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TECHNICAL EVALUATION REPORT
SECOND INTERVAL INSERVICE INSPECTION PROGRAM

PILGRIM NUCLEAR POWER STATION UNIT 1

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INTRODUCTION

This report evaluates requests for relief from certain examination and pressure test requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code* by the licensee, Boston Edison Company (BECo), of the Pilgrim Nuclear Power Station, Unit 1, a boiling water reactor. The relief requests cover the second 120-month inspection interval (December 8, 1982, to December 8, 1992). The requests are based upon the 1980 Edition of Section XI, with addenda through Winter 1980, as specified in the applicable revision of 10 CFR 50.55a.

The rest of this introduction summarizes (a) the scope of this report, (b) the previous review[1] of relief requests by Science Applications International Corporation (SAIC), and (c) the history of Pilgrim since the earlier review.[2-8]

The current revision to 10 CFR 50.55a requires that Inservice Inspection (ISI) programs be updated each 120 months to meet the requirements of newer editions of Section XI. Specifically, each program is to meet the requirements (to the extent practical) of the edition and addenda of the Code incorporated in the regulation by reference in paragraph (b) 12 months prior to the start of the current 120-month interval.

The regulation recognizes that the requirements of the later editions and addenda of the Code might not be practical to implement at facilities because of limitations due to design, geometry, and materials of construction of components and systems. It therefore permits exceptions to impractical examination or testing requirements to be evaluated. Relief from these requirements can 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. This report only evaluates requests for relief dealing with inservice examinations of components and with system pressure tests. Inservice test programs for pumps and valves (IST programs) are being evaluated separately.

The current revision of the regulation also provides that ISI programs may meet the requirements of subsequent Code editions and addenda, incorporated by reference in paragraph (b) and subject to Nuclear Regulatory Commission (NRC) approval. Portions of such editions or addenda may be

*Hereinafter referred to as Section XI or Code.

used, provided that all related requirements of the respective editions or addenda are met. These instances are addressed on a case-by-case basis in the body of this report.

Finally, Section XI of the Code provides for certain components and systems to be exempted from its requirements. In some instances, these exemptions are not acceptable to NRC or are only acceptable with restrictions. As appropriate, these instances are also discussed in this report.

In its previous Technical Evaluation Report (TER) dated September 2, 1982, SAI[1] evaluated relief requests for Pilgrim covering the last 40 months of the first inspection interval (August 9, 1979, to December 8, 1982). These requests were based on the 1974 Edition with addenda through Summer 1975. The applicable Code and interval were in accordance with the revision of 10 CFR 50.55a in effect at the time. Subsequently, the licensee submitted a response to a request for information on the first interval.[2] The NRC issued its Safety Evaluation Report, which incorporated information from the response and included SAIC's TER as an appendix, on May 19, 1983.[3]

The ISI program for the second interval was submitted December 3, 1982.[4] On August 4, 1983,[5] and December 1, 1983,[6] the licensee submitted ISI drawings and an examination plan for the 1983/1984 refueling outage, respectively. The NRC informally requested additional information to complete its review of the second interval program in February 1984.[7] The information was furnished as an attachment to the June 28, 1984,[8] letter. All relief requests identified to date are contained in References 4 and 8. One request issued in Reference 4 was amended in Reference 8.

As a result of the above submittals, eight relief requests (PRR-1 through -7 and PRR-9) have been identified as requiring disposition. These requests are evaluated in the following sections of this report. It appears that further relief from reactor vessel nozzle examinations may be needed beyond the relief requested in PRR-9. Details are given in Item I.A.3.

I. CLASS 1 COMPONENTS

A. Reactor Vessel

1. Relief Request PRR-4, Reactor Vessel Beltline Welds, Category B-A, Items B1.11 and B1.12

Code Requirement

One circumferential and one longitudinal weld in the beltline region of the reactor vessel shall be volumetrically examined in accordance with Figures IWB-2500-1 and -2 over essentially 100% of their lengths each interval. The welds should be selected at a design structural discontinuity, if any. Examinations must be performed at or near the end of the interval.

Code Relief Request

Relief is requested from the above mentioned Code requirements on the basis of inaccessibility.

Proposed Alternative Examination

Boston Edison proposes to examine the weld lengths as specified in Category B-A of the 1974 Edition of Section XI, through and including the Summer 1975 Addenda.

Licensee's Basis for Requesting Relief

Accessibility for the examination of the entire weld lengths was not provided for in the original plant design which occurred prior to the issuance of the Section XI Inservice Inspection requirements. Access is sufficient to meet all Code requirements of Section XI up to and including the Summer 1975 Addenda. This requires examination of 10% of the length of each beltline longitudinal weld and 5% of the length of each beltline circumferential weld.

Further examination of the beltline region welds is precluded by the close proximity of the biological shield wall and obstruction by the vessel insulation. The insulation consists of interlocking panels which were not designed to be easily removable. Furthermore, the annular dimensions between the shield wall and the insulation are not sufficient to allow direct access to personnel.

Examination of the beltline region welds from inside the vessel is impeded by vessel internal design features. The core shroud, jet pumps, and various brackets welded to the vessel wall are not designed to be removable.

Evaluation

The licensee has provided information[8] showing that 5% of the reactor vessel circumferential welds and 10% of the longitudinal welds are accessible for volumetric examination. The licensee has proposed to perform examinations equivalent to those required by Category B-A of the 1974 Edition, Summer 1975 Addenda of the Code. Because these are the only accessible shell weld areas on the reactor vessel, the proposed examinations provide a reasonable alternative to the required examinations. Visual examination of the vessel and shield annulus area should also be made during each system pressure test.

Conclusions and Recommendat ons

Based upon the above evaluation, it is concluded that for the vessel welds discussed above, the Code requirements are impractical. It is further concluded that the alternative volumetric and visual examinations discussed will provide necessary added assurance of structural reliability. Therefore, it is recommended that relief be granted from the Code-required volumetric examinations on reactor vessel shell welds. Relief should be contingent upon performing the following alternative examinations:

(a) The accessible weld areas should be volumetrically examined per Category B-A of the 1974 Edition, Summer 1975 Addenda, as proposed.

(b) Visual examination of the vessel and shield annulus area during system pressure tests should be performed.

References

References 4 and 8.

2. Relief Request PRR-5, Meridional and Circumferential Welds in the Reactor Vessel Bottom Head, Category B-A, Items B1.21 and B1.22

Code Requirement

The accessible lengths of one circumferential and one meridional head weld up to 100% of each shall be volumetrically examined in accordance with Figure IWB-2500-3 each interval. The initially selected welds are to be reexamined during successive intervals. The bottom head welds may be examined at or near the end of the interval.

Code Relief Request

The reactor pressure vessel bottom head contains 17 circumferential and meridional welds. Relief is requested from the Code-required examination on circumferential head welds because of inaccessibility.

Proposed Alternative Examination

Boston Edison will perform a volumetric examination of the bottom head outer circumferential weld from one side only.

Licensee's Basis for Requesting Relief

As discussed in Relief Request PRR-4, accessibility for examination of these welds was not considered in the plant design. The configuration of the vessel support skirt attachment weld and surrounding insulation limits the examination of the outer circumferential weld to one side only.

Evaluation

The Code specifies that the accessible lengths of one circumferential and one meridional head weld are to be volumetrically examined in this interval.

The licensee has provided sketches that show that the inner circumferential weld is completely inaccessible, as are the six meridional welds between the inner and outer circumferential weld. All eight meridional welds between the outer circumferential weld and the shell-to-head weld, however, are accessible. Obviously, the licensee can examine one meridional weld and relief is not needed for this Code requirement. Indeed, the licensee in response to the NRC's request for information, stated that the bottom head meridional welds can be examined.(8) A portion of the outer circumferential weld, however, is not accessible. This weld abutts against the

vessel skirt and is only accessible from the top side of the weld. Thus, it would be appropriate to grant relief to examine the outer circumferential weld from one side only.

Conclusions and Recommendations

Based on the above evaluation, relief is not needed for the meridional weld, but for the bottom head circumferential welds, the Code requirements are impractical. It is further concluded that the proposed alternative examination will provide necessary added assurance of structural reliability. Therefore, relief should be granted from examining the Code-required volume of the bottom head outer circumferential weld, provided the licensee examines the weld from one side as proposed.

References

References 4 and 8.

3. Relief Request PRR-9, Reactor Vessel Nozzle-to-Vessel Welds, Category B-D, Item B3.90

Code Requirement

All nozzle-to-vessel welds in the reactor vessel shall be volumetrically examined in accordance with Figures IWB-2500-7(a) through (d) during the interval. Nozzle-to-vessel welds and adjacent areas of nozzle 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 third inspection period of each 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 the Item 3.90 requirement to volumetrically examine the nozzle-to-vessel welds of 21 reactor vessel nozzles.

Proposed Alternative Examination

The nozzle-to-vessel welds will be volumetrically examined to the extent practical.

Licensee's Basis for Requesting Relief

Relief is requested from the above mentioned Code requirements on the basis that 100% accessibility is not permitted due to the reactor vessel insulation/biological shield configuration. Accessibility for the examination of all nozzle-to-vessel welds was not provided for in the original plant design which occurred prior to the issuance of Section XI requirements.

Evaluation

The reactor vessel insulation and shielding limit access to these welds for examination. It would be impractical to impose the 100% examination requirements because preparations for the examinations would involve many man-hours and man-rem. It is noted, though, that relief is requested only for the item B3.90 nozzle-to-vessel welds. However, the 1981 examination report by Southwest Research Institute[9] on two reactor vessel nozzles (N1B and N2K)

noted limitations to the volumetric examination of all areas of each examined nozzle; nozzle-to-vessel welds (B3.90), nozzle inside radiused sections (B3.100), and nozzle-to-safe end welds (B5.10). No relief is requested for these examinations, and it is suspected that many of the remaining 19 nozzles identified may share these limitations. If this is true, the licensee should determine the examination limitations of each nozzle and request relief where appropriate.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the nozzles discussed above, the Code requirements are impractical. It is further concluded that the alternative examination discussed above will provide necessary added assurance of structural reliability. Therefore, the following are recommended:

(a) Relief should be granted from the Item B3.90 required examinations of the subject 21 nozzle-to-vessel welds.

(b) The above examinations should alternatively be performed to the maximum extent practical, as proposed.

(c) The licensee should determine the limitations to any other required examinations of the 21 nozzles (e.g., those required by Items B3.100 and B5.10). Relief should then be requested as appropriate.

References

References 4, 8, and 9.

B. Pressurizer

Not applicable to BWRs.

C. Heat Exchangers

No relief requests.

D. Piping Pressure Boundary

1. Relief Request PRR-1, Volumetric Examination of Penetration Circumferential Welds, Category B-J, Items B9.10 and B9.21 (Item B4.5 in 1974 S75)

Code Requirements

The licensee has elected to use the 1974 Edition of the Code, Summer 1975 Addenda to determine the extent of piping examinations under Category B-J. This Code requires that examinations be performed on all the area of 25% of the circumferential joints (including the adjoining 1-ft. sections of longitudinal welds) each interval. A different 25% sample is required in successive intervals. The 1980 Code Winter 1980 Addenda requires surface and volumetric examinations in accordance with Figure IWB-2500-8 for pipe size 4 in. and greater. Only surface examinations are required for pipes less than 4 in. in diameter.

Code Relief Request

Each of the lines listed below penetrates the primary containment by means of a triple-flued head penetration assembly. These Class 1 lines, due to the design of the penetration assembly, have one circumferential pressure retaining weld that is inaccessible for volumetric or surface examination.

System	Line Size	Penetration
RHR (Shutdown)	20"	X-12
RHR (Return)	18"	X-51A, B
RHR (Head Spray)	4"	X-17
Core Spray	10"	X-16A, B
RCIC	3"	X-53
RWCU	6"	X-14
SBLC	1.5"	X-42
Feedwater	18"	X-9A, B
Main Steam	20"	X-7A, B,C,D
HPCI (Steam)	10"	X-52

Since this requirement is impractical due to plant design, relief is requested from the examination requirements.

Proposed Alternative Examination

The visual examinations during hydrostatic and leak tests required by IWB-5000 will be conducted in accordance with the Code.

Licensee's Basis for Requesting Relief

As stated in 10 CFR 50.55a(g)(1) for plants whose construction permits were issued prior to January 1, 1971, components shall meet Section XI requirements to the extent practical. Since examination requirements for these welds did not exist at the time Pilgrim Unit 1 was designed, accessibility for their inspection was not considered. The design constraints make it extremely impractical to examine the subject welds by volumetric or surface techniques. Boston Edison feels that this constitutes a basis for relief from the volumetric examination requirements of Section XI.

The safety implications of this exemption are minimal due to the fact that the safety margins in the subject welds are typical of those in all welds in the applicable systems. Since the exempted welds represent only a small fraction of the total number of welds in these systems (16 out of 496), and all of the other welds are inspected as part of the ISI program, loss in statistical significance of the inspection sampling program, due to exempting these welds is expected to be negligible.

Evaluation

The identified welds are completely inaccessible for volumetric or surface examination because the welds are located inside a containment penetration. Each primary containment penetration assembly, due to its design, leaves one pressure retaining piping weld inaccessible for examination by either surface or volumetric means. The welds can only be examined by inspecting for evidence of leakage during system hydrotests.

The initial design of the assemblies did not provide for accessibility for inservice examinations. If it is assumed, though, that the workmanship and quality assurance of the welding as well as the preservice examinations were adequate, then an examination of the first pressure boundary weld outside the containment should reflect service induced failures for that particular piping section. Thus, the first pressure boundary weld outside the containment on each of these process pipes could be volumetrically examined, where practical, over 100% of its length during each inspection interval. Such an examination would maintain sample size. Also, the licensee should conduct visual examinations as proposed.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, the Code requirements are impractical. It is further concluded that the alternative examination discussed above will provide necessary added assurance of structural reliability. Therefore, the following are recommended:

(a) Relief should be granted from the volumetric examination of the identified welds.

(b) The first pressure boundary weld outside the containment on each of these process pipes should be volumetrically examined, where practical, over 100% of its length during each inspection interval.

(c) The proposed visual examinations should be performed on the containment penetration assemblies when leakage and hydrostatic tests are conducted in accordance with IWB-5000.

References

Reference 4.

2. Relief Request PRR-6, Surface Examination of Piping Welds, Category B-J, Items B9.10 to B9.40

Code Requirements

Of the Class 1 welds selected for examination, those greater than 4-in. diameter must be volumetrically examined in the inner one-third of their volume and surface examined on their OD. All other selected welds need to be surface examined only. 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. The initially selected welds shall be reexamined during each inspection interval.

Code Relief Request

Relief is requested from the requirement to perform surface examinations on all applicable Class 1 pipe welds.

Proposed Alternative Examination

In lieu of surface examination, Boston Edison proposes to extend the examination volume as defined by Figures IWB-2500-8 and IWC-2500-7, to encompass the entire weld volume. Recordable surface indications not attributable to geometry would be subjected to an additional surface examination.

Licensee's Basis for Requesting Relief

Both the Preservice and Inservice Inspection Programs for the Pilgrim Nuclear Power Station contained no surface examination requirements for Class 1 and 2 piping welds. Also, most piping systems were painted prior to commercial operation. Degradation due to long exposure to the service environment and maintenance activities necessitates additional surface preparation to bring weld surfaces to an acceptable level for surface examination. Boston Edison does not feel that the additional radiation exposure resulting from surface preparation and increased inspection time is commensurate with the increase in quality level of the piping welds.

Evaluation

The 1980 Edition Winter 1980 Addenda requires a surface examination of all Category B-J welds. (This requirement has been in effect since the 1977 Edition.) The 1974 Edition Summer 1975 Addenda only required volumetric examination for circumferential and longitudinal welds and for branch connection welds exceeding 6 inches in diameter. The 1974 S75 Code, however, required surface examinations for branch connection welds 6 inches and smaller and socket welds. Clearly, the newer Code version emphasizes the importance of surface examinations for Class 1 B-J welds.

Even though the licensee has committed to examining the entire weld volume by ultrasonic methods, some flaws may not be detected. There is some question regarding the validity of these examinations through the paint. Also, surface flaws are not as well identified by ultrasonic testing as they are by surface methods (especially in thin-walled pipe). The paint not only precludes surface examinations but also visual examinations. Therefore, it is important that these Class 1 welds be properly prepared and the Code-required examinations performed. The current Code requires that the initially selected welds be reexamined during each succeeding interval, which limits the number of welds that must be prepared.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, the Code-required surface examinations are not impractical. Therefore, relief should not be granted from the Code surface examinations on the subject welds.

References

Reference 4.

E. Pump Pressure Boundary

1. Relief Request PRR-2, Recirculation Pump Internal Examination, Category B-L-2, Item B12.20

Code Requirement

Visual examination (VT-1) of internal pressure boundary surfaces of one pump in each of the group of pumps performing similar functions in the system shall be performed 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

Boston Edison requests relief from the Section XI examination requirement to visually examine the recirculation pump internal surfaces.

Proposed Alternative Examination

As standard maintenance practice dictates, when a pump of this type is disassembled for maintenance, examination of the pump internals and internal pressure boundary surfaces will be performed to the extent practical.

Licensee's Basis for Requesting Relief

Pilgrim Station has an ISI Class 1 recirculation pump in each of the two 28-in. diameter recirculation loops. These pumps function during normal reactor operation to provide forced recirculation through the core.

The Code requires that one of these recirculation pumps be examined visually during each inspection interval. Specifically, the area of examination includes all pump internal pressure boundary surfaces.

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

(1) to complete the subject examination, large expenditures of man-hours and man-rem are required with essentially no compensating increase in plant safety, and

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

Based on data compiled from a plant similar in age to Pilgrim Unit 1, 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 such adverse conditions as high dose rates (30-40 R/hr) and poor as-cast surface conditions realistically provides little additional information as to the pump casing integrity.

The recirculation pump casing material, cast stainless steel (ASTM A351-CF8), 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.

Boston Edison 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 not performing the visual examination of the pump internal pressure boundary surfaces.

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 the 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 the pump is disassembled for maintenance. Meanwhile, pressure and flow are monitored during pump operation to assess performance.

The proposed alternative examination and normal visual examination during system pressure tests are reasonable substitutes for the code required examination.

Conclusions and Recommendations

Based upon the above evaluation, it is concluded that for the pumps discussed above, the Code requirements are impractical. It is further concluded that the alternative visual examinations discussed will provide necessary added assurance of structural reliability. Therefore, the following is recommended:

Relief should be granted from the Code-required visual examinations. The relief should be contingent upon the licensee's performing the Code examinations on the first recirculation pump disassembled for any other purpose during this interval.

References

Reference 4.

F. Valve Pressure Boundary

1. Relief Request PRR-3, Valve Body Internal Examination, Category B-M-2, Item B12.40

Code Requirement

Visual inspection (VT-3) shall be performed of the internal pressure boundary surfaces on valves exceeding 4-in. nominal pipe size.

One valve in each group of valves of the same constructional design (e.g., globe, gate, or check valve), manufacturing method, and manufacturer that performs similar functions in the system shall be examined 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 Code examining the internal surfaces of valves in all required categories.

Proposed Alternative Examination

An examination of the internal pressure boundary surfaces will be performed, to the extent practical, each time a valve is disassembled for maintenance purposes. Additionally, in accordance with BECo letter 82-296,(2) three check valves will be disassembled for visual examination once each inspection interval. For this interval, the licensee is examining during refueling outage #6 the following 24 valves in 6 groups.(8)

Group	System	Valve No.
1	HPCI	2301-4
3	Main Steam	203-1A
		203-1B
		203-1C
		203-1D
		203-2A
		203-2B
		203-2C
		203-2D
9	RHR	1001-29A
		1001-29B
		1001-50

Group	System	Valve No.
13	Feedwater	6-58A
		6-58B
		6-62A
		6-62B
19	Main Steam	203-3A
		203-3B
		203-3C
		203-3D
20	Main Steam	203-4A
		203-4B
		203-4C
		203-4D

Licensee's Basis for Requesting Relief

In the Class 1 system, there are 56 valves that are greater than 4-in. nominal pipe size. These valves vary in size, design, and manufacturer but are all manufactured from either the cast stainless steel or carbon steel. None of the valve body casings is welded.

The Code requires a visual examination of the internal pressure boundary surfaces of one valve in each group of valves of the same constructional design and manufacturing method that perform similar functions in the system. These examinations are required to be completed each inspection interval (Code Category B-M-2).

Since these examinations must be met whether or not the valves have to be disassembled for maintenance, relief is needed from the above requirement.

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, in some cases under such adverse conditions as high dose rates (10 R/hr) and poor as-cast surface conditions, realistically provides little additional information as to valve body integrity.

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

The performance of both carbon and stainless cast 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 reduce 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 inspect the internal pressure retaining surfaces (bodies) is a major effort in terms of exposure of personnel. To do this disassembly solely to perform a visual examination of the internal body is impractical.

The licensee has committed to performing the Code examination on three check valves each interval and examining any other valve in this Code category that is disassembled for other reasons (the above listed valves were scheduled for examination during the second interval). These examinations, plus the normal system checkout during pressure tests, should justify granting relief for those valve categories not examined.

Conclusions and Recommendations

Based upon the above evaluation, it is concluded that for the valves discussed above, the Code requirements are impractical. It is further concluded that the alternative visual examinations discussed will provide necessary added assurance of structural reliability. Therefore, the following is recommended:

(a) Relief should be granted from performing the Code-required examinations in valve groups where valves are not examined during the interval.

(b) The licensee should Code examine three check valves and any other valves in this group disassembled for other reasons during each interval.

References

References 2, 4 and 8.

II. CLASS 2 COMPONENTS

A. Pressure Vessels

No relief requests.

B. Piping Pressure Boundary

1. Relief Request PRR-6, Surface Examination of Piping Welds, Category C-F, Items C5.10 to C5.32

Code Requirements

Of all Class 2 welds selected for examination, those with wall thickness greater than 1/2 in. must be volumetrically examined in the inner one-third of their volume and surface examined on the OD. All other selected welds need to be surface examined only. 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.

The welds initially selected for examination shall be reexamined over the service lifetime of the piping component.

Code Relief Request

Relief is requested from the requirement to perform surface examinations on all applicable Class 2 pipe welds.

Proposed Alternative Examination

In lieu of surface examination, Boston Edison proposes to extend the examination volume as defined by Figures IWB-2500-8 and IWC-2500-7, to encompass the entire weld volume. Recordable surface indications not attributable to geometry would be subjected to an additional surface examination.

Licensee's Basis for Requesting Relief

Both the Preservice and Inservice Inspection Programs for the Pilgrim Nuclear Power Station contained no surface examination requirements for Class 1 and 2 piping welds. Also, most piping systems were painted prior to commercial operation. Degradation due to long exposure to the service environment and maintenance activities necessitates additional surface preparation to bring weld surfaces to an acceptable level for surface examination. Boston Edison does not feel that the additional radiation exposure resulting from surface preparation and increased inspection time is commensurate with the increase in quality level of the piping welds.

Evaluation

The 1980 Edition Winter 1980 Addenda requires a surface examination of all Category C-F welds. The 1974 Edition Summer 1975 Addenda, however, only required volumetric examinations. The new requirement has been in effect since the 1977 Edition. Clearly, the newer Code versions emphasize the importance of surface examinations for Class 2 C-F welds.

Even though the licensee has committed to examining the entire weld volume by ultrasonic methods, some flaws may not be detected. There is some question regarding the validity of these examinations through the paint. Also, surface flaws are not as well identified by ultrasonic testing as they are by surface methods (especially in thin-walled pipe). The paint not only precludes surface examinations but also visual examinations. Therefore, it is important that at least some of these Class 2 welds be properly prepared and the Code-required examinations performed. Because of the substantial effort involved in weld preparation, however, the sample need not equal 25% or be designed as required by Code. The licensee should, however, try to examine a representative 10% of the welds and should submit the sample to the NRC after design for concurrence. This limited sample should provide adequate indication of the condition of these Class 2 welds. The current Code requires that the initially selected welds be reexamined during each succeeding interval, which will also limit the number of welds that must be prepared over the life of the plant.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, the Code-required surface examinations are not impractical. Therefore, relief should not be granted from the Code surface examinations on all the subject welds. Instead, the licensee should conduct the Code-required examinations on at least a 10% sample of his design. The licensee should submit the sample after design to the NRC for concurrence.

References

Reference 4.

2. Relief Request PRR-7, Containment Atmospheric Control System Welds, Category C-F, Items C5.11 and C5.12

Code Requirement

Of the welds falling under Items C5.11 and C5.12, 25% are to be surface examined each inspection interval. Weld selection is per the 1974 Edition of the Code, Summer 1975 Addenda.

Code Relief Request

Relief is requested from the Code requirement to surface examine pressure retaining welds of the containment atmospheric control system.

Proposed Alternative Examination

None are felt necessary by the licensee.

Licensee's Basis for Requesting Relief

IWC-1220(b) states that the following components are exempt from the inservice examination requirements of IWC-2500: 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 (19.00 kPa) or above a temperature of 200°F (93°C).

This system normally operates at a temperature of 50°F and a pressure of 1 psig. However, the CACS maximum operating temperature and pressure are 281°F and 56 psig, respectively. IWC-1220(b) does not specifically state that the exemption applies to systems that normally do not operate above the specified values. Therefore, since the maximum operating temperature of 281°F exceeds the 200°F temperature required for exemption by IWC-1220(b), this relief request was submitted.

As this system is normally dry and not subjected to high temperatures and pressures, the probability of failure is remote. The pressure testing required by IWC-5000 and the isolation valve tests required by Article IWV provide sufficient assurance of system integrity.

Evaluation

It is apparent that this system's pressure boundary will not be degraded to a significant extent by normal inservice conditions. Examining the required welds would increase overall personnel radiation exposure without adding appreciably to information on the system's integrity. Other prescribed tests on this system should be adequate to determine the material condition of the system.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, the Code requirements are impractical. It is further concluded that the other Code-required examinations of this system, as discussed above, will provide necessary added assurance of structural reliability. Therefore, the following is recommended:

Relief should be granted from the Code requirement to surface examine the subject welds. Code-prescribed pressure and valve tests should be performed as proposed.

References

References 4 and 8.

C. Pumps

No relief requests.

D. Valves

No relief requests.

III. CLASS 3 COMPONENTS

No relief requests.

IV. PRESSURE TESTS

No relief requests.

REFERENCES

1. Science Applications, Inc. Technical Evaluation Report, Pilgrim Nuclear Power Station Unit 1, Inservice Inspection Program, SAI Report No. 186-028-33, September 2, 1982.

2. A. V. Morisi (BECo) to D. B. Vassallo (NRC), BECo No. 82-296, November 15, 1982 (response to RAI on first ISI interval).

3. D. B. Vassallo (NRC) to W. D. Harrington (BECo), May 19, 1983 (SER on First Interval ISI Program).

4. A. V. Morisi (BECo) to D. B. Vassallo (NRC), BECo No. 82-311, December 3, 1982 (ISI Program, Second Interval).

5. W. D. Harrington (BECo) to D. B. Vassallo (NRC), BECo No. 83-207, August 4, 1983 (submits ISI drawings).

6. W. D. Harrington (BECo) to H. R. Denton (NRC), BECo No. 83-290, December 1, 1983 (ISI Examination Plan for 1983/1984 Refueling Outage).

7. NRC to BECo, February 1984 (informal transmittal of Request for Additional Information).

8. W. D. Harrington (BECo) to D. B. Vassallo (NRC, BECo No. 84-095, June 28, 1984 (response to RAI on second ISI interval).

9. A. V. Morisi (BECo) to D. B. Vassallo (NRC), BECo No. 82-185, July 2, 1982 (encloses Southwest Research Institute Final Report on 1981 ISI).