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10 CFR 50.55a

2130-06-20297
March 31, 2006

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Oyster Creek Generating Station
Facility License No. DPR-16
Docket No. 50-219

Subject: Proposed Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel – Draft Code Case N-730, "Roll-Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs, Section XI, Division 1"

References:

1) AmerGen letter 2130-00-20300 dated November 10, 2000, "Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel"
2) AmerGen letter 2130-00-20304 dated November 14, 2000, "Modification to Proposed Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel"
3) USNRC letter dated November 16, 2000, "Request to Use an Alternative Repair of the Control Rod Drive Housing Interface with the Reactor Vessel at the Oyster Creek Nuclear Generating Station (TAC NO. MB0461)"
4) AmerGen letter 2130-01-20031 dated January 19, 2001, "Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel - Clarification of Leakage Inspection"
5) USNRC letter dated January 8, 2002, "Oyster Creek Nuclear Generating Station – Clarification of Leakage Inspection (TAC NO. MB1065)"
6) AmerGen letter 2130-02-20214 dated July 26, 2002, "Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel"
7) AmerGen letter 2130-02-20291 dated October 4, 2002, "Additional Information - Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel (TAC No. MB5700)"
8) USNRC letter dated October 18, 2002, "Oyster Creek Nuclear Generating Station - Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel (TAC NO. MB5700)"
9) AmerGen letter 2130-03-20271 dated October 21, 2003, "Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel"
10) AmerGen letter 2130-04-20157 dated July 20, 2004, "Response to Request for Additional Information Concerning Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel"
11) AmerGen letter 2130-04-20201 dated August 23, 2004, "Response to Request for Additional Information Concerning Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel"

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12) AmerGen letter 2130-04-20214 dated September 8, 2004, "Response to Request for Additional Information Concerning Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel"
13) USNRC letter dated November 12, 2004, "Oyster Creek Nuclear Generating Station - Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel (TAC NO. MC1099)"

In accordance with 10 CFR 50.55a(a)(3)(i), Oyster Creek Generating Station (OCGS) is requesting a proposed alternative to the requirements of ASME Section XI, 1995 Edition through 1996 Addenda, IWA-4000, "Repair/Replacement Activities," for the repair of CRD housing penetrations 42-43 and 46-39. Specifically, OCGS proposes the use of Draft Code Case N-730, "Roll-Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs, Section XI, Division 1." Additionally, OCGS is requesting approval of the code case as an alternative repair for any additional penetrations that may exhibit leakage for the remainder of the Oyster Creek Generating Station Fourth Ten-Year Inservice Inspection Interval.

In the Reference 8 letter, the NRC staff extended the approval of the roll-expansion repairs to CRD housing penetrations 42-43 and 46-39 for one cycle until R20 (Fall 2004). The letter also recommended that if OCGS intended to use this alternative as a permanent repair, it should pursue this alternative repair of the CRD housings with the ASME Code Committee to accept this as a permanent repair through an ASME Code Case. This discussion was also reiterated in the Reference 13 letter in which NRC granted further approval until R21 (Fall 2006). Additionally, as discussed in the Reference 13 letter, NRC requested "any roll repairs intended to be left in service after, or performed at Refueling Outage R21 requires submittal of a relief request to the NRC 6 months prior to entering Refueling Outage R21 for approval." This letter satisfies that request.

OCGS has been actively pursuing the roll-expansion repair with the ASME Code Committees. OCGS is therefore requesting that the Attachment 2 draft code case be approved for use as an alternative for the remainder of the Fourth Ten-Year Inservice Inspection Interval at OCGS.

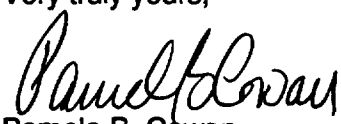
The Fourth Ten-Year Interval Inservice Inspection Program complies with the 1995 Edition through 1996 Addenda of the ASME, Section XI Code. The fourth interval began on October 15, 2002.

Attachment 1 contains Relief Request OC-06-01. Attachment 2 contains Draft Code Case N-730. Draft Code Case N-730 has been approved through the ASME Section XI Sub-Committee with Main ASME Committee approval expected by Fall 2006. The AmerGen staff will work with the NRC staff to monitor the draft code case as it moves through the consensus code committee process and will evaluate each change to ensure the code case remains acceptable to the NRC staff.

In order to support the upcoming Fall 2006 outage, we request your review and approval by September 29, 2006.

If you should have any questions, please contact Mr. Tom Loomis at 610-765-5510.

Very truly yours,



DDH

Pamela B. Cowan
Director – Licensing & Regulatory Affairs
AmerGen Energy Company, LLC

Attachments: 1) Oyster Creek Generating Station Relief Request OC-06-01
2) Draft Code Case N-730

cc: S. J. Collins, USNRC, Administrator, Region I
G. E. Miller, USNRC, Project Manager, Oyster Creek
M. S. Ferdas, USNRC, Senior Resident Inspector, Oyster Creek
File No. 06028

ATTACHMENT 1

Oyster Creek Generating Station

Relief Request

OC-06-01

AmerGen Energy Company
Oyster Creek Generating Station
Fourth 10-Year Interval
Request for Relief OC-06-01

ASME CODE COMPONENTS AFFECTED:

Code Class:	Class I
Reference:	ASME Section XI, 1995 Edition through 1996 Addenda, IWA-4000 ("Repair/Replacement Activities") and IWB-3142 ("Acceptance")
Systems:	Control Rod Drive Bottom Head Penetrations
Description:	Use of Draft Code Case N-730, "Roll-Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs, Section XI, Division 1"

APPLICABLE CODE EDITION AND ADDENDA:

ASME Section XI, 1995 Edition through 1996 Addenda

APPLICABLE CODE REQUIREMENT:

ASME Section XI, 1995 Edition through 1996 Addenda, IWA-4000, "Repair/Replacement Activities," requires that all repair and replacement be performed in accordance with the provisions of IWA-4000. Additionally, IWB-3142, "Acceptance," provides acceptance criteria for components, which includes removal of the relevant condition.

REASON FOR REQUEST:

In accordance with 10 CFR 50.55a(a)(3)(i), Oyster Creek Generating Station (OCGS) is requesting a proposed alternative to the requirements of ASME Section XI, 1995 Edition through 1996 Addenda, IWA-4000 ("Repair/Replacement Activities") and IWB-3142 ("Acceptance") for the repair of CRD housing penetrations 42-43 and 46-39. Specifically, OCGS proposes the use of Draft Code Case N-730, "Roll-Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs, Section XI, Division 1." Additionally, OCGS is requesting approval of the code case as an alternative repair for any additional penetrations that may exhibit leakage for the remainder of the Oyster Creek Generating Station Fourth Ten-Year Inservice Inspection Interval.

During refueling outage R18 (Fall 2000) at OCGS, visual inspections performed during the reactor pressure vessel (RPV) leak test identified water leaking from the under-vessel area at the mirror insulation in the vicinity of CRD housings 42-43 and 46-39. Further inspection determined that the leakage originated at the interface of the RPV lower head and CRD housing. The penetrations were roll-expansion repaired in accordance with BWRVIP-17, "Roll/Expansion Repair of Control Rod Drive and In-Core Instrument Penetrations in BWR Vessels (BWRVIP-17)," dated November 1996. This repair was approved for one cycle (until R19, Fall 2002) as discussed in the Reference 3 letter.

In the Reference 8 letter, the NRC staff extended the approval of the roll-expansion repairs to CRD housing penetrations 42-43 and 46-39 for one cycle until R20 (Fall 2004). The letter also recommended that if OCGS intended to use this alternative as a permanent repair, it should pursue this alternative repair of the CRD housings with the ASME Code Committee to accept this as a permanent repair through an ASME Code Case. This discussion was also reiterated in the Reference 13 letter in which NRC granted further approval until R21 (Fall 2006). Additionally, as discussed in the Reference 13 letter, NRC requested that "any roll repairs intended to be left in service after, or performed at Refueling Outage R21 requires submittal of a relief request to the NRC 6 months prior to entering Refueling Outage R21 for approval." This proposed alternative satisfies that request.

As part of the approval provided in the Reference 13 letter, NRC determined that OCGS's proposed alternative will provide reasonable assurance of the integrity of the CRD housing interface with the reactor pressure vessel, and concluded that the proposed alternative will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative was authorized until the next refueling outage (i.e., R21).

OCGS has been actively pursuing the roll-expansion repair with the ASME Code Committees. OCGS is therefore requesting that the attached draft code case contained in Attachment 2 be approved for use as an alternative for the remainder of the Fourth Ten-Year Inservice Inspection Interval at OCGS.

PROPOSED ALTERNATIVE AND BASIS FOR USE:

OCGS requests the use of Draft Code Case N-730, "Roll-Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs, Section XI, Division 1," for the repair of CRD housing penetrations 42-43 and 46-39. Additionally, OCGS is requesting approval of the code case as an alternative repair for any additional penetrations that may exhibit leakage for the remainder of the Oyster Creek Generating Station Fourth Ten-Year Inservice Inspection Interval.

The technical basis for the code case is provided in the Code Case N-730 Technical Basis Report, "Technical Basis for ASME Code Case N-730 Roll-Expansion of Class 1 Control Rod Drive (CRD) Bottom Head Penetrations in BWRs, Section XI, Division 1," Report XGEN-2005-10, Revision 2, March 2006.

The CRD penetrations are located in the reactor vessel lower head and each consists of a stainless steel stub tube that is welded, using alloy 82/182, to the reactor vessel lower head during the reactor vessel fabrication process. The stainless steel CRD housing is then welded in the field to the stub tube. A visual inspection of the two roll-repaired CRD housings was performed in an attempt to find the root cause of the leakage identified in R18. An adjacent control rod guide tube was removed to provide access through the core plate for the CRD housing inspection. Visual inspection of CRD housings and stub tubes 42-43 and 46-39 did not identify any leakage paths. The most probable root cause of the CRD housing leakage is a crack in the stainless steel stub tube (which was furnace-sensitized during the heat treatment of the reactor vessel) which propagated through the stub tube weld overlay. The furnace sensitized stub tubes were repaired during initial construction and had weld cladding applied as part of the repair. Alloy 182 was used for some of the cladding on the stub tubes, which has been observed to be susceptible to stress corrosion cracking in BWRs.

The previous repair of CRD housing penetrations 42-43 and 46-39 was performed in accordance with BWRVIP-17, "Roll/Expansion Repair of Control Rod Drive and In-Core Instrument Penetrations in BWR Vessels (BWRVIP-17)," dated November 1996, as discussed in the Reference 1 through 13 letters.

An ultrasonic exam of the inside diameter of CRD housing 46-39 was performed in the R20 outage (Fall 2004). No indications were identified. As discussed in the Reference 10 letter, OCGS has been visually inspecting the two (2) roll repairs each time access is gained to under the vessel, which may include forced outage conditions. To date, no additional leakage has been identified with these CRD housings. Draft Code Case N-730 permits no leakage from a roll expanded CRD housing.

Noble Metals Chemical Addition (NMCA) was injected in R19 (2002), and Hydrogen Water chemistry (HWC) has been in operation since February 1992. HWC availability has typically exceeded 98% since 2002.

DURATION OF PROPOSED ALTERNATIVE:

This relief is requested for examinations performed during the fourth ten-year interval at Oyster Creek Generating Station. The fourth ten-year Interval began on October 15, 2002.

ATTACHMENT 2

Draft Code Case N-730, "Roll-Expansion of Class 1 Control Rod Drive Bottom Head Penetrations In BWRs, Section XI, Division 1"

Proposed Code Case N-730
Roll-Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs
Section XI, Division 1

Inquiry: As an alternative to the requirements of IWB-3142, may the mechanical roll expansion technique be used to eliminate leakage from Class 1 Control Rod Drive (CRD) bottom head penetrations in Boiling Water Reactors (BWRs)?

Reply: It is the opinion of the committee that, as an alternative to the requirements of IWB-3142, the mechanical roll expansion technique may be used to eliminate leakage from Class 1 CRD bottom head penetrations in BWRs, provided the following requirements are met.

1.0. Scope

This Case applies to use of mechanical roll expansion for the purpose of sealing leakage from cracks detected in the following locations:

(a) CRD stub tube base metal
(b) CRD stub-tube-to-housing J-groove weld
(c) CRD stub-tube-to-RPV attachment weld.
(d) CRD housing-to-RPV attachment weld (BWR-6)

This Case shall not be used when leakage is due to through-wall cracking in the housing.

The following conditions shall be met:
(a) Type 304, Type 316, or Alloy 600 CRD housing
(b) SA-302 Grade B, SA-302 Grade B Modified, or SA-533 Grade B vessel material
(c) measured percent wall-thinning: 3.5% - 6.5%
(d) roll band length shall not exceed 6 in. (150 mm)
(e) minimum roller top/bottom end radius ¾-in. (19mm)
(f) ratio of housing specified minimum yield strength to vessel head specified minimum yield strength < 1.0
(g) If more than one roll is required to achieve the required roll-band length, the minimum overlap for each roll shall be at least 0.5-in. (13mm).
(h) Rollers shall be lubricated.

2.0. General Requirements

2.1 When a CRD housing is roll expanded against the vessel, creating a mechanical seal to eliminate leakage and prevent upward displacement of the housing, the following requirements shall be met:

(a) Target values for wall-thinning and roll-band length shall be specified. The target value for wall thinning for the rolling shall be 4% to 6%. Because of variations in the gap between the housing outside surface and the vessel bore inside surface, the actual amount of wall thinning may vary

from 3.5% to 6.5%. In no case shall the total wall thinning exceed 6.5%. The required wall thinning may be achieved using any number of intermediate partial rolls.

(b) The roll-band length is defined as the flat portion of the roll, excluding the rounded transition region at each end. The minimum roll band length shall not be less that in the pre qualified procedure or the length qualified by a procedure qualification.. In addition, the length shall not be less than the roll band length (L) required to resist end-of-scram loads as determined by the following equation:

$L = F / [0.4\pi (1-p) \times T \times Sy]$,
where:
F = Maximum upward end-of-scram force including a structural factor of 2, Kips (MN)
p = Nominal wall thinning Fraction (e.g. 0.04 for 4% thinning)
T = Thickness of housing, in. (m)
Sy = Yield strength of the housing material at room temperature, ksi (MPa)

(c) As an alternative to the criteria in 2.1(b) above, testing may be used to establish the minimum roll band length required to resist end-of-scram loads. The testing shall use mockups that meet the essential variables described in Table 1. A mechanical roll-expansion tool using a tapered shaft to effect expansion and a hard-stop to limit expansion shall be used. The load and deflection during a pull test on the housing shall be recorded. The load capability corresponding to initial slipping of the housing shall be determined at room temperature. The load at initial slippage (corresponding to the maximum load before the intersection of the line with slope equal to 95% of the slope of the load deflection curve) shall exceed twice the maximum required upward end-of-scram load.

(d) When multiple roll passes are required to achieve the desired roll band length the direction of the rolling shall be initiated from the top and progress downward toward the free end of the CRD housing.

(e) In no case shall rolling be performed on portions of the housing extending above or below the vessel bottom head.

2.2 A roll expansion procedure specification (REPS) shall be prepared. The REPS shall define the requirements for roll expansion for procedure qualification (if required), for performance demonstration, and for the in-plant rolling. The REPS shall define the target values for wall thinning and roll-band length as well as the procedure to be used to achieve these target values.

2.3 No plant-specific procedure qualification is required (the procedure is prequalified) if the in-plant rolling parameters are within the tolerances specified in Table 2. A mechanical roll-expansion tool using a tapered shaft to effect expansion and a hard-stop to limit expansion shall be used.

Table 1 Plant-Specific Procedure Qualification Parameters

Essential Variable	Allowable Range
Percent wall thinning	3.5% to 6.5%
Roll band length	Greater than or equal to the value used, not to exceed 6 in. (150 mm) (backed by vessel material)
Housing outside diameter	Actual housing outside diameter ±0.25 in. (6 mm)
Housing inside diameter	Actual housing inside diameter ±0.25 in. (6 mm)
Housing material	Same type as application (e.g., 300 Series stainless steel or Alloy 600)
Vessel head material	SA-302 Grade B, SA-302 Grade B Modified, or SA-533 Grade B Steel

Table 2: Prequalified Rolling Parameters

Essential Variable	Allowable Range
Percent wall thinning	3.5% to 6.5%
Roll band length,ℓ	3 in.≤ ℓ ≤ 6 in. (76 mm ≤ ℓ ≤150 mm) (backed by vessel material)
Housing outside diameter	5.975 ±0.25 in. (150 ± 6 mm)
Housing inside diameter	4.86 ±0.25 in. (123 ± 6 mm)
Housing material	Type 304 or 316 stainless steel
Vessel head material	SA-302 Grade B, SA-302 Grade B Modified, or SA-533 Grade B Steel

3.0. Plant Specific Procedure Qualification

If the design of the roll does not meet the conditions of Table 2, a plant specific procedure qualification is required. A REPS for the procedure qualification and for the in-plant application shall be developed. The procedure qualification shall be demonstrated on a mockup meeting the requirements of Table 1 as well as the critical requirements listed in 1.0. The vessel may be simulated in the mockup by a flat plate with thickness at least 1.5-in. (38 mm) greater than the target roll-band length, but in no case less than 4 in. (100 mm).

3.1 The roll-band length and percent wall thinning achieved in the procedure qualification shall be determined by measurement. The measured wall-thinning shall be equal to the target value plus or minus 0.5%. The measured roll-band length shall define the minimum qualified roll-band length for use in plant application.

3.2 The mockup shall be rolled at ambient temperature, heated to 550° F (290°C) and held at temperature for one hour and then cooled to ambient and then subjected to a leakage test at 1875 psig (13 MPa) for a minimum of one hour. Successful roll expansion requires visual verification of no leakage.

3.3 A plant may use a procedure qualification developed and qualified at another plant provided the qualification parameters listed in Table 1 are not exceeded and all other provisions of this Case are met. Transfer of the procedure qualification shall be subject to the following requirements:

(a) The Owner that performed the procedure qualification shall certify in writing that the procedure qualification was developed in accordance with a Quality Assurance Program that satisfies the requirements of IWA-1400(n).

(b) The Owner that performed the procedure qualification shall certify in writing that the procedure qualification meets the applicable provisions of this Case.

4.0. Performance Demonstration

(a) Prior to implementing a roll-expansion in a plant, a performance demonstration shall be conducted to verify personnel capabilities. The performance demonstration shall be conducted on a mockup meeting the requirements of Table 3. The vessel may be simulated in the mockup by a flat plate with thickness at least 1.5 in. (38 mm) greater than the target roll-band length, but in no case less than 4 in. (100 mm). Tooling shall be of the identical design and nominal dimensions as tooling to be used for in-plant roll.

(b) Personnel responsible for performing any tasks required to achieve the essential variables of the REP in plant applications shall perform the same tasks in the performance demonstration. Performance of a task in the performance demonstration qualifies a person to perform that task in the plant. Each task to be performed by a person shall be demonstrated by that person within the 12-month period immediately prior to in-plant application. Personnel qualification shall be documented in the plant records of the roll-expansion.

(c) The REPS for the demonstration shall define the target values for wall thinning and roll-band length as well as the location of the roll-band to be achieved in the demonstration. These target values need not be identical to those specified for the in-plant rolling.

(d) Acceptance criteria for the performance demonstration are: (1) Measured wall thinning equal to the target value plus or minus 0.5%; (2) measured roll-band length equal to the target value plus 0.25

in. (6 mm) or minus 0 in. (0 mm); and, (3) the roll-band position is equal to the target value plus or minus 0.25 in. (6 mm).

Table 3: Performance Demonstration Essential Variables

Variable	Allowable Range
Percent wall thinning	3.5% to 6.5%
Roll band length	Any value provided the roll band length is no more than 6 in. (150 mm). However, if multiple rolls will be required to achieve the required in-plant roll-band length, the performance demonstration shall require multiple rolls. (backed by vessel material)
Housing outside diameter	Actual housing outside diameter ±0.25 in. (6 mm)
Housing inside diameter	Actual housing inside diameter ±0.25 in. (6 mm)
Housing material	Same type as application (e.g., 300 Series stainless steel or Alloy 600)
Vessel head material	SA-302 Grade B, SA-302 Grade B Modified, or SA-533 Grade B Steel

5.0. Evaluation

An evaluation shall be performed for each roll expansion to demonstrate the acceptability of the proposed expansion as follows:

5.1 Analysis shall be performed to show that the thickness of the CRD housing after rolling is sufficient to meet the primary stress limits of the Construction Code.

5.2 Analysis shall be performed to evaluate crack growth, considering stress corrosion cracking and fatigue. Location and extent of cracking shall satisfy the requirements of IWB-3600.

5.3 If the source of the leakage is a crack in the vessel attachment weld, a postulated axial crack in the vessel attachment weld shall be evaluated. The evaluation shall include an assumption that the entire weld is cracked radially and shall satisfy the requirements of IWB-3600.

6.0. Examinations and Tests

6.1 Prior to roll expansion, ultrasonic (UT) examination shall be performed of the regions specified in Fig. 1 or Fig. 2 as appropriate. For stub-tube configurations (Fig. 1), the rolled region (Region 2) and the stub tube-to-housing J-weld region (Region 1) shall be examined. For the BWR/6 CRD configuration (Fig. 2), the rolled region (Region 2) and the vessel-to-housing weld (Region 1) shall be examined. If the leakage is due to through wall cracking of the housing, this Case shall not be used. The roll region (Region 2) shall not have any planar flaws. For housing indications in the area of the stub tube-to-housing J-weld region or the vessel-to-housing weld (Region 1) the housing shall be evaluated as piping for the purpose of determining flaw acceptance. The examination results shall be evaluated in accordance with IWB-3523. If flaws exceed the acceptance standards of IWB-3523, they shall be evaluated to show that the requirements of IWB-3640 are satisfied.

6.2 After completion of the roll expansion, ultrasonic examination of the J-groove weld (Region 1) shall be performed. The examination results shall be evaluated in accordance with IWB-3523. If flaws exceed the acceptance standards of IWB-3523, they shall be evaluated to show that the requirements of IWB-3640 are satisfied.

6.3 After completion of the roll expansion, ultrasonic examination of the rolled region (Region 2) shall be performed to establish that no planar flaws exist in the rolled region.

6.4 The UT procedure used in the examinations shall be demonstrated on a plant-specific mockup with flaws located in the area of interest, in accordance with Appendix I of this Case.

6.5 If the location of the leakage has not been determined, an in-vessel VT-1 visual examination of the leaking CRD penetration shall be made during the outage in which the leakage was first detected or during the next scheduled refueling outage, to attempt to locate the leakage source and to determine the general condition of the housing. Cracks, wear, or localized accumulation of corrosion products shall require corrective action. Roll expansion satisfies the corrective action requirement.

6.6 After completing the post-roll ultrasonic examination, the CRD housing penetration shall be tested in conjunction with a system leakage test in accordance with IWB-5000; for CRD housings subjected to roll-expansion, the acceptance criterion is no leakage.

7.0. Inservice Inspections

The following examinations shall be added to the inservice inspection program:

7.1 An ultrasonic examination (UT) of roll-expanded CRD housings shall be performed in accordance with Fig. 1 or Fig. 2 on at least 10% of previously-rolled housings, during each inspection interval. The examination results shall be evaluated in accordance with IWB-3523. If

flaws exceed the acceptance standards of IWB-3523, they shall be evaluated to show that the requirements of IWB-3640 are satisfied. If the requirements of IWB-3640 are not met, the defect shall be corrected by a repair/replacement activity.

7.2 If flaws are detected that fail to meet the acceptance standards of IWB-3523, the additional examination requirements of IWB-2430 shall be met.

7.3 At subsequent system leakage tests in accordance with IWB-5000, CRD housings having roll-expansion shall meet the requirements of 6.6.

7.4 The UT procedure used in the examinations shall be demonstrated on a plant-specific mockup with flaws located in the area of interest, in accordance with Appendix I of this Case.

8.0. Records

8.1 The Owner shall retain the following records for the life of the vessel.

(a) Roll Expansion Procedure Specification (REPS)

(b) record of procedure qualification, including the results of all tests required in 3.0.

(c) locations of all roll expanded CRD housings

(d) results of post-expansion examinations and evaluations

(e) evaluations performed in accordance with 5.0

(f) records of performance demonstration, including documentation of personnel qualifications

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

Applicability: From the 1989 Edition through the 2004 Edition with the 2006 Addenda.

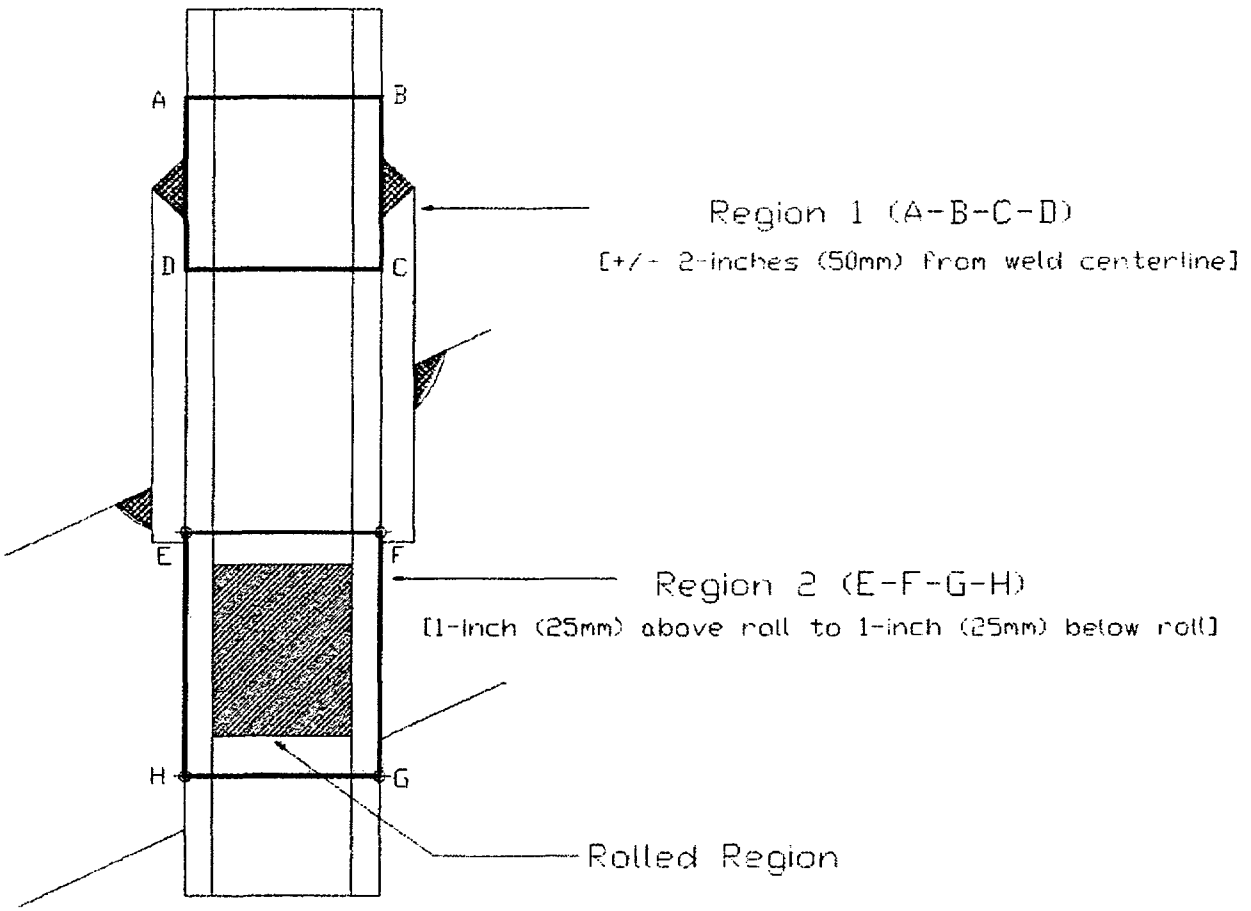


Fig. 1: Examination Volume for Stub-Tube Type CRD Housings

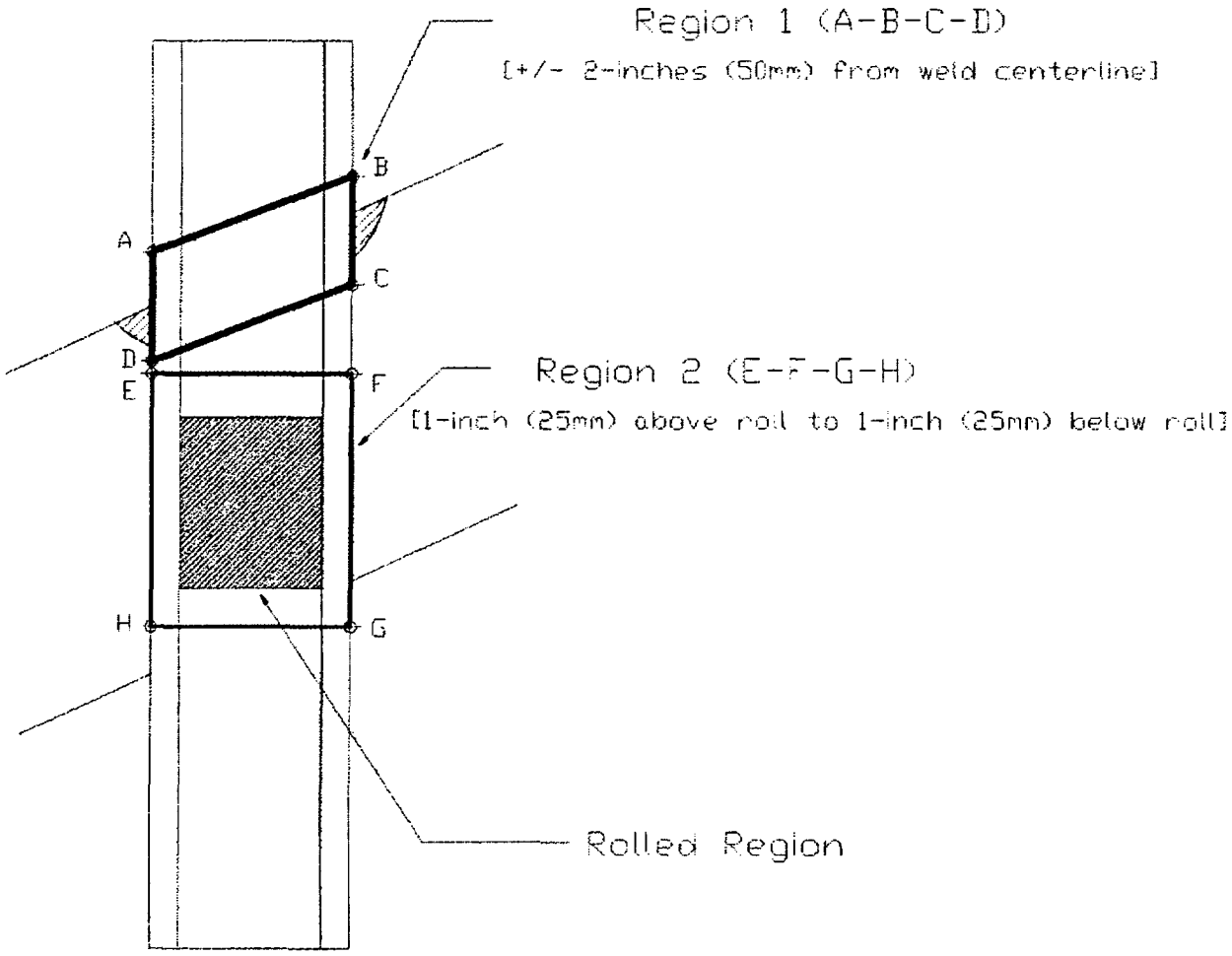


Fig. 2: Examination Volume for BWR/6 CRD Housings

CASE
N-730

APPENDIX I

USE OF MOCKUP FOR UT PROCEDURE DEMONSTRATION

1. UT procedure shall be demonstrated to perform acceptably on a mockup. Personnel who perform flaw detection and evaluation using this procedure shall be qualified in accordance with Section XI Appendix VIII Supplement 2.

2. UT shall be performed using automated computer generated data acquisition methods.

3. A short section of piping, type 304 or similar stainless steel, of inside and outside diameter in accordance with Table 3, is required for the mockup. The length shall be long enough to accommodate the required flaws and provide adequate access for the UT scanning equipment to examine the flaw areas.

4. The mockup shall contain a minimum of 10 surface-breaking flaws (distributed such that a minimum of 4 and a maximum of 6 shall be on the OD surface.) The mockup shall contain flaws that are oriented both axially and circumferentially. Flaws shall be located on the mockup such that no flaw ultrasonic response shall interfere with any other flaw response. A minimum of 3 flaws and a maximum of 5 flaws shall be oriented axially. The flaws shall range in depth from 5% to 70% through-wall from the surfaces containing them. The flaw length to depth ratios shall be distributed in a range from 2 to 6. Flaws may be either actual cracks (thermal or mechanical fatigue, or IGSCC) or notches compressed so that the faces of the notch are in contact. If compressed notches are used, the notch tip width shall have a radius no larger than 0.002 in. (0.05 mm).

5. UT procedure shall be considered acceptable if it can be demonstrated that the flaws are detected and discernible by specific criteria identified in the examination procedure (e.g., signal to noise ratio equal to or greater than 2 to 1 can be obtained from the flaws). The data from the procedure demonstration shall be evaluated to determine the length and depth-sizing error associated with the procedure. These error values shall be accounted for in any flaw acceptance evaluations.