be surface or volumetrically examined, as applicable, in accordance with Figures IWB-2500-13, -14, and -15 during the first inspection interval. Weld buildups on nozzles that serve as supports are excluded. The examination includes essentially 100% of the length of the weld to the heat exchanger and the integral attachment weld to a cast or forged integral attachment to the heat exchanger, as applicable. One hundred percent of the welding of each lug on the heat exchanger is included in the examination. The examination is limited to the attachment weld on one heat exchanger.

A.1.9 CATEGORY B-J, PRESSURE-RETAINING WELDS IN PIPING

A.1.9.1 Nominal Pipe Size 4 In. and Greater, Item B9.10

A.1.9.1.1 Circumferential Welds, Item B9.11

For circumferential welds in pipe of nominal pipe size 4 in. and greater, surface plus volumetric examinations shall be performed in accordance with Figure IWB-2500-8 over essentially 100% of the weld length during each inspection interval. The examination shall include the following:

(a) All terminal ends in each pipe or branch run connected to vessels.

(b) All terminal ends and joints in each pipe or branch run connected to other components where the stress levels exceed the following limits under loads associated with specific seismic events and operational conditions.

(1) primary plus secondary stress intensity of $2.4S_m$ for ferritic steel and austenitic steel, and

(2) cumulative usage factor U of 0.4.

(c) All dissimilar metal welds between combinations of

(a) carbon or low alloy steels to high alloy steels;
(b) carbon or low alloy steels to high nickel alloys; and
(c) high alloy steels to high nickel alloys.

(d) Additional piping welds so that the total number of circumferential butt welds selected for examination equals 25% of the circumferential butt welds in the reactor coolant piping system. This total does not include welds excluded by IWB-1220. These additional welds may be located in one loop (one loop is currently defined for both PWR and BWR plants in the 1980 Edition).

For welds in carbon or low alloy steels, only those welds showing reportable preservice transverse indications need be examined for transverse reflectors.

A.1.9.1.2 Longitudinal Welds, Item B9.12

For longitudinal welds in pipe of nominal pipe size 4 in. and greater, surface plus volumetric examinations shall be performed in accordance with Figure IWB-2500-8 for at least a pipe-diameter length, but not more than 12 in. of each longitudinal weld intersecting the circumferential welds required to be examined by Examination Categories B-F and B-J. For welds in carbon or low alloy steels, only those welds showing reportable preservice transverse indications need be examined for transverse reflectors.

A.1.9.2 Nominal Pipe Size Less Than 4 In., Item B9.20

A.1.9.2.1 Circumferential Welds, Item B9.21

For circumferential welds in pipe of nominal pipe size less than 4 in., surface examinations shall be performed in accordance with Figure IWB-2500-8 over essentially 100% of the weld length during each inspection interval. The examination shall include the following:

(a) All terminal ends in each pipe or branch run connected to vessels.

(b) All terminal ends and joints in each pipe or branch run connected to other components where the stress levels exceed the following limits under loads associated with specific seismic events and operational conditions.

(1) primary plus secondary stress intensity of $2.4S_m$ for ferritic steel and austenitic steel, and

(2) cumulative usage factor U of 0.4.

(c) All dissimilar metal welds between combinations of:

(a) carbon or low alloy steels to high alloy steels;
(b) carbon or low alloy steels to high nickel alloys; and
(c) high alloys steels to high nickel alloys.

(d) Additional piping welds so that the total number of circumferential butt welds selected for examination equals 25% of the circumferential butt welds in the reactor coolant piping system. This total does not include welds excluded by IWB-1220. These additional welds may be located in one loop (one loop is currently defined for both PWR and BWR plants in the 1980 Edition).

A.1.9.2.2 Longitudinal Welds, Item B9.22

For longitudinal welds in pipe of nominal pipe size less than 4 in., surface examinations shall be performed in accordance with Figure IWB-2500-8 for at least a pipe-diameter length, but not more than 12 in. of each longitudinal weld intersecting the circumferential welds required to be examined by Examination Categories B-F and B-J.

A.1.9.3 Branch Pipe Connection Welds, Item B9.30

A.1.9.3.1 Nominal Pipe Size 4 Inches and Greater, Item B9.31

For welds in branch connections 4 in. and greater, surface plus volumetric examinations shall be performed in accordance with Figures IWB-2500-9, -10 and -11 over essentially 100% of the weld length during each inspection interval. The examinations shall include the following:

(a) All terminal ends in each pipe or branch run connected to vessels.

(b) All terminal ends and joints in each pipe or branch run connected to other components where the stress levels exceed the following limits under loads associated with specific seismic events and operational conditions.

(1) primary plus secondary stress intensity of $2.4S_m$ for ferritic steel and austenitic steel, and

(2) cumulative usage factor U of 0.4.

(c) All dissimilar metal welds between combinations of:

(a) carbon or low alloy steels to high alloy steels;
(b) carbon or low alloy steels to high nickel alloys; and
(c) high alloy steels to high nickel alloys.

(d) Additional piping welds so that the total number of circumferential butt welds selected for examination equals 25% of the circumferential butt welds in the reactor coolant piping system. This total does not include welds excluded by IWB-1220. These additional welds may be located in one loop (one loop is currently defined for both PWR and BWR plants in the 1980 Edition).

For welds in carbon or low alloy steels, only those welds showing reportable preservice transverse indications need be examined for transverse reflectors.

A.1.9.3.2 Nominal Pipe Size Less Than 4 Inches, Item B9.32

For welds in branch pipe connections less than 4 in., surface examinations shall be performed in accordance with Figures IWB-2500-9, -10, and -11 over essentially 100% of the weld length during each inspection interval. The examinations shall include the following:

(a) All terminal ends in each pipe or branch run connected to vessels.

(b) All terminal ends and joints in each pipe or branch run connected to other components where the stress levels exceed the following limits under loads associated with specific seismic events and operational conditions.

(1) primary plus secondary stress intensity of $2.4S_m$ for ferritic steel and austenitic steel, and

(2) cumulative usage factor U of 0.4.

(c) All dissimilar metal welds between combinations of:

(a) carbon or low alloy steels to high alloy steels;
(b) carbon or low alloy steels to high nickel alloys; and
(c) high alloy steels to high nickel alloys.

(d) Additional piping welds so that the total number of circumferential butt welds selected for examination equals 25% of the circumferential butt welds in the reactor coolant piping system. This total does not include welds excluded by IWB-1220. These additional welds may be located in one loop (one loop is currently defined for both PWR and BWR plants in the 1980 Edition).

A.1.9.4 Socket Welds, Item B9.40

Socket welds shall be surface examined in accordance with Figure IWB-2500-8 over essentially 100% of the weld length during each inspection interval. The examinations shall include the following:

(a) All terminal ends in each pipe or branch run connected to vessels.

(b) All terminal ends and joints in each pipe or branch run connected to other components where the stress levels exceed the following limits under loads associated with specific seismic events and operational conditions.

(1) primary plus secondary stress intensity of $2.4S_m$ for ferritic steel and austenitic steel, and

(2) cumulative usage factor U of 0.4.

(c) All dissimilar metal welds between combinations of:

(a) carbon or low alloy steels to high alloy steels;
(b) carbon or low alloy steels to high nickel alloys; and
(c) high alloy steels to high nickel alloys.

(d) Additional piping welds so that the total number of circumferential butt welds selected for examination equals 25% of the circumferential butt welds in the reactor coolant piping system. This total does not include welds excluded by IWB-1220. These additional welds may be located in one loop (one loop is currently defined for both PWR and BWR plants in the 1980 Edition).

A.1.10 CATEGORY B-K-1, INTEGRAL ATTACHMENTS FOR PIPING, PUMPS, AND VALVES

A.1.10.1 Integrally Welded Attachments on Piping, Item B10.10

Volumetric or surface examinations, as applicable, per Figures IWB-2500-13, -14, and -15 of essentially 100% of the weld length are required for all integrally welded support attachments of piping. Includes the welded attachments of piping required to be examined by Examination Category B-J and the weld attachments of associated pumps and valves integral to such piping. Includes those attachments whose base material design thickness is 5/8 in. or greater.

A.1.10.2 Integrally Welded Attachments on Pumps, Item B10.20

Volumetric or surface examinations, as applicable, per Figures IWB-2500-13, -14, and -15 of essentially 100% of the weld length are required for all integrally welded support attachments of pumps. Includes the welded attachments of piping required to be examined by Examination

Category B-J and the weld attachments of associated pumps and valves integral to such piping. Includes those attachments whose base material design thickness is 5/8 in. or greater.

A.1.10.3 Integrally Welded Attachments on Valves, Item B10.30

Volumetric or surface examinations, as applicable, per Figures IWB-2500-13, -14, and -15 of essentially 100% of the weld length are required for all integrally welded support attachments of valves. Includes the welded attachments of piping required by Examination Category B-J and the weld attachments of associated pumps and valves integral to such piping. Includes those attachments whose base material design thickness is 5/8 in. or greater.

A.1.11 CATEGORIES B-L-1 AND B-M-1, PRESSURE-RETAINING WELDS IN PUMP CASINGS AND VALVE BODIES, AND B-L-2 AND B-M-2, PUMP CASINGS AND VALVE BODIES

A.1.11.1 Pump Casing Welds, Item B12.10

Essentially 100% of the pressure-retaining welds in at least one pump in each group of pumps performing similar functions in the system (e.g., recirculating coolant pumps) shall be volumetrically examined in accordance with Figure IWB-2500-16 during each inspection interval. The examinations may be performed at or near the end of the inspection interval.

A.1.11.2 Pump Casings, Item B12.20

The internal surfaces of at least one pump in each group of pumps performing similar functions in the system (e.g., recirculating coolant pumps) shall be visually examined (VT-3) during each inspection interval. The examination may be performed on the same pump selected for volumetric examination of welds. The examinations may be performed at or near the end of the inspection interval.

A.1.11.3 Valve Body Welds Nominal Pipe Size Less than 4 in., Item B12.30

The surfaces of essentially 100% of the body welds (nominal pipe size less than 4 in.) in at least one valve in each group of valves with the same construction design (e.g., globe, gate, or check valve) and manufacturing method that perform similar functions in the system (e.g., containment isolation and system overpressure protection) shall be examined in accordance with Figure IWB-2500-17 during each inspection interval. The examinations may be performed at or near the end of the inspection interval.

A.1.11.3.1 Valve Body Welds, Nominal Pipe Size 4 In. and Greater, Item B12.40

Essentially 100% of the body welds (nominal pipe size 4 in. and greater) in at least one valve in each group of valves with the same construction design (e.g., globe, gate, or check valve) and manufacturing method that perform similar functions in the system (e.g., containment isolation and system over-pressure protection) shall be volumetrically examined in accordance with Figure IWB-2500-17 during each inspection interval. A supplementary surface examination may be performed as required in IWB-3518.1(d). The examinations may be performed at or near the end of the inspection interval.

A.1.11.4 Valve Body Exceeding 4 In. Nominal Pipe Size, Item B12.50

The internal surfaces of at least one valve in each group of valves with the same construction design (e.g., globe, gate, or check valve) and manufacturing method that perform similar functions that exceed 4-inch diameter in the system (e.g., containment isolation and system overpressure protection) shall be visually examined (VT-3) during each inspection interval. The examination may be performed on the same valve selected for volumetric examination of welds. The examinations may be performed at or near the end of the inspection interval.

A.1.12 CATEGORIES B-N-1, INTERIOR OF REACTOR VESSEL; B-N-2, INTEGRALLY WELDED CORE SUPPORT STRUCTURES AND INTERIOR ATTACHMENTS TO REACTOR VESSELS; and B-N-3, REMOVABLE CORE SUPPORT STRUCTURES

A.1.12.1 Reactor Vessel Interior, Item B13.10

The accessible areas of the reactor vessel interior, including the spaces above and below the reactor core that are made accessible by removing components during normal refueling outages, shall be visually examined (VT-3) during the first refueling outage and subsequent refueling outages at approximately 3-year intervals.

A.1.12.2 Boiling Water Reactor Vessel Interior Attachments Within Beltline Region, Item B13.20

The accessible welds in the reactor vessel interior attachments within the beltline region shall be visually examined (VT-1) during each inspection interval. The examinations may be performed at or near the end of the inspection interval.

A.1.12.2.1 Boiling Water Reactor Vessel Interior Attachments Beyond Beltline Region, Item B13.21

The accessible welds in the reactor vessel interior attachments beyond the beltline region shall be visually examined (VT-3) during each inspection interval. The examinations may be performed at or near the end of the inspection interval.

A.1.12.2.2 Boiling Water Reactor Core Support Structure, Item B13.22

The accessible surfaces of the core support structure shall be visually examined (VT-3) during each inspection interval. The examinations may be performed at or near the end of the inspection interval.

A.1.12.3 Pressurized Water Reactor Interior Attachments Within Beltline Region, Item B13.30

The accessible welds in the reactor vessel interior attachments within the beltline region shall be visually examined (VT-1) during each inspection interval. The examinations may be performed at or near the end of the inspection interval.

A.1.12.3.1 Pressurized Water Reactor Interior Attachments Beyond Beltline Region, Item B13.31

The accessible welds in the reactor vessel interior attachments beyond the beltline region shall be visually examined (VT-3) during each inspection interval. The examinations may be performed at or near the end of the inspection interval.

A.1.12.3.2 Core Support Structure for Pressurized Water Reactor Vessels, Item B13.32

The accessible welds and surfaces of the core support structure shall be visually examined (VT-3) each inspection interval. The structure shall be removed from the reactor vessel for examination. The examinations may be performed at or near the end of the inspection interval.

A.1.13 CATEGORY B-O, PRESSURE-RETAINING WELDS IN CONTROL ROD HOUSINGS

A.1.13.1 Welds in Control Rod Drive Housings, Item B14.10

The welds in 10% of the peripheral control rod drive housings shall be surface or volumetrically examined in accordance with Figure IWB-2500-18 during each inspection interval. The examinations may be performed at or near the end of the inspection interval.

A.1.14 CATEGORY B-P, ALL PRESSURE-RETAINING COMPONENTS

A.1.14.1 Reactor Vessel Pressure-Retaining Boundary, Item B15.10

The reactor vessel pressure-retaining boundary shall be visually examined (VT-2) during the system leakage test performed in accordance with IWB-5221 during each refueling outage. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c). The pressure-retaining boundary during the system leakage test shall correspond to the reactor coolant system boundary with all valves in the normal position which is required for normal reactor operation startup. The VT-2 examination shall, however, extend to and include the second closed valve at the boundary extremity. A system hydrostatic test (IWB-5222) and the accompanying VT-2 examination are acceptable in lieu of the system leakage test (IWB-5221) and VT-2 examination.

A.1.14.1.1 Reactor Vessel Pressure-Retaining Boundary, Item B15.11

The reactor vessel pressure-retaining boundary shall be visually examined (VT-2) during the system hydrostatic test performed in accordance with IWB-5222 once per inspection interval. The pressure-retaining boundary during the test shall include all Class 1 components within the system boundary. The examinations may be performed at or near the end of the inspection interval. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c).

A.1.14.2 Pressurizer Pressure-Retaining Boundary, Item B15.20

The pressurizer pressure-retaining boundary shall be visually examined (VT-2) during the system leakage test performed in accordance with IWB-5221 during each refueling outage. System pressure tests for the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c). The pressure-retaining boundary during the system leakage test shall correspond to the reactor coolant system boundary with all valves in the normal position which is required for normal reactor operation startup. The VT-2 examination shall, however, extend to and include the second closed valve at the boundary extremity. A system hydrostatic test (IWB-5222) and the accompanying VT-2 examination are acceptable in lieu of the system leakage test (IWB-5221) and VT-2 examination.

A.1.14.2.1 Pressurizer Pressure-Retaining Boundary, Item B15.21

The pressurizer pressure-retaining boundary shall be visually examined (VT-2) during the system hydrostatic test performed in accordance with IWB-5222 once per inspection interval. The pressure-retaining boundary during the test shall include all Class 1 components within the system boundary. The examinations may be performed at or near the end of the inspection interval. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c).

A.1.14.3 Steam Generator Pressure-Retaining Boundary, Item B15.30

The steam generator pressure-retaining boundary shall be visually examined (VT-2) during the system leakage test performed in accordance with IWB-5221 during each refueling outage. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c). The pressure-retaining boundary during the system leakage test shall correspond to the reactor coolant system boundary with all valves in the normal position which is required for normal reactor operation startup. The VT-2 examination shall, however, extend to and include the second closed valve at the boundary extremity. A system hydrostatic test (IWB-5222) and the accompanying VT-2 examination are acceptable in lieu of the system leakage test (IWB-5221) and VT-2 examination.

A.1.14.3.1 Steam Generator Pressure-Retaining Boundary, Item B15.31

The steam generator pressure-retaining boundary shall be visually examined (VT-2) during the system hydrostatic test performed in accordance with IWB-5222 during each refueling outage. The examinations may be

performed at or near the end of the inspection interval. The pressure-retaining boundary during the test shall include all Class I components within the system boundary. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c).

A.1.14.4 Heat Exchanger Pressure-Retaining Boundary, Item B15.40

The heat exchanger pressure-retaining boundary shall be visually examined (VT-2) during the system leakage test performed in accordance with IWB-5221 during each refueling outage. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c). The pressure-retaining boundary during the system leakage test shall correspond to the reactor coolant system boundary with all valves in the normal position which is required for normal reactor operation startup. The VT-2 examination shall, however, extend to and include the second closed valve at the boundary extremity. A system hydrostatic test (IWB-5222) and the accompanying VT-2 examination are acceptable in lieu of the system leakage test (IWB-5221) and VT-2 examination.

A.1.14.4.1 Heat Exchanger Pressure-Retaining Boundary, Item B15.41

The heat exchanger pressure-retaining boundary shall be visually examined (VT-2) during the system hydrostatic test performed in accordance with IWB-5222 once per inspection interval. The pressure-retaining boundary during the test shall include all Class 1 components within the system boundary. The examinations may be performed at or near the end of the inspection interval. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c).

A.1.14.5 Piping Pressure-Retaining Boundary, Item B15.50

The piping pressure-retaining boundary shall be visually examined (VT-2) during the system leakage test performed in accordance with IWB-5221 during each refueling outage. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c). The pressure-retaining boundary during the system leakage test shall correspond to the reactor coolant system boundary with all valves in the normal position which is required for normal reactor operation startup. The VT-2 examination shall, however, extend to and include the second closed valve at the boundary extremity. A system hydrostatic test (IWB-5222) and the accompanying VT-2 examination are acceptable in lieu of the system leakage test (IWB-5221) and VT-2 examination.

A.1.14.5.1 Piping Pressure-Retaining Boundary, Item B15.51

The piping pressure-retaining boundary shall be visually examined (VT-2) during the system hydrostatic test performed in accordance with IWB-5222 once per inspection interval. The pressure-retaining boundary during the test shall include all Class 1 components within the system boundary. The examinations may be performed at or near the end of the inspection interval. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c).

A.1.14.6 Pump Pressure-Retaining Boundary, Item B15.60

The pump pressure-retaining boundary shall be visually examined (VT-2) during the system leakage test performed in accordance with IWB-5221 during each refueling outage. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c). System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c). The pressure-retaining boundary during the system leakage test shall correspond to the reactor coolant system boundary with all valves in the normal position which is required for normal reactor operation startup. The VT-2 examination shall, however, extend to and include the second closed valve at the boundary extremity. A system hydrostatic test (IWB-5222) and the accompanying VT-2 examination are acceptable in lieu of the system leakage test (IWB-5221) and VT-2 examination.

A.1.14.6.1 Pump Pressure-Retaining Boundary, Item B15.61

The pump pressure-retaining boundary shall be visually examined (VT-2) during the system hydrostatic test performed in accordance with IWB-5222 once per inspection interval. The pressure-retaining boundary during the test shall include all Class 1 components within the system boundary. The examinations may be performed at or near the end of the inspection interval. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c).

A.1.14.7 Valve Pressure-Retaining Boundary, Item B15.70

The valve pressure-retaining boundary shall be visually examined (VT-2) during the system leakage test performed in accordance with IWB-5221 during each refueling outage. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c). The pressure-retaining boundary during the system leakage test shall

correspond to the reactor coolant system boundary with all valves in the normal position which is required for normal reactor operation startup. The VT-2 examination shall, however, extend to and include the second closed valve at the boundary extremity. A system hydrostatic test (IWB-5222) and the accompanying VT-2 examination are acceptable in lieu of the system leakage test (IWB-5221) and VT-2 examination.

A.1.14.7.1 Valve Pressure-Retaining Boundary, B15.71

The valve pressure-retaining boundary shall be visually examined (VT-2) during the system hydrostatic test performed in accordance with IWB-5222 once per inspection interval. The pressure-retaining boundary during the test shall include all Class 1 components within the system boundary. The examinations may be performed at or near the end of the inspection interval. System pressure tests of the reactor coolant system shall be conducted in accordance with IWA-5000. System pressure tests for repaired, replaced, or altered components shall be governed by IWA-5214(c).

A.1.15 CATEGORY B-Q, STEAM GENERATOR TUBING

A.1.15.1 Steam Generator Tubing, Straight Tube Design, Item B16.10

The examination requirements, examination method, and the extent and frequency of examination shall be governed by the plant technical specifications.

A.1.15.2 Steam Generator Tubing, U-Tube Design, Item B16.20

The examination requirements, examination method, and the extent and frequency of examination shall be governed by the plant technical specifications.

A.2. CLASS 2 REQUIREMENTS

A.2.1 CATEGORY C-A, PRESSURE-RETAINING WELDS IN PRESSURE VESSELS

A.2.1.1 Shell Circumferential Welds, Item C1.10

Essentially 100% of the shell circumferential welds at gross structural discontinuities shall be volumetrically examined in accordance with Figure IWC-2500-1 during each inspection interval. A gross structural discontinuity is defined in NB-3213.2. Examples are junctions between shells of different thicknesses, cylindrical shell-to-conical shell junctions, and shell (or head)-to-flange welds and head-to-shell welds. For multiple vessels with similar design, size, and service (such as steam generators and heat exchangers), the required examinations may be limited to one vessel or distributed among the vessels.

A.2.1.2 Head Circumferential Weld, Item C1.20

Essentially 100% of the circumferential head-to-shell weld shall be volumetrically examined in accordance with Figure IWC-2500-1 during each inspection interval. For multiple vessels with similar design, size, and service (such as steam generators and heat exchangers), the required examinations may be limited to one vessel or distributed among the vessels.

A.2.1.3 Tubesheet-to-Shell Weld, Item C1.30

Essentially 100% of the tubesheet-to-shell weld shall be volumetrically examined in accordance with Figure IWC-2500-2 during each inspection interval. For multiple vessels with similar design, size, and service (such as steam generators and heat exchangers), the required examinations may be limited to one vessel or distributed among the vessels.

A.2.2 CATEGORY C-B, PRESSURE-RETAINING NOZZLE WELDS IN VESSELS

A.2.2.1 Nozzles in Vessels 1/2 In. or Less in Nominal Thickness, Item C2.10

A.2.2.1.1 Nozzle-to-Shell (or Head) Weld, Item C2.11

All nozzles in vessels 1/2 in. or less in nominal thickness at terminal ends of piping runs shall be surface examined in accordance with Figure IWC-2500-3 during each inspection interval. Terminal ends include nozzles welded to or integrally cast in vessels that connect to piping runs (manways and handholes are excluded). Only those piping runs selected for examination under Examination Category C-F are included.

A.2.2.2 Nozzles Without Reinforcing Plate in Vessels Over 1/2 In. in Nominal Thickness, Item C2.20

A.2.2.2.1 Nozzle-to-Shell (or Head) Weld, Item C2.21

The nozzle-to-shell (or head) welds of all nozzles in vessels over 1/2 in. in nominal thickness at terminal ends of piping runs shall be surface and volumetrically examined in accordance with Figure IWC-2500-4(a) or (b) during each inspection interval. Terminal ends include nozzles welded to or integrally cast in vessels that connect to piping runs (manways and handholes are excluded). Only those piping runs selected for examination under Examination Category C-F are included.

A.2.2.2.2 Nozzle Inside Radius Section, Item C2.22

The inside radius sections of all nozzles in vessels over 1/2 in. in nominal thickness at terminal ends of piping runs shall be volumetrically examined in accordance with Figure IWC-2500-4(a) or (b) during each inspection interval. Terminal ends include nozzles welded to or integrally cast in vessels that connect to piping runs (manways and handholes are excluded). Only those piping runs selected for examination under Examination Category C-F are included.

A.2.2.3 Nozzles With Reinforcing Plate in Vessels Over 1/2 In. Nominal Thickness, Item C2.30

A.2.2.3.1 Reinforcing Plate Welds to Nozzle and Vessel, Item C2.31

The reinforcing plate-to-nozzle and vessel welds of all nozzles in vessels over 1/2 in. nominal thickness at terminal ends of piping runs shall be surface examined in accordance with Figure IWC-2500-4(c) during each inspection interval. Terminal ends include nozzles welded to or integrally cast in vessels that connect to piping runs (manways and handholes are excluded). Only those piping runs selected for examination under Examination Category C-F are included.

A.2.2.3.2 Nozzle-to-Shell (or Head) Welds, Item C2.32

If the nozzle bore is accessible from inside the vessel, the nozzle-to-shell (or head) welds in vessels over 1/2 in. nominal thickness at terminal ends of piping runs shall be volumetrically examined in accordance with Figure IWC-2500-4(c) during each inspection interval. If the nozzle bore is not accessible from inside the vessel, the telltale hole in the reinforcing plate shall be examined for evidence of leakage while the vessel is undergoing the system pressure test (IWC-5221 or IWC-5222) as required by Examination Category C-H. Terminal ends include nozzles welded

to or integrally cast in vessels that connect to piping runs (manways and handholds are exluded). Only those piping runs selected for examination under Examination Category C-F are included.

A.2.3 CATEGORY C-C AND C-E, SUPPORT MEMBERS

A.2.3.1 Integrally Welded Support Attachments in Pressure Vessels, Item C3.10

The surfaces of 100% of each integrally welded attachment in pressure vessels shall be surface examined in accordance with Figure IWC-2500-5 during each inspection interval. Examination is limited to integrally welded attachments whose base material design thickness is 3/4 in. or greater. For multiple vessels of similar design and service, the required examinations may be conducted on only one vessel. Where multiple vessels are provided with a number of similar supporting elements, the examination of the support elements may be distributed among the vessels.

A.2.3.2 Integrally Welded Attachments in Piping, Item C3.20

The surfaces of 100% of each integrally welded attachment in piping shall be surface examined in accordance with Figure IWC-2500-5. Examination is limited to integrally welded attachments whose base material design thickness is 3/4 in. or greater. In addition, examinations are limited to attachments of those components required to be examined under Examination Categories C-F and C-G.

A.2.3.3 Integrally Welded Pump Attachments, Item C3.30

The surfaces of 100% of each integrally welded attachment in pumps shall be examined in accordance with Figure IWC-2500-5. Examination is limited to integrally welded attachments whose base material design thickness is 3/4 in. or greater. Examinations are limited to attachments of those components required to be examined under Examination Categories C-F and C-G.

A.2.3.4 Integrally Welded Valve Support Attachments, Item C3.40

The surfaces of 100% of each integrally welded valve attachment shall be examined in accordance with Figure IWC-2500-5 during each inspection interval. Examination is limited to integrally welded attachments whose base material design thickness is 3/4 in. or greater. Examinations are limited to attachments of those components required to be examined under Examination Categories C-F and C-G.

A.2.4 CATEGORY C-D, PRESSURE-RETAINING BOLTING GREATER THAN 2 INCHES IN DIAMETER

A.2.4.1 Bolts and Studs in Pressure Vessels, Item C4.10

For bolts and studs in pressure vessels, 100% of the bolts and studs at each bolted connection of components required to be inspected shall be volumetrically examined in accordance with Figure IWC-2500-6 during each inspection interval. Bolting may be examined on one vessel in each system required to be examined that is similar in design, size, function, and service. In addition, where the vessel contains a group of bolted connections of similar design and size (such as flange connections and manway covers), only one bolted connection among the group need be examined. Bolting may be examined in place under load or upon disassembly of the connection.

A.2.4.2 Bolts and Studs in Piping, Item C4.20

One hundred percent of the bolts and studs at each bolted piping connection shall be volumetrically examined in accordance with Figure IWC-2500-6. The examination of flange bolting in piping systems required to be examined may be limited to the flange connections in pipe runs selected for examination under Examination Category C-F. Bolting may be examined in place under load or upon disassembly of the connection.

A.2.4.3 Bolts and Studs in Pumps, Item C4.30

For pumps, 100% of the bolts and studs at each bolted connection of pumps shall be volumetrically examined in accordance with Figure IWC-2500-6. Bolting on only one pump among a group of pumps in each system required to be examined that have similar designs, sizes, functions, and

service is required to be examined. In addition, where one pump contains a group of bolted connections of similar design and size (such as flange connections and manway covers), the examination may be conducted on one bolted connection among the group. Bolting may be examined in place under load and upon disassembly of the connection.

A.2.4.4 Bolts and Studs in Valves, Item C4.40

For valves, 100% of the bolts and studs at each bolted connection of valves shall be volumetrically examined in accordance with Figure IWC-2500-6. Bolting on only one valve among a group of valves in each system required to be examined that have similar designs, sizes, functions, and service is required to be examined. In addition, where one valve contains a group of bolted connections of similar design and size (such as flange connections and manway covers), the examination may be conducted on one bolted connection among the group. Bolting may be examined in place under load and upon disassembly of the connection.

A.2.5 CATEGORY C-F, PRESSURE-RETAINING WELDS IN PIPING

A.2.5.1 Piping Welds 1/2 In. or Less Nominal Wall Thickness, Item C5.10

A.2.5.1.1 Circumferential Welds, Item C5.11

The surfaces of 100% of each circumferential weld 1/2 in. or less nominal wall thickness shall be examined in accordance with Figure IWC-2500-7 during each inspection interval. The welds selected for examination shall include

a. all welds at locations where the stresses under the loadings resulting from Normal and Upset plant conditions as calculated by the sum of Equations 9 and 10 in NC-3652 exceed the specified value;

b. all welds at terminal ends (see (e) below) of piping or branch runs;

c. all dissimilar metal welds;

d. additional welds, at structural discontinuities (see (f) below) such that the total number of welds selected for examination includes the following percentages of circumferential piping welds;

For boiling water reactors:

1. none of the welds exempted by IWC-1220;
2. none of the welds in residual heat removal and emergency core cooling systems (see (g) below);
3. 50% of the main steam system welds;
4. 25% of the welds in all other systems.

For pressurized water reactors:

1. none of the welds exempted by IWC-1220;
2. none of the welds in residual heat removal and emergency core cooling systems;
3. 10% of the main steam system welds 8 in. nominal pipe size and smaller;
4. 25% of the welds in all other systems.

e. terminal ends are the extremities of piping runs that connect to structures, components (such as vessels, pumps, and valves) or pipe anchors, each of which act as rigid restraints or provide at least two degrees of restraint to piping thermal expansion;

f. structural discontinuities include pipe weld joints to vessel nozzles, valve bodies, pump casings, pipe fittings (such as, elbows, tees, reducers, and flanges conforming to ANSI Standard B16.9), and nine branch connections and fittings;

g. examination requirements are under development.

For welds in carbon or low alloy steels, only those welds showing reportable preservice transverse indications need to be examined for transverse reflectors.

A.2.5.1.2 Longitudinal Welds, Item C5.12

Longitudinal welds 1/2 in. or less nominal wall thickness shall be surface examined in accordance with IWC-2520-7 (2.5 t at the intersecting circumferential weld) during each inspection interval.

A.2.5.2 Piping Welds Over 1/2 In. Nominal Wall Thickness, Item C5.20

A.2.5.2.1 Circumferential Welds, Item C5.21

One hundred percent of each circumferential weld over 1/2 in. nominal wall thickness shall be surface and volumetrically examined in accordance with Figure IWC-2500-7 during each inspection interval. The welds selected for examination shall include

a. all welds at locations where the stresses under the loadings resulting from Normal and Upset plant conditions as calculated by the sum of Equations 9 and 10 in NC-3652 exceed the specified value;

b. all welds at terminal ends (see (e) below) of piping or branch runs;

c. all dissimilar metal welds;

d. additional welds, at structural discontinuities (see (f) below) such that the total number of welds selected for examination includes the following percentages of circumferential piping welds;

For boiling water reactors:

1. none of the welds exempted by IWC-1220;
2. none of the welds in residual heat removal and emergency core cooling systems (see (g) below);
3. 50% of the main steam system welds;
4. 25% of the welds in all other systems.

For pressurized water reactors:

1. none of the welds exempted by IWC-1220;
2. none of the welds in residual heat removal and emergency core cooling systems;
3. 10% of the main steam system welds 8 in. nominal pipe size and smaller;
4. 25% of the welds in all other systems.

e. terminal ends are the extremities of piping runs that connect to structures, components (such as vessels, pumps, and valves) or pipe anchors, each of which act as rigid restraints or provide at least two degrees of restraint to piping thermal expansion;

f. structural discontinuities include pipe weld joints to vessel nozzles, valve bodies, pump casings, pipe fittings (such as, elbows, tees, reducers, and flanges conforming to ANSI Standard B16.9), and nine branch connections and fittings;

g. examination requirements are under development.

For welds in carbon or low alloy steels, only those welds showing reportable preservice transverse indications need to be examined for transverse reflectors.

A.2.5.2.2 Longitudinal Welds, Item C5.22

Longitudinal welds over 1/2 in. nominal wall thickness shall be surface and volumetrically examined in accordance with Figure IWC-2500-7 (2.5 t at the intersecting circumferential weld) during each inspection interval.

A.2.5.3 Pipe Branch Connections Greater than 4 In. Nominal Branch Pipe Size, Item C5.30

A.2.5.3.1 Circumferential Welds, Item C5.31

The surfaces of 100% of each circumferential weld in pipe branch connections shall be examined in accordance with Figures IWC-2500-9 to -13, inclusive, during each inspection interval. The welds selected for examination shall include

a. all welds at locations where the stresses under the loadings resulting from Normal and Upset plant conditions as calculated by the sum of Equations 9 and 10 in NC-3652 exceed the specified value;

b. all welds at terminal ends (see (e) below) of piping or branch runs;

c. all dissimilar metal welds;

d. additional welds, at structural discontinuities (see (f) below) such that the total number of welds selected for examination includes the following percentages of circumferential piping welds;

For boiling water reactors:

1. none of the welds exempted by IWC-1220;
2. none of the welds in residual heat removal and emergency core cooling systems (see (g) below);
3. 50% of the main steam system welds 8 in;
4. 25% of the welds in all other systems.

For pressurized water reactors:

1. none of the welds exempted by IWC-1220;
2. none of the welds in residual heat removal and emergency core cooling systems;
3. 10% of the main steam system welds 8 in. nominal pipe size and smaller;
4. 25% of the welds in all other systems.

e. terminal ends are the extremities of piping runs that connect to structures, components (such as, vessels, pumps, and valves) or pipe anchors, each of which act as rigid restraints or provide at least two degrees of restraint to piping thermal expansion;

f. structural discontinuities include pipe weld joints to vessel nozzles, valve bodies, pump casings, pipe fittings (such as, elbows, tees, reducers, and flanges conforming to ANSI Standard B16.9), and nine branch connections and fittings;

g. examination requirements are under development.

For welds in carbon or low alloy steels, only those welds showing reportable preservice transverse indications need to be examined for transverse reflectors.

A.2.5.3.2 Longitudinal Welds, Item C5.32

Longitudinal welds in pipe branch connections shall be surface examined in accordance with Figures IWC-2500-12 and -13 (2.5 t at the intersecting circumferential weld) during each inspection interval.

A.2.6 CATEGORY C-G, PRESSURE-RETAINING WELDS IN PUMPS AND VALVES

A.2.6.1 Pump Casing Welds, Item C6.10

One hundred percent of all pump casing welds in each piping run examined under Examination Category C-F shall be surface examined in accordance with Figure IWC-2500-8 during each inspection interval. For multiple pumps of similar design, size, function, and service in a system, only one pump among each group of multiple pumps is required to be examined. The examination may be performed from either the inside or outside surface.

A.2.6.2 Valve Body Welds, Item C6.20

One hundred percent of all valve body welds in each piping run examined under Examination Category C-F shall be surface examined in accordance with Figure IWC-2500-8 during each inspection interval. For multiple valves of similar design, size, function, and service in a system, only one valve among each group of multiple valves is required to be examined. The examination may be performed from either the inside or outside surface.

A.2.7 CATEGORY C-H, ALL PRESSURE-RETAINING COMPONENTS

A.2.7.1 Pressure Vessels, Item C7.10

Pressure vessel pressure-retaining boundaries (other than open-ended portions of systems) shall be visually examined (VT-2) during the system leakage test performed in accordance with IWC-5221 during each inspection. No components within the pressure retaining boundary are exempt or excluded from the examination requirements, except as specified in IWA-5214(c) for repairs and replacements. Where portions of a system are subject to system pressure tests associated with two different system functions, the VT-2 examination need only be performed during the test conducted at the higher of the test pressures of the respective system

function. The pressure retaining boundary includes only those portions of the system required to operate or support the safety system function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required. A system hydrostatic test (IWC-5222) and accompanying VT-2 examination are acceptable in lieu of the system pressure test (IWC-5221) and VT-2 examination.

A.2.7.1.1 Pressure Vessels, Item C7.20

Pressure vessel pressure-retaining boundaries (other than open-ended portions of systems) shall be visually examined (VT-2) during the system hydrostatic test performed in accordance with IWC-5222 during each inspection period. No components within the pressure retaining boundary [as defined by Note (7)] are exempt or excluded from the examination requirements, except as specified in IWA-5214(c) for repairs and replacements. The system hydrostatic test (IWC-5222) shall be conducted at or near the end of each inspection interval or during the same inspection period of each inspection interval of Inspection Program B. The pressure retaining boundary includes only those portions of the system required to operate or support the safety system function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required.

A.2.7.2 Piping, Item C7.30

Piping pressure-retaining boundaries (other than open-ended portions of systems) shall be visually examined (VT-2) during the system leakage test performed in accordance with IWC-5221 during each inspection period. No components within the pressure-retaining boundary are exempt or excluded from the examination requirements, except as specified in IWA-5214(c) for repairs and replacements. Where portions of a system are subject to system pressure tests associated with two different system functions, the VT-2 examination need only be performed during the test conducted at the higher of the test pressures of the respective system function. The pressure retaining boundary includes only those portions of the system required to operate or support the safety system function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required. A system hydrostatic test (IWC-5222) and accompanying VT-2 examination are acceptable in lieu of the system pressure test (IWC-5221) and VT-2 examination.

A.2.7.2.1 Piping, Item C7.40

Piping pressure-retaining boundaries (other than open-ended portions of systems) shall be visually examined (VT-2) during the system hydrostatic test performed in accordance with IWC-5222 during each inspection period. No components within the pressure-retaining boundary [as defined by Note (7)] are exempt or excluded from the examination requirements, except as

specified in IWA-5214(c) for repairs and replacements. The system hydrostatic test (IWC-5222) shall be conducted at or near the end of each inspection interval or during the same inspection period of each inspection interval of Inspection Program B. The pressure-retaining boundary includes only those portions of the system required to operate or support the safety system function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required.

A.2.7.3 Pumps, Item C7.50

Pump pressure-retaining boundaries (other than open-ended portions of systems) shall be visually examined (VT-2) during the system leakage test performed in accordance with IWC-5221 during each inspection period. No components within the pressure-retaining boundary are exempt or excluded from the examination requirements, except as specified in IWA-5214(c) for repairs and replacements. Where portions of a system are subject to system pressure tests associated with two different system functions, the VT-2 examination need only be performed during the test conducted at the higher of the test pressures of the respective system function. The pressure-retaining boundary includes only those portions of the system required to operate or support the safety system function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required. A system hydro-hydrostatic test (IWC-5222) and accompanying VT-2 examination are acceptable in lieu of the system pressure test (IWC-5221) and VT-2 examination.

A.2.7.3.1 Pumps, Item C7.60

Pump pressure-retaining boundaries (other than open-ended portions of systems) shall be visually examined (VT-2) during the system hydrostatic test performed in accordance with IWC-5222 during each inspection period. No components within the pressure-retaining boundary [as defined by Note (7)] are exempt or excluded from the examination requirements, except as specified in IWA-5214(c) for repairs and replacements. The system hydrostatic test (IWC-5222) shall be conducted at or near the end of each inspection interval or during the same inspection period of each inspection interval of Inspection Program B. The pressure-retaining boundary includes only those portions of the system required to operate or support the safety system function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required.

A.2.7.4 Valves, Item C7.70

Valve pressure-retaining boundaries other than open-ended portions of systems) shall be visually examined (VT-2) during the system leakage test in accordance with IWC-5221 during each inspection period. No components within the pressure-retaining boundary are exempt or excluded from the

examination requirements, except as specified in IWA-5214(c) for repairs and replacements. Where portions of a system are subject to system pressure tests associated with two different system functions, the VT-2 examination need only be performed during the test conducted at the higher of the test pressures of the respective system function. The pressure-retaining boundary includes only those portions of the system required to operate or support the safety system function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required. A system hydrostatic test (IWC-5222) and accompanying VT-2 examination are acceptable in lieu of the system pressure test (IWC-5221) and VT-2 examination.

A.2.7.4.1 Valves, Item C7.80

Valve pressure-retaining boundaries (other than open-ended portions of systems) shall be visually examined (VT-2) during the system hydrostatic test performed in accordance with IWC-5222 during each inspection period. No components within the pressure-retaining boundary [as defined by Note (7)] are exempt or excluded from the examination requirements, except as specified in IWA-5214(c) for repairs and replacements. The system hydrostatic test (IWC-5222) shall be conducted at or near the end of each inspection interval or during the same inspection period of each inspection interval of Inspection Program B. The pressure-retaining boundary includes only those portions of the system required to operate or support the safety system function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required.

A.3 CLASS 3 REQUIREMENTS

A.3.1 CATEGORY D-A, SYSTEMS IN SUPPORT OF REACTOR SHUTDOWN FUNCTION

A.3.1.1 Pressure-Retaining Components, Item D1.10

The pressure-retaining components in the pressure-retaining boundary shall be visually examined (VT-2) during the system pressure test IWA-5000/IWD-5221 each inspection period. A system hydrostatic test (IWD-5223) and accompanying VT-2 examination are acceptable in lieu of the system pressure test and VT-2 examination. The system hydrostatic test shall be conducted at or near the end of each inspection interval or during the same inspection period of each inspection interval for Inspection Program B. The system boundary extends up to and including the first normally closed valve or valve capable of automatic closure as required to perform the safety-related system function. There are no exemptions or exclusions from these requirements except as specified in IWA-5214(c).

A.3.1.2 Integral Attachment--Component Supports and Restraints, Item D1.20

Component supports and restraints shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.1.3 Integral Attachment--Mechanical and Hydraulic Snubbers, Item D1.30

Mechanical and hydraulic snubbers shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.1.4 Integral Attachment--Spring Type Supports, Item D1.40

Spring type supports shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.1.5 Integral Attachment--Constant Load Type Supports, Item D1.50

Constant load type supports shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.1.6 Integral Attachment--Shock Absorbers, Item D1.60

Shock absorbers shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.2 CATEGORY D-B, SYSTEMS IN SUPPORT OF EMERGENCY CORE COOLING, CONTAINMENT HEAT REMOVAL, ATMOSPHERIC CLEANUP, AND REACTOR RESIDUAL HEAT REMOVAL

A.3.2.1 Pressure-Retaining Components, Item D2.10

The pressure-retaining components in the pressure-retaining boundary shall be visually examined (VT-2) during the system pressure test IWA-5000/IWD-5221 each inspection period. A system hydrostatic test (IWD-5223) and accompanying VT-2 examination are acceptable in lieu of the system pressure test and VT-2 examination. The system hydrostatic test shall be conducted at or near the end of each inspection interval or during the same inspection period of each inspection interval for Inspection Program B. The system boundary extends up to and including the first normally closed valve or valve capable of automatic closure as required to perform the safety-related system function. There are no exemptions or exclusions from these requirements except as specified in IWA-5214(c).

A.3.2.2 Integral Attachment--Component Supports and Restraints Item D2.20

Component supports and restraints shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.2.3 Integral Attachment--Mechanical and Hydraulic Snubbers, Item D2.30

Mechanical and hydraulic snubbers shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.2.4 Integral Attachment--Spring Type Supports, Item D2.40

Spring type supports shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.2.5 Integral Attachment--Constant Load Type Supports, Item D2.50

Constant load type supports shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.2.6 Integral Attachment--Shock Absorbers, Item D2.60

Shock absorbers shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.3 CATEGORY D-C, SYSTEMS IN SUPPORT OF RESIDUAL HEAT REMOVAL FROM SPENT FUEL STORAGE POOL

A.3.3.1 Pressure-Retaining Components, Item D3.10

The pressure-retaining components in the pressure-retaining boundary shall be visually examined (VT-2) during the system pressure test IWA-5000/ IWD-5221 each inspection period. A system hydrostatic test (IWD-5223) and accompanying VT-2 examination are acceptable in lieu of the system pressure test and VT-2 examination. The system hydrostatic test shall be conducted at or near the end of each inspection interval or during the same inspection

period of each inspection interval for Inspection Program B. The system boundary extends up to and including the first normally closed valve or valve capable of automatic closure as required to perform the safety-related system function. There are no exemptions or exclusions from these requirements except as specified in IWA-5214(c).

A.3.3.2 Integral Attachment--Component Supports and Restraints, Item D3.20

Component supports and restraints shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.3.3 Integral Attachment--Mechanical and Hydraulic Snubbers, Item D3.30

Mechanical and hydraulic snubbers shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.3.4 Integral Attachment--Spring Type Supports, Item D3.40

Spring type supports shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.3.3.5 Integral Attachment--Constant Load Type Supports, Item D3.50

Constant load type supports shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b)..

A.3.3.6 Integral Attachment--Shock Absorbers; Item D3.60

Shock absorbers shall be visually examined (VT-3) in accordance with Figure IWD-2500-1 during each inspection interval. For multiple components within a system of similar design, function, and service, the integral attachment of only one of the multiple components shall be examined. The integral attachments selected for examination shall correspond to those component supports selected by IWF-2510(b).

A.4 COMPONENT SUPPORTS

A.4.1 CATEGORY F-A, PLATE AND SHELL TYPE SUPPORTS

A.4.1.1 Mechanical Connections to Pressure-Retaining Components and Building Structure, Item F1.10

Mechanical connections to pressure-retaining components and the building structure shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.1.2 Weld Connections to Building Structure, Item F1.20

Weld connections to the building structure shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.1.3 Weld and Mechanical Connections at Intermediate Joints in Multiconnected Integral and Nonintegral Supports, Item F1.30

Weld and mechanical connections at intermediate joints in multiconnected integral and nonintegral supports shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.1.4 Component Displacement Settings of Guides and Stops, Misalignment of Supports, Assembly of Support Items, Item F1.40

Component displacement settings of guides and stops, misalignment of supports, and assembly of support items shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.2 CATEGORY F-B, LINEAR TYPE SUPPORTS

A.4.2.1 Mechanical Connections to Pressure-Retaining Components and Building Structure, Item F2.10

Mechanical connections to pressure-retaining components and the building structure shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.2.2 Weld Connections to Building Structure, Item F2.20

Weld connections to the building structure shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.2.3 Weld and Mechanical Connections at Intermediate Joints in Multiconnected Integral and Nonintegral Supports, Item F2.30

Weld and mechanical connections at intermediate joints in multiconnected integral and nonintegral supports shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.2.4 Component Displacement Settings of Guides and Stops, Misalignment of Supports, Assembly of Support Items, Item F2.40

Component displacement settings of guides and stops, misalignment of supports, and assembly of support items shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.3 CATEGORY F-C, COMPONENT STANDARD SUPPORTS

A.4.3.1 Mechanical Connections to Pressure-Retaining Components and Building Structure, Item F3.10

Mechanical connections to pressure-retaining components and the building structure shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.3.2 Weld Connections to Building Structure, Item 3.20

Weld connections to the building structure shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.3.3 Weld and Mechanical Connections at Intermediate Joints in Multiconnected Integral and Nonintegral Supports, Item F3.30

Weld and mechanical connections at intermediate joints in multiconnected integral and nonintegral supports shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.3.4 Component Displacement Settings of Guides and Stops, Misalignment of Supports, Assembly of Support Items, Item F3.40

Component displacement settings of guides and stops, misalignment of supports, and assembly of support items shall be visually examined (VT-3) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.

A.4.3.5 Spring Type Supports, Constant Load Type Supports, Shock Absorbers, Hydraulic and Mechanical Type Snubbers, Item F3.50

Spring type supports, constant load type supports, shock absorbers, and hydraulic and mechanical type snubbers shall be visually examined (VT-4) in accordance with Article IWF-1300 and Figure IWF-1300-1 during each inspection interval. Component supports selected for examination shall be the supports of those components that are required to be examined under IWB, IWC, IWD, and IWE during the first interval. For multiple components within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.