FPL Energy
Seabrook Station

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JAN 14 2004

Docket No. 50-443
NYN-04000

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Seabrook Station
ASME Section III Request for the
Service Water and Service Water Cooling Tower Pumps

Pursuant to 10 CFR 50.55a(a)(3)(i), FPL Energy Seabrook, LLC hereby requests NRC approval for Seabrook Station Unit 1 to implement the requirements of Code Case N-661 for Class 3 service water piping system repairs resulting from degradation mechanisms such as erosion, corrosion, cavitation, or pitting. Copies of the 10 CFR 50.55a request and Code Case N-661 are enclosed.

FPL Energy Seabrook, LLC requests NRC review and approval of this request by December 31, 2004.

Should you have any questions regarding this letter, please contact Mr. James M. Peschel, Regulatory Programs Manager, at (603) 773-7194.

Very truly yours,
FPL Energy Seabrook, LLC

Mark E. Warner
Site Vice President

cc:
H. J. Miller, NRC Region 1 Administrator
V. Nerses, NRC Project Manager, Project Directorate I -2
G. T. Dentel, NRC Senior Resident Inspector

A047

Enclosure 1

FPL Energy Seabrook, LLC

Seabrook Station
Unit 1

ASME SECTION XI REQUEST

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1. **Component for Which Relief is Requested:**

   Service Water Piping System

2. **ASME Code Class:**

   Class 3

3. **ASME Section XI Code Requirements:**

   Article IWA-4000 in the 1995 edition with 1996 addenda of Section XI of the ASME Boiler and Pressure Vessel Code provides the rules and requirements for the repair of pressure retaining components and their supports, including appurtenances, subassemblies, parts of a component, core support structures, metal containments and their integral attachments, and metallic portions of Class CC containments and their integral attachments, by welding, brazing, or metal removal. Article IWA-4000 also provides the rules and requirements for the specification and construction of items to be used for replacement and installation of replacement items.

4. **Basis for the Relief Request:**

   Relief is being requested from the replacement and internal weld repair rules and requirements provided in ASME Section XI, Article IWA-4000 as applicable to ASME Class 3, carbon steel, Service Water system piping that has experienced internal wall thinning from localized errosion, corrosion, cavitation, or pitting. Relief is being requested from the rules and requirements of ASME Section XI, Article IWA-4000 for replacements and internal weld repairs to ASME Class 3, carbon steel, Service Water piping pursuant to 10CFR50.55a(a)(1)(3) on the basis that the proposed alternative will provide an acceptable level of quality and safety.

The design function of the Service Water system is to transfer heat loads from various sources in both the primary and secondary portions of the plant to the ultimate heat sink. The ultimate heat sink for all operating and accident loads is normally the Atlantic Ocean. Four (4) Service Water pumps located in the Service Water pump house normally supply the Service Water system heat loads. The design conditions for the Service Water system piping, valves, and pumps are 150 psig and 200°F. The piping in the safety-related portion of the Service Water system was designed, installed, and ASME Code stamped as a Class 3 component in accordance with ASME Section III, Subsection ND of the ASME Boiler & Pressure Vessel Code. The piping in the non safety-related portion of the Service Water piping system was designed and installed in accordance with the ANSI B31.1 Power Piping Code. There is no ASME Code Class 2 Service Water system piping in the plant.

In the unlikely event that the Atlantic Ocean seawater flow to the Service Water pumps in the Service Water pump house is restricted, a mechanical draft evaporative cooling tower is available to dissipate shutdown and accident heat loads. The two (2) Service Water Cooling Tower pumps are used to circulate water through the required Service Water system loads and the Service Water Cooling Tower.

5. **Alternative Requirements:**

As an alternative to ASME Section XI, Article IWA-4000 replacement and internal weld repair rules and requirements, FPL - Energy Seabrook, LLC proposes to implement ASME Section XI Code Case N-661 titled "Alternative Requirements for Wall Thickness Restoration of Classes 2 and 3 Carbon Steel Piping for Raw Water Service". This ASME Code Case was recently approved by the ASME Board Nuclear Codes & Standards (BNC&S) and has subsequently been issued in supplement 5 to the 2001 edition of the ASME Boiler & Pressure Vessel Code. This Code Case allows wall thickness restoration externally by means of a weld-deposited carbon steel or low-alloy steel reinforcement on the outside of the piping in accordance with the provisions of the Code Case.

In addition to the ASME Code Case N-661 requirements, all external weld repairs to Service Water system piping performed in accordance with Code Case N-661 will be performed by FPL Energy Seabrook, LLC or its Agent in accordance with the Operational Quality Assurance Program and work control program. Also, when FPL Energy Seabrook, LLC implements ASME Code Case N-661, the following three conditions will be met. These conditions are; (a) a root cause of the degradation will be determined, (b) the weld overlay repair of the area will only be performed once in the same location, (c) when through-wall repairs are made by welding on surfaces that are wet or exposed to water, the weld overlay repair will only be acceptable until the next refueling outage.

6. **Duration of Proposed Alternative:**

FPL Energy Seabrook LLC proposes the use of Code Case N-661 pursuant to 10 CFR 50.55 (a)(3)(i) for Seabrook Station Unit 1 until approved for general use by reference in Regulatory Guide 1.147 "Inservice Inspection Code Case Acceptability – ASME Section XI Division I."

Enclosure 2

ASME Code Case N-661

Approval Date: July 23, 2002

See Numeric Index for expiration and any reaffirmation dates.

Case N-661
Alternative Requirements for Wall Thickness Restoration of Classes 2 and 3 Carbon Steel Piping for Raw Water Service
Section XI, Division 1

Inquiry: As an alternative to replacement or internal weld repair, what requirements may be applied for wall thickness restoration of Classes 2 and 3 carbon steel raw water[1] piping systems that have experienced internal wall thinning from localized errosion, corrosion, cavitation, or pitting?

Reply: It is the opinion of the Committee that areas of Classes 2 and 3 carbon steel raw water piping experiencing internal wall thinning from localized erosion, corrosion, cavitation, or pitting may have the wall thickness restored externally by means of a weld-deposited carbon or low-alloy steel reinforcement on the outside surface of the piping in accordance with the following requirements. Excluded from these provisions are conditions involving corrosion-assisted cracking or any other form of cracking.

1.0 GENERAL REQUIREMENTS

(a) The wall thickness restoration shall be performed in accordance with a Repair/Replacement Plan satisfying the requirements of IWA-4150.[2]

(b) The wall thickness restoration shall meet the requirements of IWA-4000,[3] except as stated in this Case.

(c) If the minimum required thickness of deposited weld metal necessary to satisfy the requirements of 3.0 is greater than the nominal thickness for the size and schedule of the piping, the provisions of this Case shall not apply. In addition, the total thickness of filler metal applied over multiple repairs shall not exceed the original nominal thickness of the piping.

2.0 INITIAL EVALUATION

The material beneath the surface to which the weld overlay is to be applied shall be evaluated to establish the existing average wall thickness and the extent and configuration of degradation to be reinforced by the weld overlay. The adjacent area shall be examined to verify that the repair will encompass the entire defective area. Consideration shall be given to the cause of degradation. The extent of degradation in the piping, shall be evaluated to ensure that there are no other unacceptable locations within the surrounding area that could affect the integrity of the repaired piping. The dimensions of the surrounding area to be evaluated shall be determined by the Owner, considering the type of degradation present. The effect of the repair on the piping, and any remaining degradation shall be evaluated in accordance with IWA-4160.[4]

3.0 DESIGN

3.1 General Design Requirements

(a) Unless otherwise established by theoretical or experimental analysis, or by proof testing as provided for in 3.3 or 3.4, the full thickness of the weld overlay shall extend a distance of at least s in each direction beyond the area predicted, over the design life of the restoration to infringe upon the required thickness.[5]

where

$s = \geq \frac{3}{4}\sqrt{Rt_{nom}}$

R = outer radius of the component

t_{nom} = nominal wall thickness of the component

Edges of the weld overlay shall be tapered to the existing piping surface at a maximum angle ("α" in

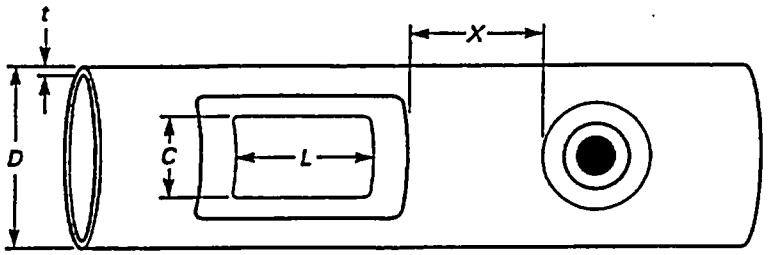
[1] Raw water is defined as water such as from a river, lake, or well or brackish/salt water used in plant equipment, area coolers, and heat exchangers. In many plants it is referred to as "Service Water."

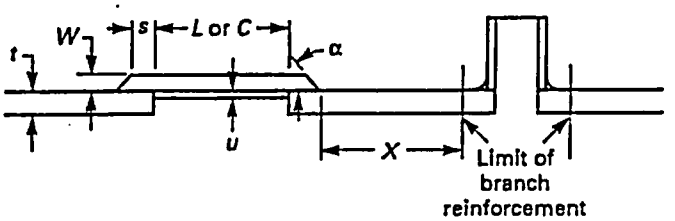
[2] IWA-4140 in the 1989 Edition with the 1991 Addenda through 1995 Edition. IWA-4130 (Repair Program) in the 1989 Edition with the 1990 Addenda and earlier Editions and Addenda.

[3] IWA-4000/7000 and IWC/IWD-4000/7000, as applicable, in the 1989 Edition with the 1990 Addenda and earlier Editions and Addenda.

[4] IWA-4150 in the 1989 Edition with the 1991 Addenda through 1995 Edition. IWA-4130 (Repair Program) in the 1989 Edition with the 1990 Addenda and earlier Editions and Addenda.

[5] Design thickness as prescribed by the Construction Code.





$X \geq 2^1/_2 \sqrt{Rt_{nom}}$

FIG. 1 BRANCH REINFORCEMENT

Fig. 1) of 45 deg. Final configuration of the reinforcement shall permit the examinations and evaluations required herein, including any required preservice or inservice examinations of encompassed or adjacent welds.

(b) The thickness shall be sufficient to maintain required thickness for the predicted life of the repair, and, except for the tapered edges, the overlay shall have a uniform thickness.

(c) The tensile strength of the weld filler metal for the reinforcement shall be at least that specified for the base metal to which it is applied.

(d) The predicted maximum degradation of the overlaid piping and the overlay over the design life of the restoration shall be considered in the design. The predicted degradation of the piping shall be based on in situ inspection and established data for similar base metals. If the weld overlay is predicted to become exposed to the corroding medium, the predicted degradation of the overlay shall be based upon established data for base metals or weld metals with similar chemical composition to that of the filler metal used for the weld overlay.

(e) The effect of weld overlay application on interior coatings shall be addressed in the Repair/Replacement Plan (previously Repair Program).

3.2 Design

The design of weld overlays not prequalified by 3.3, 3.4, or 3.5 shall be in accordance with the applicable requirements of the Construction Code or NC/ND-3100 and NC/ND-3600 (including Appendix II), and shall consider the weld overlay as an integral portion of the piping or component upon which it is applied (not as a weld). The allowable stress values of the base metal shall apply to the design of the deposited weld metal. The following factors shall be considered, as applicable, in the design and application of the reinforcement:

(a) The shrinkage effects, if any, on the piping;

(b) Stress concentrations caused by application of the overlay or resulting from existing and predicted piping internal surface configuration;

(c) If flexibility analysis was required by the original Construction Code, the effect of the weld overlay shall be reconciled with the original analysis. For rectangular-shaped overlays on piping designed to NC/ND-3650 and aligned parallel or perpendicular to the axis of the piping, unless a lower stress intensification factor (SIF or i) is established, an SIF (i) of 2.1 shall be applied for overlays on straight pipe and adjacent welds. Also, a stress *multiplier* of 1.7 shall be applied to the SIF (i) for standard elbows; and an SIF (i) of 2.1 shall be

applied for tees and branch connections when the toe of the overlay is not less than $2\frac{1}{2}\sqrt{Rt_{nom}}$ from any branch reinforcement in Fig. 1.

3.3 Proof Test Qualification as a Piping Product

As an alternative to design, the configuration of weld overlays may be qualified by performance of proof testing of a mockup in accordance with the following requirements:

(a) A satisfactory mockup burst test shall qualify the design or configuration for application in the same orientation on the same type of item, and the same location on fittings, when the following conditions are satisfied (see Fig. 1).

(1) The base metal is of the same P-No. and Group Number when impact properties are applicable, as the base metal tested.

(2) The specified minimum tensile strength of the item does not exceed that specified for the base metal tested.

(3) The average thickness of the overlay areas is at least the thickness of the mockup plug, u.

(4) The overlap on the full thickness of base metal, s, is at least that of the mockup.

(5) The transition angle at the outer edges of the overlay, α, is not greater than that of the mockup.

(6) The overlay surface finish is similar to or smoother than that tested.

(7) The maximum proportionate axial dimension, L/D, is not more than that tested.

(8) The maximum proportionate circumferential dimension, C/D, is not more than that tested.

(9) The nominal diameter is not less than one-half nor more than two times the diameter tested.

(10) The nominal thickness/diameter ratio, t/D, is not less than one-half nor more than three times the t/D, ratio tested.

(b) The mockup base shall consist of new base material of similar configuration, or type of item, as the item to be overlaid. A rounded-corner segment of the base material shall be removed to represent the maximum proportionate size (axial dimension of L and circumferential dimension of C) and location of thinning or pitting to be compensated for by the weld overlay. A plug of the same base metal and of uniform thickness, u, which shall not exceed the smallest average thickness on which the overlays will be permanently applied, shall be full-penetration welded around the opening and flush with the outside surface of the piping. Alternatively, an equivalent volume of base metal may be removed from the inside surface of the mockup by machining or grinding, without need for welding in a closure plug.

(c) The mockup weld overlay shall be applied in accordance with the design or specified configuration using the specified weld filler metal. Maximum section thickness at the overlaid opening (weld metal plus base metal plug, or $u + w$) shall not exceed $87\frac{1}{2}\%$ of the nominal thickness of the piping.

(d) Straight pipe equivalent to a minimum of one pipe diameter, or one-half diameter for piping over NPS 14, shall be provided (butt-welded to the mockup, if necessary) beyond both ends of the overlay. The piping shall be capped, and the completed mockup assembly shall be thoroughly vented and hydrostatically pressure tested to bursting. To qualify the design for general application within the limits of 3.3(a), burst pressure shall not be less than:

$$P = \frac{2tS_{act}}{D_o}$$

where

P = minimum acceptable burst pressure, psi
t = minimum specified thickness (excluding manufacturing tolerances) of the base metal being tested, in.
S_{act} = reported actual tensile strength of the base metal being tested, psi
D_o = outside diameter of the pipe, in.

(e) If flexibility analysis was required by the original Construction Code, the effect of the weld overlay shall be reconciled in accordance with 3.2(c).

3.4 Proof Test Qualification for Specific Applications

As an alternative to design by analysis or proof test qualification as a piping product, the design or configuration of weld overlays may be qualified for limited service conditions using the provisions of NC/ND-6900, "Proof Tests to Establish Design Pressure," except that component hydrostatic testing is not required (other than as required by IWA-4000[3]). The mockups shall be fabricated and tested in accordance with the provisions of 3.3(b), (c), and (d), and shall be applied in accordance with the provisions and conditions of 3.3(a). The provisions of 3.3(e) shall be met.

3.5 Prequalified Design

Application of weld overlays on straight pipe, portions of tees not less than $2\frac{1}{2}\sqrt{Rt_{nom}}$ from any branch reinforcement in Fig. 1, standard elbows, and associated welds to correct limited degradation shall be exempt from the requirements of 3.2 through 3.4 provided all of the following conditions are satisfied.

(a) All the requirements of 3.1 apply.

(b) The provisions of 3.3(e) shall be met.

(c) The full thickness of weld overlay shall not exceed a maximum axial length of the greater of 6 in. or the outside diameter of the piping.

(d) The finished overlay shall be circular, oval, full-circumferential or rectangular in shape.

(1) For each repair, the maximum dimension compensated by a circular overlay shall not exceed $\frac{2}{3}$ the nominal outside diameter of the piping.

(2) Rectangular overlays shall be aligned parallel with or perpendicular to the axis of the piping, and corners shall be rounded with radii not less than the ovelay thickness.

(3) For oval overlays, the end radii shall not be less than $\frac{3}{4}\sqrt{Rt_{nom}}$, and the axis of the overlay shall be aligned parallel with or perpendicular to the axis of the piping.

(e) The distance between toes of adjacent overlays shall not be less than t_{nom}.

4.0 WATER-BACKED APPLICATIONS

(a) Manual application of overlays on water-backed piping shall be restricted to P-No. 1 base materials. Welding of such overlays shall use the SMAW process and low-hydrogen electrodes. In addition, the surface examination required in 6.0 shall be performed no sooner than 48 hr after completion of welding. For such overlays consideration should be given to using a temper bead technique similar to that described in IWA-4650.[6]

(b) Piping with wall thickness less than the diameter of the electrode shall be depressurized before welding.

5.0 INSTALLATION

(a) The entire surface area to which the weld overlay is to be applied shall be examined using the liquid penetrant or magnetic particle method, with acceptance criteria in accordance with NC/ND-2500, NC/ND-5300 for the product form (base metal or weld) involved.

(b) If through-wall repairs are required to satisfy the acceptance criteria, or result from application of the weld overlay, they shall be accomplished by sealing with weld metal using a qualified weld procedure suitable for open-root welding. This weld shall be examined in accordance with 5.0(a). In addition, the first layer of overlay over the repaired area shall be examined in accordance with 5.0(a).

(c) Overlay weld metal shall be deposited using a grove-welding procedure qualified in accordance with Section IX and the Construction Code, or Section IX and Section XI, IWA-4610 and either IWA-4620 or IWA-4650.[7] The qualified minimum thickness specified in the weld procedure does not apply to the weld overlay or associated base metal repairs.[8]

(d) The surface of the weld overlay shall be prepared by machining or grinding, as necessary, to permit performance of surface and volumetric examinations required by 6.0. For ultrasonic examination, a surface finish of 250 RMS or better is required.

6.0 EXAMINATION

(a) The completed weld overlay shall be examined using the liquid penetrant or magnetic particle method and shall satisfy the surface examination acceptance criteria for welds of the Construction Code or NC/ND-5300.

(b) The weld overlay, including the existing piping upon which it is applied, shall be examined to verify acceptable wall thickness.

(c) Weld overlays shall be volumetrically examined as base metal repairs when required by the Construction Code, except as follows:

(1) Weld overlays not exceeding 10 in.^{2} surface area are exempt from volumetric examination.

[6] IWA-4540 in the 1989 Edition with the 1991 Addenda through the 1995 Edition. IWE-4200 in the 1986 Edition with the 1988 Addenda through the 1989 Edition with the 1990 Addenda. IWE-4320 in the 1986 Edition with the 1987 Addenda and earlier Editions and Addenda.

[7] IWA-4500 and either IWA-4510 or IWA-4540 in the 1989 Edition with the 1991 Addenda through 1995 Edition. IWA-4510 or IWE-4200 in the 1986 Edition with the 1988 Addenda through 1989 Edition with the 1990 Addenda. IWB-4320 or IWE-4320 in the 1986 Edition with the 1987 Addenda or earlier Editions and Addenda.

[8] Exception to IWA-4000.

(2) Other weld overlays shall be exempt from volumetric examination when the finished applied thickness (w in Fig. 1) does not exceed:

(a) $\frac{1}{3}t$ for $t \leq \frac{3}{4}$ in.

(b) $\frac{1}{4}$ in. for $\frac{3}{4}$ in. $< t \leq 2\frac{1}{2}$ in.

(c) The lesser of $\frac{3}{8}$ in. or 10% of t for $t > 2\frac{1}{2}$ in.

where

t = finished full-section thickness of compensated area (e.g., $w + u$ in Fig. 1)

When volumetric examination is required, the full volume of the finished overlay, excluding the tapered edges, but including the volume of base metal required for the design life of the overlay, shall be examined using either the ultrasonic or radiographic method, and shall, to the depth at the surface of the existing piping, satisfy the acceptance criteria for weldments of the Construction Code or NC/ND-5300. The volume of the existing piping, beneath the weld overlay, taken credit for in the design, shall satisfy the volumetric acceptance criteria of NC/ND-2500, NC/ND-5300 for the product form, or IWA-3000.[9]

7.0 INSERVICE EXAMINATION

(a) The Owner shall prepare a plan for additional examination to verify that minimum wall thickness is not violated over the life of the repair. The frequency and method of examination shall be determined based on an evaluation of the degradation mechanism.

(b) The maximum expected life of the repair shall be two fuel cycles unless examinations during each of the two fuel cycles are performed to establish the expected life of the repair.

8.0 DOCUMENTATION

Use of this Case shall be documented on an NIS-2 Form.

[9] IWA-3000 and IWB-3514 in the 1989 Edition with the 1990 Addenda and earlier Editions and Addenda.