Nebraska Public Power District

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NLS2016013
April 8, 2016

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Fifth Ten-Year Interval Inservice Inspection Program
Cooper Nuclear Station, Docket No. 50-298, DPR-46

Dear Sir or Madam:

The purpose of this correspondence is to provide Nebraska Public Power District's Inservice Inspection (ISI) Program for the Fifth Ten-Year Interval. Submittal of the program is in accordance with the requirements of 10 CFR 50.55a(g)(5)(i). As documented within the ISI Program, the relief requests included in the ISI Program have been previously submitted to the Nuclear Regulatory Commission and approved for use. The Fifth Ten-Year Interval for Cooper Nuclear Station (CNS) began on April 1, 2016 and concludes on February 28, 2026.

10 CFR 50.55a(g) requires ISI of certain American Society of Mechanical Engineers Code Class 1, 2, and 3 components and their supports. 10 CFR 50.55a(g)(4)(ii) requires that ISI programs conducted during successive ten-year inspection intervals following the initial ten-year interval comply with the requirements of the latest edition and addenda of the Code, incorporated by reference in paragraph (a) of 10 CFR 50.55a, twelve months prior to the start of the ten-year interval. Accordingly, the CNS Fifth Ten-Year Interval Inservice Inspection Program is based on the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, 2007 Edition with 2008 Addenda.

The enclosure to this letter contains the Fifth Ten-Year Interval Inservice Inspection Program.

There are no regulatory commitments contained in this letter.

Should you have any questions regarding the information contained in this submittal, please contact me at (402) 825-2788.

Sincerely,

Jim Shaw
Licensing Manager

A047
NRR

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/dv

Enclosure: Cooper Nuclear Station Fifth Ten-Year Interval Inservice Inspection Program and Third Ten-Year Interval Containment Inservice Inspection Program, Revision 0

cc: Regional Administrator w/enclosure
USNRC - Region IV

Cooper Project Manager w/enclosure
USNRC - NRR Plant Licensing Branch IV-2

Senior Resident Inspector w/enclosure

NPG Distribution w/o enclosure

CNS Records w/enclosure

Enclosure

Cooper Nuclear Station Fifth Ten-Year Interval Inservice Inspection Program and Third Ten-Year Interval Containment Inservice Inspection Program, Revision 0

Cooper Nuclear Station, Docket No. 50-298, DPR-46

COOPER NUCLEAR STATION
FIFTH TEN-YEAR INTERVAL
INSERVICE INSPECTION PROGRAM
AND
THIRD TEN-YEAR INTERVAL
CONTAINMENT INSERVICE INSPECTION PROGRAM
REVISION 0

Prepared by: Tim McClure/ Tim McC / 3-30-16
ISI Engineer Date

Reviewed by: Shane Charbonnet/ / 3-30-16
ISI Specialist Date

Approved by: Stan Domikaitis / / 3-30-16
Code Programs Supervisor (Acting) Date

Approved by: Troy Barker/ / 3/30/16
EP&C Manager Date

NEBRASKA PUBLIC POWER DISTRICT

March 30, 2016 CNS-16-002

Nebraska Public Power District
Cooper Nuclear Station
PO Box 98
Brownville, NE 68321

Attn: Mr. Tim McClure,
ISI Engineer

Subject: Cooper Nuclear Station 5th 10yr Interval Inservice Inspection Program & 3rd 10yr Interval Containment Inservice Inspection Program, Rev 0

Dear Mr. McClure:

This memo will be used to document the review of the Cooper Nuclear Station 5th 10yr Interval Inservice Inspection Program & 3rd 10yr Interval Containment Inservice Inspection Program, Rev 0. This review was conducted to meet the requirements stated in ASME, Section XI, 2007 Edition, 2008 Addenda, IWA-2110. This review also included the verification that the Owner has the applicable Code Books, Addenda and Code Cases.

The Program, including each of the proposed changes, has been reviewed.

Revision 0 of the Cooper Nuclear Station 5th 10yr Interval Inservice Inspection Program & 3rd 10yr Interval Containment Inservice Inspection Programs, appear to be satisfactory. This review is documented in the Daily Inspection Record.

Sincerely,

Scott A. Mascarello
Authorized Nuclear Inservice Inspector

cc: Troy Barker
Stan Domikaitis
Philip Leininger
Shane Charbonnet
Victor Krueger

1.0 TABLE OF CONTENTS

2.0 REVISION SUMMARY SHEET

Section	Summary of Changes	Revision	Date Effective
ALL	All Sections were updated to the 2007 Edition through the 2008 Addenda of ASME Section XI for the ISI 5th 10-year interval and CISI 3rd 10-year interval.		
1	Initial Issue	0	04/01/16
2	Initial Issue	0	04/01/16
3	Initial Issue	0	04/01/16
4	Initial Issue	0	04/01/16
5	Initial Issue	0	04/01/16
6	Initial Issue	0	04/01/16
7	Initial Issue	0	04/01/16
8	Initial Issue	0	04/01/16
9	Initial Issue	0	04/01/16
10	Initial Issue	0	04/01/16
11	Initial Issue	0	04/01/16
12	Initial Issue	0	04/01/16
13	Initial Issue	0	04/01/16
14	Initial Issue	0	04/01/16
15	Initial Issue	0	04/01/16
16	Initial Issue	0	04/01/16
17	Initial Issue	0	04/01/16
18	Initial Issue	0	04/01/16
19	Initial Issue	0	04/01/16
20	Initial Issue	0	04/01/16

3.0 INTRODUCTION AND PROGRAM BASIS DESCRIPTION

3.1 Introduction

3.1.1 This Program outlines the requirements for the nondestructive examination of ASME Class 1, 2, and 3 pressure-retaining components and their supports and Class MC (metallic containments) components at Cooper Nuclear Station (CNS). The Primary Containment consists of the Drywell, the Suppression Chamber (torus), and the connecting piping (vent headers).

3.1.2 The Fifth Ten-Year Interval Inservice Inspection (ISI) Program effective start date is April 1, 2016 and end date is February 28, 2026. The Third Ten-Year Interval Containment Inservice Inspection (CISI) Program is aligned with the ISI Program under Request for Alternative RC3-01 "Alignment and Synchronization of the Containment Inservice Inspection (CISI) Program Third Ten-Year Interval with the Inservice Inspection (ISI) Program Fifth Ten-Year Interval."

3.1.3 The key features of this Program are the introduction and program description, relief requests, technical approach and positions, and summary tables. The details of the ISI and CISI Programs are supported by other documents that are available at CNS. These documents include, but are not limited to, component detail drawings, piping and instrumentation diagrams, piping isometric drawings, procedures, calibration blocks, and other records required to execute the ISI or CISI Programs at CNS.

3.1.4 Regulatory Bases

The regulations in 10 CFR 50.55a(g)(4) establish the effective ASME Code edition and addenda to be used by licensees for performing inservice inspections of components (including supports). Paragraph 50.55a(g)(4)(ii) requires the use of the latest edition and addenda that has been incorporated by 10 CFR 50.55a(a), one year prior to the beginning of each 120-month ISI interval. This is considered the Code of Record. The Code of Federal Regulation in effect one year prior to the beginning of the fifth interval was CFR76FR36232 published June 21, 2011. This CFR incorporated, by reference, the ASME Section XI, 2007 Edition with the 2008 Addenda in paragraph (a)(1)(ii) with conditions.

Based on the referenced CFR above, the CNS Fifth Ten-Year Interval ISI and Third Ten-Year Interval CISI Program Plan is based on the requirements of the 2007 Edition through the 2008 Addenda of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section XI. An updated CFR79FR214[1] was published in November 2014 with the conditions contained in 10 CFR 50.55a(b)(2) as defined below:

[1] A correction was issued under CFR79FR238

3.1.4.1 10 CFR 50.55a(b)(2)(ix)(A)(2), For each inaccessible area identified for evaluation, the applicant or licensee must provide the following in the ISI Summary Report as required by IWA-6000

- 3.14.1.1 A description of the type and estimated extend of degradation and the conditions that led to the degradations;
- 3.14.1.2 An evaluation of each area and the result of the evaluation ; and
- 3.14.1.3 A description of necessary corrective actions.

3.1.4.2 10 CFR 50.55a(b)(2)(ix)(B), *Metal containment examinations: second provision.* When performing remotely the visual examinations required by Subsection IWE, the maximum direct examination distance specified in Table IWA-2210-1 (IWA-2211-1 in 2007 Ed., 2008 Add.) may be extended and the minimum illumination requirements specified in Table IWA-2210-1 may be decreased provided that the conditions or indications for which the visual examination is performed can be detected at the chosen distance and illumination.

3.1.4.3 10 CFR 50.55a(b)(2)(ix)(J), *Metal containment examinations: tenth provision.* In general, a repair/replacement activity such as replacing a large containment penetration, cutting a large construction opening in the containment pressure boundary to replace steam generators, reactor vessel heads, pressurizers, or other major equipment; or other similar modification is considered a major containment modification. When applying IWE-5000 to Class MC pressure-retaining components, any major containment modification or repair/replacement, must be followed by a Type A test to provide assurance of both containment structural integrity and leaktight integrity prior to retuning to service, in accordance with 10 CFR part 50 Appendix J, Option A or Option B on which the applicant's or licensee's Containment Leak-Rate Testing Program is based. When applying IWE-5000, if a Type A, B, or C Test is performed, the test pressure and acceptance standard for the test must be in accordance with 10 CFR part 50, Appendix J.

3.1.4.4 10 CFR 50.55a(b)(2)(xiv), *Section XI condition: Appendix VIII personnel qualification.* All personnel qualified for preforming ultrasonic examinations in accordance with Appendix VIII must receive 8 hours of annual hands-on training on specimens that contain cracks. Licensees applying the 1999 Addenda through the latest edition and addenda incorporated by reference in paragraph (a)(1)(ii) of this section may use the annual practice requirements in VII-4240 of Appendix VII of Section XI in place of the 8 hours of annual hands-on training provided that the supplemental practice is performed on material or welds that contain cracks, or by analyzing pre-recorded data from material or welds that contain cracks. In either case, training used must be completed no earlier than 6 months prior to performing ultrasonic examinations at a licensee's facility.

3.1.4.5 10 CFR 50.55a(b)(2)(xviii)(A), *NDE personnel certification: first provision.* Level I and II nondestructive examination personnel must be recertified on a 3-year interval in lieu of the 5-year interval specified in the 1997 Addenda and 1998 Edition of IWA-2314, and IWA-2314(a) and IWA-2314(b) of the 1999 Addenda through the latest edition and addenda incorporated by reference in paragraph (a)(1)(ii) of this section.

3.1.4.6 10 CFR 50.55a(b)(2)(xxii), *Section XI condition: Surface Examination.* The use of the provision in IWA-2220, "Surface Examination," of Section XI, 2001 Edition through the latest edition and addenda incorporated by reference in paragraph (a)(1)(i) of this section, that allow use of an ultrasonic examination method is prohibited.

The ISI Program at CNS is based on and documents compliance with 10CFR50.55a, which incorporated by reference the 2007 Edition, 2008 Addenda of the ASME Code, Section XI, Subsections IWA, IWB, IWC, IWD and IWF for Inspection Program. The CNS Containment Inservice Inspection (CISI) Program is in accordance with the 2007 Edition, 2008 Addenda, of the ASME Code, Section XI, Subsection IWE. It is important to note that Section XI of the ASME Code is not by itself considered to be law and alternatives to ASME Section XI may be implemented with NRC prior approval. These alternatives can be in the form of previously reviewed and approved Code cases or CNS specific Relief Requests clearly delineated in the ten-year inspection plan. Previously reviewed and approved Code cases are documented in NRC Regulatory Guide (RG) 1.147, Inservice Inspection Code Case Alternatives, ASME Section XI, Division 1.

From a licensing basis perspective, compliance with 10CFR50.55a and the ASME Section XI requirements (except where relief has been granted by the NRC) is also stipulated in Section T3.7.2 of the CNS Technical Requirements Manual (TRM).

Compliance with the regulatory requirements for the ISI Program is summarized in the following matrix:

Requirement	Basis for Compliance	Implementing Method(s)
10CFR50.55a and Technical Requirements Manual (TRM) T3.7.2: Implement ISI Program per ASME Section XI	Compliance is achieved through the ISI Program which is established and implemented by Engineering Procedure (EP) 3.28.1. The ten-year inspection interval ISI plan (or ISI Program) contains specific details relative to program scope, and inspection frequencies.	EP 3.28.1, EP 3.28.1.X series procedures, various CNS Maintenance Procedures, various CNS Surveillance Procedures, and vendor NDE procedures.
10CFR50.55a and TRM T3.7.2: Implement ISI Program per ASME Section XI, except where relief has been granted.	Deviation from ASME Section XI requirements may be obtained through Relief Requests or previously approved Code cases. These deviations are delineated in the ten-year inspection interval ISI plan (or ISI Program). Generation of Relief Requests is controlled by EP 3.28.1	EP 3.28.1

3.2. Basis

Inservice Inspection Program

3.2.1 The commercial operation date for Cooper Nuclear Station is July 1, 1974. The first, second and fourth intervals were extended as allowed by IWA-2430. CNS began the third interval on March 1, 1996. The fourth interval began on March 1, 2006. The CNS fifth interval start date is April 1, 2016.

3.2.2 The three inspection periods and corresponding outages for Class 1, 2, 3 and MC during the fifth ISI inspection and 3rd CISI inspection intervals are as follows. CNS is currently on 24 month cycles starting at the end of RE27 (2012).

First Period: April 1, 2016 to February 28, 2019
RE29 – October 2016
RE30 – October 2018

Second Period: March 1, 2019 to February 28, 2023
RE31 – October 2020
RE32 – October 2022

Third Period: March 1, 2023 to February 28, 2026
RE33 – October 2024

Containment Inservice Inspection Program

3.2.3 In the Federal Register, dated August 8, 1996 (61 FR 41303), the NRC amended its regulations (rule) to incorporate by reference the 1992 Edition and Addenda of Subsections IWE and IWL of Section XI of the ASME Code. Subsections IWE and IWL give the requirements for inservice inspection (ISI) of Class CC (concrete containments), and Class MC (metal containments) of light-water-cooled power plants. The amended rule became effective on September 9, 1996; it requires the licensees to incorporate the new requirements into their ISI plans and to complete the first containment inspection within five years (i.e., no later than September 9, 2001). Any repair or replacement (R/R) activity to be performed on containments after the effective date of September 9, 1996, has to be carried out in accordance with the respective requirements of Subsections IWE and IWL.

3.2.4 In the Federal Register, dated September 26, 1995 (60 FR 49505), the NRC amended its regulations (rule) to incorporate Option B – Performance-Based Requirements, into 10 CFR 50 Appendix J. The original requirements are now referred to as Option A – Prescriptive Requirements. Option B Section III.A states A general visual inspection of the accessible interior and exterior surfaces of the containment system for structural deterioration which may affect the containment leak-tight integrity must be conducted prior to each test and at a periodic interval between tests based on the performance of the containment system

On October 6, 1999, the District submitted to the NRC proposed changes to the CNS Technical Specifications for the implementation of Option B. The amended Technical Specifications were issued by the NRC on March 3, 2000. The General Visual Examination requirements specified herein satisfies the visual examination requirements specified in Option B.

3.2.5 Aging Management Mitigation Strategy - Torus Underwater Region

The monitoring strategy associated with the torus underwater interior region is implemented using the augmented visual examination requirements as specified in ASME Section XI. CNS has classified this region as Category E-C, "Containment Surfaces Requiring Augmented Examination" due to the observed active pitting degradation mechanism. Visible surfaces subject to augmented examination are examined using the VT-1 visual examination method as specified in Table IWE-2500-1. CNS calculations provide the technical basis for when to recoat corrosion areas per NEDC 92-213 "Review of Pacific Nuclear Calculation NPD037.0200 ASME NE Code Evaluation of Suppression Chamber/ Torus Shell Including Effects of Pitting Corrosion" and NEDC 01-001, "Torus Downcomers Minimum Wall Thickness". The intent of the inspection screening criteria is to ensure corroded areas/pits are identified and recoated during scheduled examinations well in advance of those corrosion areas/pits reaching a depth that could challenge the structural or pressure boundary integrity of the containment shell including the "downcomers" of the torus vent system.

The following provides general guidance for identifying areas of corrosion attack and thresholds for coating repair and/or engineering evaluation:

3.2.5.1 Examination region and areas

The torus shell is of prime importance when evaluating immersion area coatings (underwater) and base metal condition. Loss of base metal due to corrosive attack may ultimately compromise the integrity of the vessel if not properly evaluated and repaired. Due to large surface area, the shell is sub-divided into smaller, identifiable regions and areas as described in the following sections. This process provides a reasonable but consistent approach in monitoring and mitigation actions.

- General Shell regions below the equatorial seam are defined as any area on the immersed shell not included in an area defined as a "Near Ring Girder" region or a "Near Penetration" region. The general shell will be sub-divided into bays by the structural ring girders.
- "Near Ring Girder" regions below the equatorial seam are defined as follows:
  - Areas on the general shell extending 12" from the face of the ring girder web on the side without the miter joint and extending 12" from the miter on the side with the miter joint.
  - Areas within 12" of any of the 3 sides of the ring girder stiffener plates.
- "Near Penetration" regions are defined as follows:
  - Areas below the equatorial seam on the shell within 12" of a penetration nozzle.
  - For penetrations with a thickened insert plate, the area extends 12" from the insert plate / torus shell intersection.
  - For heavily loaded penetrations (X- 223A & B, X-227 A & B, X-226, and X-225 A, B, C, and D) the area extends 2-1/2' from the insert plate / torus shell intersection.
  - Penetrations X-223 A & B are located above the waterline, but the "Near Penetration" region extends below the waterline.
  - If a Near Penetration region overlaps a Near Ring Girder region, the requirements for the Near Penetration region shall control.

- "Downcomer" regions are defined as follows:
    - Accessible surfaces of the downcomers below the waterline.

3.2.5.2 Examination of Coated Areas

This section provides the general guidance for examination of the torus shell protective coatings in immersion service to identify and document relevant coating deficiencies. For the purpose of this examination, there are two general categories of relevant coating deficiencies.

- Category 1 includes coating deficiencies that may result in the release of coating material from the substrate.
- Category 2 includes coating deficiencies that expose base metal and may be associated with pitting at threshold depths requiring coating repair or engineering evaluation of the shell base metal.

The coating examination shall identify, classify, and evaluate relevant coating deficiencies as follows:

- Cracking (common to both barrier and sacrificial coatings) is the formation of breaks in a coating film that extend through to the underlying surface. If the underlying surface is a prime or intermediate coating and does not extend to substrate, it shall be described as "topcoat cracking". Cracking which extends to the substrate shall be described as "cracking to substrate". In both instances the affected area shall be evaluated for delamination.
- Delamination (common to both barrier and sacrificial coatings) is a separation of one coat from another coat within a coating system, or from the substrate. The deficient area shall be probed with a knife blade or paint scraper until sound adherent coating is found.
- Blistering (common to barrier coatings) appears as raised spherical bulges above the surface plane of the coating. Blister size and frequency shall be evaluated in accordance with ASTM Standard D 714.
- Mechanical Damage through to Substrate is typically caused by dropping or dragged object(s) from the surface. Rusting and /or pitting corrosion shall be identified.
- Discoloration (common to both barrier and sacrificial coatings) on the surface of the coating may be superficial or indicative of coating damage. Conditions such as pinpoint rusting, mechanical damage, radiation exposure, and chemical breakdown may cause discoloration.

- Tiger Striping (common only to inorganic zinc coatings) Tiger striping appears as alternating light and dark vertical stripes. Tiger striping is evaluated for the degree of deterioration in the anodic areas for signs of rusting, either moderate or extensive rusting with identifiable metal loss.

3.2.5.3 Examination of Un-coated surfaces

Corrosion on components and surfaces in immersion shall be examined to assess the general extent of base metal corrosion.

Corrosion conditions shall be identified and classified as follows:

- Pinpoint Rusting is rusting of the substrate that appears as pinpoint size rust stain or deposits that extend through the coating.
- Uniform Rusting of substrate occurs in areas where the protective coatings have failed or in areas that were not coated.
- Pitting corrosion shall be evaluated by visual assessment or measuring device such as go-no/go gauge or dial depth gauge as necessary to identify pits requiring quantitative evaluation.

Minimum and maximum threshold values for pits in various regions of the torus shell and downcomers that require evaluation in accordance with Table A below.

During the corrosion evaluation, the examiner(s) shall visually assess pits or take random pit depth measurements on the shell and downcomers using a dial depth gauge or go/no-go gauge.

3.2.5.4 Quantitative Evaluation of Metal Loss

Minimum and maximum threshold values for pitting in various regions of the torus shell and downcomers is listed in Table A below. A quantitative evaluation shall be performed to accurately determine metal loss values for the following conditions:

Pit Depth Thresholds

- Shallow Pit - Shallow pits are defined as pits deeper than the minimum threshold but less than the maximum threshold for a given region.
- Deep Pit - Deep pits are defined as pits exceeding the maximum threshold for a given region. The following table provides the inspection and coating repair requirements for various pit depths by region. All requirements refer to submerged surfaces that lie below the equatorial

seam of the torus pressure boundary.

Table A

1	2	3	4	5	6	7	8
Region	**Region Classification**	**Pit Type**	**Pit Depth (mil)**	**Coating Repair**	**Location Coord.**	**Cross Ref**	**Notify Engineering**
1	**Near Penetration (Below the Equatorial Seam)** (<12" from nozzle or insert & 18" from reinf. penetration)	**Shallow**	> 0 mil < 30 mil	YES	Approx	NO	NO
		Deep	≥ 30 mil	YES	Detailed	YES	YES
2	**Near Ring Girder (Below the Equatorial Seam)** (< 12" from RG Web, miter joints, stiffeners)	**N/A**	< 50 mil	NO	NO	NO	NO
		Shallow	≥ 50 mil < 90 mil	YES	Approx	NO	NO
		Deep	≥ 90 mil	YES	Detailed	YES	YES
3	**General Shell (Below the Equatorial Seam)**	**N/A**	< 90 mil	NO	NO	NO	NO
		Shallow	≥ 90 mil <150 mil	YES	Approx	NO	NO
		Deep	≥ 150 mil	YES	Detailed	YES	YES
4	**Downcomers**	**N/A**	< 50 mil	NO	NO	NO	NO
		Shallow	≥ 50 mil < 90 mil	NO	Detailed	YES	YES
		Deep	≥ 90 mil	YES	Detailed	YES	YES

Table A Notes:

- Region refers to areas defined in Section 3.2.6.1.
- Pit Types and the corresponding threshold pit depths are shown in columns 3 and 4.
- Column 5 identifies pits requiring coating repair.
- Column 6 indicates the requirements for pit location by X /Y coordinate or azimuth and distance.
- Column 7 identifies pit types requiring identification of adjacent pits.
- Column 8 identifies pit types requiring notification of engineering for evaluation of structural integrity related to NEDC 92-213.
- Pits identified with greater than 10% loss shall be documented as relevant indications per IWE-3521.

3.2.6.5 Pit Grouping

In certain cases, it is acceptable to group pits by proximity in order to reduce the number of individual pits requiring documentation.

When pits are grouped, the pit group can be documented as one pit by recording the depth of the deepest single pit and the diameter of the pit group.

Table B summarizes the pit grouping rules:

Table B

Pit Location	Depth	Small Group		Large Group	
		Max. Group Diameter	Clear Spacing Adjacent Pits	Max. Group Diameter	Clear Spacing Adjacent Pits
Near Penetration below the equatorial seam (<12" from Insert Plate)	**Shallow** > 0 mil < 30 mil	2.5"	N/A	N/A	N/A
	Deep ≥ 30 mil	1.5"	2.5"	N/A	N/A
Near Ring Girder below the equatorial seam (<12" from Ring Girder Web)	**Shallow** ≥ 50 mil < 90 mil	2.5"	N/A	N/A	N/A
	Deep ≥ 90 mils	N/A	N/A	N/A	N/A
General Shell (below the equatorial seam and away from penetrations and ring girders)	**Shallow** ≥ 90 mil <150 mil	2.5"	N/A	19"	N/A
	Deep ≥ 150 mil	2.5"	2.5"	19"	24"
Downcomer	**Shallow** ≥ 50 mil < 90 mil	2.5"	2.5"	N/A	N/A
	Deep ≥ 90 mil	2.5"	2.5"	N/A	N/A

Combined ISI and IWE Program

3.2.6 The three inspection periods and corresponding outages for Class MC during the third inspection interval are the same as the ISI Program (see 3.2.2 above, Request for Alternative RC3-01 was submitted to align the ISI and CISI Intervals).

3.2.7 This Program was developed in accordance with the requirements of 10 CFR 50.55a and the 2007 Edition, 2008 Addenda of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, Subsections IWA, IWB, IWC, IWD, IWE, and IWF for Inspection Program. Later editions and addenda of the Code may be used, provided that the NRC has approved them, and all related requirements are met. Prior NRC approval to use later editions and addenda is required per 10CFR50.55a(g)(4)(iv) (see Regulatory Issue Summary (RIS) 2004-12).

3.2.7.1 The scram discharge volume is considered as Class 2 piping for examination purposes, but is pressure tested with the reactor coolant pressure boundary piping each refueling outage, in accordance with GL 86-01.

3.2.8 This section contains the ASME Code Cases applicable to the CNS ISI Fifth Inspection Interval and CISI Third Inspection Interval.

3.2.8.1 Adoption of Code Cases

ASME Section XI Code Cases adopted for the ISI/CISI activities for the Fifth and Third Interval are listed in Tables 3.2.7-1, 3.2.7-2, and 3.2.7-3. The use of Code Cases is in accordance with ASME Section XI, IWA-2420, 10 CFR 50.55a, and Regulatory Guide 1.147[2]. As permitted by ASME Section XI and Regulatory Guide 1.147 or 10 CFR 50.55a, ASME Section XI Code Cases may be adopted and used as described below:

<u>Adoption of Code Cases Listed for Generic Use in Regulatory Guide 1.147</u>

Code Cases that are listed for generic use in the latest revision of Regulatory Guide 1.147 may be included in the ISI/CISI program provided any additional provisions specified in the Regulatory Guide are also incorporated. Table 3.2.7-1 identifies the Code Cases approved for generic use and adopted for the fifth interval and third interval.

<u>Adoption of Code Cases Not Approved in Regulatory Guide 1.147</u>

Certain Code Case that has been approved by the ASME Board of Nuclear Codes and Standards may not have been reviewed and approved by the NRC Staff for generic use and listed in Regulatory Guide 1.147. Use of such Code Cases may be requested in the form of a "Request for Alternative" in accordance with 10 CFR 50.55a(z). Once approved, these Requests for Alternatives will be available for use until such time that the Code Cases are adopted into Regulatory Guide 1.147, at which time compliance with the conditions in the Regulatory Guide is required.

Table 3.2.7-2 identified those Code Cases that have been requested through Requests for Alternatives. For convenience to the user of this ISI/CISI Program, the appropriate internal correspondence number is provided to assist in their retrieval from Document Control. All other Requests for Alternatives and Relief Requests (those not associated with NRC approval of Code Cases) are addressed in Section 7.0.

<u>Adoption of Code Cases Mandated by 10 CFR 50.55a</u>

Code Cases required by rule in 10 CFR 50.55a are incorporated into the ISI Program and implemented at the specified schedule. Code Cases currently required by 10 CFR 50.55a and that are applicable to CNS are identified in Table 3.2.7-3.

[2] The Original Revision of RG 1.147 that was used for this Interval is Rev. 17

Use of Annulled Code Cases

As permitted by Regulatory Guide 1.147, Code Cases that have been adopted for use in the current interval that are subsequently annulled by ASME, may be used for the remainder of the interval.

Code Case Revisions

Initial adoption of a Code Case requires use of the latest revision of that Code Case listed in Regulatory Guide 1.147. However, if an adopted Code Case is later revised and approved by the NRC, then either the earlier or later revision may be used. An exception to this provision would be the inclusion of a limitation or condition on the later revision necessary to enhance safety. In this situation, the limitation imposed on the later revision must be incorporated into the program.

Adoption of Code Cases Issued Subsequent to Filing the Inservice Inspection Plan

Code Cases issued by ASME subsequent to filing the Inservice Inspection Plan with the NRC may be incorporated within the provisions of RG 1.147 by revision to this ISI Plan. Any subsequent Code Cases shall be incorporated into the program and identified in either Table 3.2.7-1 or 3.2.7-2, as applicable, prior to their use.

Code Cases not approved for use by the NRC

Certain Code Cases that have been approved by the ASME Board of Nuclear Codes and Standards have been reviewed and are not approved by the NRC Staff for generic use. These Code Cases are listed in Regulatory Guide 1.193, ASME Code Cases Not Approved for Use. However, the NRC may approve their use in specific cases. Code Cases listed in the Regulatory Guide will not be used at CNS without an approved Request for Alternative in accordance with 10 CFR 50.55a(z).

Table 3.2.7-1 - Code Cases Adopted from Regulatory Guide 1.147				
Code Case Number	Applicability	RG 1.147 Revision	Title	NRC Conditions
N-432-1	1971 Edition with the Summer 1973 Addenda up to 2015 Edition	17	Repair Welding Using Automatic or Machine Gas Tungsten-Arc Welding (GTAW) Temper Bead Technique	None

Table 3.2.7-1 - Code Cases Adopted from Regulatory Guide 1.147				
Code Case Number	Applicability	RG 1.147 Revision	Title	NRC Conditions
N-508-4	1989 Edition up to 2007 Edition with 2008 Addenda	17	Rotation of Snubbers and Pressure Retaining Items for the Purpose of Testing or Preventive Maintenance	NRC condition is only applicable to plants using Section XI 2006 Edition or earlier
N-513-3	1983 Edition with the Winter 1985 Addenda up to 2007 Edition with 2008 Addenda	17	Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping	The repair or replacement activity temporarily deferred under the provisions of this Code Case shall be performed during the next scheduled outage.
N-516-3	1977 Edition with the Summer 1978 Addenda up to 2013 Edition	17	Underwater Welding	Licensees must obtain NRC approval in accordance with 10 CFR 50.55a(z) regarding the technique to be used in the weld repair or replacement of irradiated material underwater.
N-526	1974 Edition up to 2010 Edition with 2011 Addenda	17	Alternative Requirements for Successive Inspections of Class 1 and 2 Vessels	None
N-532-5	1995 Edition with the 1996 Addenda up to 2013 Edition	17	Repair/Replacement Activity Documentation Requirements and Inservice Inspection Summary Report Preparation and Submission	None

Table 3.2.7-1 - Code Cases Adopted from Regulatory Guide 1.147				
Code Case Number	Applicability	RG 1.147 Revision	Title	NRC Conditions
N-552-1	2004 Edition up to 2010 Edition with the 2011 Addenda	17	Alternative Methods - Qualification for Nozzle Inside Radius Section from the Outside Surface	(1) To achieve consistency with the 10 CFR 50.55a rule change published September 22, 1999 (64 FR 51370), incorporating Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," to Section XI, add the following to the specimen requirements: a. "At least 50 percent of the flaws in the demonstration test set must be cracks and the maximum misorientation must be demonstrated with cracks. Flaws in nozzles with bore diameters equal to or less than 4 inches may be notches." b. Add to detection criteria, "The number of false calls must not exceed three."
N-561-2	1977 Edition up to 2015 Edition	17	Alternative Requirements for Wall Thickness Restoration of Class 2 and High Energy Class 3 Carbon Steel Piping	(1) Paragraph 5(b): for repairs performed on a wet surface, the overlay is only acceptable until the next refueling outage (2) Paragraph 7(c): if the cause of the degradation has not been determined, the repair is only acceptable until the next refueling outage (3) The area where the weld overlay is to be applied must be examined using ultrasonic methods to demonstrate that no crack-like defects exist. (4) Piping with wall thickness less than the diameter of the electrode shall be depressurized before welding.

Table 3.2.7-1 - Code Cases Adopted from Regulatory Guide 1.147				
Code Case Number	Applicability	RG 1.147 Revision	Title	NRC Conditions
N-562-2	1977 Edition up to 2015 Edition	17	Alternative Requirements for Wall Thickness Restoration of Class 3 Moderate Energy Carbon Steel Piping	(1) Paragraph 5(b): for repairs performed on a wet surface, the overlay is only acceptable until the next refueling outage (2) Paragraph 7(c): if the cause of the degradation has not been determined, the repair is only acceptable until the next refueling outage (3) The area where the weld overlay is to be applied must be examined using ultrasonic methods to demonstrate that no crack-like defects exist. (4) Piping with wall thickness less than the diameter of the electrode shall be depressurized before welding.
N-586-1	1977 Edition with the Summer 1978 Addenda up to 2007 Edition with the 2008 Addenda	17	Alternative Additional Examination Requirements for Classes 1, 2, and 3 Piping, Components, and Supports	None

Table 3.2.7-1 - Code Cases Adopted from Regulatory Guide 1.147				
Code Case Number	Applicability	RG 1.147 Revision	Title	NRC Conditions
N-597-2	1974 Edition up to 2015 Edition	17	Requirements for Analytical Evaluation of Pipe Wall Thinning	(1) Code Case must be supplemented by the provisions of EPRI Nuclear Safety Analysis Center Report 202L-R2, "Recommendations for an Effective Flow Accelerated Corrosion Program", April 1999, for developing the inspection requirements, the method of predicting the rate of wall thickness loss, and the value of the predicted remaining wall thickness. As used in NSAC-202L-R2, the term "should" is to be applied as "shall" (i.e., a requirement) (2) Components affected by flow-accelerated corrosion to which this Code Case are applied must be repaired or replaced in accordance with the construction code of record and Owner's requirements or later NRC approved edition of Section III,, "Rules for Construction of Nuclear Power Plant Components," of the ASME Code prior to the value of t_p reaching the allowable minimum wall thickness, t_{min} as specified in -3622.1(a)(1) of this Code Case. Alternatively, use of the Code Case is subject to NRC review and approval per 10 CFR 50.55a(z). (3) For Class 1 piping not meeting the criteria of -3221, the use of evaluation methods and criteria is subject to NRC review and approval per 10 CFR 50.55a(z). (4) For those components that do not require immediate repair or replacement, the rate of wall thickness loss is to be used to determine a suitable inspection frequency so that repair or replacement occurs prior to reaching allowable minimum wall thickness, t_{min}. (5) For corrosion phenomenon other than flow accelerated corrosion, use of the Code Case is subject to NRC review and approval. Inspection plans and wall thinning rates may be difficult to justify for certain degradation mechanisms such as MIC and pitting. (6) The evaluation criteria in Code Case N-513-2 may be applied to Code Case N-597-2 for the temporary acceptance of wall thinning (until the next refueling outage) for moderate-energy Class 2 and 3 piping. Moderate-energy piping is defined as Class 2 and 3 piping whose maximum operating temperature does not exceed 200°F and whose maximum operating pressure does not exceed 275 psig. Code Case N-597-2 shall not be used to evaluate through-wall leakage conditions.

Table 3.2.7-1 - Code Cases Adopted from Regulatory Guide 1.147				
Code Case Number	Applicability	RG 1.147 Revision	Title	NRC Conditions
N-600	1977 Edition with the Summer 1978 Addenda up to 2010 Edition with the 2011 Addenda	17	Transfer of Welder, Welding Operator, Brazer, and Brazing Operator Qualifications Between Owners	None
N-606-1	1977 Edition with the Summer 1978 Addenda up to 2015 Edition	17	Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique for BWR CRD Housing/Stub Tube Repairs	Prior to welding an examination or verification must be performed to ensure proper preparation of the base metal, and that the surface is properly contoured so that an acceptable weld can be produced. This verification is to be required in the welding procedures.
N-613-1	1989 Edition with the 1989 Addenda up to 2007 Edition with the 2008 Addenda	17	Ultrasonic Examination of Penetration Nozzles in Vessels, Examination Category B-D, Item Nos. B3.10 and B3.90, Reactor Nozzle-to-Vessel Welds, Figs. IWB-2500-7(a), (b), and (c)	None
N-629	1977 Edition with the Summer 1978 Addenda up to 2010 Edition with the 2011 Addenda	17	Use of Fracture Toughness Test Data to Establish Reference Temperature for Pressure Retaining Materials	None

Table 3.2.7-1 - Code Cases Adopted from Regulatory Guide 1.147				
Code Case Number	Applicability	RG 1.147 Revision	Title	NRC Conditions
N-639	1986 Edition with the 1987 Addenda up to 2015 Edition	17	Alternative Calibration Block Material	Chemical ranges of the calibration block may vary from the materials specification if (1) it is within the chemical range of the component specification to be inspected, and (2) the phase and grain shape are maintained in the same ranges produced by the thermal process required by the material specification.
N-641	1977 Edition with the Summer 1978 Addenda up to 2015 Edition	17	Alternative Pressure-Temperature Relationship and Low Temperature Overpressure Protection System Requirements	None
N-648-1	1977 Edition with the Summer 1978 Addenda up to 2015 Edition	17	Alternative Requirements for Inner Radius Examination of Class 1 Reactor Vessel Nozzles	In lieu of a UT Examination, licensees may perform a VT-1 examination in accordance with the code of record for the Inservice Inspection Program utilizing the allowable flaw length criteria of Table IWB-3512-1 with limiting assumptions on the flaw aspect ratio.
N-651	1977 Edition with the Summer 1978 Addenda up to 2013 Edition	17	Ferritic and Dissimilar Metal Welding Using SMAW Temper Bead Technique Without Removing the Weld Bead Crown for the First Layer	None

Table 3.2.7-1 - Code Cases Adopted from Regulatory Guide 1.147				
Code Case Number	Applicability	RG 1.147 Revision	Title	NRC Conditions
N-661-2	1977 Edition up to 2015 Edition	17	Alternative Requirements for Wall Thickness Restoration of Classes 2 and 3 Carbon Steel Piping for Raw Water Service	(1) Paragraph 4(b): for repairs performed on a wet surface, the overlay is only acceptable until the next refueling outage. (2) Paragraph 7(c): if the cause of the degradation has not been determined, the repair is only acceptable until the next refueling outage. (3) The area where the weld overlay is to be applied must be examined using ultrasonic methods to demonstrate that no crack-like defects exist. (4) Piping with wall thickness less than the diameter of the electrode shall be depressurized before welding.
N-705	1983 Edition with the Winter 1985 Addenda up to 2015 Edition	17	Evaluation Criteria for Temporary Acceptance of Degradation in Moderate Energy Class 2 or 3 Vessels and Tanks	None
N-716-1	1995 Edition up to 2015 Edition	17	Alternative Piping Classification and Examination Requirements	None
N-730	1989 Edition up to 2015 Edition	17	Roll Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs.	None
N-735	1995 Edition with the 1996 Addenda up to 2015 Edition	17	Successive Inspections of Class 1 and 2 Piping Welds.	None
N-747	1989 Edition up to 2015 Edition	17	Reactor Vessel Head-to-Flange Weld Examinations	None

Table 3.2.7-1 - Code Cases Adopted from Regulatory Guide 1.147				
Code Case Number	Applicability	RG 1.147 Revision	Title	NRC Conditions
N-751	1989 Edition up to 2015 Edition	17	Pressure Testing of Containment Penetration Piping	When a 10 CFR, Appendix J, Type C test is performed as an alternative to the requirements of IWA-4540 (IWA-4700 in the 1989 edition through the 1995 edition) during repair and replacement activities, nondestructive examination must be performed in accordance with IWA-4540(a)(2) of the 2002 Addenda of Section XI.
N-762	1995 Edition with the 1995 Addenda up to 2010 Edition	17	Temper Bead Procedure Qualification Requirements for Repair/Replacement Activities Without Post Weld Heat Treatment.	None
N-765	1989 Edition up to 2007 Edition with the 2008 Addenda	17	Alternative to Inspection Interval Scheduling Requirements of IWA-2430.	None
N-769	1989 Edition up to 2015 Edition	17	Roll Expansion of Class 1 In-Core Housing Bottom Head Penetrations in BWRs.	None

Code Cases Approved Through Request for Alternatives

The following ASME Code Cases are not contained in Regulatory Guide 1.147, Revision 17 and require a request for alternative prior to implementation. Reference Section 7.0 of this plan for the applicable requests.

Table 3.2.7-2 - Code Cases Adopted Via NRC Approved Requests			
Code Case Number	Applicability	Title	Request for Alternative No.
N-795	1998 Edition with the 1999 Addenda 2015 Edition	Alternative Requirements for BWR Class 1 System Leakage Test Pressure Following Repair/Replacement Activities	RP5-01

Code Cases Required by 10 CFR 50.55a

The following ASME Code Cases are not contained in Regulatory Guide 1.147, Revision 17, but are mandated in 10 CFR 50.55a and applicable to CNS.

Table 3.2.7-3 - Code Cases Required by 10 CFR 50.55a		
Code Case Number	Title	Notes
	NONE	

3.3. System Classification

3.3.1 In accordance with the Code, IWA-1400(a), it is the Owner's responsibility to determine the appropriate code class for each component and to identify the system boundaries subject to inspection. IWA-1300 states that components identified for inspection and testing shall be included in the ISI Program, and that the selection of components for the ISI Program is subject to review by the regulatory and enforcement authorities having jurisdiction at the plant site. The component classifications of the Code (Class 1, 2, 3, or MC) determine the rules and requirements for inspection and testing and define the ASME Section XI examination boundaries. Because early vintage nuclear plants were designed and constructed before ASME Section III of the Code was incorporated into 10CFR50.55a, the ASME Section XI code classifications for ISI may differ from the original design classifications. The ASME code classifications determine applicability of the rules for repair/replacement activities, and for component inspection requirements.

3.3.2 The NRC issued the construction permit for the CNS in June 1968. The plant design was completed when the Nebraska Public Power District (NPPD) applied for an operating license and submitted the Final Safety Analysis Report (FSAR) for the facility in March 1971. The license was issued in January 1974. The United States of America Standards (USAS) used for the original design and construction of CNS were B31.1 (1967), Code for Power Piping, and B31.7 (February 1968 with Draft and Errata of June 1968), Code for Nuclear Power Piping. The ASME Code, Section III, Class B, 1965 Edition, 1967 Addenda, and Code Cases 1177 and 1330 were used for the design, fabrication, erection, and testing of the Primary Containment. The

"General Design Criteria for Nuclear Power Plant Construction Permits" was published for comment in the Federal Register in July 1967. The final version of these design criteria were not incorporated into the Code of Federal Regulations (10 CFR 50, Appendix A) until February 1971, approximately the same time that NPPD submitted its FSAR to the NRC. As discussed in the NRC Safety Evaluation Report dated February 14, 1973, the license for CNS is based, in part, on the intent of the Draft General Design Criteria published in July 1967.

The current component classifications did not exist at the time of CNS design and construction. Boundary classifications are located in DCD-39, CNS ISI Boundary Basis.

Because CNS was designed and constructed prior to the issuance of Regulatory Guide 1.26 and NUREG-0800, these documents were not used to establish the original ASME Section XI examination boundaries. NPPD has not formally committed to the use of Regulatory Guide 1.26 or NUREG-0800, Section 3.3.2. However, the CNS ISI Program for the fifth ten-year inspection interval and CISI of the third ten-year inspection interval uses these documents for guidance in determining the applicability of component inspections and the examination boundaries.

3.3.3 The primary containment structure is a portion of the General Electric (GE) Mark I Primary Containment Pressure Suppression System. The complete pressure suppression system consists of the Drywell, which houses the reactor vessel and reactor coolant recirculation loops, the pressure Suppression Chamber, the connecting vent system between the Drywell and pressure Suppression Chamber, isolation valves, vacuum relief system, and containment cooling systems. The isolation valves and vacuum relief system are discussed elsewhere in this document.

3.3.4 The Drywell is a low leakage steel pressure vessel designed to confine the reactor coolant that would be released during a postulated pipe rupture, and prevent the gross release of radioactive materials to the environment. The lower portion of the Drywell is spherical with a 65 foot diameter and the upper portion is cylindrical with a 35 foot, 7 inch diameter. The overall height of the Drywell is 110 feet.

The Drywell is enclosed in reinforced concrete to provide the required radiological shielding during normal plant operations. The concrete also provides additional resistance to deformation and buckling. Shielding above the Drywell is provided by removable, segmented reinforced concrete plugs.

The Drywell is designed for an internal design pressure of 56.0 psig (62.0 psig maximum code allowable), 2.0 psid external design pressure, and a maximum temperature of 281°F. The applicable dead, live, and seismic loads are imposed on the shell along with the above design conditions.

3.3.5 The Suppression Chamber is a steel pressure vessel designed to hold a large volume of water for use as a heat sink for any postulated transient or accident conditions in which the normal heat sink is unavailable. The water volume (Suppression Pool) also serves as a heat sink for the High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) turbine exhaust. The Suppression Pool also functions as a water source for the Emergency Core Cooling Systems. The Suppression Pool is the primary water source for the Core Spray (CS) and Residual Heat Removal (RHR) Systems and a secondary water source for the HPCI and RCIC Systems.

Transient conditions which require the operation of the Main Steam (MS) relief valves will transfer energy to the suppression pool via the relief valve discharge piping. Postulated pipe ruptures in the Drywell will transfer energy to the Suppression Pool via the vent system. In each case the steam flow is discharged below the surface of the Suppression Pool and condensed. Any non-condensable gases and fission products are released to the Suppression Chamber air space.

The Suppression Chamber is a toroidal shape located below and completely encircling the Drywell with a centerline diameter of 102 feet with a cross-sectional diameter of 28 feet, 9 inches. The Suppression Chamber (also known as the Torus) is constructed of 16 mitered sections to eliminate the need for compound curves in the shell.

The shell is stiffened by sixteen (16) internal ring girders located at the miter joints. The torus is supported by sixteen (16) pairs of reinforced W14x136 columns at the ring girder locations. The Suppression Chamber is designed to the same material and code requirements as the Drywell.

3.3.6 The Drywell and Suppression Chamber are connected with eight (8) 5'-11" diameter circular vent pipes anchored at the Drywell. The vent pipes are located at 45° intervals and penetrate the Suppression Chamber shell at alternating segments midway between the ring girders. The vent pipes are provided with expansion joints to accommodate differential movement of the Drywell and Suppression Chamber, and jet deflectors located at the Drywell entrance to the vent to prevent damage that might occur due to jet forces associated with a pipe break in the Drywell.

The vent pipes connect to a 4'-2" diameter vent header contained in the air space of the Suppression Chamber. Projecting downward from the vent header to a minimum submergence depth of 3'-0" are 80 downcomer pipes, 24 inches in diameter to direct steam flow to the suppression pool for condensation.

The vent system is designed to the same pressure and temperature requirement as the Drywell and Torus. The Mark I Containment Program Plant Unique Analysis Report for Cooper Nuclear Station provides additional design information and a summary of modifications performed to meet the originally intended design safety margins for the redefined hydrodynamic loads not explicitly included in the original design.

3.3.7 The Personnel Airlock serves as an access into or out of the Primary Containment Vessel (Drywell). The airlock was furnished as an assembly and consists of a cylinder with a stiffened bulkhead at each end containing a door. The doors are hinged so a positive pressure inside containment tends to seat the doors. Each door is equipped with an elastomer gasket to provide a positive seal. The doors are equipped with a positive latch mechanism. The control mechanism is interlocked such that only one door may be opened at a time unless the interlock is intentionally bypassed when primary containment integrity is not required.

3.3.8 The Drywell and the Suppression Chamber were designed and constructed to the requirements of the ASME Boiler and Pressure Vessel Code and therefore have certain additional plate thickness in the shell for corrosion allowance. As a matter of good practice the interior of the Drywell and the Suppression Chamber were coated to provide protection against corrosion of the surface.

3.4. Contents of ISI/CISI Program

The ISI Program addresses the requirements for inservice inspection of components, system pressure testing, and augmented inspection. Although some sections of this Program are common, the specific requirements for component inspections, system pressure testing, and augmented inspections are addressed separately. A general description of each section follows:

3.4.1 Section 1 - Table of Contents

Provides the organizational format for the ISI Program.

3.4.2 Section 2 - Revision Summary Sheet

Provides the revision status of the effective sections in the ISI Program.

3.4.3 Section 3 - Introduction and Program Basis Description

Provides details on the background, scope, basis, and contents of the ISI Program, system classifications, and augmented inservice inspection requirements.

3.4.4 Section 4 - Application of Exemption Criteria

Provides the basis for determining the Class 1, 2, and 3 exempted components from surface and volumetric examination requirements in accordance with ASME Section XI, Subsections IWB-, IWC-, and IWD-1200.

3.4.5 Sections 5 - Inservice Inspection Summary Table

The CNS ISI/CISI Table provides the following information:

3.4.5.1 Examination Category

Provides the examination category as identified in ASME Section XI, Tables IWB-2500-1, IWC-2500-1, IWD-2500-1, IWE-2500-1, and IWF-2500-1. Only those examination categories applicable to CNS are identified.

Also includes Category R-A in accordance with the Risk Informed methodology described in Code Case N-716-1.

3.4.5.2 Item Number and Item Description

Provides the item number and description as defined in ASME Section XI, Tables IWB-2500-1, IWC-2500-1, IWD-2500-1, IWE-2500-1, and IWF-2500-1. Only those item numbers applicable to CNS are identified.

3.4.5.3 Examination Method

Provides the examination method(s) as defined in ASME Section XI, Tables IWB-2500-1, IWC-2500-1, IWD-2500-1, IWE-2500-1, and IWF-2500-1. Only those item numbers applicable to CNS are identified.

3.4.5.4 Number of Components in the Item No.

Provides the population of components subject to examination. The number of components actually examined during the inspection interval will be based upon the Code requirements for the subject item number.

3.4.5.5 Required to be Examined During Interval

Provides the total required number of components/items that are to be examined during the interval based on the selection requirements required by ASME Section XI, Tables IWB-2500-1, IWC-2500-1, IWD-2500-1, IWE-2500-1, and IWF-2500-1. Only those item numbers applicable to CNS are identified.

3.4.5.6 Examination Percentage Required

Provides the percentage required based on the selection requirements in ASME Section XI, Tables IWB-2500-1, IWC-2500-1, IWD-2500-1, IWE-2500-1, and IWF-2500-1. Only those item numbers applicable to CNS are identified.

3.4.5.7 Number to be Examined in Period

Provides the total number to be examined in each inspection period based on the requirements in Table IWB-2411-1, IWC-2411-1, IWD-2411-1, IWE-2411-1, and IWF-2410-1. Only those item numbers applicable to CNS are identified.

3.4.6 Section 6 - Inservice Inspection Technical Approach and Position Index Summaries

When the requirements of ASME Section XI are not easily interpreted, CNS has reviewed general licensing/regulatory requirements, industry practices and code interpretations to determine the appropriate method of implementing Code requirements. The technical positions contained in this section have been provided to clarify CNS's implementation of ASME Section XI requirements for inservice inspection.

3.4.7 Section 7 - Inservice Inspection Relief Requests and Requests for Alternatives

This section contains relief requests for impracticable nondestructive examinations in accordance with 10 CFR 50.55a(g)(5). If examination requirements are determined to be impracticable during the course of the interval, additional or modified relief requests will be submitted, in accordance with 10 CFR 50.55a (g)(5). In addition, requests for alternatives in accordance with 10 CFR 50.55a(z) are listed.

3.4.8 Sections 8 - Pressure Testing

The CNS System Pressure Testing Summary Tables provide the following information:

3.4.8.1 Examination Category

Provides the examination category as identified in ASME Section XI, Tables IWB-2500-1, IWC-2500-1 and IWD-2500-1. Only those examination categories applicable to CNS are identified.

3.4.8.2 Item Number

Provides the item number as identified in accordance with the applicable table of IWB, IWC, and IWD-2500-1.

3.4.8.3 Test Type

Describes the required Code test that is being performed.

3.4.8.4 Test Frequency

Provides the frequency that a required Code pressure test is performed. The tests are performed either on a Period or refueling outage basis.

3.4.8.5 Technical Positions and Relief Requests

Provides a listing of technical positions and relief requests applicable to the performance of pressure tests. If a technical position number is identified, see the corresponding technical position in Section 9. If a relief request number is identified, see the corresponding relief request in Section 10.

3.4.9 Section 9 - System Pressure Testing Technical Approach and Position Index Summaries

When the requirements of ASME Section XI are not easily interpreted, CNS has reviewed general licensing/regulatory requirements, industry practice and code interpretations to determine the appropriate method of implementing the Code requirement. The technical approach and position documents contained in this section have been provided to clarify CNS's implementation of ASME Section XI requirements for system pressure testing.

3.4.10 Section 10 - System Pressure Testing Relief Requests and Requests for Alternatives

This section contains relief requests for impracticable pressure tests in accordance with 10 CFR 50.55a(g)(5). If testing requirements are determined to be impracticable during the course of the interval, additional or modified relief requests will be submitted, in accordance with 10 CFR 50.55a(g)(5). In addition, requests for alternatives in accordance with 10 CFR 50.55a(z) are listed.

3.4.11 Section 11 - Augmented Inservice Inspection

This section contains component examination requirements not addressed by ASME Section XI. These requirements may come from regulatory commitments, vendor recommendations (e. g. GE SILs), or CNS management directives.

3.4.12 Section 12 - List of Applicable P&IDs, Isometric and Component Drawings

Provides a listing of P&ID's, piping isometric and component drawings corresponding to each system that contains components subject to examination under this Program.

3.4.13 Section 13 - Nondestructive Examination Procedure Listing

This section contains the listing of CNS visual examination procedures. CNS does not have the in-house capability to perform surface or volumetric nondestructive examinations. Vendor procedures are used during outages to perform the required examinations.

3.4.15 Section 14 - Ultrasonic Calibration Blocks

This section contains the listing of Ultrasonic calibration blocks for examination of components in accordance with regulatory requirements, vendor recommendations, or CNS management directives.

3.4.16 Section 15 - Component Examination Summary Tables

This section contains the tables and the schedule for examination of components and component supports in accordance with the requirements of ASME Section XI.

3.4.17 Section 16 - Index of Abbreviations

This section contains the abbreviations used in the preceding tables.

3.4.18 Section 17 – Risk Informed Program

This section contains the RI-ISI Living Program Evaluation. It also includes the RI-ISI Program Plan.

3.4.19 Section 18 – Commitment Management

This section contains NRC Commitments that were made and are applicable to the ISI/CISI Program.

3.4.20 Section 19 – Containment Indication Tracking

This section contains a tabular listing, along with several figures, of key surface indications identified during various visual examinations of underwater Torus, Torus exterior, and Drywell.

3.4.21 Section 20 – ISI and CISI Program History

This section contains the history of both the ISI and CISI Programs.

4.0 APPLICATION OF EXEMPTION CRITERIA

4.1. Section XI Class 1 Exemptions:

4.1.1 ASME Section XI, Subparagraph IWB-1220(a), gives specific guidance for exempting components from the volumetric and surface examination requirements of IWB-2500, if they are: connected to the reactor coolant system (RCS); and are part of the reactor coolant pressure boundary; and of such a size and shape so that, upon postulated rupture, the resulting flow of coolant from the RCS, under normal plant operating conditions, is within the capacity of makeup systems that are operable from on-site emergency power. The emergency core cooling systems are excluded from the calculation of makeup capacity.

Components and items that are exempt from the volumetric and surface examination requirements of ASME Section XI, and from the provisions of referenced code cases, are not exempt from the requirements for repair/replacement activities or pressure testing.

4.1.2 CNS performed an analysis per IWB-1220(a) to identify those systems and piping line sizes that could be exempted. This analysis was performed under Calculation Number GENE-637-05-1192 "ASME Section XI Code Pipe Exclusion Revised Analysis for Cooper Nuclear Station" (Roll#07176, Frame 0674).

In determining the size of the liquid and steam lines excluded from surface and volumetric examination, liquid lines were defined as those that penetrate the reactor pressure vessel (RPV) below the normal water level, and steam lines as those that penetrate the RPV above the normal water level.

The systems credited in this calculation with providing normal makeup are the Reactor Core Isolation Cooling (RCIC) and Control Rod Drive (CRD) systems.

System	Pump Flow Rate (gpm)	Maximum Fluid Temperature ($^{\circ}$ F)	Emergency Power
CRD System	160	140	Yes, on-site
RCIC System	400	140	Yes, on-site

Water flow rates from a liquid line break are taken as 8000 $lbs/sec/ft^2$ at 1000 psi. Steam flow rates from a steam line are taken as 2000 $lbs/sec/ft^2$ at 1000 psi. Make-up water weighs 8.33 lbs per gallon at 70^{o} F. On this basis, the exclusion diameters based on reactor coolant make-up system capacity are as follows:

$$(560gpm)(1\ ft^3/7.48gal)(62.4\ lbm/ft^3)(1\ min/60sec)= 77.86\ lb/sec$$

$$(77.86\ lb/sec)/(2000Lb/sec\text{-}ft^2)= 0.0389\ ft^2 \text{ for steam}$$

$$(77.86\ lb/sec)/(8000Lb/sec\text{-}ft^2)= 0.0097\ ft^2 \text{ for water}$$

Therefore, the exempt diameter for steam is 0.22ft ID and the exempt diameter for water is 0.11ft ID. Thus those portions of steam piping with an inside diameter of 2.64 inches, and water piping with an inside diameter of 1.34 inches, may be exempted from the surface and volumetric examination requirements of Table IWB-2500-1.

4.1.3 ASME Section XI, Subparagraph IWB-1220(b), provides additional criteria that can be used to exempt components and piping segments from examination using size. Components and piping segments are NPS 1 and smaller, components and piping segments which have one inlet and one outlet, both of which are NPS 1 and smaller or components and piping segments which have multiple inlets or multiple outlets whose cumulative pipe cross-section area does not exceed the cross-sectional area define d by the OD of NPS 1 pipe.

4.1.4 In accordance with IWB-1220(c), the reactor vessel drain line nozzle and associated piping are exempt.

4.1.5 ASME Section XI, Subparagraph IWB-1220(d) allows inaccessible welds or portions or welds to be exempt due to being encased in concrete, buried underground, located inside a penetration, or encapsulated by guard pipe.

4.2. <u>Section XI Class 2 Exemptions</u>

4.2.1. Components Within Residual Heat Removal (RHR), Emergency Core Cooling(ECC), and Containment Heat Removal (CHR) Systems

4.2.2.1. Components and piping segments 4 NPS and smaller.

4.2.2.2. Components and piping segments which have one inlet and one outlet both of which are NPS 4 or smaller or multiple inlets or multiple outlets whose cumulative pipe cross-sectional area does not exceed the cross-sectional area defined by the OD of NPS 4 pipe.

4.2.2.3. Piping and other components of any size beyond the last shutoff valve in open ended portions of systems that do not contain water during normal plant operating conditions.

4.2.2. **Components Within Systems or Portions of Systems Other than RHR, ECC, and CHR Systems**

4.2.2.1. Components and Piping segments 4 NPS and smaller.

4.2.2.2. Vessels, piping, pumps, valves, other components and component connections of any size in systems or portions of systems that operate (when the system function is required) at a pressure equal to or less than 275 psig and at a temperature equal to or less than 200ºF.

4.2.2.3. Components and piping segments which have one inlet and one outlet both of which are NPS 4 and smaller or component and piping segments which have multiple inlets or multiple outlets whose cumulative pipe cross-sectional area does not exceed the cross-sectional area defined by the OD of NPS 4 pipe.

4.2.2.4. Piping and other components of any size beyond the last shutoff valve in open ended portions of systems that do not contain water during normal plant operating conditions.

4.2.2.5. Welds or portions of welds that are inaccessible due to being encased in concrete, buried underground, located inside a penetration, or encapsulated by guard pipe.

4.3. <u>Section XI Class 3 Exemptions:</u>

4.3.1 Components and piping segments 4 NPS and smaller.

4.3.2 Components and piping segments which have one inlet and one outlet both of which are NPS 4 and smaller or components and piping segments which have multiple inlets or multiple outlets whose cumulative pipe cross-sectional area does not exceed the cross-sectional area defined by the OD of NPS 4 pipe.

4.3.3. Components that operate at a pressure of 275 psig or less and at a temperature of 200ºF or less in systems (or portions of systems) whose function is not required in support of residual heat removal, containment heat removal, and emergency core cooling.

4.3.4 Welds or portions of welds that are inaccessible due to being encased in concrete, buried underground, located inside a penetration, or encapsulated by guard pipe.

4.4 Section XI Class MC Exemptions:

4.4.1 IWE-1220 gives specific guidance for exempting components from the examination requirements of IWE-2500 if they are: vessels, parts, and appurtenances outside the boundaries of the containment system as defined in the design specifications; embedded or inaccessible portions of containment vessels, parts, and appurtenances with welds that meet the requirements of the original Construction Code; portions of containment vessels, parts, and appurtenances that become embedded or inaccessible as a result of vessel repair/replacement activities if the conditions of IWE-1232(a) and (b) and IWE-5220 are met; piping, pumps, and valves that are part of the containment system, or which penetrate, or are attached to the containment vessel.

4.4.2 The concrete biological shield and the shield plugs are not part of the containment design and are, therefore excluded from this program.

4.4.3 The portion of the drywell below the concrete floor is inaccessible. The welds in the lower head were double butt-welded and radiographed in accordance with the Construction Code. Therefore, the lower head of the drywell below the concrete floor is exempt per IWE-1220(b).

4.4.4 Welded attachments to components which are exempt from examination under IWE-1220 are also exempt from the examination requirements of IWE-2500 and Table IWE-2500-1.

4.4.5 Welded attachments to components which are classified as ASME 1, 2 or 3 are examined under the rules of IWB, IWC, or IWD as applicable.

4.4.6 Moisture barriers are not part of the containment pressure boundary (NE-2110(b). The placement of the concrete and the moisture barrier for the exterior biological shield was not subject to Code rules during construction. In response to IN 86-77 and GL 87-05, CNS performed a special test of the drywell sand cushion. No moisture was detected. Furthermore, the moisture barrier external to the containment is not accessible for examination. Therefore, the moisture barrier external to the drywell is exempt.

4.5. Section XI IWF Exemptions:

4.5.1 Supports connected to piping and other items exempted from the volumetric, surface, or VT-1 or VT-3 visual examination requirements of IWB-1220, IWC-1220, IWD-1220, and IWE-1220 are exempt. In addition, portions of supports that are inaccessible due to being encased in concrete, buried underground, located inside a penetration, or encapsulated by guard pipe are also exempt.

4.6. **Section XI Repair/Replacement Activity Exemptions:**

4.6.1 IWA-4120(a thru e) identifies the applicability of the ASME XI repair/replacement activity rules.

4.6.2 Per IWA-4131.1 (a)(1) and IWA-4131.1(b), class 1 piping, tubing (except heat exchanger tubing, an sleeves and plugs used for heat exchanger tubing) valves, fittings and associated supports no larger than NPS 1 and Class, 2 and 3 piping, tubing (except heat exchanger tubing, and sleeves and welded plugs used for heat exchanger tubing) valves, and fittings NPS 1 and smaller and associated supports are exempt from the repair / replacement rules. IWA-4131.1(a)(2) is not used.

4.6.3 For the exempt items in 4.6.2 above, the rules of IWA-4131.2 shall be followed. That is, the items must be purchased and installed in accordance with the CNS Quality Assurance Program to assure that material is furnished in accordance with the applicable material specification and construction code requirements.

4.6.4 The repair and replacement activity provisions in IWA-4540(c) of the 1998 Edition through the 2000 Addenda of Section XI for pressure testing Class 1, 2, and 3 mechanical joints shall be applied per 10 CFR 50.55a(b)(2)(xxvi).

Section 5 – CNS Code Category Summary

B- A Pressure Retaining Welds in Reactor Vessel

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
B-A(1)	B1.11	Reactor Vessel Circumferential Shell Welds	Volumetric	4	0%(2)	0(2)	0(2)	0(2)	0%(2)	0(2)	0%(2)	0(2)	0%(2)
B-A(1)	B1.12	Reactor Vessel Longitudinal Shell Welds	Volumetric	12	100%	12	12	10	100%	0	0%	2(3)	100%
B-A(1)	B1.21	Reactor Vessel Circumferential Head Welds	Volumetric	3	66.67%(4)	2(4)	2(4)	0(4)	0%(4)	1(4)	50%(4)	1(4)	100%
B-A(1)	B1.22	Reactor Vessel Meridional Head Welds	Volumetric	22	100%	22	22	0	0%	14	64%	8	100%
B-A(1)	B1.30(5)	Reactor Vessel Shell to Flange Weld	Volumetric	1	100%	1	1	1	100%	0	100%	0	100%
B-A(1)	B1.40(6)	Reactor Vessel Head to Flange Weld	Volumetric/ Surface	1	100%	2	2	0	0%	0	0	2	100%
			Category Total	**43**		**39(2)(4)**	**39**	**11**	**28%**	**15**	**67%**	**13**	**100%**

Notes for Cat. B-A	Note 1: Table IWB-2412-1 percentages do not apply. Note 2: Table IWB-2500-1 requires 100%, however none are required based on NRC approved Relief Request RI5-01 (pending). Note 3: Welds VLC-BB-2 and VLC-BB-3 require manual pick-ups to meet the volumetric percentage requirements through feedwater nozzle shield doors for N4-B and N4-C. Note 4: Table IWB-2500-1 requires accessible length of all welds, however HMD-BB-1 is not accessible and therefore not required to be examined (See Technical Positon TP-72). Note 5: Permissible to defer based on meeting Note 3 or 5 in Table IWB-2500-1 (Intent Interpretation XI-1-13-08R clarified that either note can be used independent of each other). Note 6: Permissible to defer based on meeting Note 4 or 5 in Table IWB-2500-1 (Intent Interpretation XI-1-13-08R clarified that either note can be used independent of each other).

B-D Full Penetration Welded Nozzles in Vessels													
Category	**Item Number**	**Description**	**Exam Method**	**Number of Components in Item No.**	**Exam Percentage Required**	**Actual Required**	**Total Scheduled Exams**	**Number to be Examined in First Period**	**% Req.**	**Number to be Examined in Second Period**	**% Req.**	**Number to be Examined in Third Period**	**% Req.**
B-D(1)	B3.90	Reactor Vessel Nozzle to Vessel Welds	Volumetric	28	50%	14(2)	14	6	29%(3)	2	62%(3)	6	100%
B-D(1)	B3.100	Reactor Vessel Nozzle Inside Radius Section	Volumetric	19	52.6%	10(2)	10	4	24%(3)	0	53%(3)	6	100%
B-D(1)	B3.100	Reactor Vessel Nozzle Inside Radius Section	Visual (4) (VT-1)	9	44.44%	4(2)	4	2	50%	2	100%	0	100%
			Category Total	**56**		**28(2)**	**28**	**12**	**43%(3)**	**4**	**64%(3)**	**12**	**101%**
Notes for Cat. B-D	Note 1: Table IWB-2412-1 percentages do not apply with exception that 1st Period percentages are minimum of 25% per IWB-2500-1, Note 2. Note 2: Number of welds based on NRC approval of Relief Request RI5-03 using BWRVIP-108, BWRVIP-241 and Code Case N-702 as basis for relief (pending). Note 3: Percentages based on NRC approval of Relief Request RI5-03 using BWRVIP-108, BWRVIP-241 and Code Case N-702 as basis for relief (pending). Note 4: Visual VT-1 examination based on application of CC N-702. CC only allowed to be used on nozzles not containing thermal sleeves (i.e., N1, N3, N6, N7's) (pending NRC approval of RI5-03 to use N-702).												

B-F Pressure Retraining Dissimilar Metal Welds in Vessel Nozzles (INFORMATION ONLY - Superseded by RI-ISI)													
Category	**Item Number**	**Description**	**Exam Method**	**Number of Components in Item No.**	**Exam Percentage Required**	**Required to be Examined During Interval (Rounded up)**	**Total Scheduled Exams**	**Number to be Examined in First Period**	**% Req.**	**Number to be Examined in Second Period**	**% Req.**	**Number to be Examine d in Third Period**	**% Req.**
B-F(1)	FormerlyB 5.10	Nozzle-to-Safe End Butt Welds, NPS 4 or Larger	Volumetric and surface(3)	17	N/A	N/A	See Cat R-A	0	N/A	0	N/A	0	N/A
B-F(1)	FormerlyB 5.20	Nozzle-to-Safe End Butt Welds, Less than NPS 4	Surface	5	N/A	N/A	See Cat R-A	0	N/A	0	N/A	0	N/A
B-F(1)	Formerly B5.130 & B5.140(2)	Piping welds	Volumetric	6	N/A	N/A	See Cat R-A	0	N/A	0	N/A	0	N/A
			Category Total	**28**		**0(2)**		**0**	**N/A**	**0**	**N/A**	**0**	**N/A**
Notes for Cat.	Note 1: Inspection requirements for this Category have been superseded by RI-ISI requirements based on Code Case N-716-1. Note 2: These welds are included in the RI-ISI Program. These dissimilar welds were B5.130 and B5.140 under the 3rd interval. Note 3: Examination method is only volumetric per the CNS RI-ISI Program.												

B-G-1 Pressure Retaining Bolting, Greater than 2 in. in Diameter

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded Up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examine d in Third Period	% Req.
B-G-1[1]	B6.10	Reactor Vessel Closure Head Nuts	Visual, VT-1	52	100%	52	52	27	52%	25	100%	0	100%
B-G-1[1]	B6.20	Reactor Vessel Closure Studs	Volumetric	52	100%	52	52	0	0%	52	100%	0	100%
B-G-1[1]	B6.40	Threads in Reactor Vessel Flange	Volumetric	52	100%	52	52	0	0%	0	0%	52	100%
B-G-1[1]	B6.50	Reactor Vessel Closure Washers, Bushings	Visual, VT-1	104	53.84%	56[7]	56	27	48%	25	93%	4	100%
B-G-1[1]	B6.180	Bolts and Studs in Pumps	Volumetric	2[2]	50%[6]	1[2]	1[2]	1[5]	100%	0	0%	0	0%
B-G-1[1]	B6.190	Flange Surface, When Disassembled, in Pumps	Visual, VT-1	2[3]	50%[3]	1[3]	1[3]	1[3]	100%[3]	0[3]	0%[3]	0[3]	0%[3]
B-G-1[1]	B6.200	Nuts, Bushings, and Washers in Pumps	Visual, VT-1	4[4]	50%[6]	2[4]	2[4]	2	100%	0	0%	0	0%
			Category Total	**268**		**216[7]**	**216[7])**	**58**	**27%**	**102**	**75%**	**56**	**100%**

Notes for Cat.	Note 1: Table IWB-2412-1 percentages do not apply as examinations may be deferred to end of interval or are only required under certain circumstances such as disassembly of a flange, pump, or valve. Note 2: 1 set of 16 bolts per pump, 2 pumps total. Note 3: 1 flange per pump, 2 reactor recirc. pumps total, examine if disassembled (includes 1 inch annular surface around each stud) (See Technical Position TP-4). Note 4: 1 set of 16 nuts and 16 washers per pump.. Note 5: Studs will be examined in place under tension if not disassembled. Scheduled examination (See Technical Position TP-1). Note 6: Per Table IWB-2500-1, Note 3, examination can be limited to one bolted connection of a group of similar pumps resulting in 1 of the 2 reactor recirc pumps to be examined. Examination is not required unless connection is disassembled (see TableIWB-2500-1, Note 4) (See Technical Position TP-5) Note 7: Bushing exams reduced to only the 4 where the studs are removed. (Footnote 2 (See Technical Position TP-73)

B-G-2 Pressure Retaining Bolting, 2 in and less in Diameter

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
B-G-2[1]	B7.10	Bolts, Studs, and Nuts in Reactor Vessel	Visual, VT-1	3 Sets[2]	N/A	1	1	1	100%	0	N/A	0	N/A
B-G-2[1,4]	B7.50	Bolts, Studs, and Nuts in Piping	Visual, VT-1	13 Sets	N/A	0	0	0	N/A	0	N/A	0	N/A
B-G-2[1,5]	B7.70	Bolts, Studs, and Nuts in Valves	Visual, VT-1	32 Sets	N/A	0	0	0	N/A	0	N/A	0	N/A
			Category Total	**185**		**1**	**1**	**1**	**100%**	**0**	**N/A**	**0**	**N/A**
Notes for Cat.		Note 1: Table IWB-2412-1 percentages do not apply as bolting is only required to be examined if connection is disassembled, Reference Note 1 to Table IWB-2500-1, Cat B-G-2. Note 2: The reactor vessel has three top head flanges, 2 have blind flanges and 1 flange is disconnected each refueling outage (See Technical Position TP-74). Note 3: Deleted Note Note 4: Table IWB-2412-1 percentages do not apply as bolting is only required to be examined if connection is disassembled and can be limited to one connection among a group of bolted connections of similar design, size, function, and service. Reference Note 3 to Table IWB-2500-1, Cat B-G-2. CNS has 3 Groups: Group F (3 sets) (Technical Position TP-6), Group G (8 sets) (See Technical Position TP-7), and Group N/A (2 sets)(See Technical Position TP-8). Note 5: Table IWB-2412-1 percentages do not apply as bolting is only required to be examined if connection is disassembled and can be limited to one connection among a group of bolted connections of similar design, size, function, and service. Reference Note 2 to Table IWB-2500-1, Cat B-G-2. CNS has 8 Groups: Group B (2 sets)(See Technical Position TP-11), Group D (4 sets)(See Technical Position TP-12), Group F (3 sets)(See Technical Position TP-13), Group G (8 sets)(See Technical Position TP-14), Group H (8 sets)(See Technical Position TP-15), Group J (1 set)(See Technical Position TP-16), Group M(2 sets)(See Technical Position TP-17), and Group Q (4 sets)(See Technical Position TP-18).											

B-J Pressure Retaining Welds in Piping (INFORMATION ONLY - Superseded by RI-ISI)

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
B-J[1]	Formerly B9.11	Circumferential Welds in Piping, NPS 4 or Larger	Volumetric and Surface	366	N/A	0	See Cat R-A	0	N/A	0	N/A	0	N/A
B-J[1]	Formerly B9.21	Circumferential Welds in Piping, Less than NPS 4	Surface	47	N/A	0	See Cat R-A	0	N/A	0	N/A	0	N/A
B-J[1]	Formerly B9.31	Branch Pipe Connection Welds, NPS 4 or Larger	Volumetric and Surface	16	N/A	0	See Cat R-A	0	N/A	0	N/A	0	N/A
B-J[1]	Formerly B9.32	Branch Pipe Connection Welds, Less than NPS 4	Surface	23	N/A	0	See Cat R-A	0	N/A	0	N/A	0	N/A
B-J[1]	Formerly B9.40	Socket Welds	Surface	169	N/A	0	See Cat R-A	0	N/A	0	N/A	0	N/A
		Category Total		**621**		**0**		**0**	N/A	**0**	N/A	**0**	N/A
Notes for Cat.		Note 1: Table IWB-2412-1 percentages do not apply. Inspection requirements for this Category has been superseded by RI-ISI requirements based on Code Case N-716-1.											

B-K Welded Attachments for Vessels, Piping, Pumps, and Valves

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
B-K(1)	B10.10	Integrally Welded Attachments to Pressure Vessels	Surface	5	20%(2)	1	1	0	0%	1	100%	0	100%
B-K(1)	B10.20	Integrally Welded Attachments to Piping	Surface	66	3.03%(3)	2	2	1	58%	0	86%	1	100%
B-K(1)	B10.30	Integrally Welded Attachments to Pumps	Surface	6	16.60%(3)	1	1	0	0%	0	0%	1	100%
			Category Total	**77**		**4**	**4**	**1**	**25%**	**1**	**50%**	**2**	**100%**
Notes for Cat.	Note 1: Table IWB-2412-1 percentages apply. Note 2: Percentage based on performing 1 of the 5 attachments per Note 4 of Table IWB-2500-1, Category B-K– I (See Technical Position TP-2) Note 3: Percentage based on Footnote 5 of Table IWB-2500-1, Category B-K. For piping and pumps, a sample of 10% of the welded attachments associated with the component supports selected for examination under IWF-2510 shall be examined. This ten percent sample is equivalent to 3.03% of all piping attachments (See Technical Position TP-3) and 16.60% of all pump attachments (See Technical Position TP-31).												

B-L-2 Pressure Retaining Pump Cases

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
B-L-2(1)	B12.20	Pump Casing	Visual VT-3	2	50%(3)	1(2)	1(2)	1	100%	0	0%	0	0%
			Category Total	**2**		**1(2)**	**1(2)**	**1**	**100%**	**0**	**0%**	**0**	**100%**
Notes for Cat.	Note 1: Table IWB-2412-1 percentages do not apply. Note 2: Examination limited to one of the two Reactor Recirc. pumps and only when disassembled (See Technical Position TP-32). Note 3: The Recirculation Pump (RR-P-A) on the A Loop is scheduled in RE29.												

B-M-2 Pressure Retaining Valve Bodies

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
B-M-2(1)	B12.50	Valve Body exceeding NPS 4	Visual, VT-3	50	N/A(2)(3)	0(2)(3)	0	0	N/A	0	N/A	0	N/A
			Category Total	**50**		**0**	**0**	**0**	**N/A**	**0**	**N/A**	**0**	**N/A**
Notes for Cat.	Note 1: Table IWB-2412-1 percentages do not apply. Note 2: Examinations are only required if valves are disassembled for maintenance or repair. Note 3: Examinations are limited to at least one valve within each group of similar valves that perform similar functions. CNS has 14 Groups: Group A (4 valves)(See Technical Position TP-33), Group B (2 Valves)(See Technical Position TP-34), Group C (3 Valves)(See Technical Position TP-35), Group D (4 Valves)(See Technical Position TP-36), Group E (2 Valves)(See Technical Position TP-37), Group F (3 Valves)(See Technical Position TP-38), Group G (8 Valves)(See Technical Position TP-38), Group H (8 Valves)(See Technical Position TP-40), Group I (2 Valves)(See Technical Position TP-41), Group J (1 Valve)(See Technical Position TP-42), Group K (3 Valves)(See Technical Position TP-43), Group L (4 Valves)(See Technical Position TP-44), Group M (2 Valves)(See Technical Position TP-45), and Group Q (4 Valves)(See Technical Position TP-46).												

B-N-1 Interior of Reactor Vessel

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
B-N-1(1)	B13.10	Vessel Interior	Visual, VT-3	4	N/A(2)	0	N/A	0	N/A	0	N/A	0	N/A
			Category Total	**4**		**0**	**N/A**	**0**	**N/A**	**0**	**N/A**	**0**	**N/A**
Notes for Cat.	Note 1: Table IWB-2412-1 percentages do not apply. Note 2: Request for Alternative RI5-02 (approved) uses the BWRVIP Program in lieu of Examination Category B-N-1 (See BWRVIP Program for examination requirements and scheduling)												

B-N-2 Welded Core Support Structures and Interior Attachments to Reactor Vessel													
Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
B-N-2(1)	B13.20	Interior Attachments within Beltline Region	Visual, VT-1	13	N/A(2)	0	N/A	0	N/A	0	N/A	0	N/A
B-N-2(1)	B13.30	Interior Attachments beyond Beltline Region	Visual, VT-3	29	N/A(2)	0	N/A	0	N/A	0	N/A	0	N/A
B-N-2(1)	B13.40	Core Support Structure	Visual, VT-3	141	N/A(2)	0	N/A	0	N/A	0	N/A	0	N/A
			Category Total	**183**		**0**	**N/A**	**0**	**N/A**	**0**	**N/A**	**0**	**N/A**
Notes for Cat.		Note 1: Table IWB-2412-1 percentages do not apply. Note 2: Request for Alternative RI5-02 (approved) uses the BWRVIP Program in lieu of Examination Category B-N-2 (See BWRVIP Program for examination requirements and scheduling)											

B-0 Pressure Retaining Welds in Control Rod Housings													
Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
B-0(1)	B14.10	Welds in CRD housing	Surface	36 peripheral CRDs, 72 upper and lower welds	10%(2)	8(2)	8	2	25%	2	50%	4	100%
			Category Total	**274**		**8(2)**	**8**	**2**	**28%**	**2**	**56%**	**4**	**100%**
Notes for Cat.		Note 1: Table IWB-2412-1 percentages do not apply. Deferral to end of interval is permissible. Note 2: Code requires 10% of the peripheral upper and lower CRD welds to be examined either by volumetric or surface on 4 CRDs each interval. Upper welds are inaccessible and will require a relief request after the attempted examination in RE29.											

B-P All Pressure Retaining Components													
Category	**Item Number**	**Description**	**Exam Method**	**Number of Components in Item No.**	**Exam Percentage Required**	**Required to be Examined During Interval (Rounded up)**	**Total Scheduled Exams**	**Number to be Examined in First Period**	**% Req.**	**Number to be Examined in Second Period**	**% Req.**	**Number to be Examined in Third Period**	**% Req.**
B-P(1)	B15.10	Pressure Retaining Components	Visual, VT-2	2(2)	100% each outage	8	8	4	50%	4(3)	50%	0	0%
B-P	B15.20	Pressure Retaining Components	Visual, VT-2	2(2)	100% each interval	2	2	0	0%	0	0%	2	100%
			Category Total	**4**		**10**	**10**	**4**	**40%**	**4(3)**	**80%**	**2(3)**	**100%**
Notes for Cat.		Note 1: Table IWB-2412-1 percentages do not apply. Required every outage. Note 2: Number is based on vessel and Class 1 piping along with vessel leak detection line as the second component (Code Case N-805 will be used for the vessel leak detection line (pending NRC approval in RG 1.147, this exam not required until end of Interval)). Note 3: Leakage tests conducted per 6.MISC.502 for 8 of the 10 tests. The final system leakage test (Item No. B15.20) is performed per 6.MISC.504 in the 3rd period..											

C-A Pressure Retaining Welds in Pressure Vessels (INFORMATION ONLY - Superseded by RI-ISI)													
Category	**Item Number**	**Description**	**Exam Method**	**Number of Components in Item No.**	**Exam Percentage Required**	**Required to be Examined During Interval (Rounded up)**	**Total Scheduled Exams**	**Number to be Examined in First Period**	**% Req.**	**Number to be Examined in Second Period**	**% Req.**	**Number to be Examined in Third Period**	**% Req.**
C-A	C1.10	Shell Circumferential Welds	Volumetric	8	0%(1)	0	0	0	0%	0	0%	0	0%
C-A	C1.20	Head Circumferential Welds	Volumetric	2	0%(1)	0	0	0	0%	0	0%	0	0%
			Category Total	**10**		**0**	**0**	**0**	**0%**	**0**	**0%**	**0**	**0%**
Notes for Cat.		Note 1: Evaluation performed under Code Case N-716-1 determined the RHR Heat Exchangers to be Low Safety Significant (LSS) and therefore no examinations are required (See Technical Positions TP-55 and TP-56).											

C-B Pressure Retaining Nozzle Welds in Vessels (INFORMATION ONLY - Superseded by RI-ISI)													
Category	**Item Number**	**Description**	**Exam Method**	**Number of Components in Item No.**	**Exam Percentage Required**	**Required to be Examined During Interval (Rounded up)**	**Total Scheduled Exams**	**Number to be Examined in First Period**	**% Req.**	**Number to be Examined in Second Period**	**% Req.**	**Number to be Examined in Third Period**	**% Req.**
C-B	C2.21	Nozzle-to-Shell (or Head) Weld without Reinforcing Plates in Vessels > 1/2" Nominal Thickness	Volumetric and Surface	2	0%(1)	0	0	0	0%	0	0%	0	0%
C-B	C2.22	Nozzle Inner Radius	Volumetric	2	0%(1)	0	0	0	0%	0	0%	0	0%
C-B	C2.31	Reinforcing Plate Welds to Nozzle & Vessel for Nozzles in Vessels > 1/2" Nominal Thickness	Surface	4	0%(1)	0	0	0	0%	0	0%	0	0%
C-B	C2.33	Nozzle-to-Shell (or Head or nozzle-to-nozzle) Welds when Inside of Vessel is Inaccessible, for Vessels > 1/2" Nominal Thickness with Reinforcing Plates	Visual, VT-2	2	0%(1)	0	0	0	0%	0(4)	0%	0	0%
			Category Total	**10**		**0**	**0**	**0**	**0%**	**0**	**0%**	**0**	**0%**
Notes for Cat.		Note 1: Evaluation performed under Code Case N-716-1 determined the RHR Heat Exchangers to be Low Safety Significant (LSS) and therefore no examinations are required (See Technical Positions TP-57, TP-58, TP-75 and TP-76).											

C-C Welded Attachments for Vessels, Piping, Pumps, and Valves										Period 1 (16% - 50%)		Period 2 (50% - 75%)		Period 3 (100%)	
Category	Item	Code Type	Code Page	Exam Type	Total Assigned	Percent Required	Actual Required	Rounded Up Required	Total Scheduled	Scheduled	Actual Percent	Scheduled	Actual Percent	Scheduled	Actual Percent
Category: C-C															
C-C	C3.10	TP	TP-59	Weld-SUR	2	50.00%	1	1	1	0	0.00%	1	100.00%	0	100.00%
C-C	C3.20	TP	TP-60	Weld-SUR	139	2.88%	4	4	4	2	50.00%	1	75.00%	1	100.00%
C-C	C3.30	TP	TP-61	Weld-SUR	6	33.33%	2	2	2	0	0.00%	0	0.00%	2	100.00%
					147		7	7	7	2	28.57%	2	57.14%	3	100.00%

Notes for Cat.	Note 1: Table IWC-2412-1 percentages apply. Note 2: Sample includes 10% of the welded attachments associated with the component supports selected for examination under IWF-2510. Only 4 piping welded attachments are required to be examined (See Technical Position TP-60). Only 2 pump welded attachments are required to be examined (See Technical Position TP-61). Note 3: Number of components limited to one of the two RHR Hx's (each RHR HX. has 1 welded attachment consisting of two circumferential welds on the reinforcing band (dwg. M82704)) per Note 4 of Table IWC-2500-1, Cat C-C that permits only one component be examined for multiple vessels of similar design, function, and service (See Technical Position TP-59).

C-F-2 Pressure Retaining Welds in Carbon or Low Alloy Steel Piping (INFORMATION ONLY - Superseded by RI-ISI)													
Category	**Item Number**	**Description**	**Exam Method**	**Number of Components in Item No.**	**Exam Percentage Required**	**Required to be Examined During Interval (Rounded up)**	**Total Scheduled Exams**	**Number to be Examined in First Period**	**% Req.**	**Number to be Examined in Second Period**	**% Req.**	**Number to be Examined in Third Period**	**% Req.**
C-F-2(1)	C5.51	Circumferential Welds in Piping ≥ 3/8" Nominal Wall Thickness for Piping > NPS 4	Volumetric and Surface	794	N/A	0	0	0	N/A	0	N/A	0	N/A
C-F-2(1)	C5.81	Circumferential Welds in Pipe Branch Connections of Branch Piping ≥ NPS 2	Surface	4	N/A	0	0	0	N/A	0	N/A	0	N/A
C-F-2(1)	----	Welds not subject to examination based on Table IWC-2500-1 criteria (e.g., <3/8")	N/A	136	N/A	0	0	0	N/A	0	N/A	0	N/A
			Category Total	**934**		**0**	**0**	**0**	**N/A**	**0**	**N/A**	**0**	**N/A**
Notes for Cat.	Note 1: Table IWC-2412-1 percentages do not apply. Inspection requirements for this Category have been superseded by RI-ISI requirements based on Code Case N-716-1.												

C-H All Pressure Retaining Components													
Category	**Item Number**	**Description**	**Exam Method**	**Number of Components in Item No.**	**Exam Percentage Required**	**Required to be Examined During Interval (Rounded up)**	**Total Schedule Exams**	**Number to be Examined in First Period**	**% Req.**	**Number to be Examined in Second Period**	**% Req.**	**Number to be Examined in Third Period**	**% Req.**
C-H(1)	C7.10	Pressure Retaining components	Visual, VT-2	8	100% per Period	24	Pressure retaining boundary	8	100%	8	100%	8	100%
			Category Total	**8(3)**		**24(2)**		**8**	**100%**	**8**	**100%**	**8**	**100%**
Notes for Cat.	Note 1: Table IWC-2412-1 percentages do not apply. Note 2: Visual examination per IWA-5240. Note 3: Systems include CRD, CS (A/B), HPCI, RCIC, REC, and RHR (A/B).												

D-A Welded Attachments for Vessels, Piping, Pumps, and Valves											Period 1 (16% - 50%)		Period 2 (50% - 75%)		Period 3 (100%)	
Category	Item	Code Type	Code Page	Exam Type	Total Assigned	Percent Required	Actual Required	Rounded Up Required	Total Scheduled	Total Percent Scheduled	Scheduled	Actual Percent	Scheduled	Actual Percent	Scheduled	Actual Percent
D-A(1)	D1.10	TP	TP-77	Weld-VIS	24(2)	16.67%	4	4	4	100.00%	2	50.00%	1	75.00%	1	100.00%
D-A(1)	D1.20	STD	D-A D1.20	Weld-VIS	110(2)	10.00%	11	11	12	109.09%	4	36.36%	3	63.64%	5	109.09%
D-A(1)	D1.30	STD	D-A D1.30	Weld-VIS	4	10.00%	0.4	1	1	100.00%	1	250.00%	0	250.00%	0	250.00%
				Total	4		15	16	17	106.25%	7	45.45%	4	71.43%	6	110.39%

Notes for Cat.	Note 1: Table IWD-2412-1 percentages apply. Note 2: Welded integral attachments examined at same time as F-A component typically. However, in some cases, there may be multiple welded integral attachment ID's for a single F-A support component (e.g., ECST tank has one F-A support component ID with six integral attachment ID's).

D-B All Pressure Retaining Components												
Category	**Item Number**	**Description**	**Exam Method**	**Number of Components in Item No.**	**Exam Percentage Required**	**Required to be Examined During Interval (Rounded up)**	**Extent and Frequency of Exam**	**Number to be Examined in First Period**	**% Req.**	**Number to be Examined in Second Period**	**% Req.**	**Number to be Examined in Third Period**	**% Req.**
D-B(1)	D2.10	Pressure Retaining components	Visual, VT-2	5	100% per Period	15	Pressure Retaining boundary	5	100%	5	100%	5	100%
			Category Total	**5(2)**		**15**		**5**	**100%**	**5**	**100%**	**5**	**100%**

Notes for Cat.	Note 1: Table IWD-2412-1 percentages do not apply. Note 2: Systems include Emergency Condensate storage, NBI, REC, and SW (A/B).

E-A Containment Surfaces

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
E-A	E1.11	Accessible Surface Areas	General Visual	6	100% per Period	18	18	6	100%	6	100%	6	100%
E-A	E1.12	Wetted Surfaces or Submerged Surfaces	Visual, VT-3	0(1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E-A	E1.20	BWR Vent System; Accessible Surface Areas	Visual, VT-3	80	100%	80	80	24	30%	24	60%	32	100%
E-A	E1.30	Moisture Barriers	General Visual	2(2)	50%	3	3	1	100%	1	100%	1	100%
			Category Total	**88**		**101**	**101**	**31**	**31%**	**31**	**61%**	**39**	100%
Notes for Cat.		Note 1: All areas for Item Number E1.12 have been considered susceptible to accelerated corrosion per IWE-1240 and therefore placed in Category E-C, Item Number E4.11. Note 2: The Drywell Exterior Moisture Barrier is inaccessible (Ref. TP-1).											

E-C Containment Surfaces Requiring Augmented Examination

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
E-C	E4.11	Visible Surfaces	Visual, VT-1	48	100% per Outage(1)	48	240	96	100%	96	100%	48	100%
			Category Total	**48**		**48**	**240**	**96**	**100%**	**96**	**100%**	**48**	**100%**
Notes for Cat.		Note 1: Examination is required each outage based on License Renewal Commitment NLS2010050-02											

E-G Pressure Retaining Bolting													
Category	**Item Number**	**Description**	**Exam Method**	**Number of Components in Item No.**	**Exam Percentage Required**	**Required to be Examined During Interval (Rounded up)**	**Total Scheduled Exams**	**Number to be Examined in First Period**	**% Req.**	**Number to be Examined in Second Period**	**% Req.**	**Number to be Examined in Third Period**	**% Req.**
E-G[1]	E8.10	Bolted Connections	Visual, VT-1	22	100%	22	22	4	100%[2]	0	100%[2]	18	100%
			Category Total	**22**		**22**	**22**	**4**	**N/A[1]**	**0**	**N/A[1]**	**18**	**100%**
Notes for Cat.		Note 1: Table IWE-2411-1 percentages do not apply. Note 2: Examination may be performed with the connection assembled and bolting in place under tension, provided the connection is not disassembled during the interval. If the bolted connection is disassembled for any reason during the interval, the examination shall be performed with the connection disassembled.											

F-A Supports										Period 1 (16% - 50%)		Period 2 (50% - 75%)		Period 3 (100%)	
Category	Item	System	Exam Type	Total Assigned	Percent Required	Actual Required	Rounded Up Required	Total Scheduled	Total Percent Scheduled	Scheduled	Actual Percent	Scheduled	Actual Percent	Scheduled	Actual Percent
Category: F-A															
F-A(1)	F1.10.A	MS	SupportVIS	3	25.00%	0.75	1	1	100.00%	0	0.00%	1	133.33%	0	133.33%
F-A(1)	F1.10.A	NBDR	SupportVIS	2	25.00%	0.5	1	1	100.00%	0	0.00%	1	200.00%	0	200.00%
F-A(1)	F1.10.A	RF	SupportVIS	4	25.00%	1	1	1	100.00%	0	0.00%	1	100.00%	0	100.00%
F-A(1)	F1.10.A	RHR	SupportVIS	2	25.00%	0.5	1	1	100.00%	0	0.00%	0	0.00%	1	200.00%
F-A(1)	F1.10.A	RWCU	SupportVIS	6	25.00%	1.5	2	2	100.00%	0	0.00%	0	0.00%	2	133.33%
F-A(1)	F1.10.A	SLC	SupportVIS	19	25.00%	4.75	5	5	100.00%	0	0.00%	4	84.21%	1	105.26%
F-A(1)	F1.10.B	MS	SupportVIS	4	25.00%	1	1	1	100.00%	1	100.00%	0	100.00%	0	100.00%
F-A(1)	F1.10.B	RR	SupportVIS	2	25.00%	0.5	1	1	100.00%	0	0.00%	1	200.00%	0	200.00%
F-A(1)	F1.10.C	CS	SupportVIS	6	25.00%	1.5	2	2	100.00%	1	66.67%	1	133.33%	0	133.33%
F-A(1)	F1.10.C	MS	SupportVIS	37	25.00%	9.25	10	10	100.00%	4	43.24%	3	75.68%	3	108.11%
F-A(1)	F1.10.C	MSDR	SupportVIS	2	25.00%	0.5	1	1	100.00%	0	0.00%	1	200.00%	0	200.00%
F-A(1)	F1.10.C	RF	SupportVIS	27	25.00%	6.75	7	7	100.00%	5	74.07%	1	88.89%	1	103.70%
F-A(1)	F1.10.C	RHR	SupportVIS	39	25.00%	9.75	10	10	100.00%	3	30.77%	3	61.54%	4	102.56%
F-A(1)	F1.10.C	RR	SupportVIS	13	25.00%	3.25	4	4	100.00%	2	61.54%	0	61.54%	2	123.08%
F-A(1)	F1.10.C	RWCU	SupportVIS	6	25.00%	1.5	2	2	100.00%	0	0.00%	2	133.33%	0	133.33%
F-A(1)	F1.20.A	CS	SupportVIS	18	15.00%	2.7	3	3	100.00%	1	37.04%	2	111.11%	0	111.11%
F-A(1)	F1.20.A	HPCI	SupportVIS	16	15.00%	2.4	3	3	100.00%	1	41.67%	1	83.33%	1	125.00%
F-A(1)	F1.20.A	MS	SupportVIS	32	15.00%	4.8	5	5	100.00%	1	20.83%	1	41.67%	3	104.17%
F-A(1)	F1.20.A	PC	SupportVIS	9	15.00%	1.35	2	2	100.00%	0	0.00%	2	148.15%	0	148.15%
F-A(1)	F1.20.A	RCIC	SupportVIS	11	15.00%	1.65	2	2	100.00%	1	60.61%	0	60.61%	1	121.21%
F-A(1)	F1.20.A	RHR	SupportVIS	48	15.00%	7.2	8	8	100.00%	2	27.78%	2	55.56%	4	111.11%
F-A(1)	F1.20.A	SDV	SupportVIS	32	15.00%	4.8	5	5	100.00%	2	41.67%	1	62.50%	2	104.17%

F-A(1)	F1.20.B	CS	SupportVIS	12	15.00%	1.8	2	2	100.00%	0	0.00%	1	55.56%	1	111.11%
F-A(1)	F1.20.B	HPCI	SupportVIS	8	15.00%	1.2	2	2	100.00%	1	83.33%	1	166.67%	0	166.67%
F-A(1)	F1.20.B	MS	SupportVIS	4	15.00%	0.6	1	1	100.00%	0	0.00%	0	0.00%	1	166.67%
F-A(1)	F1.20.B	RCIC	SupportVIS	5	15.00%	0.75	1	1	100.00%	0	0.00%	0	0.00%	1	133.33%
F-A(1)	F1.20.B	RHR	SupportVIS	25	15.00%	3.75	4	4	100.00%	1	26.67%	1	53.33%	2	106.67%
F-A(1)	F1.20.B	SDV	SupportVIS	6	15.00%	0.9	1	1	100.00%	1	111.11%	0	111.11%	0	111.11%
F-A(1)	F1.20.C	CS	SupportVIS	18	15.00%	2.7	3	3	100.00%	1	37.04%	1	74.07%	1	111.11%
F-A(1)	F1.20.C	HPCI	SupportVIS	5	15.00%	0.75	1	1	100.00%	0	0.00%	0	0.00%	1	133.33%
F-A(1)	F1.20.C	MS	SupportVIS	34	15.00%	5.1	6	6	100.00%	2	39.22%	2	78.43%	2	117.65%
F-A(1)	F1.20.C	PC	SupportVIS	2	15.00%	0.3	1	1	100.00%	0	0.00%	1	333.33%	0	333.33%
F-A(1)	F1.20.C	RCIC	SupportVIS	2	15.00%	0.3	1	1	100.00%	0	0.00%	1	333.33%	0	333.33%
F-A(1)	F1.20.C	RHR	SupportVIS	97	15.00%	14.55	15	16	106.67%	5	34.36%	7	82.47%	4	109.97%
F-A(1)	F1.30.A	CM	SupportVIS	1	10.00%	0.1	1	1	100.00%	0	0.00%	1	1000.00%	0	1000.00%
F-A(1)	F1.30.A	HPCI	SupportVIS	23	10.00%	2.3	3	3	100.00%	0	0.00%	3	130.43%	0	130.43%
F-A(1)	F1.30.A	MSRV	SupportVIS	9	10.00%	0.9	1	1	100.00%	0	0.00%	0	0.00%	1	111.11%
F-A(1)	F1.30.A	REC	SupportVIS	32	10.00%	3.2	4	4	100.00%	1	31.25%	1	62.50%	2	125.00%
F-A(1)	F1.30.A	SW	SupportVIS	161	10.00%	16.1	17	17	100.00%	5	31.06%	6	68.32%	6	105.59%
F-A(1)	F1.30.B	CM	SupportVIS	1	10.00%	0.1	1	1	100.00%	0	0.00%	1	1000.00%	0	1000.00%
F-A(1)	F1.30.B	HPCI	SupportVIS	6	10.00%	0.6	1	1	100.00%	1	166.67%	0	166.67%	0	166.67%
F-A(1)	F1.30.B	MSRV	SupportVIS	6	10.00%	0.6	1	1	100.00%	0	0.00%	0	0.00%	1	166.67%
F-A(1)	F1.30.B	REC	SupportVIS	7	10.00%	0.7	1	2	200.00%	1	142.86%	0	142.86%	1	285.71%
F-A(1)	F1.30.B	SW	SupportVIS	50	10.00%	5	5	5	100.00%	1	20.00%	2	60.00%	2	100.00%
F-A(1)	F1.30.C	HPCI	SupportVIS	1	10.00%	0.1	1	1	100.00%	0	0.00%	0	0.00%	1	1000.00%
F-A(1)	F1.30.C	MSRV	SupportVIS	87	10.00%	8.7	9	10	111.11%	5	57.47%	2	80.46%	3	114.94%
F-A(1)	F1.30.C	REC	SupportVIS	10	10.00%	1	1	1	100.00%	1	100.00%	0	100.00%	0	100.00%
F-A(1)	F1.30.C	SW	SupportVIS	11	10.00%	1.1	2	2	100.00%	1	90.91%	1	181.82%	0	181.82%
F-A(1)	F1.40.A	CM	SupportVIS	2	50.00%	1	1	1	100.00%	0	0.00%	1	100.00%	0	100.00%
F-A(1)	F1.40.A	NB	SupportVIS	5	100.00%	5	5	5	100.00%	2	40.00%	1	60.00%	2	100.00%

F-A[1]	F1.40.A	PC	SupportVIS	56	100.00%	56	56	56	100.00%	15	26.79%	26	73.21%	15	100.00%
F-A[1]	F1.40.A	REC	SupportVIS	7	71.40%	5	5	5	100.00%	1	20.00%	0	20.00%	4	100.00%
F-A[1]	F1.40.A	RHR	SupportVIS	8	50.00%	4	4	4	100.00%	0	0.00%	4	100.00%	0	100.00%
F-A[1]	F1.40.B	CS	SupportVIS	2	50.00%	1	1	1	100.00%	0	0.00%	0	0.00%	1	100.00%
F-A[1]	F1.40.B	HPCI	SupportVIS	2	100.00%	2	2	2	100.00%	2	100.00%	0	100.00%	0	100.00%
F-A[1]	F1.40.B	PC	SupportVIS	72	100.00%	72	72	72	100.00%	20	27.78%	31	70.83%	21	100.00%
F-A[1]	F1.40.B	RCIC	SupportVIS	1	100.00%	1	1	1	100.00%	1	100.00%	0	100.00%	0	100.00%
F-A[1]	F1.40.B	REC	SupportVIS	4	25.00%	1	1	1	100.00%	0	0.00%	1	100.00%	0	100.00%
F-A[1]	F1.40.B	RHR	SupportVIS	4	25.00%	1	1	1	100.00%	0	0.00%	0	0.00%	1	100.00%
F-A[1]	F1.40.B	SW	SupportVIS	10	30.00%	3	3	3	100.00%	2	66.67%	0	66.67%	1	100.00%
F-A[1]	F1.40.C	RR	SupportVIS	12	50.00%	6	6	6	100.00%	6	100.00%	0	100.00%	0	100.00%
			Totals	1146		299	321	324	100.93%	100	33.43%	124	74.89%	100	108.32%

Notes for Cat.

Note 1: Table IWF-2410-2 percentages apply.

Note 2: Summary Numbers that include F1.10D, F1.20D, F1.30D, and F1.40D denote snubbers governed under the OM Code, Subsection ISTD. However percentages are based on total number of supports for each Class. Snubber supports (pin to building and pin to component) are included in totals for Type C supports based on function and system. Reference 2007 Edition through the 2008 Addenda of ASME Section XI, Figure IWF-1300(f) for break between OM Code and Section XI.

Note 3: Class MC components required to be examined per License Renewal Commitment NLS2008071-12.

Note 4: Table IWF-2500-1 requires 100% of F1.40 supports to be examined with the exception per Note 3 where only one support is required to be examined for multiple components of similar design, function and service. Consequently, the percentage required for examination is based on the particular breakdown of similar components. The total required examinations for F1.40A, B and C component supports is based on following:

F1.40A - Number of components based on 1 (ECST A) + 4(REC HX A) + 1 (REC tank) + 4 (RHR HX A) + 1 (RPV Skirt) + 4 (RPV Stabilizers) + 56 (Torus Downcomer and Vent Header) = 71

F1.40B - Number of components based on 1 (CSP B) + 1 (HPCI BP) + 1 (HPCI MP) + 1 (RCIC MP) + 1 (REC Pump A) + 1 (RHR Pump A) + 1 (SW BP A) + 1 (SW P A) + 1 (SW Strainers A) + 60 (Torus Downcomer Pair Support, Earthquake Ties, and Saddle Supports) + 12 Vacuum Breaker Supports = 81.

F1.40C (including D's) – Number of components based on 3 (RR P A constants) + 3 (RR P A snubbers) + 3 (RR P B constants) + 3 (RR P B snubbers) = 12. Only the RR P A Pump is scheduled which results in 6 supports examined.

R-A RI-ISI										Period 1 (16% - 50%)		Period 2 (50% - 75%)		Period 3 (100%)	
Category	Item	System	Code Type	Code Page	Exam Type	Total Assigned	Percent Required	Actual Required	Total Scheduled	Scheduled	Actual Percent	Scheduled	Actual Percent	Scheduled	Actual Percent
Category: R-A															
R-A	R1.16	NB	STD	R-A R1.16	Weld-VOL	1	100.00%	1	1	0	0.00%	1	100.00%	0	100.00%
R-A	R1.20	CS	TP	TP-88	Weld-VOL	32	12.25%	3.92	5	3	76.53%	0	76.53%	2	127.55%
R-A	R1.20	NBI	TP	TP-88	Weld-VOL	10	12.25%	1.22	1	0	0.00%	0	0.00%	1	81.97%
R-A	R1.20	RR	TP	TP-88	Weld-VOL	84	12.25%	10.29	9	5	48.59%	3	77.75%	1	87.46%
R-A	R1.20	NBDR	TP	TP-88	Weld-VOL	12	12.25%	1.47	2	0	0.00%	2	136.05%	0	136.05%
R-A	R1.20	SLC	TP	TP-88	Weld-VOL	4	12.25%	0.49	1	0	0.00%	0	0.00%	1	204.08%
R-A	R1.20	MS	TP	TP-88	Weld-VOL	149	12.25%	18.25	15	7	38.36%	6	71.23%	2	82.19%
R-A	R1.20	NB	TP	TP-88	Weld-VOL	3	12.25%	0.37	0	0	0.00%	0	0.00%	0	0.00%
R-A	R1.20	RF	TP	TP-88	Weld-VOL	89	12.25%	10.9	9	2	18.35%	1	27.52%	6	82.57%
R-A	R1.20	RHR	TP	TP-88	Weld-VOL	53	12.25%	6.49	10	2	30.82%	2	61.63%	6	154.08%
R-A	R1.20	RWCU	TP	TP-88	Weld-VOL	14	12.25%	1.72	3	0	0.00%	2	116.28%	1	174.42%
R-A	R1.20	MSDR	TP	TP-88	Weld-VOL	7	12.25%	0.86	1	0	0.00%	1	116.28%	0	116.28%
					Category Subtotal	458		57	57	19	33.35%	18	64.94%	20	100.04%
R-A	R1.20	Note 7	TP	TP-89	Visual	191[3][6]	5.7%[2]	11[4]	55[4]	22[4]	N/A[4]	22[4]	N/A[4]	11[4]	N/A[4]
R-A	R1.00	LSS	TP	TP-88	VT-2	934	0%[5]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
					Category Total	1583									

Notes for Cat.	Note 1: Table IWB-2412-1 percentages used as guidance for distribution of examinations over the interval. Note 2: Percentage based on number of selected welds divided by the number of welds in the R-A assigned Item (See Technical Positions TP-88 and TP-89). Note 3: These welds are addressed by Technical Position TP-89 Note 4: The Visual VT-2 examination is performed each Refueling outage per 6.MISC.502 and per 6.MISC.504 for the last outage of the interval, therefore the percentage requirements do not apply. Note 5: These welds were evaluated as Low Safety Significant (LSS) and therefore exempt per 4(c) of Code Case N-716-1. Note 6: RVD-BJ-10, SLC-BJ-8, and SLC-BJ-9 welds are included in the License Renewal Commitment NLS2010044-01 which requires a volumetric examination every interval. Note 7: Welds Not Subject to a Degradation Mechanism (Socket Welds and NPS 2 and less Branch Connections)

NUREG-0619

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
B-D	B3.100	Feedwater Nozzle Inner Radii	Volumetric	4	100%	4	4	0	0%	0	0%	4	100%
XM11.1	NR.0619.B	Feedwater Nozzle Bore Region 3	Volumetric	4	100%	4	4	0	0%	0	0%	4	100%
			Category Total	**8**		**8**	**8**	**0**	**0%**	**0**	**0%**	**8**	**100%**
Notes for NUREG-0619	None												

GE SIL No. 459

Category	Item Number	Description	Exam Method	Number of Components in Item No.	Exam Percentage Required	Required to be Examined During Interval (Rounded up)	Total Scheduled Exams	Number to be Examined in First Period	% Req.	Number to be Examined in Second Period	% Req.	Number to be Examined in Third Period	% Req.
N/A	N/A	Recirculation Pump Shaft & Cover	Visual	1	0%	1	0[1]	1	100%	0	0%	0	100%
			Category Total	**1**		**1**	**0**	**0**	**0%**	**0**	**0%**	**0**	**100%**
Notes for GE SIL No. 459	Note 1: If Recirculation Pump A (RR-P-A) is disassembled for maintenance only without a new rotating assembly, a visual examination of the pump shaft, cover and impeller to the shaft attachment region, including bolts, the hydrostatic bearing flange and baffle plate shall be performed looking for thermal cracks.												

6.0 INSERVICE INSPECTION
TECHNICAL APPROACH AND POSITION INDEX/SUMMARIES

Position	Summary
CT-01	Pipe Calibration Blocks used for Examination of Fittings
CT-02	Weld Reference System

TECHNICAL APPROACH AND POSITION NUMBER: CT-01

COMPONENT IDENTIFICATION

Code Classes:	1 and 2
References:	ASME Section XI, III-3400
Examination Category:	Not Applicable
Item Number:	Not Applicable
Description:	Pipe Calibration Blocks Used for Examination of Fittings

CODE REQUIREMENT

ASME Section XI, III-3410, states that basic calibration blocks shall be made from material of the same wall thickness (within 25%) as the component to be examined.

POSITION

The Code does not specifically address the examination of pipe to fitting welds, pipe to valve welds, pipe to pump welds, fitting to valve welds, fitting to pump welds, or fitting to fitting welds. Pumps, valves, and fittings generally see higher stresses than pipe and are normally fabricated with a heavier wall for the same service conditions. The pump, valve, or fitting is then counterbored or tapered to the mating pipe wall thickness.

Ultrasonic examinations of pipe to fitting welds, pipe to valve welds, and pipe to pump welds, will be performed from both sides of the weld when geometry and access conditions permit. The calibration will be performed on the basic calibration block for the pipe material. For carbon steel and wrought stainless steel fittings, the pipe and fitting material are acoustically similar. Cast stainless steel fittings, valves, and pumps cannot be ultrasonically examined with the currently available technology. The examination of the weld from the fitting, valve, or pump side is performed using the same pipe calibration block since the area of interest is the weld and the heat affected zone. The calibration will have an adequate metal path for the thicknesses being examined.

The examination of fitting to fitting welds, fitting to valve welds, and fitting to pump welds will also be performed using the basic calibration block for the pipe material. The geometry of these welds usually limits the examination. Furthermore, there are very few of these kinds of welds selected for ISI to justify procuring a special calibration block. If one of these kinds of welds is required to be examined for ISI, a best effort will be made to examine the area of interest (the inner third of the weld and the heat-affected zone).

CNS will use the basic calibration block for the pipe material of the same wall thickness within 25% to calibrate and examine pipe to fitting welds, pipe to valve welds, pipe to pump welds, fitting to fitting welds, fitting to valve welds, and fitting to pump welds for similar materials

TECHNICAL APPROACH AND POSITION NUMBER: CT-02

COMPONENT IDENTIFICATION

Code Classes:	1 and 2
References:	ASME Section XI, IWA-2600
Examination Category:	Not Applicable
Item Number:	Not Applicable
Description:	Weld Reference System

CODE REQUIREMENT

ASME Section XI, IWA-2610, states that a reference system shall be established for all welds and areas subject to surface and volumetric examination. Each such weld and area shall be located and identified by a system of reference points. The system shall permit identification of each weld, location of each weld centerline, and designation of regular intervals along the weld length.

ASME Section XI, IWA-2640 states a reference system for component welds is given in IWA-2641. A different system may be used provided it meets the requirements of IWA-2610.

POSITION

At the time of construction of CNS, neither datum reference markings nor a reference system was required by Code. Application of such physical markings to each and every item subject to surface and volumetric examination at an operating plant would require significant expenditure of resources and would result in additional, unnecessary personnel radiation exposure. In many instances, limited or no physical access is available to permit such markings.

In accordance with IWA-2640, CNS has adopted a different system for weld referencing in lieu of physically marking all applicable ISI welds installed during original construction. This position is consistent with ASME Section XI Code requirements and Interpretation XI-1-95-05 which states:

Interpretation:	XI-1-95-05
Subject:	Section XI, IWA-2600; Weld Reference System - Identification of (Winter 1981 Addenda and Later Editions and Addenda Through 1992 Edition)
Date Issued:	October 13, 1994

File Number: IN93-035

Related Documents:

Question: Is it the intent of IWA-2610 to physically mark piping with reference points designating regular intervals along the weld length?

Reply: No

It is CNS's position to continue using the present weld identification method employed during the previous 10-year inspection intervals. This is accomplished by procedurally describing datum or reference points such that subsequent relocation of the examination area can be repeatedly achieved.

During the course of performing examinations for the fifth inspection interval, in accordance with the requirements of the ISI Program, reference points will be physically applied to welds where flaw indications are detected and are determined to be relevant.

Where new welds are installed as a result of repair or replacement activities and a preservice inspection is performed, the requirements of IWA-2600 will be met.

Interpretation:	XI-1-92-06
Subject:	Section XI, IWA-2600 and IWA-4130; Weld Reference System - Recording (1980 Edition With Winter 1981 Addenda, and Later Editions and Addenda Through the 1989 Edition)
Date Issued:	September 13, 1991
File Number:	IN91-019
Related Documents:	

Question: Is it the intent of Section XI, IWA-4130(a)(2) to require recording of dimensions for reference points of a repair only when required by IWA-2600?

Reply: Yes

INSERVICE INSPECTION RELIEF REQUESTS

7.0 RELIEF REQUESTS

Throughout this program, the term "relief request" is used interchangeably referring to submittals to the NRC requesting permission to deviate from either an ASME Section XI requirement, a 10 CFR 50.55a rule, or to use provisions from Editions or Addenda of Section XI not approved by the NRC as referenced in 10 CFR 50.55a(1)(ii). However, when communicating with the NRC and in written requests to deviate, the terms as defined below must be used for clarity and to satisfy 10 CFR 50.55a. Submittals to the NRC must clearly identify which of the below rules are being used to request the deviation.

Table 7.0-1 contains an index of Relief Requests written in accordance with 10 CFR 50.55a(z) and (g)(5)(iii). The applicable NPPD submittal and NRC Safety Evaluation Report (SER) correspondence numbers are also included for each request.

7.1 Request for Alternatives

When seeking an alternative to the rules contained in 10 CFR 50.55a(b), (c), (d), (e), (f), (g), or (h) the request is submitted under the provision of 10 CFR 50.55a(z). Once approved by the Director, Office of Nuclear Reactor Regulation, the alternative may be incorporated into the ISI program. These types of requests are typically used to request use of Code Cases, Code Edition, or Addenda not yet approved by the NRC. Request for Alternatives must be approved by the NRC prior to their implementation or use. Within the provisions of 10 CFR 50.55a(z) there are two specific methods of submittal:

7.1.1 10 CFR 50.55a(a)(z)(1) allows alternatives when authorized by the NRC, if the proposed alternatives would provide an acceptable level of quality and safety. Requests submitted under these provisions are not required to demonstrate hardship or burden.

7.1.2 10 CFR 50.55a(z)(2) also allows alternatives when authorized by the NRC, if compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. When submitted under this provision, there must be evidence of unusual hardship or difficulty. Typically this hardship will be dose or excessive disassembly.

7.2 Relief Request Required due to Impracticality or Limited Examinations
10 CFR 50.55(a)(g)(5)(iii) and (iv) allows relief to be requested in instances when a Code requirement is deemed impractical with (iv) being specific to examination requirements that are determined to be impractical. The provisions of these two paragraphs are typically used to address impracticalities like limited examination coverage. Under 10 CFR 50.55(a)(g)(5)(iv), relief

requests for examination impracticalities must be submitted for NRC review and approval not later than 12 months after the expiration of the initial or subsequent 120-month inspection interval for which relief is sought.

In cases where the ASME Section XI requirements for inservice inspection are considered impractical, NPPD will notify the NRC and submit information to support the determination, as required by 10 CFR 50.55a(g)(5)(iii). The submittal of this information will be referred to as a Request for Relief.

In the event that the entire examination volume or surface (as defined in the ASME Code) cannot be examined due to interference by another component or part geometry, then in accordance with IWA-2200(c) (incorporation of Code Case N-460), a reduction in examination volume or area is acceptable if the reduction is less than 10%. In the event that the reduction in examination volume or area is 10% or greater, a request for relief will be submitted. NRC Information Notice 98-42 provides additional guidance that all ASME Section XI examinations should meet the examination coverage criteria established in Code Case N-460. Therefore, the guidance included in NRC Information Notice 98-42 will be followed by NPPD when determining whether to prepare a relief request or apply the criteria of IWA-2200 for examinations where less than 100% coverage of any Section XI examination is obtained.

7.3 Requests to use Later Edition and Addenda of ASME Section XI

On July 28, 2004, the NRC published Regulatory Issue Summary (RIS) 2004-12, "Clarification on Use of Later Editions and Addenda to ASME OM Code and Section XI". This RIS clarifies the NRC position on using Editions and Addenda of Section XI, in whole or in part, later than those specified in the ISI program. If the desired Edition or Addenda are referenced in 10 CFR 50.55a(1)(ii), the request is submitted following the guidance of the RIS. These types of request are not required to demonstrate hardship, difficulty, or provide evidence of quality and safety. They do need to ensure that all related requirements are also used. Requests to use edition and/or addenda of ASME Section XI that are referenced in 10 CFR 50.55a(1)(ii) that are later than the initial Code of Record established for the ISI program shall be submitted under the provisions of 10 CFR 50.55a(g)(4)(iv).

Table 1 summarizes each NRC approved relief request. Table 2 summarizes outstanding Relief Requests currently pending approval by the NRC. Relief requests are numbers are the same as those used in Interval 3 to maintain continuity. Table 3 summarizes Relief Requests in preparation for submittal (or resubmittal) to the NRC. Percentages are tentatively adjusted assuming approval will be granted prior to end of the applicable Period as required to ensure Code percentage requirements are maintained.

Table 1 NRC Approved				
Relief Request	**Rev #**	**Description**	**NPPD Correspondence**	**NRC Correspondence**
RI5-02	0	Implementation of BWRVIP in lieu of B-N-1 and B-N-2.	NLS201502 dated 6/9/2015	Approved - NRC2016004 dated 2/17/2016
RC3-01	0	Alignment and Synchronization of the Containment Inservice Inspection (CISI) Program Third Ten-Year Interval with the Inservice Inspection (ISI) Program Fifth Ten-Year Interval.	NLS201502 dated 6/9/2015	Approved - NRC2016002 dated 2/12/2016
RR5-01	0	Alternative Weld Overlay Repair for the Dissimilar Metal Weld on the Nozzle-to-Control Rod Drive End Cap.	NLS201502 dated 6/9/2015	Approved – NRC2016006 dated 2/24/2016

Table 2 Pending NRC Approval				
Relief Request	**Rev #**	**Description**	**NPPD Correspondence**	**NRC Correspondence**
RI5-01	0	Reactor Pressure Vessel Circumferential Shell Welds using BWRVIP-05.	NLS201502 dated 6/9/2015	NRC2015048 acknowledge withdrawal of RI5-01 (temporary to address RAI before resubmitting)

Table 3 Pending NPPD Submittal				
Relief Request	**Rev #**	**Description**	**NPPD Correspondence**	**NRC Correspondence**
RI5-01	1	Reactor Pressure Vessel Circumferential Shell Welds using BWRVIP-05.	--------	----------
RI5-03	0	Inspection of Reactor Vessel Nozzle-to-Vessel Shell Welds and Nozzle Inner Radius Sections	--------	----------

Acronyms

ALARA	As Low as Reasonably Achievable
ART	Adjusted Reference Temperature
ASME	American Society of Mechanical Engineers
BWR	Boiling Water Reactor
BWRVIP	Boiling Water Reactor Vessel Internals Project
CFR	Code of Federal Regulation
CISI	Containment Inservice Inspection
CRD	Control Rod Drive
EPRI	Electric Power Research Institute
EVT-1	Enhanced Visual (VT-1) Testing
FN	Ferrite Number
GTAW	Gas Tungsten Arc Weld
HAZ	Heat Affected Zone
I&E	Inspection and Evaluation
ID	Inner Diameter or Identification
IGSCC	Intergranular Stress Corrosion Cracking
ISI	In-Service Inspection
LLC	Limited Liability Corporation
LRA	License Renewal Application
No.	Number
NP	Non Proprietary
NPPD	Nebraska Public Power District
NRC	Nuclear Regulatory Commission
NUREG	US Nuclear Regulatory Commission Regulation
PDI	Performance Demonstration Initiative
PSI	Pre-service Inspection
PWHT	Post-Weld Heat Treat
PWR	Pressurized Water Reactor
Rev	Revision
RG	Regulatory Guide
RPV	Reactor Pressure Vessel
RT_{NDT}	Reference Temperature for Nil Ductility Transition
SCC	Stress Corrosion Cracking
SDC	Shut Down Cooling
SER	Safety Evaluation Report
US	United States
UT	Ultrasonic Testing
VT	Visual Testing
VT-1	Detailed inspection
VT-3	General condition inspection

10 CFR 50.55a Request No. RI5-02
Implementation of BWRVIP Documents in lieu of B-N-1 and B-N-2
Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1)
Acceptable Level of Quality and Safety

ASME Code Component(s) Affected

Code Class:	ASME Section XI Code Class 1
Component Numbers:	Code Item Numbers: B13.10 – Vessel Interior, B13.20 – Interior Attachments, within Beltline Region, B13.30 – Interior Attachments beyond Beltline Region, and B13.40 – Core Support Structure
Code References:	ASME Section XI, 2007 Edition with 2008 Addenda
Examination Category:	B-N-1, B-N-2
Item Number(s):	B13.10, B13.20, B13.30, and B13.40

Applicable ASME Code Requirements

ASME Section XI, 2007 Edition through the 2008 Addenda requires the examination of components within the Reactor Pressure Vessel. These examinations are included in Table IWB-2500-1, Examination Categories B-N-1 and B-N-2 and identified with the following Item Numbers:

B13.10 Examine accessible areas of the reactor vessel interior each period by the VT-3, visual examination method (B-N-1); includes only those spaces above and below the core made accessible by removal of components during normal refueling outages.

B13.20 Examine accessible interior welded attachments within the beltline region each interval by the VT-1, visual examination method (B-N-2)

B13.30 Examine accessible interior welded attachments beyond the beltline region each interval by the VT-3, visual examination method (B-N-2)

B13.40 Examine the accessible surfaces of welded core support structures each interval by the VT-3, visual examination method (B-N-2)

These examinations are performed to assess the structural integrity of the reactor vessel interior, its welded attachments, and the welded core support structure within the boiling water reactor pressure vessel.

Reason for Request

In accordance with 10 CFR 50.55a(z)(1), NPPD is requesting the NRC approval of a proposed alternative to the Code requirements provided above on the basis that the use of the BWRVIP

guidelines discussed below provide an acceptable level of quality and safety.
The BWRVIP Inspection and Evaluation (I&E) Guidelines recommend specific inspection by BWR owners to identify material degradation with BWR components. A wealth of inspection data has been gathered during these inspections across the BWR industry. The BWRVIP I&E Guidelines focus on specific and susceptible components, specify appropriate inspection methods capable of identifying known or potential degradation mechanisms, and require re-examination at appropriate intervals. The scope of the I&E Guidelines exceed that of ASME Section XI and in most instances include components that are not part of the ASME Section XI jurisdiction.

Use of this proposed alternative will maintain an adequate level of quality and safety and avoid duplicate or unnecessary inspections, while conserving radiological dose.

Proposed Alternative and Basis for Use

Proposed Alternative

NPPD requests authorization to utilize the alternative requirements of the BWRVIP Guidelines in lieu of the requirements of ASME Code Section XI.

NPPD will satisfy the Examination Category B-N-1 and B-N-2 requirements as described in Table 1 in accordance with BWRVIP guideline requirements. This relief request proposes to utilize the identified BWRVIP guidelines in lieu of the associated Code requirements, including examination method, examination volume, frequency, training, successive and additional examinations, flaw evaluations, and reporting.

Not all of the components addressed by these guidelines are Code components. The proposed alternative includes:

For Examination Category B-N-1.

As an alternative to meeting ASME Section XI and performing a VT-3 examination of the RPV interior above and below the core made accessible by a normal refuel outage, NPPD will implement the BWRVIP Guidelines listed below and as outlined in Table 1. By this request for alternative the BWRVIP Guidelines will be used as an alternative to the requirements of ASME Section XI.

- BWRVIP-03, Revision 17, "BWR Vessel and Internals Project, Reactor Pressure Vessel and Internal Examinations Guidelines"
- BWRVIP-18, Revision 1-A, "BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines"
- BWRVIP-25, "BWR Core Plate Inspection and Flaw Evaluation Guidelines"
- BWRVIP-26-A, "BWR Top Guide Inspection and Flaw Evaluation Guidelines"

- BWRVIP-27-A, "BWR Standby Liquid Control System/Core Plate ΔP Inspection Flaw Evaluation Guidelines"
- BWRVIP-41, Revision 3, "BWR Jet Pump Assembly Inspection and Evaluation Guidelines"
- BWRVIP-47-A, "BWR Lower Plenum Inspection and Evaluation Guidelines"
- BWRVIP-138 Revision 1-A, "BWRVIP Updated Jet Pump Beam Inspection and Flaw Evaluation"

For Examination Category B-N-2

As an alternative to meeting ASME Section XI and performing a VT-1 or VT-3, as required by ASME Section XI, examination of the RPV welded attachments and welded core support structures, NPPD will implement the BWRVIP Guidelines listed below and as outlined in Table 1. By this request for alternative the BWRVIP Guidelines will be used as an alternative to the requirements of ASME Section XI.

- BWRVIP-03, Revision 17 "BWR Vessel and Internals Project, Reactor Pressure Vessel and Internal Examinations Guidelines"
- BWRVIP-38, "BWR Shroud Support Inspection and Flaw Evaluation Guidelines"
- BWRVIP-48-A, "Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines"
- BWRVIP-76, Revision 1-A, "BWR Core Shroud Inspection and Flaw Evaluation Guidelines"
- BWRVIP-100-A, "Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds"

Note: If flaw evaluations are required for BWRVIP-76 Revision 1-A examinations, the fracture toughness values of BWRVIP-100-A will be utilized.

When a BWRVIP Guideline refers to ASME Section XI, the technical requirements of ASME Section XI as described by the BWRVIP Guideline will be met, but the examination is under the auspices of the BWRVIP program as defined by BWRVIP-94NP Revision 2, "BWRVIP Vessel and Internals Project Program Implementation Guide".

The NPPD reactor vessel internals inspection programs have been developed and implemented to satisfy the requirements of BWRVIP-94NP, Revision 2. It is recognized that the BWRVIP executive committee periodically revises the BWRVIP guidelines to address industry operating experience, include enhancements to inspection techniques, and add or adjust flaw evaluation methodologies. BWRVIP-94NP, Revision 2 states that where guidance in existing BWRVIP documents has been supplemented or revised by subsequent correspondence approved by the BWRVIP Executive Committee, the vessel and internals program shall be modified to reflect the new requirements and implement the guidance within two refueling outages, unless a different schedule is specified by the BWRVIP.

However, if new guidance approved by the Executive Committee includes changes to NRC approved BWRVIP guidance that are less conservative than those approved by the NRC, the less conservative guidance shall be implemented only after NRC approves the changes, which generally means publication of a "-A" document or equivalent. Therefore, where the revised version of a BWRVIP inspection guideline continues to also meet the requirements of the version of the BWRVIP inspection guideline approved by the NRC, it may be implemented. Otherwise, the revised guidelines will only be implemented after NRC approval of the revised BWRVIP guidelines or a plant-specific request for alternative has been approved. Table 1 below only represents the most current comparison.

Any deviations from the referenced BWRVIP Guidelines for the duration of the proposed alternative will be appropriately documented and communicated to the NRC, per the BWRVIP Deviation Disposition Process.

Note that other regulatory commitments (i.e., NUREG-0619) are still being implemented separately from the ASME Section XI Program or this request for alternative.

In the event that conditions are identified that require repair or replacement and the component is within the jurisdiction of ASME Section XI (welded attachments to the RPV or Core Support Structure), the repair or replacement activities will be performed in accordance with ASME Section XI, Article IWA-4000. Subsequent examinations will be in accordance with the applicable BWRVIP Guideline.

Basis for Use

As part of the BWRVIP initiative, the BWR reactor internals and attachments were subjected to a safety assessment to identify those components that provide a safety function and to determine if long-term actions were necessary to ensure continued safe operation. The safety functions considered are those associated with (1) maintaining a coolable geometry, (2) maintaining control rod insertion times, (3) maintaining reactivity control, (4) assuring core cooling and (5) assuring instrumentation availability. The results of the safety assessment are documented in BWRVIP-06, Revision 1-A "BWR Vessel and Internals Project Safety Assessment of BWR Internals" which has been approved by the NRC. As a result of BWRVIP-06, Revision 1-A, component specific BWRVIP guidelines were developed providing appropriate examination and evaluation requirements to address the specific component safety function and potential degradation mechanism.

Along with the component specific guidelines, the BWRVIP has established a reporting protocol for examination results and deviations. The NRC has agreed with the BWRVIP approach in principal and has issued Safety Evaluations for many of these guidelines (see References).

As additional justification, Attachment 2, "Comparison of Code Examination Requirements to BWRVIP Examination Requirements", provides specific examples which compare the inspection requirements of ASME Code Section XI Table IWB-2500-1, Item Numbers B13.10, B13.20, B13.30 and B13.40 to the inspection requirements in the BWRVIP documents. Specific BWRVIP documents are provided as examples. This comparison also includes a discussion of the inspection methods.

Therefore, use of the BWRVIP guidelines as an alternative to ASME Section XI, as shown by the comparison provides an acceptable level of quality and safety.

Duration of Proposed Alternative

This proposed alternative will be used for the Fifth Ten-Year Interval of the Inservice Inspection Program for CNS.

Precedents

Similar Request for Alternatives has been previously approved for the following other licensees.

1. US NRC Letter to Entergy Nuclear Operations, "Grand Gulf Nuclear Station, Unit 1 – Request for Relief GG-ISI-017, Alternative to use Boiling Water Reactor Vessel and Internals Project Guidelines in lieu of specific ASME Code Requirements (TAC No. MF2357)", dated June 30, 2014 (Accession Number ML14148A262).

2. US NRC Letter to Entergy Nuclear Operations, "River Bend, Unit1 – Request for Relief No. RBS-ISI-019, Alternative to use Boiling Water Reactor Vessel and Internals Project Guidelines in lieu of ASME Code, Section XI Requirements for the Fourth 10-Year Inservice Inspection Interval (TAC NO. MG1867), dated May 30, 2014 (Accession Number ML14127A327).

3. US NRC Letter to Exelon Generation Company, LLC, "Dresden Nuclear Power Station, Units 2 and 3 – Safety Evaluation in support of Request for Relief associated with the Fifth 10-Year Inservice Inspection Interval Program (TAC NOS. ME9682, ME9684, ME9685, ME9686, ME9687, ME9688, ME9689, ME9690, ME9691, ME9692, ME9693, ME9694, ME9695, ME9696, and ME9697), dated September 30, 2013 (Accession Number ML13260A585).

4. US NRC Letter to Exelon Generation Company, LLC, "Quad Cities Nuclear Power Station Units 1 and 2 – Safety Evaluation in support of Request for Relief associated with the Fifth 10 Year Interval Inservice Inspection Program (TAC NOS. ME9668, ME9669, ME9670, ME9671, ME9672, ME9674, ME9675, ME9676, ME9677, ME9678, ME9679, ME9680, ME9681), dated September 30, 2013 (Accession Number ML13267A097).

5. US NRC Letter to Exelon Nuclear, "Oyster Creek Nuclear Generating Station – Relief from the Requirements of the ASME Code, Relief Request No. I5R-01 (TAC NO. ME9490), dated August 5, 2013 (Accession Number ML13169A062).

References

1. US NRC Letter to BWRVIP, dated July 29, 2008, "Safety Evaluation for Electric Power Research Institute (EPRI) Boiling Water Reactor (BWR) Vessel and Internals Project (BWRVIP) Topical Report (TR)-1006598, "BWRVIP-06-A : BWR Vessel and Internals Project, Safety Assessment of BWR Reactor Internals, Revised Section 4.0: Consideration of Loose Parts" (TAC NO. MC7448)

2. Letter from NRC to BWRVIP, "Final Safety Evaluation for Electric Power Research Institute Boiling Water Reactor Vessel and Internals Project Technical Report 1016568, "BWRVIP-18, Revision 1: BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines (TAC No. ME2189)", dated January 30, 2012 (ML113620684).

3. US NRC Letter to BWRVIP, dated December 19, 1999, "Final Safety Evaluation of BWRVIP Vessel and Internals Project, "BWR Vessel and Internals Project, BWR Core Plate Inspection and Flaw Evaluation Guidelines (BWRVIP-25)", EPRI Report TR-107284, December 1996 (TAC NO. M97802).

4. US NRC Letter to BWRVIP, dated September 9, 2005, "NRC Approval Letter of BWRVIP-26-A, "BWR Vessel and Internals Project Boiling Water Reactor Top Guide Inspection and Flaw Evaluation Guidelines."

5. US NRC Letter to BWRVIP, dated June 10, 2004, Proprietary Version of NRC Staff Review of BWRVIP-27-A, "BWR Standby Liquid Control System/Core Plate ΔP Inspection Flaw Evaluation Guidelines."

6. US NRC Letter to BWRVIP, dated July 24, 2000, "Final Safety Evaluation of the "BWR Vessel and Internals Project, BWR Shroud Support Inspection and Flaw Evaluation Guidelines (BWRVIP-38), "EPRI Report TR-108823 (TAC NO. M99638).

7. US NRC Letter to BWRVIP, dated February 4, 2001, "Final Safety Evaluation of the "BWR Vessel and Internals Project, BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines (BWRVIP-41)," (TAC NO. M99870).

8. US NRC Letter to BWRVIP, dated September 9, 2005, "NRC Approval Letter of BWRVIP-47-A, "BWR Vessel and Internals Project Boiling Water Reactor Lower Plenum Inspection and Flaw Evaluation Guidelines."

9. US NRC Letter to BWRVIP, dated July 25, 2005, "NRC Approval Letter of BWRVIP-48-A, "BWR Vessel and Internals Project Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines."

10. US NRC Letter to BWRVIP, dated November 12, 2014, "Final Safety Evaluations of the Boiling Water Reactor Vessel and Internals Project 76, REV 1 Topical Report, "Boiling Water Reactor Core Shroud Inspection and Flaw Evaluation Guidelines" (TAC NO. ME8317)"

11. Letter from Chairman, BWR Vessel and Internals Project to NRC, "Project No. 704 – BWRVIP Program Implementation Guide (BWRVIP-94NP, Revision 2), "dated September 22, 2011 (MLI1271A058).

12. US NRC Letter to BWRVIP, dated November 1, 2007, "NRC Approval Letter of Comment for BWRVIP-100-A, BWR Vessel and Internals Project, Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds."

13. US NRC Letter to BWRVIP, dated May, 2012, Electric Power Research Institute Final Safety Evaluation for Technical Report 1016574 "BWRVIP-138 Revision 1: BWR [Boiling Water Reactor] Vessel and Internals Project "Updated Jet Pump Beam Inspection and Flaw Evaluation Guidelines" (TAC No. ME2191)

Table 1								
ASME Item No. Table IWB-2500-1	Component	ASME Exam Scope	ASME Exam Type	ASME Frequency	Applicable BWRVIP Document	BWRVIP Exam Scope	BWRVIP Exam Type	BWRVIP Frequency
B13.10	Reactor Vessel Interior	Areas of the RPV above and below the core made accessible during a normal refuel.	VT-3	Each Period	None	While there is not a specific BWRVIP Guideline that addresses the scope of B-N-1, the examinations performed by BWRVIP-18, 25, 26, 27, 41, 47, 138 provide a general overview of the reactor interior which may be considered representative of the B-N-1 scope.		
B13.20	Interior Attachments within Beltline - Riser Braces	Accessible Welds	VT-1	Each 10-year Interval	BWRVIP-48 Table 3-2	Riser Brace Attachment	EVT-1	100% in first 12 years, 25% during each subsequent 6 years
	Lower Surveillance Specimen Holder Brackets				BWRVIP-48, Table 3-2	Bracket Attachment	VT-1	Each 10-Year Interval
B13.30	Interior Attachments beyond Beltline - Steam Dryer Hold-down Brackets	Accessible Welds	VT-3	Each 10-year interval	BWRVIP-48, Table 3-2	Bracket Attachment	VT-3	Each 10-Year Interval
	Guide Rod Brackets				BWRVIP-48, Table 3-2	Bracket Attachment	VT-3	Each 10-Year Interval
	Steam Dryer Support Brackets				BWRVIP-48, Table 3-2	Bracket Attachment	EVT-1	Each 10-Year Interval
	Feedwater Sparger Brackets				BWRVIP-48, Table 3-2	Bracket Attachment	EVT-1	Each 10-Year Interval
	Core Spray Piping Brackets				BWRVIP-48, Table 3-2	Bracket Attachment	EVT-1	Every 4 Refueling Cycles

Table 1

ASME Item No. Table IWB-2500-1	Component	ASME Exam Scope	ASME Exam Type	ASME Frequency	Applicable BWRVIP Document	BWRVIP Exam Scope	BWRVIP Exam Type	BWRVIP Frequency
	Upper Surveillance Specimen Holder Brackets				BWRVIP-48, Table 3-2	Bracket Attachment	VT-3	Each 10-Year Interval
	Shroud Support (Weld H9) including gussets				BWRVIP-38, 3.1.3.2, Figures 3-2 and 3-5	Weld H-9 including gussets	EVT-1 or UT	Maximum of 6 years for EVT-1, Maximum of 10 years for UT
B13.40	Integrally Welded Core Support Structure	Accessible Surfaces	VT-3	Each 10-year interval	BWRVIP-38, 3.1.3.2, Figures 3-2 and 3-5	Shroud support welds H8 and H9 including gussets	EVT-1 or UT	Based on as-found conditions, to a maximum 6 years for one side EVT-1, 10 years for UT where accessible
	Shroud Horizontal Welds				BWRVIP-76, 2.2	Welds H1-H7 as applicable	UT or EVT-1	Based on as-found conditions, to a maximum of 10 years for UT when inspected from both sides of the welds
	Shroud Vertical Welds				BWRVIP-76, 2.3	Vertical Welds as applicable	EVT-1 or UT	Maximum 10 years for UT based on inspection of horizontal welds

ATTACHMENT 2
Comparison of ASME Code Section XI Examination Requirements to BWRVIP Examination Requirements

The following provides a comparison of the examination requirements provided in ASME Code Section XI Table IWB-2500-1, Examination Category B-N-1 and B-N-2, Item Numbers B13.10, B13.20, and B13.30, to the examination requirements in the BWRVIP Guidelines. Specific BWRVIP Guidelines are provided as examples for comparisons. This comparison also includes a discussion of the examination methods.

Code Requirement – B13.10 – Reactor Vessel Interior Accessible Areas (B-N-1)

The ASME Section XI Code requires a VT-3 examination of reactor vessel accessible areas, which are defined as the spaces above and below the core made accessible during normal refueling outages. The frequency of these examinations is specified as the first refueling outage, and at intervals of approximately 3 years during the first inspection interval, and each period during each successive 10-year Inspection Interval. Typically, these examinations are performed every other refueling outage of the Inspection Interval. This examination requirement is a non-specific requirement that is a departure from the traditional Section XI examinations of welds and surfaces. As such, this requirement has been interpreted and satisfied differently across the licensees, and vendors of this inspection service. Based on the acceptance criteria specified in IWB-3520.2, the examination is to identify relevant conditions such as distortion or displacement of parts, loose, missing, or fractured fasteners, foreign material, corrosion, erosion, or accumulation of corrosion products, wear, and structural degradation.

Portions of the various examinations required by the applicable BWRVIP Guidelines require access to accessible areas of the reactor vessel during each refueling outage. Examination of Core Spray Piping and Spargers (BWRVIP-18-R1-A), Top Guide (BWRVIP-26-A), Jet Pump Welds and Components (BWRVIP-41-R3), Interior Attachments (BWRVIP-48-A), Core Shroud Welds (BWRVIP-76-R1), Shroud Support (BWRVIP-38), and Lower Plenum Components (BWRVIP-47-A) provides such access. Locating and examining specific welds and components within the reactor vessel areas above, below (if accessible), and surrounding the core (annulus area) entails access by remote camera systems that essentially perform equivalent VT-3 examination of these areas or spaces as the specific weld or component examinations are performed. This provides an equivalent method of visual examination on a more frequent basis than that required by the ASME Section XI Code. Evidence of wear, structural degradation, loose, missing, or displaced parts, foreign materials, and corrosion product buildup can be, and has been observed during the course of implementing these BWRVIP examination requirements. Therefore, the requirements specified by the BWRVIP Guidelines meet or exceed the subject Code requirements for examination method and frequency of the interior of the reactor vessel. Accordingly, these BWRVIP examination requirements provide an acceptable level of quality and safety as compared to the subject Code requirements.

Code Requirement – B13.20 – Interior Attachments Within the Beltline (B-N-2)

The ASME Section XI Code requires a VT-1 examination of accessible reactor interior surface attachment welds within the beltline each 10-year interval. In the Boiling Water Reactor, this includes the Jet Pump Riser Brace Weld-to-Vessel Wall and the Lower Surveillance Specimen Support Bracket Welds-to-Vessel Wall. In comparison, the BWRVIP requires the same examination method and frequency for the Lower Surveillance Specimen Support Bracket Welds, and requires an EVT-1 examination on the remaining attachment welds in the beltline region in the first 12 years, and then 25% during each subsequent 6 years.

The Jet Pump Riser Brace examination requirements are provided below to show a comparison between the Code and the BWRVIP examination requirements.

<u>Comparison to BWRVIP Requirements – Jet Pump Riser Braces (BWRVIP-41-R3 and BWRVIP-48-A)</u>

- The ASME Code requires a 100% VT-1 examination of the Jet Pump Riser Brace-to-Reactor Vessel Wall Pad welds each 10-year Interval.
- The BWRVIP requires an EVT-1 baseline examination of 100% of the Jet Pump Riser Brace-to-Reactor Vessel Wall Pad welds in the first 12 years with at least 50% being inspected in the first 6 years. Reinspection consists of 25% during each subsequent 6 year period.
- BWRVIP-48-A specifically defines the susceptible regions of the attachment that are to be examined.

The Code VT-1 examination is conducted to detect discontinuities and imperfections on the surfaces of components, including such conditions as cracks, wear, corrosion, or erosion. The BWRVIP enhanced VT-1 (EVT-1) is conducted to detect discontinuities and imperfections on the surface of components and is additionally specified to detect potentially very tight cracks characteristic of fatigue and intergranular stress corrosion cracking (IGSCC), the relevant degradation mechanisms for these components. General wear, corrosion, or erosion although generally not a concern for inherently tough, corrosion resistant stainless steel material, would also be detected during the process of performing a BWRVIP EVT-1 examination.

The ASME Code visual examination method requires (depending on applicable ASME Edition) that a letter character with a height of 0.044 inches can be read. The BWRVIP EVT-1 visual examination method requires the same 0.044 inch resolution on the examination surface and additionally the performance of a cleaning assessment and cleaning as necessary. While the Jet Pump Riser Brace configuration varies depending on the vessel manufacturer, BWRVIP-48-A includes diagrams for each configuration and prescribes examination for each configuration.

The calibration standards used for BWRVIP EVT-1 examinations utilize the same Code characters, thus assuring at least equivalent resolution compared to the Code. Although the

BWRVIP examination may be less frequent, it is a more comprehensive method. Therefore, the BWRVIP guidance provides an acceptable level of quality and safety to that provided by the ASME Code.

Code Requirement – B13.30 – Interior Attachment Beyond the Beltline Region (B-N-2)

The ASME Section XI Code requires a VT-3 examination of accessible Reactor Interior Surface Attachment Welds beyond the beltline each 10-year Interval. In the Boiling Water Reactor, this includes the Core Spray Piping Primary, the Upper Surveillance Specimen Support Bracket Welds-to-Vessel Wall, the Feedwater Sparger Support Bracket Welds-to-Reactor Vessel Wall, the Steam Dryer Support and Hold-Down Bracket Welds-to-Reactor Vessel Wall, the Guide Rod Support Bracket Weld-to-Reactor Vessel Wall, the Shroud Support Plate-to-Vessel Welds, and Shroud Support Gussets. BWRVIP-48-A requires as a minimum the same VT-3 examination method as the Code for some of the interior attachment welds beyond the beltline region, and in some cases specifies an enhanced visual examination technique EVT-1 for these welds. For those interior attachment welds that have the same VT-3 method of examination, the same scope of examination (accessible welds), the same examination frequency (each 10 year interval) and ASME Section XI flaw evaluation criteria, the level of quality and safety provided by the BWRVIP requirements are equivalent to that provided by the ASME Code.

The Core Spray Piping Bracket-to-Vessel Attachment Weld is used as an example for comparison between the Code and BWRVIP examination requirements as discussed below:

<u>Comparison to BWRVIP Requirements – Core Spray Piping Bracket Welds (BWRVIP-48-A)</u>

- The Code examination requirement is a VT-3 examination of each weld every 10 years.
- The BWRVIP examination requirement is an EVT-1 for the Core Spray Piping Bracket Attachment Welds with each weld examined every four cycles (8 years for units with a 2 year fuel cycle)

The BWRVIP examination method EVT-1 has superior flaw detection and sizing capability than the Code VT-3, the examination frequency is greater than the Code requirements, and the same flaw evaluation criteria are used.

The Code VT-3 examination is conducted to detect component structural integrity by ensuring the components general condition is acceptable. An enhanced EVT-1 is conducted to detect discontinuities and imperfections on the examination surfaces, including such conditions as tight cracks caused by IGSCC or fatigue, the relevant degradation mechanisms for BWR internal attachments. Additionally, BWRVIP-48-A guidance requires indications detected by an EVT-1 to be examined by ultrasonics to determine if the indication has propagated into the reactor vessel base material.

Therefore, with the EVT-1 examination method, the same examination scope (accessible welds), an increased examination frequency (8 years instead of 10 years) in some cases, and the same flaw evaluation criteria (ASME Code Section XI), the level of quality and safety provided by the BWRVIP criteria is superior to that provided by the ASME Code.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

RECEIVED 2/23/16
NRC2016004

February 17, 2016

Mr. Oscar A. Limpias
Vice President-Nuclear and CNO
Nebraska Public Power District
72676 648A Avenue
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR STATION - REQUEST FOR RELIEF RI5-02, ALTERNATIVE TO USE BOILING WATER REACTOR VESSEL AND INTERNALS PROJECT GUIDELINES IN LIEU OF SPECIFIC ASME CODE REQUIREMENTS (CAC NO. MF6336)

Dear Mr. Limpias:

By letter dated June 9, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15167A066), as supplemented by letters dated October 21, 2015 (ADAMS Accession No. ML15301A249), and December 21, 2015 (ADAMS Accession No. ML15364A013), Nebraska Public Power District (NPPD, the licensee) submitted Relief Request RI5-02, to the U.S. Nuclear Regulatory Commission (NRC), for the use of alternatives to certain inservice examination requirements in Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), for the fifth 10-year inservice inspection (ISI) program interval at Cooper Nuclear Station (CNS).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the proposed alternative in RI5-02 on the basis that the alternative provides an acceptable level of quality and safety.

The NRC staff has reviewed the subject relief request and concludes, as set forth in the enclosed safety evaluation (SE), that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the use of Relief Request RI5-02 for the duration of the fifth 10-year ISI interval at CNS, which commences on March 1, 2016.

All other requirements of the ASME Code, Section XI for which an alternative has not been specifically requested remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector. Any ASME Code, Section XI, reactor vessel internals components that are not included in this request for alternative are to continue to be inspected in accordance with the ASME Code, Section XI requirements.

The NRC staff notes that if the licensee intends to take exceptions to, or deviations from, the NRC staff-approved Boiling Water Reactor Vessel Internals Project (BWRVIP) inspection guidelines, the licensee will be required to revise and resubmit this request for alternative. The licensee shall obtain staff approval for such exceptions prior to implementing the revised inspection guidelines for the CNS unit's reactor pressure vessel interior surfaces, attachments, and core support structures.

If you have any questions, please contact Thomas Wengert at 301-415-4037 or via e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

Meena K. Khanna, Chief
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF RI5-02

RELATED TO THE INSERVICE INSPECTION PROGRAM

FOR THE FIFTH 10-YEAR INTERVAL

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

DOCKET NO. 50-298

NLS2015133

1.0 INTRODUCTION

By letter dated June 9, 2015 (Agencywide Documents Access and Management Systerr (ADAMS) Accession No. ML15167A066), as supplemented by letters dated October 21, (ADAMS Accession No. ML15301A249), and December 21, 2015 (ADAMS Accession No. ML15364A013), Nebraska Public Power District (NPPD, the licensee) submitted Relief Request RI5-02 for its fifth 10-year interval inservice inspection (ISI) program plan for the reactor vessel internals (RVI) components* at Cooper Nuclear Station (CNS).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee proposed to use an alternative to codes and standards requirements on the basis that the alternative would provide an acceptable level of quality and safety. Specifically, the licensee proposed to use the Boiling Water Reactor Vessel and Internals Project (BWRVIP) guidelines as an alternative to certain requirements of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for ISI of reactor pressure vessel interior surfaces, attachments, and core support structures.

2.0 REGULATORY EVALUATION

The ISI of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda as required by 10 CFR 50.55a(g), except where specific relief has been granted by the U.S. Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 50.55a(g)(6)(i). Pursuant to 10 CFR 50.55a(z), alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC if: (1) the proposed alternatives would provide an acceptable level of quality and safety, or

* In this safety evaluation (SE), the term "RVI components" includes reactor pressure vessel interior surfaces, attachments, and core support structures.

Enclosure

(2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components.

The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code and addenda incorporated by reference in 10 CFR 50.55a(a)(1)(ii), 12 months prior to the start of the 120-month interval, subject to the conditions listed in 10 CFR 50.55a(b)(2).

The regulations in 10 CFR 50.55a(g)(4)(iv) state that inservice examination of components and system pressure tests may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in paragraph 10 CFR 50.55a(a), subject to the limitations and modifications listed in 10 CFR 50.55a(b) and subject to Commission approval. Portions of editions or addenda may be used provided that all related requirements of the respective editions or addenda are met.

Based on the above, and subject to the following evaluation, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative and the NRC to authorize the proposed alternative.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components Affected

ASME Code, Section XI, Class 1, Examination Categories B-N-1 and B-N-2, Code Item Numbers B13.10 (Vessel Interior), B13.20 (Interior Attachments within Beltline Region), B13.30 (Interior Attachments Beyond Beltline Region), and B13.40 (Core Support Structure).

3.2 Applicable Code Edition and Addenda

The applicable ASME Code of record for the fifth 10-year ISI interval for CNS is ASME Code, Section XI, 2007 Edition through the 2008 Addenda.

3.3 Examination Requirements for Which an Alternative is Requested

ASME Code, Section XI requires the visual examination (VT) of certain RVI components. These examinations are included in Table IWB-2500-1, Categories B-N-1 and B-N-2, and identified with the following item numbers:

- B13.10 - Examine accessible areas of the RV interior each period using a technique that meets the requirements for a VT-3 examination, as defined in paragraph IWA-2213 of the ASME Code, Section XI.

- B13.20 - Examine interior attachment welds within the beltline region each interval using a technique that meets the requirements for a VT-1 examination, as defined in paragraph IWA-2211 of the ASME Code, Section XI.

- B13.30 - Examine interior attachment welds beyond the beltline region each interval using a technique that meets the requirements for a VT-3 examination, as defined in paragraph IWA-2213 of the ASME Code, Section XI.

- B13.40 - Examine surfaces of the core support structure each interval using a technique that meets the requirements for a VT-3 examination, as defined in paragraph IWA-2213 of the ASME Code, Section XI.

These examinations are performed to assess the structural integrity of the reactor pressure vessel interior surfaces, attachments, and core support structures.

3.4 Licensee's Basis for Requesting an Alternative and Justification for Granting Relief

In its letter dated June 9, 2015, the licensee, in lieu of ASME Section XI, Code requirements, submitted an alternative inspection program per the BWRVIP guidelines for B-N-1 and B-N-2 reactor pressure vessel interior surfaces, attachments, and core support structures at CNS. The licensee stated that implementation of the alternative inspection program will maintain an adequate level of quality and safety of the affected welds and components and avoid duplication of unnecessary inspections, while conserving radiological dose.

In its application dated June 9, 2015, the licensee stated, in part:

> As part of the BWRVIP initiative, the BWR [boiling-water reactor] reactor internals and attachments were subjected to a safety assessment to identify those components that provide a safety function and to determine if long-term actions were necessary to ensure continued safe operation. The safety functions considered are those associated with (1) maintaining a coolable geometry, (2) maintaining control rod insertion times, (3) maintaining reactivity control, (4) assuring core cooling and (5) assuring instrumentation availability. The results of the safety assessment are documented in BWRVIP-06, Revision 1-A, "BWR Vessel and Internals Project Safety Assessment of BWR Reactor Internals" which has been approved by the NRC. As a result of BWRVIP-06, Revision 1-A, component specific BWRVIP guidelines were developed providing appropriate examination and evaluation requirements to address the specific component safety function and potential degradation mechanism.
>
> Along with the component specific guidelines, the BWRVIP has established a reporting protocol for examination results and deviations. The NRC has agreed with the BWRVIP approach in principal and has issued Safety Evaluations for many of these guidelines....

As additional justification, the licensee included in its application a comparison of ASME Code Section XI examination requirements to "BWRVIP examination requirements," which provides specific examples that compare the inspection requirements of ASME Code Section XI Table IWB-2500-1, Item Numbers B13.10, B13.20, B13.30 and B13.40 to the inspection requirements in the BWRVIP documents. Specific BWRVIP documents are provided as examples. This comparison also includes a discussion of the inspection methods.

The proposed alternative includes examination methods, examination volume, frequency, training, successive and additional examinations, flaw evaluations, and reporting.

3.5 Licensee's Proposed Alternative Examination

In lieu of the requirements specified in Section XI of the ASME Code, the licensee proposed to examine the CNS RVI components in accordance with BWRVIP guideline requirements. The licensee included only the RVI components that are categorized under the jurisdiction of the ASME Code, Section XI (Code components). The following BWRVIP reports contain the relevant inspection and evaluation (I&E) guidelines for the RVI interior surfaces, attachments, and core support structures. Furthermore, the licensee clarified that not all RVI components listed in the following BWRVIP reports are ASME Code, Section XI components.

- BWRVIP-03, Revision 17, "BWR Reactor Pressure Vessel and Internals Examination Guidelines"
- BWRVIP-18, Revision 1-A, "BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines"
- BWRVIP-25, "BWR Core Plate Inspection and Flaw Evaluation Guidelines"
- BWRVIP-26-A, "BWR Top Guide Inspection and Flaw Evaluation Guidelines"
- BWRVIP-27-A, "BWR Standby Liquid Control System/Core Plate Delta P Inspection and Flaw Evaluation Guidelines"
- BWRVIP-38, "BWR Shroud Support Inspection and Flaw Evaluation Guidelines"
- BWRVIP-41, Revision 3, "BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines"
- BWRVIP-47-A, "BWR Lower Plenum Inspection and Flaw Evaluation Guidelines"
- BWRVIP-48-A, "Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines"
- BWRVIP-76, Revision 1-A, "BWR Core Shroud Inspection and Flaw Evaluation Guidelines"
- BWRVIP-94NP, Revision 2, "BWR Program Implementation Guide"
- BWRVIP-138, Revision 1-A, "BWR Updated Jet Pump Beam Inspection and Flaw Evaluation Guidelines"

- BWRVIP-100-A, "Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shroud"

The licensee further indicated that the BWRVIP has an established reporting protocol for examination results and deviations that are consistent with the requirements of BWRVIP-94NP.

In Table 1 of the Attachment to the submittal dated June 9, 2015, the licensee provided a comparison of the ASME Code, Section XI, examination requirements for B-N-1 and B-N-2 categories of the RVI interior surfaces, attachments, and core support structures with the previously identified BWRVIP I&E guidelines. In the Attachment, the licensee also provided additional information regarding the BWRVIP inspection requirements for welds of the RVI surfaces, attachments, and core support structures and their subcomponents. As an example, in the Attachment to the submittal, the licensee provided additional information regarding the BWRVIP inspection requirements for the following welds (shown as examples) of the reactor pressure vessel interior surfaces, attachments, and core support structures and their subcomponents representing each of the ASME Code, Section XI Item Numbers:

- Core Spray Piping (B13.10)
- Jet Pump (B13.20)
- Core Spray Piping Braces (B13.30)
- Core Shroud Support and Core Support Structure (B13.40)

The licensee stated that these examples demonstrate that the inspection techniques that are recommended by the BWRVIP inspection guidelines are the same as or superior to the inspection techniques mandated by the ASME Code, Section XI ISI program. Additionally, these examples supported the licensee's assertions that the BWRVIP inspection guidelines require more frequent inspections of some RVI components than the corresponding ASME Code, Section XI requirements. Therefore, the licensee concluded that implementation of the BWRVIP I&E guidelines for the CNS RVI surfaces, attachments, and core support structures would provide an acceptable level of quality and safety. Furthermore, in its June 9, 2015, submittal the licensee provided an inspection summary that included inspection methods used on the RVI components, inspection dates, the results of the inspection and corrective actions related to the findings of the inspections of the RVI components at CNS.

4.0 NRC STAFF EVALUATION

The NRC staff reviewed the information provided by the licensee in its submittal dated June 9, 2015, as supplemented by letters dated October 21, 2015, and December 21, 2015, regarding its proposed alternatives to the ASME Code, Section XI ISI requirements and the technical bases for the licensee's proposed alternatives. The staff reviewed the status of each of the referenced BWRVIP guidance documents to provide effective aging management and found the application of all of the referenced BWRVIP reports to be acceptable, provided that the conditions associated with each BWRVIP report are implemented. The following paragraphs address the NRC staff's requests for additional information (RAIs), the licensee's responses, and the staff's evaluation of the licensee's responses to the RAIs.

In the June 9, 2015, submittal, the licensee included a report of the previous inspections of the RVI components at CNS. The NRC staff reviewed the inspection report and, by an e-mail dated September 16, 2015 (ADAMS Accession No. ML15259A579), issued RAI-1 (a), (b), and (c).

In RAI-1 (a) and (b), the licensee was requested to identify whether the following type of welds were inspected thus far, at CNS: (a) furnace sensitized stainless steel vessel attachment welds and, (b) vessel attachment welds made with nickel base alloy 182 welding electrodes, and if these welds were inspected in the past, to provide a number of welds that were identified with cracks and the corrective actions taken.

Because welds made with nickel base alloy 182 welding electrodes are more susceptible to intergranular stress corrosion cracking (IGSCC) than stainless steel welds, the licensee was requested to confirm whether any of the alloy 182 welds of the RVI components (both ASME Section XI welds and/or non-ASME Section XI welds) were inspected at CNS, and if they were inspected, to provide a brief summary of the inspection results.

In RAI-1 (c), the licensee was requested to confirm whether core shroud welds were ever repaired.

In its response by letter dated October 21, 2015, the licensee stated that for RAI-1 (a) previous inspections performed on the furnace sensitized stainless steel vessel attachment welds revealed no indications. For RAI-1 (b), the licensee stated that previous inspections performed on the attachment welds made with nickel base alloy 182 welding electrodes revealed no indications. The licensee included the following welds in this category: (1) core spray brackets; (2) surveillance capsule brackets; (3) steam dryer support lugs; and, (4) guide rod brackets.

Since no cracks were identified, the NRC staff concluded that reasonable assurance is provided regarding the effectiveness of the current aging management program for these welds. In addition, routine inspections of these welds in the future would identify any active aging degradation in a timely manner, to ensure that proper corrective actions are taken by the licensee. The staff considers that the RAI-1 (a) and (b) were adequately addressed and therefore, finds the licensee's responses to be acceptable and this issue is closed.

In addressing RAI-1 (c), the licensee stated that no repair was performed on the core shroud component at CNS. However, a review of the results of the previous inspections that were included in the June 9, 2015, submittal, indicated that cracking was observed in core shroud welds H1 through H7. Subsequent inspections of these welds revealed that the existing cracks did not grow. The licensee has implemented the relevant I&E guidelines for the core shroud components, which are addressed in the NRC staff-approved BWRVIP-76 report. The staff reviewed the information provided by the licensee, and the subsequent inspection criteria addressed in BWRVIP-76. Based on its review, the staff concludes that aging degradation in the core shroud is effectively monitored by the licensee because: (1) the inspection frequency addressed in BWRVIP-76 is more conservative than the ASME Code, Section XI; (2) frequent subsequent inspections as recommended by BWRVIP-76 guidelines will identify any aging effects in a timely manner; and, (3) the licensee, as part of its license renewal commitment, will continue to inspect the core shroud component during the period of extended operation. Therefore, the staff concludes that if any new crack were to occur, proper corrective action can be implemented by the licensee in a timely manner. The staff finds this response to be acceptable and this issue is closed.

The NRC staff noted that, as part of its strategy to mitigate IGSCC in the RVI components, the licensee has implemented on-line noble metal chemical addition (OLNC) at CNS. If OLNC is not effective, existing cracks due to IGSCC would grow and this aging effect would be identified during subsequent inspections. To assess the effectiveness of the OLNC at the CNS, the staff issued RAI-2.

In RAI-2, the licensee was requested to provide information regarding whether it continues to implement the addition of the hydrogen water chemistry (HWC) and/or HWC+ noble metal chemical addition (NMCA) in the reactor vessel at CNS. In addition, the licensee was requested to provide details on the methods for determining the effectiveness of HWC/NMCA by using the latest measured values of the following parameters:

(a) Electro Chemical Potential - applicable to HWC or HWC+NMCA,
(b) Hydrogen/oxygen molar ratio - applicable if HWC+NMCA method is implemented, and
(c) Catalyst loading (platinum) - applicable to HWC+ NMCA

In its response dated October 21, 2015, the licensee provided the plant-specific values for parameters (a) and (b), and the NRC staff subsequently verified that these values are in compliance with the NRC staff-approved report, "BWRVIP-62NP-A: BWR Vessel Internals Project, Technical Basis for Inspection Relief for BWR Internal Components with Hydrogen Injection" (ADAMS Accession No. ML11137A193).

The NRC staff's position is that a review of the previous inspection results would provide the necessary information related to the effectiveness of the OLNC. If OLNC is not effective, existing cracks due to IGSCC would grow and this aging effect would be identified during subsequent inspections. The staff expects the licensee to continue to comply with subsequent inspections of the ASME Code, Section XI RVI components per the applicable BWRVIP I&E guidelines. Routine inspections that are recommended by the BWRVIP reports will enable the licensee to monitor the effectiveness of the OLNC implementation. The staff will be reviewing the efficacy of the platinum role in combating IGSCC in BWR units that implement the OLNC application. The ASME Code, Section XI re-inspection intervals are less conservative than the intervals stipulated in the BWRVIP I&E guidelines. Therefore, the staff concludes that if the cracks were to occur due to a reduction in platinum coverage under the OLNC, they will be identified during the subsequent inspections. Frequent re-inspections that will be performed using the BWRVIP guidelines will be more effective in identifying the cracks than the ASME Code, Section XI inspection requirements. Based on its review, the staff finds the licensee's response to be acceptable and this issue is closed.

BWR licensees are expected to perform plant-specific leakage assessments in the core spray, jet pump and core shroud systems in accordance with BWRVIP reports related to jet pump, core spray, and core shroud. The ability to cool the core during postulated loss-of-coolant accidents depends upon the leakage assessment of the aforementioned RVI components. Accordingly, the NRC staff issued the following RAI-3:

> Confirm whether a plant-specific leakage assessment was performed, as required by BWRVIP-18, BWRVIP-41, and BWRVIP-76 for the internals at CNS that accounts for the leakage from all internals that impact the ability to cool the

core and maintain peak clad temperature (PCT) within allowed limits during postulated loss of coolant accidents. Provide a summary of all internal components included in the leakage assessment along with a summary of the following for each component:

(a) the number and length of all cracks detected in past examinations for the component
(b) the number and length of all cracks evaluated in the leakage assessment
(c) the calculated leak rate from each crack evaluated in the leakage assessment.

The NRC staff also requested the licensee to "confirm whether a plant-specific integrated leakage assessment (if any) associated with the aforementioned RVI components was performed at CNS."

In its response dated October 21, 2015, the licensee stated that a plant-specific leakage assessment was performed for the core spray piping because cracks were identified in this piping at CNS. The current core spray leakage is below the acceptance criteria for the allowed leakage assessment until the next re-inspection (i.e., 24 month cycle). The licensee stated that, for the projected leakage in the jet pump assembly, the leakage is bounded by the allowed leakage assessment until the next re-inspection (i.e., 24 month cycle). The licensee further stated that no through wall cracks were identified in the core shroud welds, and, therefore, consistent with Section 2.2.1 in BWRVIP-76, Revision 1, a leakage assessment in the core shroud component is not required.

In its letter dated December 21, 2015, the licensee provided an integrated leakage assessment over the 24-month cycle, taking into account postulated leakage through cracking in core spray and the jet pump assemblies.

A plant-specific integrated leakage assessment over one 24-month cycle at CNS indicated the following: (1) leakage through core spray is conservatively calculated to be bounded by the allowable limit, (2) leakage through jet pump is bounded by the allowable limit, and (3) integrated leakage that takes into account postulated combined leakage in core spray, jet pump and core shroud is bounded by the allowable limit established in the loss-of-coolant accident analysis. In addition, the projected increase in PCT is below the 10 CFR 50.46(b) regulatory limit.

The NRC staff accepts this response because the licensee's postulated leakage assessment of the core spray, jet pump and shroud systems is consistent with that of the criteria addressed in the BWRVIP-18, BWRVIP-41, and, BWRVIP-76, respectively. In addition, the licensee has complied with the PCT criteria addressed in 10 CFR 50.46(b). Based on its review, the staff finds that the licensee has adequately addressed the issue related to the plant-specific leakage assessment for CNS. Therefore, the staff considers this issue to be closed.

The BWRVIP I&E guidelines require more frequent inspections than the ASME Code, Section XI criteria for RVI components that are susceptible to aging degradation mechanisms. Therefore, subsequent inspections of the RVI components per the relevant BWRVIP I&E guidelines will provide adequate assurance that any emerging aging effects will be identified in a timely manner. In addition, frequent inspections in accordance with these guidelines will enable the licensee to effectively monitor existing aging degradation in reactor pressure vessel interior surfaces, attachments, and core support structures.

Consistent with the determination that was made in the NRC staff's SEs that approved each of the cited BWRVIP I&E requirements, the licensee's proposed alternative will identify aging degradation of the RVI components in a timely manner. Therefore, the staff concludes that the implementation of the I&E requirements specified in the licensee's proposed alternative will ensure that the integrity of the RVI components will be maintained with an acceptable level of quality and safety.

In the event the licensee wishes to take exceptions to, or deviations from, the NRC staff-approved BWRVIP inspection guidelines authorized as a proposed alternative, the licensee must revise and resubmit its request for authorization to use the proposed alternative under 10 CFR 50.55a.

The NRC staff acknowledges that the BWRVIP Executive Committee periodically revises the BWRVIP guidelines to include enhancements in inspection techniques and flaw evaluation methodologies. While the licensee may choose to implement enhancements described in a revised version of a BWRVIP inspection guideline, the licensee must continue to also meet the requirements of the version of the BWRVIP inspection guideline that forms the safety basis for the staff-authorized proposed alternative to the requirements of 10 CFR 50.55a. The licensee may, of course, also choose to return to complying with the inspection requirements of the ASME Code of Record for CNS.

5.0 CONCLUSION

The NRC staff has reviewed the subject relief request and concludes, as set forth above, that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the use of Relief Request RI5-02 for the duration of the fifth 10-year ISI interval at CNS, which commences on March 1, 2016.

All other requirements of ASME Code, Section XI for which an alternative has not been specifically requested and approved remain applicable, including third party review by the Authorized Nuclear Inservice Inspector. Any ASME Code, Section XI, RVI components that are not included in this request for alternative will continue to be inspected in accordance with the ASME Code, Section XI requirements. The I&E guidelines addressed in the relevant BWRVIP reports should be implemented for the non-ASME Code, Section XI, RVI components at CNS.

The NRC staff notes that if the licensee intends to take exceptions to, or deviations from, the NRC staff-approved BWRVIP inspection guidelines, the licensee is required to revise and resubmit this request for alternative. The licensee shall obtain staff approval for such exceptions prior to implementing the revised inspection guidelines for the CNS unit's reactor pressure vessel interior surfaces, attachments, and core support structures.

Principal Contributor: G. Cheruvenki

Date: February 17, 2016

The NRC staff notes that if the licensee intends to take exceptions to, or deviations from, the NRC staff-approved Boiling Water Reactor Vessel Internals Project (BWRVIP) inspection guidelines, the licensee will be required to revise and resubmit this request for alternative. The licensee shall obtain staff approval for such exceptions prior to implementing the revised inspection guidelines for the CNS unit's reactor pressure vessel interior surfaces, attachments, and core support structures.

If you have any questions, please contact Thomas Wengert at 301-415-4037 or via e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

/RA/

Meena K. Khanna, Chief
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosure:
Safety Evaluation

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10 CFR 50.55a Request Number RC3-01
Alignment and Synchronization of the Containment Inservice Inspection (CISI) Program Third Ten-Year Interval with the Inservice Inspection (ISI) Program Fifth Ten-Year Interval

Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1)
Acceptable Level of Quality and Safety

ASME Code Component(s) Affected

Code Class:	MC
Examination Categories:	E-A, E-C and E-G
Reference:	IWA-2430 Inspection Intervals
Item Numbers:	Various
Description:	Alignment of the CISI Program Third Ten-Year Interval dates with the ISI Program Fifth Ten-Year Interval dates and including Synchronization of the ASME Code of Record Requirements for each program as required in 10 CFR 50.55a and its future revisions.
Component Numbers:	All Class MC Components

Applicable Code Edition and Addenda

The ASME Code of Record for the CISI Program Third Ten-Year Interval and the ISI Program Fifth Ten-Year Interval will be ASME Code, Section XI, 2007 Edition, 2008 Addenda.

Applicable Code Requirement

The following Code requirements for inspection intervals are from Subarticle IWA-2430, Inspection Intervals of the ASME Code, Section XI, 2001 Edition, 2003 Addenda as applied to the current CISI Program Second Ten-Year Interval and the corresponding requirements of the ASME Code, Section XI, 2007 Edition, 2008 Addenda for the proposed CISI Third Ten-Year Interval describing the requirements for a 10 year inspection interval. The requirements in 10 CFR 50.55a use a 120-month interval and it is the same as the 10 year interval used in the ASME Code. For purposes of this request the term Ten-Year Interval is used.

Paragraph IWA-2430(b) – The inspection interval shall be determined by calendar years following placement of the plant into commercial service. (2001 Edition, 2003 Addenda and 2007 Edition, 2008 Addenda)

Subsubarticle IWA-2432 (2001 Edition, 2003 Addenda and IWA-2431 2007 Edition, 2008 Addenda) – The inspection intervals shall comply with the following, except as modified by IWA-2430(d) – (2001 Edition, 2003 Addenda) – IWA-2430(c) – (2007 Edition, 2008 Addenda):

1st Inspection Interval – 10 years following initial start of plant commercial service
Successive Inspection Intervals – 10 years following the previous inspection interval

Reason for Request

Pursuant to 10 CFR 50.55a, "Codes and Standards," paragraph (z)(1), an alternative is requested to allow the CISI Program Third Ten-Year Interval start date to be aligned with the ISI Program Fifth Ten-Year Interval and to synchronize the ASME Code, Section XI, 2007 Edition, 2008 Addenda requirements of these programs on the basis that the proposed alternative would provide an acceptable level of quality and safety.

Specifically, this is an administrative type of request that is being sought to complete the CISI Program Second Ten-Year Interval early on February 29, 2016 in lieu of the currently scheduled end date of May 8, 2018 and to begin the CISI Program Third Ten-year Interval on March 1, 2016 aligning it with the start of the ISI Program Fifth Ten-Year Interval. Additionally, synchronization of the 10 CFR 50.55a requirements to use the same ASME Code, Section XI, 2007 Edition, 2008 Addenda for both programs will also begin on March 1, 2016 and this alignment and synchronization will continue for successive CISI and ISI Ten-Year Intervals to the end of the extended license period for CNS. The net effect of this request is to establish one common Ten-Year Interval for both the CISI and ISI Programs at the CNS.

This request for alignment and synchronization of these programs will allow NPPD as the licensee for CNS a burden reduction in procedure development and maintenance and to reduce possible errors associated with applying two different ASME Code, Section XI, Editions and Addenda requirements at the same time.

Currently, the CISI Program Second Ten-Year Interval is using the ASME Code, Section XI, 2001 Edition, 2003 Addenda. If this request is not authorized procedures will have to remain in place to support the related Code requirements of the CISI Program using Subsection IWE of the ASME Code, Section XI, 2001 Edition, 2003 Addenda and related requirements in IWA-1000, IWA-2000 and IWA-4000. This means that for the ISI Program Fifth Ten Year Interval that will use ASME Code, Section XI, 2007 Edition, 2008 Addenda and begins March 1, 2016 these same types of procedures will have to be revised to include both sets of Code requirements or separate procedures written for each set of Code requirements. Then again in 2018, because of the current CISI Program Second Ten-Year Interval end date, a later ASME Code, Section XI, Edition or Addenda could be required and more changes would have to be made and CNS is trying to alleviate this situation from occurring with this request.

The current ASME Code requirement in IWA 2430 described above was not used in the implementation of the CISI Program. In the Final Rule change to 10 CFR 50.55a that required the implementation of ASME Code, Subsection IWE requirements that was published in the Federal Register (61 FR 41303) dated August 8, 1996, the NRC amended its regulations (Rule) to incorporate by reference the 1992 Edition and 1992 Addenda of Subsections IWE and IWL of Section XI of the ASME Code. Only Subsection IWE for Metal Containments applied to CNS because it is a BWR with a Mark I Containment. The amended rule became effective on September 9, 1996, it required the licensees to incorporate the new requirements into their ISI plans and to complete the first period containment inspections within five years (i.e., no later than September 9, 2001).

CNS proceeded to develop their CISI Program and to complete the first period examinations by September 9, 2001. Thus, the CISI Program First Ten-Year Interval began on September 9, 1996 and ended on May 8, 2008. This is actually about a 12 year interval and was due to the 5 years allowed to complete the first period examinations. This CISI Program First Ten-Year Interval set the start date of May 9, 2008 to the end date of May 8, 2018 for the current CISI Program Second Ten-Year Interval.

In the Federal Register (67 FR 60520) dated September 26, 2002 another Final Rule change to 10 CFR 50.55a was published and in the Supplementary Information in Section 2.2 Section XI, Pages 60521 and 60522, it contains statements supporting the proposed alternative for modifying the CISI Interval. Specifically, the information pointed out that 10 CFR 50.55a(g)(4)(ii) does not prohibit licensees from updating to a later Edition and Addenda of the ASME Code midway through a Ten-Year IWE and IWL examination interval. Additionally, the information advised that licensees wishing to synchronize their 120-month intervals may submit a request in accordance with Section 50.55a(a)(3), which is currently reflected in a new Section 50.55a(z).

Using a common interval date for both the CISI Program Third Ten-Year Interval and the ISI Program Fifth Ten-Year Interval based on the current requirement to update the ISI Program Fifth Ten-Year Interval on March 1, 2016 and using the Code of record for that interval, which is to be set on February 28, 2015 [i.e., 12 months prior to the start of the successive interval in accordance with 10 CFR 50.55a(g)(4)(ii)] currently is ASME Code, Section XI, 2007 Edition, 2008 Addenda. Thus, with authorization of this request CNS intends to use the same start and end dates for the CISI Program Third Ten-Year Interval and the ISI Program Fifth Ten-Year Interval along with the same ASME Code, Section XI, 2007 Edition with the 2008 Addenda requirements.

In conclusion, NPPD has determined that authorizing the proposed alternative as described herein provides and acceptable level of quality and safety and does not adversely impact the health and safety of the public.

Proposed Alternative and Basis for Use

As an alternative to the full CISI Program Second Ten-Year Interval duration requirements of IWA-2430(b) and IWA-2432 of the ASME Code, Section XI, 2001 Edition, 2003 Addenda, CNS proposes to start the new CISI Program Third Ten-Year Interval on March 1, 2016 instead of the current start date which would be May 9, 2018. This will permit the subsequent ISI and CISI Programs to share a common inspection interval and to implement a common ASME Code, Section XI Edition and Addenda. The common Code of record for both the CISI Program Third Ten-Year Interval and the ISI Program Fifth Ten-Year Interval will be the ASME Code, Section XI, 2007 Edition, 2008 Addenda.

Since this alternative will shorten the current CISI Program Second Ten-Year Interval by approximately two years CNS has completed all the required CISI examinations for the CISI Second Ten-Year Interval during the last refueling outage RE28 in October 2014 in preparation for the submittal of this request. Examinations performed to date have satisfied the acceptance standards contained in Article IWE-3000. Based on these completed examinations and the regulatory information that has been described above it is concluded that this request has the necessary information to support authorization for its use.

Duration of Proposed Alternative

This proposed alternative when authorized will be used at the start of the CISI Program Third Ten-Year Interval and will continue until the end of the extended license period for CNS.

Precedents

1. Limerick Generating Station, 10 CFR 50.55a(a)(3)(i) Alternative Request 13R-01 includes a similar request and was authorized for use on January 24, 2007 under (TAC NOS. MD2727 and MD2728) and (ADAMS Accession No. ML063390103).

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NRC 2016002

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 12, 2016

Mr. Oscar A. Limpias
Vice President-Nuclear and CNO
Nebraska Public Power District
72676 648A Avenue
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR STATION - REQUEST FOR RELIEF RC3-01 FOR ALIGNMENT OF INSERVICE INSPECTION AND CONTAINMENT INSERVICE INSPECTION (CAC NO. MF6333)

Dear Mr. Limpias:

By letter dated June 9, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15167A066), Nebraska Public Power District (NPPD, the licensee) submitted Relief Request RC3-01, to the U.S. Nuclear Regulatory Commission (NRC), for the use of an alternative to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components" for Cooper Nuclear Station (CNS).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, paragraph 50.55a(z)(1), the licensee is requesting relief to reduce the duration of the CNS second containment inservice inspection (CISI) interval in order to create a common inservice inspection (ISI) interval for CNS, on the basis that the alternative provides an acceptable level of quality and safety. This relief will permit subsequent CISI interval dates to be synchronized with the future ISI intervals. The net effect of this request is to establish one common interval for both the ISI and CISI programs at CNS. The CNS conversion to the common ISI interval start date would commence on March 1, 2016.

Based on the NRC staff's evaluation of the information provided in the licensee's submittal, the staff concludes, as set forth in the enclosed safety evaluation, that the licensee's proposed alternative to the requirements of ASME Code, Section XI, Subarticle IWA-2430, is acceptable because it will provide an acceptable level of quality and safety. Accordingly, the staff concludes that the licensee has adequately addressed the regulatory requirements set forth in 10 CFR 50.55a(z)(1) and is in compliance with the requirements of the ASME Code for which relief was not requested. Therefore, the staff authorizes the licensee to end the second CISI program interval early and commence the use of the 2007 Edition with the 2008 Addenda of the ASME Code, Section XI, for ISI of ASME Code Class MC Components as the common Code of record for the CISI program third 10-year interval commencing on March 1, 2016.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact Thomas Wengert at 301-415-4037 or via e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

M Khanna

Meena K. Khanna, Chief
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosure:
Safety Evaluation

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF RC3-01

ALIGNMENT OF INSERVICE INSPECTION AND CONTAINMENT INSERVICE INSPECTION

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

DOCKET NO. 50-298

1.0 INTRODUCTION

By letter dated June 9, 2015 (Agencywide Document Access and Management System (ADAMS) Accession No. ML15167A066), Nebraska Public Power District (NPPD, the licensee), requested an alternative to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," for the Cooper Nuclear Station (CNS).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, paragraph 50.55a(z)(1), the licensee is requesting relief to reduce the duration of the CNS second containment inservice inspection (CISI) interval in order to create a common inservice inspection (ISI) interval for CNS, on the basis that the alternative provides an acceptable level of quality and safety. This relief will permit subsequent CISI interval dates to be synchronized with the future ISI intervals. The net effect of this request is to establish one common interval for both the ISI and CISI programs at CNS. The CNS conversion to the common ISI interval start date would commence on March 1, 2016.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g) specifies that ISI of nuclear power plant components shall be performed in accordance with the requirements of the ASME Code, Section XI. Section 50.55a(z) of 10 CFR states, in part, that alternatives to the requirements of paragraph (g) may be used, when authorized by the Nuclear Regulatory Commission (NRC), if (1) the proposed alternative would provide an acceptable level of quality and safety, or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), components that are classified as Class MC and Class CC pressure retaining components and their integral attachments, must meet the requirements, except the design and access provisions and preservice examination requirements, set forth in

Enclosure

the ASME Code, Section XI, to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations in 10 CFR 50.55a(g)(4) require that inservice examination of components and system pressure tests conducted during successive 120-month inspection intervals must comply with the requirements of the latest edition and addenda of Section XI of the ASME Code, incorporated by reference in Paragraph (a) of 10 CFR 50.55a, 12 months before the start of the 120-month inspection interval, subject to the limitations and modifications listed therein.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components Affected

ASME Section XI, Code Class MC Components.

3.2 Applicable Code Edition and Addenda

The licensee stated that the current Code of record for the CISI Program Second 10-Year Interval is the ASME Code, Section XI, 2001 Edition, 2003 Addenda. However, if the requested alternative is approved, the CISI program third 10-year interval start date will be aligned with the ISI program fifth 10-year interval and synchronized with the ASME Code, Section XI, 2007 Edition, 2008 Addenda requirements of these programs.

3.3 Applicable ASME Code Requirement

ASME Code, Section XI, Subarticle IWA-2432 (2001 Edition, 2003 Addenda; IWA-2431, 2007 Edition, 2008 Addenda) requires that each inspection interval consist of a 10-year duration and permits the inspection interval to be reduced or extended by as much as 1 year, provided that successive intervals are not altered by more than 1 year from the original pattern of intervals, except as modified by IWA-2430(d), and IWA-2430(c) for the 2007 Edition, 2008 Addenda.

3.4 Licensee Proposed Alternative and Basis for Use

Currently, the CNS fifth 10-year ISI program interval is scheduled to begin on March 1, 2016, while the CISI third 10-year program interval is scheduled to begin on May 9, 2018. CNS proposes to reduce the duration of the CISI third 10-year program interval to coincide with the start of the ISI fifth 10-year program interval. This proposed alternative will permit the subsequent ISI and CISI programs to share a common inspection interval and to implement a common ASME Code Section XI Edition and Addenda (2007 Edition, 2008 Addenda). The licensee stated that since this proposed alternative will shorten the current CISI program second 10-year interval by approximately 2 years, CNS has completed all the required CISI examinations for the CISI second 10-year interval during the last refueling outage (RE28 in October 2014) in preparation for this submittal. The licensee further stated that the examinations performed, to date, have satisfied the acceptance standards contained in Article IWE-3000.

The licensee stated that 10 CFR 50.55a(g)(4)(ii) does not prohibit licensees from updating to a later Edition and Addenda of the ASME Code midway through a 10-year IWE and IWL examination interval. The licensee further stated that using the common interval date justified above and based on the current ISI program, the ASME Code of record for the fifth 10-year interval ISI and third 10-year interval CISI programs, is to be set on March 1, 2016. The latest edition and addenda of the ASME Code incorporated by reference in 10 CFR 50.55(a)(1)(ii) of the regulation is the 2007 Edition, 2008 Addenda. Currently, the CISI program second 10-year interval is using the ASME Code, Section XI, 2001 Edition, 2003 Addenda. Thus, CNS will utilize the 2007 Edition, 2008 Addenda of Section XI to develop the ISI program update for the fifth 10-year ISI interval and third 10-year CISI interval. The licensee asserts that the proposed alternative, as described above, provides an acceptable level of quality and safety and does not adversely impact the health and safety of the public.

3.5 NRC Staff Evaluation

In the supplementary information contained in Section 2.2 of the Final Rule (67 FR 60520), dated September 26, 2002, the NRC staff stated, in part, that 10 CFR 50.55a(g)(4)(ii) does not prohibit licensees from updating to a later edition and addenda of the ASME Code midway through a 10-Year IWE or 5-Year IWL examination interval. Additionally, the staff advised that licensees wishing to synchronize their 120-month intervals may submit a request in accordance with 10 CFR 50.55a(a)(3), currently reflected in 10 CFR 50.55a(z), to obtain authorization to extend or reduce 120-month intervals.

In the subject alternative request, the licensee proposed an alternative to the requirements of the ASME Code, Section XI, IWA-2430(b) and IWA-2432 requirements. The proposed alternative will reduce the duration of the second 10-year CISI program interval by approximately 26 months (March 1, 2016 versus May 9, 2018). However, ASME Code, Section XI, IWA-2432(d) allows only a 1-year change to the original pattern of the 10-year ISI interval. Therefore, to determine whether the proposed alternative will provide an acceptable level of quality and safety, the NRC staff's review focused on its effect on the implementation of the ASME Code-required CISI program.

The proposed alternative will align the 10-year CISI interval with the ISI interval starting on March 1, 2016. This will establish a common 10-year interval for both the CISI and the ISI programs at CNS and allow the use of a common ASME Code of record. The common Code of record for this interval, which was set on February 28, 2015 (i.e., 12 months prior to the start of the successive interval in accordance with 10 CFR 50.55a(g)(4)(ii)), currently is ASME Code, Section XI, 2007 Edition, 2008 Addenda.

CNS has different 10-year CISI and ISI program interval dates, which may result in implementation of different governing code editions and requirements in subsequent ISI program intervals. The 10-year program interval dates are different because the CISI program was not implemented until the NRC's amended rule became effective on September 9, 1996. The proposed alternative will align and synchronize both 10-year programs and establish the use of the ASME Code, Section XI, 2007 Edition, 2008 Addenda, as the common Code of record. The licensee stated that there are distinct advantages in implementing the same Code requirements in a common interval, such as the reduction of administrative burden in developing and maintaining different sets of procedures and requirements, thus reducing possible errors associated with applying two different ASME Code Editions and Addenda requirements at the same time. The licensee also stated that any CISI examinations unique to and specifically required for the remainder of the second 10-year interval have already been performed and not deferred to the end of the interval. The licensee stated that it has completed all of the required CISI examinations for the second 10-year interval during the last refueling outage (RE28 in

October 2014) in preparation of this request, and that the completed examinations performed to date have satisfied the acceptance standards of Article IWE-3000. The licensee stated that upon authorization by the NRC staff of this proposed alternative, CNS intends to use the same start and end dates for the CISI program third 10-year interval and the ISI program fifth 10-year interval along with the same ASME Code, Section XI, 2007 Edition with the 2008 Addenda requirements.

The 2007 Edition, 2008 Addenda, is the latest edition and addenda available and have been previously reviewed by the NRC staff and incorporated by reference into 10 CFR 50.55a for use by licensees. Since the licensee did not request relief from any of the conditions applicable to the 2007 Edition, 2008 Addenda, any applicable conditions will remain in effect. Since the licensee completed all of the examinations applicable to the second 10-year CISI interval, implementation of this request would not result in any fewer examinations.

The NRC staff review addressed the ability of the licensee to maintain an acceptable level of quality and safety after altering its ISI programs and to ensure integrity of the containment. Based on these considerations, the staff has determined that the licensee's proposed alternative to allow the CISI program third 10-year interval start date to be aligned with the ISI program fifth 10-year interval and to synchronize the ASME Code, Section XI, 2007 Edition, 2008 Addenda, requirements of these programs (e.g., use of a common ASME Code of record), with no change to the inspection frequency of examinations, provides reasonable assurance of quality and safety.

4.0 CONCLUSION

Based on the NRC staff's evaluation of the information provided in the licensee's submittal, the staff concludes that the licensee's proposed alternative to the requirements of ASME Code, Section XI, Subarticle IWA-2430, is acceptable because it will provide an acceptable level of quality and safety. Accordingly, the staff concludes that the licensee has adequately addressed the regulatory requirements set forth in 10 CFR 50.55a(z)(1) and is in compliance with the requirements of the ASME Code for which relief was not requested. Therefore, the staff authorizes the licensee to end the second CISI program interval early and commence the use of the 2007 Edition with the 2008 Addenda of the ASME Code, Section XI, for inservice inspection of ASME Code Class MC Components as the common Code of record for the CISI program third 10-year interval at Cooper Nuclear Station, commencing on March 1, 2016.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: R. Pettis

Date: February 12, 2016

If you have any questions, please contact Thomas Wengert at 301-415-4037 or via e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

/RA/

Meena K. Khanna, Chief
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosure:
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NAME	TWengert	PBlechman	TLupold	MKhanna
DATE	02/09/16	02/08/16	01/29/16	02/12/16

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10 CFR 50.55a Request No. RR5-01
Alternative Weld Overlay Repair for a Dissimilar Metal Weld Joining Nozzle to Control Rod Drive End Cap
Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1)
Acceptable Level of Quality and Safety

ASME Code Component(s) Affected

Code Class: 1
Examination Categories: B-F
Item Number: B5.10
Component Numbers: RCA-BF-1, 5 inch Control Rod Drive Return Cap to Nozzle N9 Weld

Applicable Code Edition and Addenda

ASME Code, Section XI, 2007 Edition, 2008 Addenda.

Applicable Code Requirement

American Society of Mechanical Engineers (ASME) Section XI, IWA-4411 requires repair/replacement activities to be performed in accordance with the Owner's Requirements and the original Construction Code of the component or item. Alternatively, IWA-4411 (a) and (b) allows use of later Editions/Addenda of the Construction Code either in its entirety or portions thereof, Code Cases, and revised Owner Requirements.

IWA-4190(a) requires Code Cases used for repair/replacement activities to be applicable to the Edition and Addenda of Section XI specified for the activity.

IWA-4411(e) permits the use of IWA-4600(b) when welding is to be performed without postweld heat treatment required by the Construction Code. IWA-4600(b) provides temper bead welding requirements as an alternative to the welding and postweld heat treatment requirements of the Construction Code. And as an alternative to IWA-4600(b), the requirements of Code Case N-638-4, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique", as approved by the NRC, may be used.

IWA-4411(h) permits the use on Nonmandatory Appendix Q for the installation of welded overlays for the repair of stress corrosion cracking (SCC) in Class 1, 2 or 3 austenitic stainless steel pipe weldments.

Mandatory Appendix VIII, Supplement 11 provides procedure and personnel qualification requirements for examination of full structural overlaid wrought austenitic piping welds and is required by Nonmandatory Appendix Q.

Reason for Request

The control rod drive return line cap to nozzle weld is considered susceptible to stress corrosion cracking and is classified as Category D in BWRVIP-75A. Previous ultrasonic examinations of this nozzle weld have not identified any relevant indications. In the event an examination identifies conditions requiring repair, the methods currently available within ASME Section XI do not provide techniques to support a repair without draining the reactor vessel.

Because ASME Section XI, Nonmandatory Appendix Q does not specifically apply to the overlay of dissimilar metal welds and the requirements of IWA-4600(b) or Code Case N-638-4 do not specifically apply to the welding of overlays, an alternative is required to combine the requirements of Nonmandatory Appendix Q and Code Case N-638-4 to provide a complete set of requirements for a full structural weld overlay of the control rod drive return line cap to nozzle weld.

Pursuant to 10 CFR 50.55a, "Codes and Standards," Paragraph (z)(1), relief is requested from the requirements of ASME Code Section XI as described below:

Nonmandatory Appendix Q

Historically, similar requests for relief have been based, in part, on Code Case N-504 (various revisions). However, Code Case N-504 was incorporated into ASME Section XI as Nonmandatory Appendix Q in the 2004 Edition with the 2005 Addenda. Nonmandatory Appendix Q, as part of ASME Section XI, is approved by the NRC, by reference, without condition in 10 CFR 50.55a(b)(2).

Like Code Case N-504, Nonmandatory Appendix Q is applicable to weld overlay of austenitic stainless steel material. However an alternative is required because the configuration subject to this request includes the overlay of an SA 508 Class 2 nozzle, Alloy 82 and 182 weld materials, and an SB-166 cap.

Nonmandatory Appendix Q, paragraph Q-2000(a), requires the reinforcement weld metal to be low carbon (0.035 percent maximum) austenitic stainless steel. An alternative is required since a nickel-based weld material (Alloy 52M) will be used.

Nonmandatory Appendix Q, paragraph Q-2000(d), requires the first two layers of the weld overlay to have a ferrite content of at least 7.5 FN (Ferrite Number). An alternative is required because the overlay weld material is a nickel based alloy (Alloy 52M) which is fully austenitic.

Nonmandatory Appendix Q, Article Q-4000, requires ultrasonic examination (UT) personnel and procedures to be qualified in accordance with Mandatory Appendix VIII. Mandatory Appendix VIII, Supplement 11 provides requirements for the qualification of procedures and personnel for examination of full structural overlaid wrought austenitic piping welds. The overlay configuration subject to this request is a dissimilar metal weld and not within the scope of Supplement 11. An alternative is required to accept the use of personnel and procedures qualified by the Electric Power Research (EPRI) Performance Demonstration Initiative (PDI) which is based on Code Case N-653-1 with modifications.

Code Case N-638-4

As an alternative to IWA-4600(b), Code Case N-638-4, will be used.

Code Case N-638-4 is listed in Regulatory Guide 1.147, Revision 17, Table 2 as approved by the NRC with two conditions:

(1) Demonstration for ultrasonic examination of the repaired volume is required using representative samples which contain construction type flaws.
(2) The provisions of 3(e)(2) or 3(e)(3) may only be used when it is impractical to use the interpass temperature measurement methods described in 3(e)(1), such as in situations where the weldment area is inaccessible (e.g., internal bore welding) or when there are extenuating radiological conditions.

ASME Section XI, IWA-4190(a) requires Code Cases used for repair/replacement activities to be applicable to the Edition and Addenda specified for the repair/replacement activity. The applicability of Code Case N-638-4 (latest approved by the NRC) is limited to the 2004 Edition of ASME Section XI and the ASME Section XI that is specified for this repair/replacement activity is the 2007 Edition with the 2008 Addenda. An alternative to IWA-4190(a) is required to permit use of Code Case N-638-4 with the 2007 Edition through the 2008 Addenda of ASME Section XI as described in this request.

Code Case N-638-4, paragraphs 4(a), and 4(a)(4) state that all welds (including repair welds) shall be volumetrically examined in accordance with the requirements and acceptance criteria of the Construction Code or ASME Section III. An alternative is required to use the examination requirements of paragraph Q-4100 of ASME Section XI, Nonmandatory Appendix Q.

Proposed Alternative and Basis for Use

Proposed Alternative

The component subject to repair using the requirements described in the request for alternative is described in Table 1. The repair would consist of a full structural welded overlay to replace the original pressure boundary of the dissimilar metal weld identified in Table 1.

Table 1				
Component	**Component Description**	**Material 1**	**Material 2**	**Maximum Surface Area of Weld**

Identification				Overlay (Ferritic side, in^2)
RCA-BF-1	5 inch Control Rod Drive Return Cap to Nozzle N9 Weld	Nozzle: A-508 Class 2	SB-166	260

Nonmandatory Appendix Q applies specifically to austenitic stainless steel piping and weldments. As an alternative CNS proposes the use of Code Case N-638-4 and Nonmandatory Appendix Q to install a weld overlay on a configuration that consists of an A-508, Class 2 low alloy steel nozzle, Alloy 182/82 weld materials, and an SB-166, Alloy 600 nickel alloy cap using ERNiCrFe-7A (Alloy 52M) filler metal.

Appendix Q, paragraph Q-2000(a) requires weld metal used to fabricate weld overlays be low carbon steel (0.035%) austenitic stainless steel. As an alternative, NPPD proposes to perform the weld overlay using ERNiCrFe-7A (Alloy 52M). Therefore, this requirement does not apply.

Appendix Q, paragraph Q-2000(d) requires the weld overlay to consist of at least two austenitic stainless steel weld layers, each layer having an as-deposited delta ferrite content of at least 7.5 FN or 5 FN under certain conditions. As an alternative, NPPD proposes to perform the weld overly using ERNiCrFe-7A (Alloy 52M) which is purely austenitic. Therefore, the delta ferrite requirement does not apply.

Code Case N-638-4 is included in the latest Revision of Regulatory Guide 1.147 Rev. 17 with the following conditions:

1. Demonstration for ultrasonic examination of the repaired volume is required using representative samples which contain construction type flaws.

    - CNS will implement this condition.

2. The provisions of 3(e)(2) and 3(e)(3) may only be used when it is impractical to use the interpass temperature measurement methods described in 3(e)(1), such as in situations where the weldment area is inaccessible (e.g., internal bore welding) or when there are extenuating radiological conditions.

    - CNS is not using the provisions of 3(e)(2) or 3(e)(3). In monitoring preheat and interpass temperatures during the application of the overlay, CNS will comply 3(e)(1) of the code case as described below:

      "Preheat and interpass temperatures will be measured using a contact pyrometer. In the first three layers, the interpass temperature will be measured every three to five passes. After the first three layers, interpass temperature measurements will be taken every six to ten passes for the subsequent layers. Contact pyrometers will be calibrated in accordance with approved calibration and control program documents."

The reason N-638-4 is not applicable to the 2007 Edition through the 2008 Addenda is due to a change in ASME Section XI references that occurred in the 2005 Addenda. To remedy this situation, the ASME Section XI committees created a "Guideline for Cross-Referencing Section XI Cases" which includes "Cross Reference List for Section XI Cases." This was added in the front of the Nuclear Code Case Book. Code Case N-638 has been added to this table showing the correct references for using the Code Case with Editions/Addenda of Section XI later than the 2004 Edition. Using the corrected references in Table 2 ensures N-638-4 is correctly used with the 2007 Edition through the 2008 Addenda of ASME Section XI.

Table 2
References for Alternative Editions and Addenda for Section XI[1]

2008 Addenda	*2007 Edition*	*2006 Addenda*	*2005 Addenda*	1989 Edition with 1991 Addenda through 2004 Edition	1986 Edition with 1998 Addenda through 1989 Edition with 1990 Addenda	1983 Edition with 1983 Addenda through 1986 Edition with the 1987 Addenda	1980 Edition with 1981 Winter Addenda through 1983 Edition with 1983 Summer Addenda
IWA-2200	*IWA-2200*	*IWA-2200*	*IWA-2200*	IWA-2210 Visual Examinations	IWA-2210	IWA-2210	IWA-2210
IWA-2300	*IWA-2300*	*IWA-2300*	*IWA-2300*	IWA-2300 Personnel Qualifications	IWA-2300	IWA-2300	IWA-2300
IWA-4000	*IWA-4000*	*IWA-4000*	*IWA-4000*	IWA-4000 Repair/Replacement Activities	IWA-4000 & IWA-7000	IWA-4000 & IWA-7000	IWA-4000 & IWA-7000

1 The *italicized* text has been added to the existing Table 1 from Code Case N-638-4.

IWA-4410 IWA-4411 IWA-4420 IWA-4440	*IWA-4410 IWA-4411 IWA-4420 IWA-4440*	*IWA-4410 IWA-4411 IWA-4420 IWA-4440*	*IWA-4410 IWA-4411 IWA-4420 IWA-4440*	IWA-4400 Welding, Brazing, Metal Removal and Installation	IWA-4400	IWA-4300	IWA-4300

This shows that the applicability of Code Case N-638-4 can be extended to the 2007 Edition through the 2008 Addenda with the corrected references.

This proposed alternative provides an acceptable methodology for installing and examining a full structural overlay that will provide structural integrity for the life of the plant.

The full structural weld overlay will be designed consistent with the requirements of the following:

1. Nonmandatory Appendix Q "Weld Overlay Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping Weldments", and

2. IWB-3640, ASME Section XI 2007 through the 2008 Addenda as referenced by Nonmandatory Appendix Q.

The use of an overlay filler material that provides excellent resistance to SCC creates an effective barrier to flaw extension. Also, temper bead welding techniques produce excellent toughness and ductility in the weld heat-affected zone (HAZ) of low alloy steel materials and in this case results in compressive residual stresses on the inside surface that help to inhibit further SCC of the original weldment. The design of the overlay for the nozzle to end cap weldment uses methods that are standard in the industry. There are no new or different approaches in this overlay design which would be considered either a first-of-a-kind or inconsistent with previous approaches.

The overlay will be designed as a full structural weld overlay in accordance with Nonmandatory Appendix Q. The temper bead welding technique to be implemented in accordance with Code Case N-638-4 will produce a tough, ductile, corrosion-resistant overlay.

<u>Welder Qualification and Welding Procedures – Use of Alloy 52M</u>

All welders, welding operators, and weld procedures will be qualified in accordance with ASME Section IX and any special requirements of Nonmandatory Appendix Q or Code Case N-638-4. Qualified personnel under the vendor's welding program will perform the weld overlay repair.

A welding procedure specification utilizing machine GTAW (with cold wire feed) for welding

SFA-5.14, ERNiCrFe-7A, UNS N06054, F-No. 43 (commercially known as Alloy 52M) will be used. This alloy has nominally 30% chromium, which is significantly greater than Inconel 82 (which nominally contains 20% chromium), and has been accepted by the NRC in NUREG-0313, Revision 2, as a resistant material against intergranular stress corrosion cracking (IGSCC) in the boiling water reactor (BWR).
If repairs to the overlay are required, manual GTAW for welding SFA-5.14, ERNiCrFe-7A, UNS N06054, F-No. 43 (commercially known as Alloy 52M) will be used. In the unlikely event of a through-wall defect, UNS W86152, F No. 43 manual shield metal arc weld rod (commercially known as Alloy 152) will be used to seal any defect if it is greater than 0.125 inch from the P-3 nozzle material before beginning the structural weld overlay using GTAW.

Welding Wire and Electrodes

A consumable nickel based welding wire, highly resistant to SCC, is selected as the weld overlay material. This material is Alloy 52M, contains a nominal 30% Cr level that imparts excellent resistance to SCC. Where localized repairs are required, Alloy 52M will also be used.

Weld Overlay Design

The weld overlay will extend around the full circumference of the end cap to nozzle weldment location in accordance with Nonmandatory Appendix Q. The overlay length will extend across the projected flaw intersection with the outer surface beyond the extreme axial boundaries of the flaw. The design thickness and length will be determined in accordance with the guidance provided in Nonmandatory Appendix Q (paragraph Q-3000(a)) and ASME Section XI, paragraph IWB-3640, 2007 Edition through the 2008 Addenda for the evaluation methodology for flawed pipe. The overlay will completely cover the area of the flaw and other Alloy 182 or susceptible austenitic stainless steel material with the highly resistant Alloy 52M weld filler material. The overlay length will conform to Nonmandatory Appendix Q, paragraph Q-3000(a), which satisfies the stress and load transfer requirements. .

In order to apply the necessary weld overlay geometry, it will be necessary to weld on the low alloy steel nozzle base material. A temper bead welding approach will be used for this purpose following ASME Section XI Code Case N-638-4 as described herein. This code case provides for fabricating machine GTAW temper bead weld repairs to P-No. 3 Group No. 3 nozzle base materials at ambient temperature. The temper bead approach was selected because temper bead welding is an acceptable alternative to the requirement for post-weld heat treatment (PWHT) of the HAZ in welds on low alloy steel material. Also, the temper bead welding technique produces excellent toughness and ductility as demonstrated by welding procedure qualification in the HAZ of welds on low alloy steel materials and, in this case, results in compressive residual stresses on the inside surface, which assists in inhibiting SCC. This approach provides a comprehensive weld overlay repair and increases the volume under the overlay that can be examined.

Pressure Testing

The completed repair shall be pressure tested in accordance with ASME Section XI Nonmandatory Appendix Q, Q-4400.

Basis for Use

Code Case N-638-4 is approved (with two conditions) for generic use in Regulatory Guide 1.147 Revision 17 and was developed for both similar and dissimilar metal welding using ambient temperature machine GTAW temper bead technique. The welding methodology of Code Case N-638-4 will be followed for the overlay, whenever welding within the 0.125-minimum distance from the low alloy steel nozzle base material.

Nonmandatory Appendix Q is approved in 10 CFR 50.55a with no conditions and was developed for welding on and using austenitic stainless steel material. An alternative application for nickel-based and low alloy steel materials is proposed due to the specific configuration of this weldment. The weld overlay proposed is austenitic material having a mechanical behavior similar to austenitic stainless steel. It is also compatible with the existing weld and base materials. The methodology of Nonmandatory Appendix Q will be followed with the following exceptions:

Alternative to Appendix Q, Requirement Q-2000(a)

Q-2000(a) requires the weld overlay to be low carbon (0.35% maximum) austenitic stainless steel. A consumable welding wire highly resistant to SCC was selected for the overlay material. This material, designated as UNS N06054, FN 43, is a nickel based alloy weld filler material, commonly referred to as Alloy 52M, and will be deposited using the machine GTAW process with cold wire feed. Alloy 52M contains about 30% chromium, which imparts excellent corrosion resistance to the material. By comparison, Inconel 82 is identified as an SCC resistant material in NUREG-0313, Revision 2, and contains nominally 20% chromium, while Alloy 182 has a nominal chromium content of 15%. With its significantly higher chromium content than Inconel 82, Alloy 52M provides and even a higher level of resistance to SCC consistent with the requirements of the code case. Therefore, this alternative provides an acceptable level of quality and safety.

Alternative to Appendix Q, Requirement Q-2000(d)

Q-2000(d) requires the first two layers of the weld overlay to have a ferrite content of at least 7.5 FN. The composition of nickel-based Alloy 52M is such that delta ferrite does not form during welding, because Alloy 52M welds are 100% austenitic and contain no delta ferrite due to the high nickel composition (approximately 60% nickel). Consequently, delta ferrite measurements will not be performed for this overlay. Therefore, this alternative provides an acceptable level of quality and safety.

Alternative to Code Case N-638-4, Paragraph 4(a) and 4(a)(4)

Code Case N-638-4, Paragraph 4(a) and 4(a)(4), state that all welds (including repair welds) shall be examined in accordance with the requirements and acceptance criteria of the Construction Code or ASME Section III. As an alternative, CNS proposes to examine the weld overlay in accordance with the requirements and acceptance criteria of Nonmandatory Appendix Q, Article Q-4000 of ASME Section XI. The examination requirements and acceptance standards in Nonmandatory Appendix Q, paragraph Q-4100 were developed specifically for weld overlays unlike those in Code Case N-638-4. However, the examinations required by Nonmandatory Appendix Q will not be performed until after the three tempering layers have been in place for at least 48 hours as required by 4(a)(2) of Code Case N-638-4.

Nonmandatory Appendix Q, Article Q-4000, requires UT examination procedures and personnel to be qualified in accordance with Appendix VIII of ASME Section XI. Supplement 11 of Appendix VIII addresses qualification requirements for weld overlays, but is limited to full structural overlaid wrought austenitic piping welds.

Alternative to 2007 Edition with 2008 Addenda of ASME Section XI, Appendix VIII, Supplement 11,

The PDI qualification program for structural overlays does not implement Mandatory Appendix VIII, Supplement 11, but is based on Code Case N-653-1 with modifications. The attached Table 1 provides a comparison of Supplement 11 requirements and the alternate requirements contained within EPRI PDI guidance documents, written in accordance with Code Case N-653-1. Based on the attached Table and as described below, use of the EPRI PDI qualification program for qualification of procedures and personnel as an alternative to ASME Section XI, Mandatory Appendix VIII, Supplement 11 will provide an acceptable level of quality and safety.

- The scope was changed to broaden the applicability of Supplement 11
    - The title of ASME Section XI, Supplement 11 in the 2007 Edition with Addenda through 2008 is "Qualification Requirements for Full Structural Overlaid Wrought Austenitic Piping Welds". When originally written, this was accurate for the extent of usage of weld overlay repairs. However, the use of weld overlays has broadened. Weld overlays are now being designed that are not intended as full-structural replacements to the original weld and base material. In addition, weld overlays are now being applied over cast austenitic stainless steel piping welds, as well as wrought. Therefore, the alternatives proposed within this relief request are required broaden the applicability of Supplement 11 as written in the 2007 Edition with Addenda through 2008 of the ASME Section XI Code.
- The names of the grading units were changed from base metal and overlay fabrication to inservice (ISI) and preservice (PSI) respectively.

- Originally, Supplement 11 was written to cover the examination of weld overlay repairs of BWR recirculation piping welds, which were applied due to SCC cracking. At the time, SCC cracking was only occurring in the base metal adjacent to the weld (in the heat affected zone). Therefore, for qualification purposes, it was appropriate to refer to the grading units intended to contain cracking in the original pipe as "base metal" grading units. Subsequently, mechanisms have been discovered that cause cracking not only in the base metal, but also in the weld and buttering of these types of welds. And overlays are being applied to welds in PWRs, as well, where the cracking is primarily found in the weld and buttering material. Therefore, it is now more appropriate to call the grading unit for the original piping as an "inservice" grading unit, which is a broad enough term to encompass flaws in the base material or weld material. And since the term for grading units in the original piping was being changed to "inservice", it seemed appropriate to change the term for grading units intended to contain fabrication related discontinuities in the weld overlay (i.e. bonding and weld cleanliness) to "preservice". It is during the preservice inspection that these indications are expected to be discovered.

  - The term base metal flaws was changed to service-induced flaws and the term overlay fabrication flaws was changed to fabrication-induced flaws in this revision.

  - This relief request proposes using "service-induced flaws" as an alternative to the term "base metal flaws" and "fabrication-induced flaws" as an alternative to "overlay fabrication flaws" to describe the flaw types to make them broad enough to encompass all currently recognized degradation mechanisms.

- Provisions have been added for qualification of "optimized" weld overlays.

  - The qualification requirements provided in ASME Section XI, Appendix VIII, Supplement 11 were written strictly for weld overlay repairs designed as full structural replacements for the original weld and base material beneath them. The volumetric examination coverage required for full structural weld overlays was the thickness of the overlay, plus the outer 25% of the original weld and base material. Since that time, the industry has begun to use overlay repairs on larger piping systems, for which full structural overlays are not practical, due to the weight they would add to the piping system and the time it would take to install them. These new "optimized" weld overlays are thinner and are designed as a partial structural replacement to the original piping. They are only designed as a repair for up to a 75% through-wall circumferential crack, instead of a 100% through-wall crack. Because of this, the volumetric examination requirements can be increased to greater than the outer 25% of the original base material. The proposed alternatives contain provisions to allow for qualification of this extended examination volume.

- Qualification for width sizing of laminar flaws is now addressed.
    - The acceptance criteria for laminar flaws in a weld overlay repair are based upon, among other things, the total area of the flaw. However, Supplement 11 only contains provisions for length sizing and is silent on qualification for width sizing. The common technique for both length sizing and width sizing of laminar flaws is to map the edges of the flaw using a 0° (straight beam) transducer. There is virtually no difference in these measurements in terms of axial versus circumferential directions. Therefore, this relief request includes a clarifying sentence for the qualification for both length and width sizing of laminar flaws.

Additional NDE Information

The length, surface finish, and flatness of the weld overlay will comply with Q-4100(a) to facilitate examination in accordance with ASME Section XI, Appendix Q. Figure Q-4100-1 describes the examination volume for acceptance examination while Figure Q-4300-1 does the same for preservice and inservice examinations. Preservice and inservice examination requirements are specified in Q-4200 and Q-4300 of Appendix Q. The examinations required by Nonmandatory Appendix Q as described by this request for alternative will provide adequate assurance that the integrity of the proposed weld overlay is consistent with the structural integrity assumptions of the design.

Duration of Proposed Alternative

This proposed alternative will be used for the Fifth Ten-Year Interval of the Inservice Inspection Program for CNS.

Precedents

Similar Request for Alternatives previously approved by the NRC.

1. This request is consistent with RI-35, Revision 1, approved by the NRC for CNS for the 4th Interval, however limited to only RE24 (Fall 2008) (Adams Accession ML080370464, TAC MD8025)

2. Palisades Nuclear Plant – Relief Request Number RR-4-19, Proposed Alternative to the Requirements of ASME Code Case N-638-4 (Adams Accession NO. ML14199A557, TAC NO. MF3517)

3. Millstone Unit 3 was approved by the NRC in a letter dated May 3, 2007 (Adams Accession ML071210024, TAC MD3379)

Attachment to this Relief Request

The following attachment is a two column Table providing the ASME Section XI, Appendix VIII, Supplement 11, 2007 Edition with 2008 Addenda requirements as compared with requirements contained within EPRI PDI Supplement 11 demonstration documents, written in accordance with Code Case N-653-1.

SECTION XI, 2007 EDITION with 2008 Addendum, APPENDIX VIII, SUPPLEMENT 11 REQUIREMENTS VS. PDI PROGRAM REQUIREMENTS USED TO MEET CODE CASE N-653-1	
2007 Edition with 2008 Addendum ASME, Section XI, Appendix VIII, Supplement 11 (See Note 1)	**Alternate Requirements to Supplement 11 per EPRI Program Requirements, which are written to meet requirements of Code Case N-653-1 (See Note 2)**
None	<u>SCOPE</u> <u>This alternative provides qualification requirements for detection and length and depth sizing for both service-induced and fabrication-induced flaws. It is applicable for wrought austenitic, ferritic, or dissimilar metal welds, overlaid with austenitic weld material.</u>
1.0 SPECIMEN REQUIREMENTS	***SPECIMEN REQUIREMENTS***
Qualification test specimens shall meet the requirements listed herein, unless a set of specimens is designed to accommodate specific limitations stated in the scope of the examination procedure (e.g., pipe size, weld joint configuration, access limitations). The same specimens may be used to demonstrate both detection and sizing qualification.	*Qualification test specimens shall meet the requirements listed* in this document, *unless a set of specimens is designed to accommodate specific limitations stated in the scope of the examination procedure (e.g., pipe size, weld joint configuration, access limitations). The same specimens may be used to demonstrate both detection and sizing qualification.*
1.1 General. The specimen set shall conform to the following requirements. (a) Specimens shall have sufficient volume to minimize spurious reflections that may interfere with the interpretation process.	*General - The specimen set shall conform to the following requirements.* *Specimens shall have sufficient volume to minimize spurious reflections that may interfere with the interpretation process.*
(b) The specimen set shall consist of at least three specimens having different nominal pipe diameters and overlay thicknesses. They shall include the minimum and maximum nominal pipe diameters for which the examination procedure is applicable. Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent. If the procedure is applicable to pipe diameters of 24 in. (600 mm) or larger, the specimen set must include at least one specimen 24 in. (600 mm) or larger but need not include the maximum diameter. The specimen set **shall** include **at least one** specimen with overlay not thicker than 0.1 in. (2.5 mm) more than the minimum thickness, and at least one specimen with overlay not thinner than 0.25 in. (6 mm) less than the maximum for which the examination procedure is applicable.	*The specimen set shall consist of at least three specimens having different nominal pipe diameters and overlay thicknesses. They shall include the minimum and maximum nominal pipe diameters for which the examination procedure is applicable. Pipe diameters within a range of 0.9 to 1.5 times the nominal diameter shall be considered equivalent. If the procedure is applicable to pipe diameters of 24 in. (<u>610</u> mm) or larger, the specimen set must include at least one specimen 24 in. (<u>610</u> mm) or larger but need not include the maximum diameter. The specimen set <u>must</u> include specimens with overlay not thicker than 0.1 in. (2.5 mm) more than the minimum thickness, and at least one specimen with overlay not thinner than 0.25 in. (6 mm) less than the maximum thickness for which the examination procedure is applicable.*
(c) The surface condition of at least two specimens shall approximate the roughest surface condition for which the examination procedure is applicable.	*The surface condition of at least two specimens shall approximate the roughest surface condition for which the examination procedure is applicable."*
(d) Flaw Conditions (1) Base metal flaws. All flaws must be in or near the butt weld heat-affected zone, open to the inside surface, **and extending at least 75% through the base metal wall. Intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws.** At least 70% of the flaws in the detection and sizing tests shall be actual cracks. Specimens containing IGSCC shall be used if they are available. If implantation of actual cracks produces spurious reflectors that are not characteristic of actual flaws, alternative flaws may be used but shall comprise not more than 30% of the total of base material flaws. Alternative flaws, if used, shall provide crack-like reflective characteristics and shall be semielliptical. The tip width of the alternative flaws shall not exceed 0.002 in.	<u>Service-induced Flaws</u> *All flaws must be in or near the butt weld heat-affected zone, open to the inside surface.* <u>The examination procedure shall specify the examination volume. If the examination procedure specifies an examination volume greater than the outer 25% of the base metal wall thickness, the detection and sizing test sets shall include at least five representative flaws suitable to demonstrate the procedure capability in this extended volume.</u> *Intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws. Specimens containing IGSCC shall be used when available.* *At least 70% of the flaws in the detection and sizing tests shall be actual cracks.* *If implantation of actual cracks produces spurious reflectors that are not characteristic of actual flaws; alternative flaws may be used but shall*

SECTION XI, 2007 EDITION with 2008 Addendum, APPENDIX VIII, SUPPLEMENT 11 REQUIREMENTS VS. PDI PROGRAM REQUIREMENTS USED TO MEET CODE CASE N-653-1	
2007 Edition with 2008 Addendum ASME, Section XI, Appendix VIII, Supplement 11 (See Note 1)	**Alternate Requirements to Supplement 11 per EPRI Program Requirements, which are written to meet requirements of Code Case N-653-1 (See Note 2)**
	comprise not more than 30% of the total of base material flaws. Alternative flaws, if used, shall provide crack-like reflective characteristics. The shape of the alternative flaw is intended to simulate the growth pattern of actual flaws and may be semielliptical. *The tip width of the alternative flaws shall not exceed 0.002 inches.*
(2) Overlay fabrication flaws. At least 40% of the flaws shall be noncrack fabrication flaws (e.g., sidewall lack of fusion or laminar lack of bond) in the overlay or the pipe-to-overlay interface. At least 20% of the flaws shall be cracks. The balance of the flaws shall be of either type.	Fabrication-induced Flaws *At least 40% of the flaws shall be non-crack fabrication flaws (e.g., sidewall lack of fusion or laminar lack of bond) in the overlay or the pipe-to-overlay interface. At least 20% of the flaws shall be cracks* wholly contained in the overlay. *The balance of the flaws shall be of either type.*
(e) Detection Specimens (1) At least 20% but less than 40% of the base metal flaws shall be oriented within ±20 deg of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access.	*Detection Specimens* *At least 20% but less than 40% of the base metal flaws shall be oriented within ±20 deg. of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access.*
(2) Specimens shall be divided into base metal and overlay fabrication grading units. Each specimen shall contain one or both types of grading units. Flaws shall not interfere with ultrasonic detection or characterization of other flaws.	*Specimens shall be divided into base metal* (ISI) *and overlay fabrication* (PSI) *grading units. Each specimen shall contain one or both types of grading units. Flaws shall not interfere with ultrasonic detection or characterization of other flaws.* ISI Grading Unit. A grading unit designed to include a portion of the original weld and base material and the weld overlay material above it and designed to contain service-induced flaws (cracks) PSI Grading Unit. A grading unit designed to include a portion of the weld overlay, including the interface between the weld overlay and the original weld and base material, and designed to contain fabrication-induced flaw types (e.g. interbead lack of fusion, laminar lack of bond, cracks). Each specimen shall contain one or both types of grading units. Flaws shall not interfere with ultrasonic detection or characterization of other flaws.
(a)(1) **A base metal** grading unit includes the overlay material and the **outer 25% of the original overlaid weld.** The base metal grading unit shall extend circumferentially for at least 1 in. (25 mm) and shall start at the weld centerline and be wide enough in the axial direction to encompass one half of the original weld crown and at least 1/2 in. (13 mm) of the adjacent base material. For axially-oriented discontinuities, the axial dimension of the base metal grading unit may encompass the original weld crown and at least 1/2 in. (13 mm) of the adjacent base materials.	ISI *grading units include the overlay material and the* examination volume specified in the examination procedure. ISI *grading units shall extend circumferentially for at least 1 inch (25 mm) and shall start at the weld centerline and shall be wide enough in the axial direction to encompass 1/2 of the original weld crown and at least 1/2 inch (13 mm) of the adjacent base material.* The grading units shall be of various sizes. *For an axially oriented discontinuity, the axial dimension of the base metal grading unit may encompass the original weld crown and at least 1/2inch (13 mm) of* both *adjacent base materials.* The base metal grading unit shall not include the inner 75% of the overlaid weld and base metal, or base metal-to-overlay interface. For axially-oriented discontinuities, the axial dimension of the base metal grading unit may encompass the original weld crown and at least 1/2 in. (13 mm) of the adjacent base metal.
(2) **When base metal** flaws penetrate into the overlay material, the base	If service-induced *flaws penetrate into the overlay material, the base*

SECTION XI, 2007 EDITION with 2008 Addendum, APPENDIX VIII, SUPPLEMENT 11 REQUIREMENTS VS. PDI PROGRAM REQUIREMENTS USED TO MEET CODE CASE N-653-1	
2007 Edition with 2008 Addendum ASME, Section XI, Appendix VIII, Supplement 11 (See Note 1)	**Alternate Requirements to Supplement 11 per EPRI Program Requirements, which are written to meet requirements of Code Case N-653-1 (See Note 2)**
metal grading unit shall not be used as part of any **overlay** grading unit.	*metal grading unit* (ISI) *shall not be used as part of any* (PSI) *grading unit.*
(3) Sufficient unflawed overlaid weld and base metal shall exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws.	*Sufficient unflawed overlaid weld and base metal shall exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws.*
(b)(1) **An overlay fabrication** grading unit shall include the overlay material and the base metal-to-overlay interface for a length of at least 1 in. (25 mm).	PSI *grading unit shall include the overlay material and the overlay-to-component interface for a length of at least 1 inch (25 mm).*
(2) **Overlay** fabrication grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed **base metal-to-overlay** interface for at least 1 in. (25 mm) at both ends. Sufficient unflawed overlaid weld and base metal shall exist on both sides of the **overlay fabrication** grading unit to preclude interfering reflections from adjacent flaws. The specific area used in one **overlay fabrication** grading unit shall not be used in another overlay fabrication grading unit. **Overlay fabrication** grading units need not be spaced uniformly about the specimen.	PSI *grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed* overlay-to-component *interface for at least 1 inch (25 mm) at both ends. Sufficient unflawed overlaid weld and base metal shall exist on both sides of the* PSI *grading unit to preclude interfering reflections from adjacent flaws. The specific area used in one* PSI *grading unit shall not be used in another overlay* (PSI) *fabrication grading unit.* PSI *grading units need not be spaced uniformly about the specimen.*
(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed base metal grading units, ten unflawed base metal grading units, five flawed overlay fabrication grading units, and ten unflawed overlay fabrication grading units. For each type of grading unit, the set shall contain at least twice as many unflawed as flawed grading units. For initial procedure qualification, detection sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.	*Detection sets shall be selected from Table VIII-S2-1.* The detection sample sets shall contain at least ten flawed ISI grading units and five flawed PSI grading units. Additionally, *for each type of grading unit, the sets shall contain at least twice as many unflawed as flawed grading units. For initial procedure qualification, detection sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.*
(f) Sizing Specimen [1.1(f)] *(1)* **The minimum number of flaws shall be ten.** At least 30% of the flaws shall be overlay fabrication flaws. At least 40% of the flaws shall be open to the inside surface. **To assess sizing capabilities,** sizing sets shall contain a representative distribution of flaw dimensions. For initial procedure qualification, sizing sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.	Section 6.4 Sizing sample sets *shall* contain at least *ten* flaws. *At least 30% of the flaws shall be overlay fabrication-*induced *flaws. At least 40% of the flaws shall be* service-induced flaws and shall be *open to the inside surface. Sizing sets shall contain a representative distribution of flaw dimensions* that cover the examination volume specified in the examination procedure. *For initial procedure qualification, sizing sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.*
(2) At least 20% but less than 40% of the flaws shall be oriented axially. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access.	*At least 20% but less than 40% of the flaws shall be oriented axially. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access.*
(3) Base metal flaws used for length sizing demonstrations shall be oriented circumferentially.	Service-induced *flaws used for length sizing demonstrations shall be oriented circumferentially.*
(4) Depth sizing specimen sets shall include at least two distinct locations where a **base metal** flaw extends into the overlay material by at least 0.1 in. (2.5 mm) in the through-wall direction.	*Depth sizing specimen sets shall include at least two distinct locations where a* service-induced *flaw extends into the overlay material by at least 0.1 inches (2.5 mm) in the through-wall direction.*
2.0 CONDUCT OF PERFORMANCE DEMONSTRATIONS	
The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of	*The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular*

SECTION XI, 2007 EDITION with 2008 Addendum, APPENDIX VIII, SUPPLEMENT 11 REQUIREMENTS VS. PDI PROGRAM REQUIREMENTS USED TO MEET CODE CASE N-653-1	
2007 Edition with 2008 Addendum ASME, Section XI, Appendix VIII, Supplement 11 (See Note 1)	**Alternate Requirements to Supplement 11 per EPRI Program Requirements, which are written to meet requirements of Code Case N-653-1 (See Note 2)**
particular specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited. The **overlay fabrication flaw** test and the **base metal flaw** test may be performed separately.	*specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited.* *The PSI test and the ISI test may be performed separately.*
2.1 Detection Test. Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (**base** or **overlay fabrication**) that are present for each specimen.	*Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (ISI orPSI) that are present for each specimen.*
2.2 Length Sizing Test *(a)* The length sizing test may be conducted separately or in conjunction with the detection test.	*Length Sizing Test* *Length sizing tests may be conducted separately or in conjunction with the detection test.*
(b) If the length sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of **1.1(f)**, additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.	If *the length sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements* for the sizing specimens detailed above, *additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.*
(c) For a separate length sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.	*For a separate length sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.*
(d) For flaws in **base metal** grading units, the candidate shall estimate the length of that part of the flaw that is in the **outer 25% of the base metal wall thickness.**	*For flaws in ISI grading units, the candidate shall estimate the length of that part of the flaw that part of the flaw that is in the* examination volume specified in the examination procedure.
2.3 Depth Sizing Test *(a)* Depth sizing consists of measuring the metal thickness above the flaw (i.e., remaining ligament), and may be conducted separately or in conjunction with the detection test.	*Depth Sizing Test* *Depth sizing consists of measuring the metal thickness above the flaw (i.e., remaining ligament) and may be conducted separately or in conjunction with the detection test.*
(b) If the depth sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of 1.1(f), additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.	*If the depth sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements for the sizing specimens above, additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.*
(c) For a separate depth sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.	*For a separate depth sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.*
3.0 ACCEPTANCE CRITERIA	*ACCEPTANCE CRITERIA*
3.1 Detection Acceptance Criteria.	Procedure Qualification In addition to the specimen and performance demonstration

SECTION XI, 2007 EDITION with 2008 Addendum, APPENDIX VIII, SUPPLEMENT 11 REQUIREMENTS VS. PDI PROGRAM REQUIREMENTS USED TO MEET CODE CASE N-653-1	
2007 Edition with 2008 Addendum ASME, Section XI, Appendix VIII, Supplement 11 (See Note 1)	**Alternate Requirements to Supplement 11 per EPRI Program Requirements, which are written to meet requirements of Code Case N-653-1 (See Note 2)**
(a) Examination procedures **shall be** qualified as follows: *(1)* All flaws within the scope of the procedure **shall be** detected, and the results of the performance demonstration **shall** satisfy the acceptance criteria of Table VIII-S2-1 for false calls. *(2)* At least one successful personnel demonstration shall be performed meeting the acceptance criteria defined in 3.1(b).	requirements, procedure qualification shall satisfy the following: The specimen set shall include the equivalent of at least three personnel performance demonstration test sets. Successful personnel demonstrations may be combined to satisfy these requirements. *At least one successful personnel demonstration shall be performed* Delectability of all flaws in the procedure qualification test set within the scope of the procedure shall be demonstrated. Length and depth sizing shall meet the requirements of the below paragraphs.
(b) Examination equipment and personnel **shall be considered** qualified for detection **if** the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls.	*Examination equipment and personnel shall be considered qualified for detection if the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls.* If the procedure is intended to be used to examine greater than the upper 25% of the original pipe volume, a candidate for personnel qualification shall not fail to detect more than one of the flaws located in the extended volume
(c) **The criteria in 3.1(a) and 3.1(b)** shall be satisfied separately by the demonstration results for **base metal** grading units and by those for **overlay fabrication** grading units.	The detection test, length sizing test, and depth sizing test criteria *shall be satisfied separately by the demonstration results for* ISI *grading units and by those for* PSI *grading units.*
3.2 Sizing Acceptance Criteria. Examination procedures, equipment, and personnel are qualified for sizing when the results of the performance demonstration satisfy the following criteria. *(a)* **The** RMS error of the flaw length measurements, **as** compared to the true flaw lengths, is **less than or equal to** 0.75 in. (19 mm). The length of a **base metal** flaw is measured **at the 75% through-base-metal position**.	*Examination procedures, equipment, and personnel are qualified for* length *sizing* if *the RMS error of the* circumferential *flaw length measurements, compared to the true circumferential flaw lengths, is* not more than *0.75 in.(19mm). The length of a* service-induced *flaw is measured* in accordance with the length sizing test requirements. *Examination procedures, equipment, and personnel qualified for length sizing in accordance with the criteria above are considered qualified for both length and width sizing of laminar flaws.*
(b) The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 in. (3.2 mm).	Examination procedures, equipment and personnel are qualified for depth sizing if the *RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 in (3.2 mm).*

Note (1) The **"bolded"** words contained within the ASME Section XI, Appendix VIII, Supplement 11 requirements are used to highlight the differences between the Supplement 11 and EPRI PDI requirements.

Note (2) The *"italicized"* words contained within the EPRI PDI Program PDI alternative requirements, are the same as found in Section XI, 2007 Edition with 2008 Addenda, Appendix VIII, Supplement 11 requirements. The "non-italicized/underlined" words are alternate to the wording/requirements of Section XI, 2007 Edition with 2008 Addenda, Appendix VIII, Supplement 11.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

NRC2016006

February 24, 2016

RECEIVED 3/8/16

Mr. Oscar A. Limpias
Vice President-Nuclear and CNO
Nebraska Public Power District
72676 648A Avenue
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR STATION - REQUEST FOR RELIEF RR5-01, ALTERNATIVE WELD OVERLAY REPAIR FOR A DISSIMILAR METAL WELD JOINING NOZZLE TO CONTROL ROD DRIVE END CAP IN LIEU OF SPECIFIC AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE REQUIREMENTS (CAC NO. MF6332)

Dear Mr. Limpias:

By letter dated June 9, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15167A066), as supplemented by letter dated October 29, 2015 (ADAMS Accession Number ML15310A059), Nebraska Public Power District (NPPD, the licensee) requested an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, IWA-4000, "Repair/Replacement Activities," and Nonmandatory Appendix Q, "Weld Overlay Repair of Classes 1, 2, and 3 Austenitic Stainless Steel Piping Weldments," at Cooper Nuclear Station (CNS).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee proposed an alternative to codes and standards requirements on the basis that the alternative would provide an acceptable level of quality and safety. Specifically, Relief Request RR5-01 proposes an Inservice Inspection (ISI) alternative to install a full structural weld overlay (FSWOL) on the control rod drive nozzle to cap weld at CNS during Refueling Outage 29, which is projected to occur during the fifth 10-year ISI interval. The licensee intends to use the ISI alternative only as a contingency in the event that a flaw is discovered in the control rod drive nozzle to cap weld resulting in the need for a FSWOL.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject relief request and concludes, as set forth in the enclosed safety evaluation, that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1) and is in compliance with the requirements of the ASME Code, Section XI for which relief was not requested. Therefore, the NRC staff authorizes the use of Relief Request RR5-01 at CNS as a contingency, if a flaw is discovered during Refueling Outage 29. The proposed alternative is authorized for the fifth 10-Year ISI interval.

All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and authorized by NRC staff remain applicable, including a third party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact Thomas Wengert at 301-415-4037 or via e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

Meena K. Khanna, Chief
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF RR5-01

ALTERNATIVE WELD OVERLAY REPAIR FOR A DISSIMILAR

METAL WELD JOINING NOZZLE TO CONTROL ROD DRIVE END CAP

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

DOCKET NO. 50-298

1.0 INTRODUCTION

By letter dated June 9, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15167A066), as supplemented by letter dated October 29, 2015 (ADAMS Accession Number ML15310A059), Nebraska Public Power District (NPPD, the licensee) requested an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, IWA-4000, "Repair/Replacement Activities," and Nonmandatory Appendix Q, "Weld Overlay Repair of Classes 1, 2, and 3 Austenitic Stainless Steel Piping Weldments," at Cooper Nuclear Station (CNS).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee proposed an alternative to codes and standards requirements on the basis that the alternative would provide an acceptable level of quality and safety. Specifically, Relief Request RR5-01 proposes an inservice Inspection (ISI) alternative to install a full structural weld overlay (FSWOL) on the control rod drive nozzle to cap weld at CNS during Refueling Outage 29, which is projected to occur during the fifth 10-year ISI interval. The licensee intends to use the ISI alternative only as a contingency in the event that a flaw is discovered in the control rod drive nozzle to cap weld resulting in the need for an FSWOL. CNS currently has no weld overlays installed.

2.0 REGULATORY EVALUATION

The licensee requested authorization of an alternative to the requirements of Article IWA-4000 of the ASME Code, Section XI, pursuant to 10 CFR 50.55a(z)(1).

Adherence to Section XI of the ASME Code is mandated by 10 CFR 50.55a(g)(4), which states, in part, that ASME Code Class 1, 2, and 3 components (including supports) will meet the

Enclosure

requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI.

The regulation in 10 CFR 50.55a(z) states, in part, that alternatives to the requirements of paragraph (g) of 10 CFR 50.55a may be used, when authorized by the U.S. Nuclear Regulatory Commission (NRC), if the licensee demonstrates that: (1) the proposed alternative provides an acceptable level of quality and safety, or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The proposed alternative must be submitted and authorized prior to implementation.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative and the NRC to authorize the proposed alternative.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components Affected

Code Class:	ASME Section XI Code Class 1
Examination Categories:	B-F
Item Number:	B5.10
Component Numbers:	RCA-BF-1, 5 inch Control Rod Drive Return Cap to Nozzle N9 Weld

3.2 Applicable Code Edition and Addenda

ASME Code, Section XI, 2007 Edition through 2008 Addenda.

3.3 Applicable Code Requirements

ASME Section XI, Article IWA-4000, "Repair/Replacement Activities" provides requirements for repair or replacement of Class 1, 2 or 3 components. Article IWA-4400, "Welding, Brazing, Metal Removal, Fabrication, and Installation" provides requirements for repair/replacement of Class 1, 2 or 3 components by welding.

ASME Section XI, IWA-4411 requires repair/replacement activities to be performed in accordance with the Owner's Requirements and the original Construction Code of the component or item. Alternatively, IWA-4411(a) and (b) allows use of later Editions and Addenda of the Construction Code either in its entirety or portions thereof, Code Cases, and revised Owner Requirements. IWA-4411(e) permits the use of IWA-4600(b) when welding is to be performed without postweld heat treatment (PWHT) required by the Construction Code. IWA-4411(h) permits the use of Nonmandatory Appendix Q for the installation of welded overlays for the repair of stress corrosion cracking (SCC) in Class 1, 2 or 3 austenitic stainless steel pipe weldments.

ASME Section XI, IWA-4190(a) requires Code Cases used for repair/replacement activities to be applicable to the Edition and Addenda of Section XI specified for the activity.

IWA-4600(b) provides temper bead welding requirements in accordance with IWA-4620, IWA-4630 and IWA-4640 as an alternative to the welding and postweld heat treatment requirements of the Construction Code. NRC-approved Code Cases may also be used as an alternative to the welding and postweld heat treatment requirements of the Construction Code.

ASME Section XI, Code Case N-638-4, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW [Gas Tungsten Arc Welding] Temper Bead Technique," may be used as an alternative to following the preheat and PWHT requirements of IWA-4400. Code Case N-638-4 is the latest version of this Code Case approved by the NRC, but is not applicable for editions of the Code later than 2004. Paragraph 2.1 of Code Case N-638-4 provides the requirements for qualifying procedures used to perform temper bead welding of similar and dissimilar metal weld joints using the ambient temperature machine GTAW technique. Paragraph 2.1.c of Code Case N-638-4 requires that consideration shall be given to the effects of irradiation on the properties of material for applications in the core belt line region of the reactor vessel. Paragraphs 2.1.g, 2.1.h, 2.1.i and 2.1.j of Code Case N-638-4 contain the requirements for performing Charpy V-notch impact testing of procedure qualification test assemblies of ferritic materials.

ASME Section XI Mandatory Appendix VIII provides procedure and personnel qualification requirements for ultrasonic examination and is required by Nonmandatory Appendix Q. Appendix VIII, Supplement 11 is applicable to full structural overlaid wrought austenitic piping welds. Appendix VIII, Supplement 11 is not applicable to overlays of dissimilar metal welds.

ASME Section XI Nonmandatory Appendix Q, "Weld Overlay Repair of Classes 1, 2, and 3 Austenitic Stainless Steel Piping Weldments" provides guidance for the weld overlay repair of austenitic stainless steel pipe weldments. Appendix Q is not applicable to the repair of weldments involving alloy steel and/or austenitic nickel-based alloys.

3.4 <u>Reason for Request</u>

The licensee stated that the control rod drive return line cap to nozzle weld (which is a dissimilar metal weld) is considered susceptible to SCC and is classified as Category D in BWRVIP-75A "BWR [Boiling-Water Reactor] Vessel and Internals Project Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules." Category D welds are defined in BWRVIP-75A as welds that are susceptible to intergranular stress corrosion cracking (IGSCC), a subset of SCC, which have not been treated with an IGSCC remedy, but for which cracks have not been reported. The licensee stated that previous ultrasonic examinations of this component weld have not identified any relevant indications. In the event an examination during Refueling Outage 29 identifies conditions requiring repair, such as SCC, the methods currently available within ASME Section XI do not provide techniques to support a repair without draining the reactor vessel. The licensee proposes to perform a FSWOL, as specified by Nonmandatory Appendix Q, for the repair of Class 1 austenitic stainless steel pipe weldments in the event that SCC is found in the subject component weld during Refueling Outage 29. The licensee proposes to use weld material Alloy 52M to perform this FSWOL.

The licensee further stated that, because ASME Section XI, Nonmandatory Appendix Q does not specifically apply to the overlay of dissimilar metal welds, or materials other than austenitic stainless steel, and because the requirements of IWA-4600(b) or Code Case N-638-4 do not specifically apply to the welding of overlays, an alternative is required to combine the requirements of Nonmandatory Appendix Q and Code Case N-638-4 to provide a complete set of requirements for a FSWOL of the control rod drive return line cap to nozzle weld. Also, the following requirements of Nonmandatory Appendix Q cannot be applied to the subject dissimilar metal weld because they were not intended for dissimilar metal welds made with Alloy 52M weld material:

- Nonmandatory Appendix Q, paragraph Q-2000(a), requires the reinforcement weld metal to be low carbon (0.035 percent maximum) austenitic stainless steel.

- Nonmandatory Appendix Q, paragraph Q-2000(d), requires the first two layers of the weld overlay to have a ferrite content of at least 7.5 Ferrite Number (FN).

ASME Section XI, IWA-4190(a) requires Code Cases used for repair/replacement activities to be applicable to the Edition and Addenda specified for the repair/replacement activity. The applicability of Code Case N-638-4 (latest approved by the NRC) is limited to the 2004 Edition of ASME Section XI but the ASME Section XI edition that is specified for this repair/replacement activity is the 2007 Edition with the 2008 Addenda. The limitation of Code Case N-638-4 applicability to the 2004 Edition of Section XI is not due to any technical limitations of Code Case N-638-4, but rather due to a change in Section XI numbering that occurred in the 2005 Addendum. An alternative to IWA-4190(a) is required to permit use of Code Case N-638-4 with the 2007 Edition through the 2008 Addenda of ASME Section XI as described in this request.

The licensee noted that Code Case N-638-4, paragraphs 4(a), and 4(a)(4) state that all welds (including repair welds) shall be volumetrically examined in accordance with the requirements and acceptance criteria of the Construction Code or ASME Section III. An alternative is required to use the examination requirements of Article Q-4100 of ASME Section XI, Nonmandatory Appendix Q.

3.5 Proposed Alternative

The licensee proposes to repair the following component at CNS, as needed, to correct any relevant indications identified by ISI during Refueling Outage 29. The repair, if needed, would consist of a FSWOL to replace the original pressure boundary of the dissimilar metal weld identified below.

Component Identification	Component Description	Nozzle Material	End Cap Material	Maximum Surface Area Of Overlay
RCA-BF-1	5 inch Control Rod Drive Return Line End Cap to Nozzle N9 Weld	A-508, Class 2 (low alloy steel)	SB-166 (Inconel Alloy 600)	260 square inches on the ferritic side

In its letter dated June 9, 2015, the licensee stated, in part, that:

> The weld overlay [if needed], will extend around the full circumference of the end cap to nozzle weldment location in accordance with Nonmandatory Appendix Q. The overlay length will extend across the projected flaw intersection with the outer surface beyond the extreme axial boundaries of the flaw. The design thickness and length will be determined in accordance with the guidance provided in Nonmandatory Appendix Q (paragraph Q-3000(a)) and ASME Section XI, paragraph IWB-3640, 2007 Edition through the 2008 Addenda for the evaluation methodology for flawed pipe. The overlay will completely cover the area of the flaw and other Alloy 182 or susceptible austenitic stainless steel material with the highly resistant Alloy 52M weld filler material. The overlay length will conform to Nonmandatory Appendix Q, paragraph Q-3000(a), which satisfies the stress and load transfer requirements.

The licensee further states that Nonmandatory Appendix Q applies specifically to austenitic stainless steel piping and weldments. As an alternative, the licensee proposes to use Code Case N-638-4 and Nonmandatory Appendix Q to install a weld overlay on a configuration that consists of an A-508, Class 2 low alloy steel nozzle, Alloy 182/82 weld materials, and an SB-166, Alloy 600 nickel alloy cap using ERNiCrFe-7A (Alloy 52M) filler metal. As needed for welding within 0.125 inch from the low alloy steel nozzle material, the licensee proposes to use Code Case N-638-4 with the condition that demonstration for ultrasonic examination of the repaired volume is required using representative samples, which contain construction type flaws. In monitoring preheat and interpass temperatures during the application of the overlay, the licensee proposes to comply with 3(e)(1) of the Code Case, which means that the interpass temperature will be directly measured during the welding process. The conditions proposed by the licensee for the use of Code Case N-638-4 are consistent with the conditions imposed by the NRC in Regulatory Guide (RG) 1.147, Revision 17, "Inservice Inspection Code Case Acceptability ASME Section XI, Division 1 (ADAMS Accession No. ML13339A689).

Appendix Q, Article Q-2000(a) requires weld metal used to fabricate weld overlays be low carbon steel (0.035%) austenitic stainless steel. As an alternative, the licensee proposes to perform the weld overlay using ERNiCrFe-7A (Alloy 52M) which is an austenitic nickel based alloy.

The licensee stated that Appendix Q, Article Q-2000(d) requires the weld overlay to consist of at least two austenitic stainless steel weld layers, each layer having an as-deposited delta ferrite content of at least 7.5 FN, or 5 FN under certain conditions. As an alternative, the licensee proposes to perform the weld overlay using ERNiCrFe-7A (Alloy 52M), which is purely austenitic. Since the alternative weld deposits are purely austenitic, the licensee maintains that the delta ferrite requirements of Appendix Q are not applicable.

In its letter dated June 9, 2015, the licensee further states, in part:

> Code Case N-638-4, Paragraphs 4(a) and 4(a)(4), state that all welds (including repair welds) shall be examined in accordance with the requirements and acceptance criteria of the Construction Code or ASME Section III. As an alternative, CNS proposes to examine the weld overlay in accordance with the requirements and acceptance criteria of Nonmandatory Appendix Q,

> Article Q-4000 of ASME Section XI. The examination requirements and acceptance standards in Nonmandatory Appendix Q, [Article] Q-4100 were developed specifically for weld overlays unlike those in Code Case N-638-4. However, the examinations required by Nonmandatory Appendix Q will not be performed until after the three tempering layers have been in place for at least 48 hours as required by [paragraph] 4(a)(2) of Code Case N-638-4.

ASME Section XI Mandatory Appendix VIII with Supplement 11, is applicable to full structural overlaid wrought austenitic piping welds. As an alternative, the licensee proposes to use the Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) qualification program, as described in the licensee's submittal dated June 9, 2015.

ASME Section XI Nonmandatory Appendix Q, "Weld Overlay Repair of Classes 1, 2, and 3 Austenitic Stainless Steel Piping Weldments," provides guidance for the weld overlay repair of austenitic stainless steel pipe weldments. As an alternative, the licensee proposes to use Nonmandatory Appendix Q for the FSWOL of the subject dissimilar metal weld.

3.6 Basis for Use

Code Case N-638-4 is approved (with Conditions) for generic use in RG 1.147, Revision 17, and was developed for both similar and dissimilar metal welding using ambient temperature machine GTAW temper bead technique. The licensee proposes to follow the approved welding methodology of this Code Case (consistent with the conditions imposed by RG 1.147) for the overlay, whenever welding within the 0.125-minimum distance from the low alloy steel nozzle base material.

The licensee stated that nonmandatory Appendix Q is approved in 10 CFR 50.55a with no conditions and was developed for welding on and using austenitic stainless steel material. The weld overlay proposed is austenitic nickel-based material having a mechanical behavior similar to austenitic stainless steel. It is also compatible with the existing weld and base materials.

3.7 Duration of Proposed Alternative

This proposed alternative will be used for the Fifth 10-Year Interval of the ISI Program for CNS.

4.0 NRC STAFF EVALUATION

4.1 Weld Description

The licensee stated that the control rod drive return line cap to nozzle weld is classified as Category D in BWRVIP-75A. Per BWRVIP-75A, Category D welds are classified as not resistant to IGSCC, with no mitigating stress improvement performed, but with no reported cracking. The licensee proposes to apply Alloy 52M FSWOL to this weld if SCC is found during the Refueling Outage 29 inspection of the weld. In nickel-based alloys, increasing levels of chromium are associated with increasing level of corrosion resistance. Alloy 52M contains nominally 28 percent chromium, which imparts excellent corrosion resistance to the material. By comparison, Alloy 82 contains nominally 20 percent chromium, while Alloy 182 has a nominal chromium content of 15 percent. Alloy 82 is considered resistant to SCC, but

Alloy 182, with its lower chromium content, is considered to be less resistant to SCC. Operating experience indicates that alloy 182 welds are not immune to SCC.

The control rod drive return line cap to nozzle weld is a dissimilar metal weld, which joins a low alloy steel (SA 508, Cl 2) nozzle to a nickel-based alloy (Alloy 600) end cap. The licensee stated in its submittals that the existing weld consists of both nickel-based Alloys 82 and 182. In its response to Request for Information (RAI)-3, dated October 29, 2015, the licensee clarified that, although Alloy 82 weld metal was used to weld the cap to the nozzle, Alloy 182 is still present in the weld joint from a previous weld that was not completely removed when that weld joint was cut. Also, as discussed in the licensee's response to RAI-3, the profile of the existing weld joint is as follows: a low alloy steel nozzle is joined to Alloy 182 weld metal (full penetration); the Alloy 182 weld metal (full penetration) is joined to Alloy 82 weld metal (full penetration); and, the Alloy 82 weld metal (full penetration) is joined to the nickel-based alloy end cap.

The licensee proposes to use Alloy 52M austenitic nickel-based alloy weld material for the overlay. Based on the weld joint description provided by the licensee, the overlay would cover the following materials: alloy steel (SA 508, Cl 2) base material, Alloy 182 weld material, Alloy 82 weld material, and Alloy 600 base material. Although there is no Code section or NRC-approved Code Case with specific requirements for performing FSWOL with this material combination, it is generally accepted that Alloy 52M is compatible with this material combination and the Code would allow this overlay, provided the welding procedure is properly qualified.

4.2 Code Welding Requirements

The application of this FSWOL falls under the requirements of Article IWA-4400 for welding repairs. When performing weld repairs, a licensee may opt to follow the temper bead welding requirements of Article IWA-4600(b) or the NRC-approved Code Case as an alternative to the welding and postweld heat treatment requirements of the Construction Code. In this request, the licensee has proposed to follow the temper bead welding requirement of Code Case N-638-4, which was approved by the NRC staff in RG 1.147. Although a licensee may opt to perform welding repairs in accordance with the temper bead welding requirements of NRC-approved Code Case N-638-4, NPPD must request NRC-approval for the proposed FSWOL since this Code Case in not applicable to the Edition and Addenda specified for the repair/replacement activity. As stated previously in this safety evaluation (SE), the limitation of Code Case N-638-4 applicability to the 2004 Edition of Section XI is not due to any technical limitation of Code Case N-638-4, but rather due to a change in Section XI numbering that occurred in the 2005 Addendum. In the proposed alternative, the licensee included a cross-reference that will allow the use of Code Case N-638-4 with later editions and addenda of the Code. The NRC staff has reviewed this cross-reference and determined it to be an acceptable method to apply Code Case N-638-4 to the Code Edition and Addenda applicable to the welding repairs proposed by the licensee.

In RG 1.147, the NRC staff approved Code Case N-638-4 with the following Conditions:

1. Demonstration for ultrasonic examination of the repaired volume is required using representative samples which contain structural type flaws

2. The provisions of [paragraphs] 3(e)(2) and 3(e)(3) may only be used when it is impractical to use the interpass temperature measurement methods described in [paragraph] 3(e)(1), such as in situations where the weldment area is inaccessible...or when there are extenuating radiological circumstances.

As stated previously in this SE, the licensee proposes to comply with Condition 1 and also to measure interpass temperature directly in accordance with paragraph 3(e)(1). Therefore, the licensee proposes to use Code Case N-638-4 in accordance with the Conditions imposed by the NRC staff in RG 1.147. The staff finds the licensee's request to use Code Case N-638-4, rather than the later revision of this Code Case applicable to the Code of Record, acceptable, because Code Case N-638-4, which is conditionally approved by NRC staff in RG 1.147, is compatible with the proposed alternative, and the licensee has submitted an acceptable cross-reference, which will allow the use of this Code Case with the 2007 Edition through 2008 Addenda of the Code.

4.3 Irradiation Effects

Code Case N-638-4 requires that the welding procedure and welding operators shall be qualified in accordance with Section IX and the requirements of paragraphs 2.1 and 2.2 of the Code Case. Paragraph 2.1.c of Code Case N-638-4 requires that consideration shall be given to the effects of irradiation on the properties of material "for applications in the core belt line region of the reactor vessel." Because irradiation effects were not discussed in the licensee's submittal, the NRC staff issued RAI-2 to request the licensee to identify whether the proposed FSWOL will be in the core belt line region discussed in Code Case N-638-4, and if so, to discuss how consideration was given to the effects of irradiation. In RAI-2, the NRC staff clarified the core belt line to be that region of reactor vessel ferritic materials with a fluence projected to be greater than 1×10^{17} neutrons per square centimeter (n/cm^2) for Energy greater than 1 million electron volts (E>1MeV). In the licensee's response to RAI-2 dated October 29, 2015, the licensee stated that the weld subject to the proposed FSWOL is physically located outside the core belt line region, and does not identify any consideration given to the effect of irradiation on the properties of the material. The NRC staff finds the licensee response to RAI-2 acceptable because, based on its location outside the core belt line region, the proposed FSWOL would be in a region with a projected fluence of less than 1×10^{17} n/cm^2 (E>1MeV) and Code Case N-638-4 would not require that any consideration be given to the effects of irradiation on the properties of the material.

4.4 Impact Testing Requirements

Paragraph 2.1.j of Code Case N-638-4 states, in part, that for weld procedures qualified for use with Code Case N-638-4:

> The average lateral expansion value of the three HAZ Charpy V-notch specimens shall be no less than the average lateral expansion value of the three unaffected base metal specimens. However, if the average lateral expansion value of the HAZ Charpy V-notch specimens is less than the average value for the unaffected base metal specimens and the procedure qualification meets all the other requirements of this Case, either of the following shall be performed:

(1) The welding procedure shall be requalified.

(2) An Adjustment Temperature for the procedure qualification shall be determined in accordance with the applicable provisions of NB-4335.2 of Section III, 2001 Edition with the 2002 Addenda. The RT_{NDT} [Reference Temperature for Nil Ductility Transition] or lowest service temperature of the materials for which the welding procedure will be used shall be increased by a temperature equivalent to that of the Adjustment Temperature.

Because paragraph 2.1.j, option 2, has the potential to affect reactor vessel integrity analyses, the NRC staff issued RAI-1, requesting the licensee to identify whether option 1 or option 2 was used to qualify the subject weld repair overlay. In the licensee's response to RAI-1 dated October 29, 2015, the licensee clarified that a vendor has not yet been chosen to perform the overlay and therefore, the procedure qualification records have not yet been reviewed. The licensee also clarified that option 2 would only be chosen after option 1 had been attempted and it was determined that option 2 is the only available solution. The licensee also stated, in part, in its response to RAI-1:

> If option 2 is determined to be the only available solution, the effects of the Adjusted Temperature would be determined before the Full Structural Weld Overlay (FSWOL) is installed. If the new Adjusted Temperature is determined to affect the pressure-temperature curves, the curves would be revised before plant startup from refuel outage 29. However, because the location of the FSWOL is outside of the beltline region [fluence values greater than 1×10^{17} n/cm^2 (E>1 MeV)], it is not expected that minor changes to the Adjusted Temperature would affect the pressure-temperature curves.

The NRC staff finds the licensee's response to RAI-1 acceptable, because the licensee clarified how the welding procedure would be qualified and, because the welding procedure would be qualified in accordance with the requirements of the Code as specified in Code Case N-638-4.

The NRC staff finds the licensee's statement that, "If the new Adjusted Temperature is determined to affect the pressure-temperature curves, the curves would be revised before plant startup from refuel outage 29," to be acceptable, because the licensee will evaluate the effect on the pressure-temperature (P-T) limits if an adjustment temperature must be determined as a result of the weld procedure qualification. The licensee also indicated in its response to RAI-1 that it does not expect a change to the P-T limits to be necessary due to the low fluence at the location of the FSWOL. However, the NRC staff notes that, as clarified in Regulatory Issue Summary (RIS) 2014-11, "Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components," 10 CFR 50, Appendix G requires that all ferritic materials within the entire reactor vessel be considered in the development of the P-T limits, not just those with fluence greater than 1×10^{17} n/cm^2 (E>1MeV). This is because the effects of structural discontinuities for a material with a lower reference temperature, such as a nozzle with a lower fluence, may result in more restrictive allowable P-T limits than those for the vessel shell material with a higher reference temperature.

4.5 <u>Design and Ultrasonic Examination Requirements</u>

The licensee proposes to use a modified version of ASME Section XI, Nonmandatory Appendix Q for this potential repair. Nonmandatory Appendix Q is applicable to the FSWOL of austenitic stainless steel material (per Article Q-1000) using austenitic stainless steel weld material (per Article Q-2000(a) & (d)) and contains design considerations (Article Q-3000) and ultrasonic examination requirements (Article Q-4000). As stated previously in this SE, the licensee's proposed alternative is applicable to the FSWOL of a dissimilar metal weld using austenitic nickel-base material. The NRC staff agrees that, despite the material differences, the design consideration and ultrasonic examination requirements of Appendix Q can be used for the proposed alternative with the following two exceptions:

- Appendix Q (Article Q-2000(a)) requires the weld overlay to be fabricated from low carbon austenitic stainless steel weld metal. The proposed alternative will fabricate the weld overlay from ERNiCrFe-7A (Alloy 52M) filler metal which is an austenitic nickel-based alloy.

- Appendix Q (Article Q-2000(d)) imposes minimum delta ferrite requirements on the weld overlay. This requirement is appropriate for overlays made with austenitic stainless steel weld metal which as deposited contain both austenite and delta ferrite phases. The proposed alternative will not impose minimum delta ferrite requirements on the weld overlay since the proposed alternative will use nickel-based alloy, which will be deposited without any delta ferrite phase.

The NRC staff finds the licensee's request to use Appendix Q with the above exceptions for the proposed alternative to be acceptable because the design considerations and the ultrasonic examination requirements of Appendix Q can be applied to the dissimilar metal weld combination of the proposed alternative, and will result in a FSWOL with sufficient structural integrity to mitigate the detrimental impact of SCC, if found.

ASME Section XI, Mandatory Appendix VIII provides procedure and personnel qualification requirements for ultrasonic examination and is required by Nonmandatory Appendix Q. Supplement 11 to Mandatory Appendix VIII is applicable to full structural overlaid wrought austenitic piping welds, but is not applicable to overlays of dissimilar metal welds. As an alternate to Mandatory Appendix VIII with Supplement 11, the licensee proposes to use the EPRI PDI qualification program as described in the licensee's submittal. The NRC staff performed a comprehensive review of the proposed PDI qualification program and Mandatory Appendix VIII, Supplement 11. An NRC staff review of the two programs has determined that the PDI Program for qualifying procedures, equipment, and personnel, as described in the relief request, is very similar to Mandatory Appendix VIII, Supplement 11. For the qualification of full structural weld overlays, the primary differences between the Appendix VIII requirements and the PDI Program are administrative or semantic in nature, such as changing "base metal flaws" to "service-induced flaws." The staff finds the licensee's request acceptable because the PDI qualification program, as described in the licensee's submittal, is applicable to overlays of dissimilar metal welds and is similar to the Mandatory Appendix VIII requirements except for administrative or semantic differences.

4.7 Summary

The licensee's proposed alternative FSWOL, which follows the design requirements of Nonmandatory Appendix Q with the exceptions noted previously, will provide an acceptable repair for any SCC defects found during ISI, as discussed in Section 4.5 (of this SE). Alloy 52M with its high chromium content will provide superior corrosion resistance to the Alloy 82 and 182 weld materials used in the existing weld, as discussed in Section 4.1. The temper bead welding Code Case N-638-4 is acceptable for welding to alloy steel when post weld heat treatment of the weld joint is not performed, as discussed in Section 4.2. The welding for the proposed alternative will be performed and qualified in accordance with Code requirements, as discussed in Section 4.4. Because the projected neutron fluence is less than 1 x 10^{17} n/cm^2 (E>1 MeV), the Code Case requirement that irradiation effects be considered for applications in the core belt line does not apply here, as discussed in Section 4.3. The PDI Program is acceptable for qualifying ultrasonic examination procedures, equipment, and personnel to be used for the proposed alternative, as discussed in Section 4.5. Therefore, the NRC staff finds that the proposed alternative provides an acceptable level of quality and safety and structural integrity.

5.0 CONCLUSION

As set forth above, the NRC staff determines that the proposed alternative demonstrates an acceptable level of quality and safety and provides a reasonable assurance of structural integrity for the subject weld. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1) and is in compliance with the requirements of the ASME Code, Section XI for which relief was not requested. Therefore, the NRC staff authorizes the use of Relief Request RR5-01 at CNS as a contingency, if a flaw is discovered during Refueling Outage 29. The proposed alternative is authorized for the fifth 10-Year ISI interval.

All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and authorized by NRC staff remain applicable, including a third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: J. Jenkins

Date: February 24, 2016

If you have any questions, please contact Thomas Wengert at 301-415-4037 or via e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

/RA/

Meena K. Khanna, Chief
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosure:
Safety Evaluation

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DATE	2/22/16	2/17/16	02/05/16	2/24/16

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8.0 PRESSURE TESTING

System pressure tests shall be conducted in accordance with the rules of ASME Section XI as modified by 10CFR50.55a to the maximum extent practicable. Where such impracticalities exist, relief has been requested and alternative test requirements have been proposed. Relief requests are outlined in this program, Section 10. Pressure tests are implemented in accordance with CNS administrative procedures.

System pressure tests of Class 1, 2, and 3 systems will be performed as specified in the Pressure Test Summary Tables on the following pages.

System	Class	Exam Category	Item No.	Test Type	Freq. (Period)	P&ID sheet #	Relief Request	Technical Position
NSSS (Leakage)	1	B-P	B15.10	IWB-5220[1]	Each Refueling Outage	2026, 2027, 2038, 2039, 2040, 2041, 2042-1, 2043, 2044 2045-1, 2045-2	RP5-01	
	2	C-H	C7.10	IWC-5220				
NSSS (Leakage)	1	B-P	B15.20	IWB-5220[1]	Once Per Interval	2026, 2027, 2038, 2039, 2040, 2041, 2042-1, 2043, 2044 2045-1, 2045-2	RP5-01	
CS LOOP A	2	C-H	C7.10	IWC-5220	Each Period	2045-1		PT-01, PT-02, PT-03
CS LOOP B	2	C-H	C7.10	IWC-5220	Each Period	2045-1		PT-01, PT-02, PT-03
HPCI	2	C-H	C7.10	IWC-5220	Each Period	2044		PT-01, PT-02, PT-03, PT-04
	3	D-B	D2.10	IWD-5220				

System	Class	Exam Category	Item No.	Test Type	Freq. (Period)	P&ID sheet #	Relief Request	Technical Position
REC	2 3	C-H D-B	C7.10 D2.10	IWC-5220 IWD-5220	Each Period	2031-1 2031-2 2036-1		
RCIC	2	C-H	C7.10	IWC-5220	Each Period	2041 2043		PT-01, PT-02, PT-03, PT-04
RHR LOOP A	2	C-H	C2.33 C7.10	IWC-5220	Each Period	2040		PT-01, PT-02, PT-03
RHR LOOP B	2	C-H	C2.33 C7.10	IWC-5220	Each Period	2040		PT-01, PT-02, PT-03
NBI	3	D-B	D2.10	IWD-5220	Each Period	2026, 2027, 2041		
Note 1. Per IWB-5222(b), The Class 1 pressure retaining boundary which is not pressurized when the system valves are in the position required for normal reactor startup shall be pressurized and examined at or near the end of the inspection interval. This boundary may be tested in its entirety or in portions and testing may be performed during the testing of the boundary of IWB-5222(a)..								
SW LOOP A	3	D-B	D2.10	IWD-5220	Each Period	2006-1, 2006-2, 2006-3, 2006-4, 2036-1, 2077		
SW LOOP B	3	D-B	D2.10	IWD-5220	Each Period	2006-1, 2006-2, 2006-3, 2006-4, 2036-1, 2077		
MSRV DISCHARGE	3	D-B	D2.10	IWD-5220	Each Period	2028		PT-03

System	Class	Exam Category	Item No.	Test Type	Freq. (Period)	P&ID sheet #	Relief Request	Technical Position
TIP	2	C-H	C7.10	IWC-5220	Each Period	2083		
SERVICE AIR	2	C-H	C7.10	IWC-5220	Each Period	2010-3		
H2O2	2	C-H	C7.10	IWC-5220	Each Period	2022		
DEMIN WATER	2	C-H	C7.10	IWC-5220	Each Period	2027		
DRAINS	2	C-H	C7.10	IWC-5220	Each Period	2028		
REACTOR RECIRC.	2	C-H	C7.10	IWC-5220	Each Period	2027		
INST AIR	2	C-H	C7.10	IWC-5220	Each Period	2010-2		
PCC, NI, and SBNI	2	C-H	C7.10	IWC-5220	Each Period	2022, 2084		
RPV INST	2	C-H	C7.10	IWC-5220	Each Period	2026		

9.0 SYSTEM PRESSURE TESTING
TECHNICAL APPROACH AND POSITION INDEX/SUMMARIES

Position	Summary
PT-01	Valve Seats as Pressurization Boundaries
PT-02	Leakage through mechanical connections
PT-03	Open ended discharge piping
PT-04	Buried Components

TECHNICAL APPROACH AND POSITION NUMBER: PT-01

COMPONENT IDENTIFICATION

Code Classes:	1, 2, and 3
Examination Categories:	B-P, C-H, and D-B
Items:	B15.10, C7.10, D2.10
Description:	Valve Seats as Pressurization Boundaries.

CODE REQUIREMENT

ASME Section XI requires that the pressurization boundary for the system leakage test extend to the components containing pressurized reactor coolant under the plant mode of normal reactor startup (IWB-5222) and components required to operate or support the safety function of the system (IWC-5222 and IWD-5222).

Hydrostatic test boundaries, IWA-5222(a), shall be defined by the system boundaries within which the components have the same minimum required classification and are designed to the same pressure rating as governed by the system function and the internal fluid operating conditions, respectively.

POSITION

CNS's position is that regardless of the type of pressure test performed (i.e. system leakage or hydrostatic), the pressurization boundary extends up to the seat of the valve used for isolation. For example, in order to hydrostatically test the Class 1 components, the valve that provides the Class break would be used as the isolation point. In this case, the true pressurization boundary, and class break, is actually at the valve seat.

Any requirement to test beyond the valve seat is dependent only on whether or not the piping on the other side of the valve seat is ISI Class 1, 2, or 3.

The extension of the pressurization boundary during a system leakage test would require an abnormal valve line-up. Extending the boundary for a hydrostatic test could result in over pressurization of low pressure piping at systems that have a high/low pressure interface (such as RHR and Core Spray).

In order to simplify preparation of the walkdown checklists, CNS will perform a VT-2 visual examination of the entire boundary valve body and bonnet (during pressurization up to the valve seat).

REFERENCES

1. ASME Section XI, 2007 Edition, 2008 Addenda, IWA-5221, IWA-5222, IWB-5222, IWC-5222, IWD-5222

TECHNICAL APPROACH AND POSITION NUMBER: PT-02

COMPONENT IDENTIFICATION

Code Classes: 1, 2, and 3 Examination Categories: B-P, C-H, and D-B
Items: B15.10, C7.10, D2.10
Description: Leakage through mechanical connections.

CODE REQUIREMENT

ASME Section XI requires that the pressurization boundary for the system leakage test extend to the components containing pressurized reactor coolant under the plant mode of normal reactor startup (IWB-5222) and components required to operate or support the safety function of the system (IWC-5222 and IWD-5222).

Hydrostatic test boundaries, IWA-5222(a), shall be defined by the system boundaries within which the components have the same minimum required classification and are designed to the same pressure rating as governed by the system function and the internal fluid operating conditions, respectively.

POSITION

The CNS position is that leakage through mechanical connections, such as valve packing or gaskets, is not considered to be a failure of the pressure test, provided that the test pressure is maintained for the duration of the test. Leakage through mechanical connections will be noted and evaluated in accordance with plant administrative procedures. Excessive leakage will be repaired; however, a subsequent pressure test is not required.

Similarly, leakage past a valve seat is not considered to be a failure. If the valve is required to pass a seat leakage test, then leakage in excess of the allowable limit will be evaluated and appropriate corrective action taken. A subsequent seat leakage test may be required, but another pressure test is not required.

REFERENCES

1. ASME Section XI, 2007 Edition, 2008 Addenda, IWA-5221, IWA-5222, IWB-5222, IWC-5222, IWD-5222

TECHNICAL APPROACH AND POSITION NUMBER: PT-03

COMPONENT IDENTIFICATION

Code Classes:	2 and 3
Examination Categories:	C-H and D-B
Items:	C7.10 and D2.10
Description:	Open ended discharge piping

CODE REQUIREMENT

ASME Section XI requires that the pressure test boundary for the system leakage test includes only those portions of the system required to operate or support the safety function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required (IWC-5222(a) and IWD-5222(a)).

Items outside the boundaries described above, and open ended discharge piping, are excluded from the examination requirements (IWC-5222(b) and IWD-5222(b)).

Interpretation:	XI-1-98-13
Subject:	IWC-2500-1; Category C-H (Winter 1979 Addenda through 1990 Addenda), Table IWD-2500-1; Categories D-A, D-B, and D-C (Winter 1977 Addenda through 1990 Addenda), IWC-5240 (1991 Addenda Through 1992 Addenda), IWC-5222 (1993 Addenda Through 1996 Addenda), and IWD-5240 (1991 Addenda Through 1996 Addenda)
Date Issued:	November 21, 1997
File Number:	IN97-007

Question: Is it the intent of Section XI that open-ended portions of Class 2 and 3 systems are exempted from system pressure tests and associated VT-2 visual examination?

Reply: Yes.

POSITION

The CNS position is that test return lines on Class 2 systems (e.g., HPCI, RCIC, Core Spray) that discharge to the suppression pool are not required for the safety function of the parent system (they may have a passive safety function as extensions of primary containment) are therefore excluded from the examination requirements. They will be verified for unobstructed flow in conjunction with the satisfactory performance of the applicable IST pump test.

Containment spray lines in the RHR System beyond the injection valves are also considered open ended Class 2 piping and are similarly excluded from examination. An open flow test is not required for this piping.

The MS relief valve discharge piping in containment is considered open ended Class 3 piping. The Class 1 relief valve is the isolation boundary. This discharge piping is not included in any periodic pressure test because it is not periodically pressurized as described in IWD-5221.

References

1. ASME Section XI, 2007 Edition, 2008 Addenda IWC-5222(b), IWD-5222(b)

2. ASME Section XI Interpretation XI-1-98-13

TECHNICAL APPROACH AND POSITION NUMBER: PT-04

COMPONENT IDENTIFICATION

Code Classes:	3
Examination Categories:	D-B
Item:	D2.10
Description:	Buried Components

CODE REQUIREMENT

Table IWD-2500-1, Item No. D2.10 requires system leakage tests for the pressure retaining boundary of Class 3 piping. IWA-5244(b)(1) states for buried components where a VT-2 visual examination cannot be performed and the line is isolable by means of valves, a test that determines the rate of pressure loss is required. Alternatively, the test may determine the change in flow between the ends of the buried components.

POSITION

The HPCI and RCIC Class 3 suction piping (18" HP-5 common suction) leading from the Emergency Condensate storage tanks contain a portion of piping that is buried between the Control Building and Reactor Building and is inaccessible for VT-2 examination.

Per 6.HPCI.501, verification that tank levels do not decrease provides verification, per Paragraph IWA-5244(b)(1), that no side stream leakage in the buried portion of the piping is occurring.

REFERENCES

1. ASME Section XI, 2007 Edition, 2008 Addenda, IWA-5244
2. Burns and Roe drawing 4179, STRUCTURAL CONTROL BUILDING SECTIONS & DETAILS
3. Burns and Roe drawing 4171, STRUCTURAL CONTROL BUILDING FOUNDATION PLAN & SECTIONS

10.0 PRESSURE TESTING RELIEF REQUESTS AND REQUESTS FOR ALTERNATIVES

10.0 RELIEF REQUESTS

Throughout this program, the term "relief request" is used interchangeably referring to submittals to the NRC requesting permission to deviate from either an ASME Section XI requirement, a 10 CFR 50.55a rule, or to use provisions from Editions or Addenda of Section XI not approved by the NRC as referenced in 10 CFR 50.55a(1)(ii). However, when communicating with the NRC and in written requests to deviate, the terms as defined below must be used for clarity and to satisfy 10 CFR 50.55a. Submittals to the NRC must clearly identify which of the below rules are being used to request the deviation.

Table 10.0-1 contains an index of Relief Requests written in accordance with 10 CFR 50.55a(z) and (g)(5). The applicable NPPD submittal and NRC Safety Evaluation Report (SER) correspondence numbers are also included for each request.

10.1 Request for Alternatives

When seeking an alternative to the rules contained in 10 CFR 50.55a(b), (c), (d), (e), (f), (g), or (h) the request is submitted under the provision of 10 CFR 50.55a(z). Once approved by the Director, Office of Nuclear Reactor Regulation, the alternative may be incorporated into the ISI program. These types of requests are typically used to request use of Code Cases, Code Edition, or Addenda not yet approved by the NRC. Request for Alternatives must be approved by the NRC prior to their implementation or use. Within the provisions of 10 CFR 50.55a(z) there are two specific methods of submittal:

10.1.1 10 CFR 50.55a(a)(z)(1) allows alternatives when authorized by the NRC, if the proposed alternatives would provide an acceptable level of quality and safety. Requests submitted under these provisions are not required to demonstrate hardship or burden.

10.1.2 10 CFR 50.55a(z)(2) also allows alternatives when authorized by the NRC, if compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. When submitted under this provision, there must be evidence of unusual hardship or difficulty. Typically this hardship will be dose or excessive disassembly.

10.2 Relief Request Required due to Impracticality or Limited Examinations

10 CFR 50.55(a)(g)(5)(iii) and (iv) allows relief to be requested in instances when a Code requirement is deemed impractical with (iv) being specific to examination requirements that are determined to be impractical. The provisions of these two paragraphs are typically used to address impracticalities like limited examination coverage. Under 10 CFR 50.55(a)(g)(5)(iv), relief requests for examination impracticalities must be provided to the NRC no later than 12 months after the end of the active 120-month interval.

In cases where the ASME Section XI requirements for inservice inspection are considered impractical, NPPD will notify the NRC and submit information to support the determination, as required by 10 CFR 50.55a(g)(5). The submittal of this information will be referred to as a Request for Relief.

10.3 Requests to use Later Edition and Addenda of ASME Section XI

On July 28, 2004, the NRC published Regulatory Issue Summary (RIS) 2004-12, "Clarification on Use of Later Editions and Addenda to ASME OM Code and Section XI". This RIS clarifies the NRC position on using Editions and Addenda of Section XI, in whole or in part, later than those specified in the ISI program. If the desired Edition or Addenda are referenced in 10 CFR 50.55a(1)(ii), the request is submitted following the guidance of the RIS. These types of request are not required to demonstrate hardship, difficulty, or provide evidence of quality and safety. They do need to ensure that all related requirements are also used. Requests to use edition and/or addenda of ASME Section XI that are referenced in 10 CFR 50.55a(1)(ii) that are later than the initial Code of Record established for the ISI program shall be submitted under the provisions of 10 CFR 50.55a(g)(4)(iv).

Table 10.0-1
Cooper Nuclear Station
Fifth Interval Relief Requests

Relief Request	Revision	Relief Request Description	NPPD Correspondence	NRC SER Correspondence
RP5-01	0	Implementation of Code Case N-795	NLS2015025 dated 6/18/15	NRC2016005 dated 2/24/16 (CAC No. MF6335)

10 CFR 50.55a Request No. RP5-01
Implementation of Code Case N-795
Propose Alternative in Accordance with 10 CFR 50.55a(z)(2)
Hardship without a Compensating Increase in Quality and Safety

ASME Code Component(s) Affected

Code Class:	ASME Section XI Code Class 1
Component Numbers:	Not Applicable
Code References:	ASME Section XI, 2007 Edition with 2008 Addenda, IWB-5221(a)
Examination Category:	Not Applicable
Item Number(s):	Not Applicable

Applicable ASME Code Requirements

10 CFR 50.55a(b)(2)(xxvi) requires the use of the 1998 Edition, IWA-4540(c) for pressure testing of Class 1, 2, & 3 mechanical joints

The 1998 Edition of ASME Section XI, IWA-4540(c) states: "Mechanical joints made in installation of pressure retaining items shall be pressure tested in accordance with IWA-5211(a). Mechanical joints for component connections, piping, tubing (except heat exchanger tubing), valves, and fittings, NPS-1 and smaller, are exempt from the pressure test." NPPD understands that this means a pressure test is required for a mechanical joint when a new valve or flange greater than NPS-1 is installed as part of the repair/replacement activity, and does not include those items covered by IWA-4132 "Items Rotated From Stock."

Note that the 1998 Edition, IWA-5211(a) states "a system leakage test conducted during operation at nominal operating pressure, or when pressurized to nominal operating pressure and temperature." NPPD has defined this to be a minimum of 1005 psig for components within the Reactor Coolant Pressure Boundary (RCPB).

The applicability for Code Case N-795 begins with the 1998 Edition with the 1999 Addenda and includes applicability to the 2007 Edition with the 2008 Addenda; although the 1998 Edition specified in 10 CFR 50.55a(b)(2)(xxvi) is not included in the published applicability, NPPD believes that the comparison of IWB-5211(a) from the 1998 Edition and IWB-5221(a) of the 2007 Edition with the 2008 Addenda is compatible when the pressure has been defined specifically as described above. Therefore, NPPD concludes that Code Case N-795 may be used for the 1998 Edition specified by the NRC condition found in 10 CFR 50.55a.

Welded or Brazed Joints

ASME Section XI, 2007 Edition with the 2008 Addenda

IWA-4540(a) states: "Unless exempted by IWA-4540(b), repair/replacement activities performed by welding or brazing on pressure-retaining boundary shall include a hydrostatic or system leakage test in accordance with IWA-5000, prior to, or as part of, returning to service. Only brazed joints and welds made in the course of a repair/replacement activity require pressurization and VT-2 visual examination during the test."

Pressure Testing Requirements

ASME Section XI, 2007 Edition with the 2008 Addenda

IWB-5221(a) states: "The system leakage test shall be conducted at a pressure not less than the pressure corresponding to 100% rated reactor power."

Reason for Request

At the Cooper Nuclear Station (CNS), Class 1 pressure tests for repair/replacement activities in accordance with IWA-4540 at pressure corresponding to 100% rated reactor power when performed after Table IWB-2500-1, Category B-P testing has been completed, requires abnormal plant conditions/alignments. Testing at these abnormal plant conditions/alignments results in additional risks and delays while providing little added benefit beyond tests which could be performed at slightly reduced pressures under normal plant conditions.
Code Case N-795 is intended to provide alternative test pressure for certain Class 1 pressure tests. The code case would be used following repair/replacement activities (excluding those on the reactor vessel) which occur subsequent to the periodic Class 1 pressure test required by Table IWB-2500-1, Category B-P and prior to the next refueling outage on those components that cannot be isolated. Component's which can be isolated will be pressure tested at a pressure in accordance with IWB-5221(a).

Performance of the Category B-P pressure test each refueling outage, places CNS in a position of significantly reduced margin, approaching the fracture toughness limits defined in the Technical Specification Pressure Temperature (P-T) Curves. To violate these curves would place the vessel in a low temperature over pressure (LTOP) condition. With strict operational control procedures, specific component alignment and operations staff training regarding LTOP this may be considered acceptable to be at this reduced margin condition for the purpose of verifying the leakage status/integrity of the primary system in order to meet the ASME Section XI, Category B-P requirements prior to startup from a refueling outage, however to perform this evolution more frequently would increase the overall risks to the plant.

Proposed Alternative and Basis for Use

Proposed Alternative

Pursuant to 10 CFR 50.55a(z)(2), relief is requested on the basis that the proposed alternative provides an acceptable level of quality and safety.

NPPD proposes to perform the system leakage testing and associated VT-2 examination following repair/replacement activities on those components that cannot be isolated in accordance with Code Case N-795, however using a longer hold times than specified in the code case. The system leakage test will be performed during the normal operational start-up sequence at a minimum of 900 psig (~90% of the pressure required by IWB-5221(a)) following a one hour hold time (for uninsulated components) and an eight hour hold time (for insulated components) in lieu of the nominal operating pressure associated with 100% reactor power of approximately 1005 psig. Note that this code case is not applicable to Class 1 pressure tests performed to satisfy the periodic requirement of Table IWB-2500-1, Category B-P and is not applicable to pressure tests required following repair/replacement activities on the reactor vessel. NPPD will continue to conduct the periodic system leakage tests required by IWB-2500-1, Category B-P at the end of each refueling outage at a pressure corresponding to 100% rated reactor power.

Basis for Use

By the end of a normal refueling outage the core decay heat has had time to decrease and some spent fuel has been removed and some new fuel has been added. The result is a much lower decay heat load and much lower heatup rates. At the end of a normal refueling outage, the rate of temperature increase is able to be tolerated during the system leakage test. During normal performance of this system leakage test, the pressurization phase of the test is taken at a slow and very controlled pace. The pressurization phase normally takes several hours to reach test conditions.

However, following a maintenance or forced outage, there is a much larger decay heat load from the reactor core. That heat load is difficult to control once SDC has been removed from service. Once SDC is removed from service, heatup starts immediately. During a short term mid-cycle shutdown, the projected heatup rate could be in the order of 0.4°F per minute depending on how quickly SDC is secured. Under those conditions, the time available to pressurize up to test conditions, perform the VT-2 exam and return to SDC will be greatly reduced. The hurried time frames may create a more error-likely environment.

During short mid-cycle outages, the core does have a larger decay heat load. Considering only the actions of isolating SDC from the vessel under high decay heat loads, there is some inherent risk. There would be some probability that once isolated, mechanical, control or operational problems could occur which could delay return to SDC.

The required VT-2 examinations performed following repair/replacement activities are limited to the areas affected by the work thereby allowing for a focused exam. The VT-2 exams, therefore, have a much smaller examination boundary than the periodic test. However, during normal startup with normal power ascension, nominal operating pressure of 1005 psig is reached at a reactor power level of approximately 85%. If access to containment were permitted at this power level, personnel would be exposed to excessive radiation levels, including significant exposure to neutron radiation field, which is contrary to Station ALARA practices.

Indication of leakage identified through the VT-2 examinations during a test at a pressure correlating to either the 100% rated reactor power level or at ~90% of that value will not be significantly different between the two tests. Higher pressure under the otherwise same conditions will produce a higher flow rate but the difference is not significant. Code Case N-795 proposes increased hold times, as compared to a test performed at normal operating pressure, to allow for more leakage from the pressure boundary if a through-wall or mechanical joint leakage condition exists; Further, NPPD proposes to implement longer hold times than specified by the Code Case. NPPD believes these longer hold times are justified to allow for additional leakage to accumulate at the area of interest so as to be more evident during the VT-2 examination, should a through-wall or mechanical joint leakage condition exist. This alternate test pressure, when combined with longer hold times, is still adequate to provide evidence of leakage, should a leak exist.

With respect to using the alternative requirements of Code Case N-795 to welded repair/replacement activities, the ASME concluded during the development of Code Case N-416 "Alternative Pressure Test Requirements for Welded or Brazed Repair, Fabrication Welds or Brazed Joints for Replacement Parts and Piping Subassemblies, or Installation of Replacement Items by Welding or Brazing, Classes 1, 2, and 3" and Code Case N-498, "Alternative Requirements for 10-Year System Hydrostatic Testing for Class 1, 2, and 3 Systems", that the hydrostatic test (a test using pressure higher than a system leakage test) was not a structural integrity test, but a leakage test. The fact that the hydrostatic test does not verify structural integrity served as the basis for replacing it with a system leakage test. Both code cases are approved by the NRC in Regulatory Guide 1.147. It is the requirements of the construction code including the construction code nondestructive examinations used for the repair/replacement activity that ensures structural integrity of the pressure boundary and its welded or brazed connections. Based on research performed by ASME, the effect of testing at a pressure that corresponds with 90% of rated power verses 100% of rated power is not reduced validation of structural integrity, but a potential in leakage rate reduction. Therefore, NPPD believes that the alternative requirements of Code Case N-795 on welded or brazed repair/replacement activities are acceptable.

Research described in the White Paper performed by Argonne National Laboratory, as commissioned by the NRC, indicates that the relationship of leakage and pressure is relatively linear. Therefore, leakage rates associated with pressure at 90% of normal operating pressure would be approximately 10% less than a leakage rate at 100% of normal operating pressure. However, any reduction in leakage rate is more than compensated for by the increase in hold time (600% for noninsulated and 200% for insulated). Other research cited in the White Paper supports the conclusions of Argonne National Laboratory.

While NPPD does not expect that leakage will occur, any leakage will be related to the differential pressure at the point of leakage, or across the connection. A 10% reduction in the test pressure is not expected to result in the arrest of a leak that would occur at nominal operating pressure. In the unlikely event that leakage would occur subsequent to the VT-2 examination, at higher pressures associated with 100% rated reactor power, leakage would be detected by the drywell monitoring systems, which include drywell pressure monitoring, the containment atmosphere monitoring system (CAM), and the drywell floor drain sumps. Leakage monitoring is required by Technical Specifications.

Code Case N-795 and the NPPD proposed hold times allows for an adequate pressure test to be performed; ensuring the safety margin is not reduced due to VT-2 examination being performed at the slightly reduced pressure. There is no physical benefit withheld by testing at the slightly reduced pressure. The affected pressure boundary will be tested and will be otherwise fully capable of performing its intended safety function as part of the Reactor Coolant Pressure Boundary.

The use of Code Case N-795 will only be applied if the System Leakage Test required by IWB-2500-1, Category B-P has been completed for the cycle on components that cannot be isolated and will not be implemented for any repair/replacement activity performed on the reactor pressure vessel.

In summary, the proposed alternative is to perform the system leakage test and VT-2 examination in accordance with Code Case N-795 at 900 psig with a minimum hold time of one hour for uninsulated components and an eight hour hold time for insulated components during maintenance, forced outages, or following the performance of the periodic pressure test required by Table IWB-2500-1, Category B-P during refueling outages. The provisions of this alternative are not applicable to the Examination Category B-P pressure test performed during refueling outages or to pressure tests of repair/replacement activities of the reactor pressure vessel or components that can be isolated. Considering the discussion above, NPPD believes that this alternative will provide an acceptable verification of the leak integrity of the locations having repair/replacement activities performed without putting the plant in a non-conservative operational condition and without unnecessary radiation exposure and safety challenges to personnel.

Duration of Proposed Alternative

This proposed alternative will be used for the entire Fifth Ten-Year Interval of the Inservice Inspection Program for CNS.

Precedents

1. 10 CFR 50.55a(a)(3)(ii) request was approved for Susquehanna Steam Electric Station, Units 1 and 2 Relief Request for the Fourth 10-Year Inservice Inspection Interval (TAC NOS. MF2705 through MF-2714) dated June 9, 2014 and (ADAMS Accession No. ML14141A073).
2. 10 CFR 50.55a(a)(3)(ii) request was approved for Columbia Generating Station Relief Request 3ISI-12 proposed alternative using Code Case N-795 (TAC NO. MF0319) dated August 9, 2013 and (ADAMS Accession No. ML13191A054).
3. 10 CFR 50.55a(a)(3)(ii) request was approved for Monticello Nuclear Generating Plant relief from the requirements of the American Society of Mechanical Engineers code for the Fifth 10-Year Inservice Inspection Program Interval (TAC NOS. ME8068, ME8070, and ME8701) dated February 26, 2013 and (ADAMS Accession No. ML13035A158).
4. 10 CFR 50.55a(a)(3)(ii) request was approved for the MNGP during their Fourth 10-Year Inservice Inspection Interval as a one-time relief by NRC letter "Monticello Nuclear Generating Plant – One Time Inservice Inspection Program Plan Relief Request No. 8 for Leak Testing the "B" and "G" Main Steam Safety Relief Valves (TAC No. MB9538)", dated June 13, 2003 and (ADAMS Accession No. ML031640464).

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

NRC2016005

February 24, 2016

RECEIVED 3/7/16

Mr. Oscar A. Limpias
Vice President-Nuclear and CNO
Nebraska Public Power District
72676 648A Avenue
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR STATION - REQUEST FOR INSERVICE INSPECTION PROGRAM ALTERNATIVE RP5-01 FOR IMPLEMENTATION OF CODE CASE N-795 (CAC NO. MF6335)

Dear Mr. Limpias:

By letter dated June 9, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15167A066), as supplemented by letter dated November 9, 2015 (ADAMS Accession No. ML15321A012), Nebraska Public Power District (NPPD, the licensee) submitted the request for alternative RP5-01, "Implementation of Code Case N-795," to the U.S. Nuclear Regulatory Commission (NRC) for review and authorization.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, paragraph 50.55a(z)(2), the licensee proposed to use provisions similar to those of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Case N-795, "Alternative Requirements for BWR [Boiling Water Reactor] Class 1 System Leakage Test Pressure Following Repair/Replacement Activities, Section XI, Division 1," to perform the leakage testing and associated visual examination for leakage following repair/replacement activities at Cooper Nuclear Station (CNS). ASME Code Case N-795 has not been approved for use by the NRC staff in Regulatory Guide 1.147, Revision 17. The licensee requested to use the proposed alternative on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

As set forth in the enclosed safety evaluation, the NRC staff concludes that proposed alternative RP5-01 provides reasonable assurance of structural integrity and leak tightness, and that complying with the ASME Code requirement would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes use of the proposed alternative at CNS during the fifth 10-year ISI interval that will commence on March 1, 2016, and is scheduled to end on February 28, 2026, until such time as ASME Code Case N-795 is published in a future revision of Regulatory Guide 1.147, which is incorporated by reference in 10 CFR 50.55a.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact Thomas Wengert at 301-415-4037 or via e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

Meena K. Khanna, Chief
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ALTERNATIVE RP5-01

IMPLEMENTATION OF CODE CASE N-795 FOR

FIFTH 10-YEAR INSERVICE INSPECTION PROGRAM INTERVAL

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

DOCKET NO. 50-298

1.0 INTRODUCTION

By letter dated June 9, 2015, as supplemented by letter dated November 9, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML15167A066 and ML15321A012, respectively), Nebraska Public Power District (NPPD, the licensee) submitted request for alternative RP5-01, "Implementation of Code Case N-795," to the U.S. Nuclear Regulatory Commission (NRC) for review and authorization.

Specifically, the licensee proposes to use provisions similar to those of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Case N-795, "Alternative Requirements for BWR [Boiling Water Reactor] Class 1 System Leakage Test Pressure Following Repair/Replacement Activities, Section XI, Division 1," to perform the leakage testing and associated visual examination for leakage (VT-2) following repair/replacement activities at Cooper Nuclear Station (CNS) during the fifth 10-year inservice inspection (ISI) interval. ASME Code Case N-795 has not been approved for use in Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability ASME Section XI, Division 1," Revision 17 (ADAMS Accession No. ML13339A689). The licensee requested to use the proposed alternative on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 REGULATORY EVALUATION

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, paragraph 50.55a(g)(4), "Inservice inspection standards requirements for operating plants," ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the

Enclosure

ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year inspection interval and subsequent 10-year inspection intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month inspection interval, subject to the limitations and modifications listed therein.

The regulations in 10 CFR 50.55a(z) state, in part, that alternatives to the requirements of 10 CFR 50.55a(g) may be used, when authorized by the NRC, if (1) the proposed alternatives would provide an acceptable level of quality and safety, or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Based on analysis of the regulatory requirements, the NRC staff concludes that the regulatory authority exists to authorize the licensee's proposed alternative to the ASME Code requirement on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the staff has reviewed and evaluated the licensee's request pursuant to 10 CFR 50.55a(z)(2).

3.0 TECHNICAL EVALUATION

3.1 The Licensee's Request for Alternative

The licensee is requesting relief from the pressure requirement of ASME Code, Section XI, required system leakage testing of ASME Code Section III, Class 1 mechanical joints made in the installation of pressure retaining items and the Class 1 pressure retaining boundary on which repair/replacement activities have been performed by welding.

ASME Code Requirements

The Code of Record for the CNS fifth 10-year ISI interval that will commence on March 1, 2016, and is scheduled to end on February 29, 2026, is ASME Code, Section XI, 2007 Edition through the 2008 Addenda.

For mechanical joints resulting from repair/replacement activities[1], ASME Code, 1998 Edition, Section XI, paragraph IWA-4540(c) requires mechanical joints made in the installation of pressure retaining items be pressure tested during a system leakage test in accordance with IWA-5211(a). IWB-5221(a) requires that the system leak test be conducted during operation at nominal operating pressure, or when pressurized to nominal operating pressure and temperature.

[1] 10 CFR 50.55a(b)(2)(xxvi), *Pressure Testing Class 1, 2 and 3 Mechanical Joints,* requires licensees using the ASME Code, Section XI, 2001 Edition and later editions and addenda to use the 1998 Edition of the ASME Code, Section XI, paragraph IWA-4540(c), for pressure testing Class 1, 2, and 3 mechanical joints.

For pressure retaining boundaries on which repair/replacement activities have been performed by welding, ASME Code, Section XI, paragraph IWA-4540 requires a hydrostatic or system leakage test in accordance with IWA-5000 prior to, or as part of, returning to service. IWA-5200 requires that a VT-2 examination be performed to detect leakage while the system is in operation, during a system operability test, or while the system is at test conditions using an external pressurization source at temperature and pressure defined in IWB-5000. IWB-5221(a) requires that the system leakage test to be conducted at a pressure not less than the pressure corresponding to 100 percent rated reactor power.

Licensee's Proposed Alternative

The licensee proposes to perform the system leakage test and associated VT-2 examination following repair/replacement activities in maintenance or forced outages in accordance with the provisions of ASME Code Case N-795, but using longer holding times than those specified in the code case. The system leakage test will be performed during the normal operational start-up sequence at a minimum of 900 pounds per square inch gauge (psig), approximately 90 percent of the pressure corresponding to 100 percent rated reactor power [1005 psig] with VT-2 examination following after a 1-hour holding time for uninsulated components and after an 8-hour holding time for insulated components.

Licensee's Basis for Requesting Relief

During normal startup with normal power ascension, nominal operating pressure of 1005 psig is reached at a reactor power level of approximately 85 percent. If access to containment were permitted at this power level, personnel would be exposed to excessive radiation levels, including significant exposure to neutron radiation fields, which is contrary to station as low as reasonably achievable (ALARA) practices.

The licensee stated that, during a maintenance or forced outage, there is a large decay heat load from the reactor core that is difficult to control once shutdown cooling (SDC) has been removed from service. During a short term mid-cycle shutdown, the projected heatup rate could be in the order of 0.4 degrees Fahrenheit per minute once SDC is removed from service. Under those conditions, the time available to pressurize up to test conditions, perform the VT-2 exam and return to SDC would be greatly reduced, and the hurried time frames may create a more error-likely environment. In addition, there is some inherent risk that mechanical, control or operational problems could occur while the SDC is isolated, which could delay return to SDC. Testing at these abnormal plant conditions/alignments results in additional risks and delays while providing little added benefit beyond tests, which could be performed at slightly reduced pressures under normal plant conditions.

As stated, in part, in the licensee's letter dated June 9, 2015:

> Indication of leakage identified through the VT-2 examinations during a test at a pressure correlating to either the 100% rated reactor power level or at ~90% of that value will not be significantly different between the two tests. Higher pressure under the otherwise same conditions will produce a higher flow rate but the difference is not significant. Code Case N-795 proposes increased hold times, as compared to a test performed at normal operating pressure, to allow for more leakage from the pressure boundary if a through-wall or mechanical joint

leakage condition exists. NPPD proposes to implement longer hold times than those specified by the code case. NPPD believes these longer hold times are justified to allow for additional leakage to accumulate at the area of interest so as to be more evident during the VT-2 examination, should a through-wall or mechanical joint leakage condition exist. This alternate test pressure, when combined with longer hold times, is still adequate to provide evidence of leakage, should a leak exist.

3.2 NRC Staff Evaluation

Performance of a system leakage test of pressure retaining boundaries, including mechanical joints, on which repair/replacement activities have been performed, is an integral part of ASME Code, Section XI requirements. The system leakage test for Examination Category B-P components normally occurs at the end of a refueling outage when the core decay heat has had time to decrease, some spent fuel has been removed, and some new fuel has been added, resulting in a relatively low decay heat load. The low decay heat load, compared to that for the high decay heat load found at the start of an outage, results in low heatup rates. When a system leakage test immediately follows a maintenance or forced outage, there is a large decay heat load from the reactor core that is difficult to control once SDC has been removed from service. Isolating SDC under high decay heat loads requires abnormal plant conditions/alignments and is accompanied by inherent risk, and the hurried time frames that result from the high heatup rates may create a more error-likely environment. In addition, there is inherent risk that mechanical, control, or operational problems could occur while the SDC is isolated.

ASME developed Code Case N-795 to provide an alternative test pressure for some Class 1 pressure tests following repair/replacement activities at BWR plants. The alternative was developed because some BWR licensees believe that the Class 1 pressure tests performed at pressures corresponding to 100 percent reactor power require abnormal plant conditions and alignments that increase risk. Code Case N-795 specifies that the leakage test shall be performed at a test pressure of at least 87 percent of that required by IWB-5221(a). Code Case N-795 requires that, before the VT-2 examination commences, a minimum 15-minute holding time for noninsulated components and a 6-hour holding time for insulated components shall be maintained.

In its response to the NRC staff's request for additional information (RAI), by letter dated November 9, 2015, the licensee detailed three methods that would permit VT-2 inspection while at a pressure corresponding to 100 percent normal operating pressure. The first of these methods would require the reactor pressure vessel (RPV) to be filled with coolant and the steam lines flooded to provide a water-solid condition. Use of this method would result in extensive valve manipulations, system lineups, and procedural controls in order to heat up and pressurize the primary system to establish the necessary test pressure without the withdrawal of control rods. The staff concludes that performance of a system leakage test at the conditions present immediately following a maintenance or forced outage using this method, would present multiple operational challenges, unusual difficulty, present a risk to plant operation, and therefore, would present a hardship.

The second method described in the licensee's RAI response would perform the VT-2 examination during normal startup procedures. Nominal operating pressure of 990 psig can be attained with normal startup and normal power ascension, at a reactor power level of approximately 100 percent. If access to containment were permitted at this power level, personnel would be exposed to excessive radiation levels, including significant exposure to neutron radiation fields, which is contrary to station ALARA practices. Establishing the 990 psig test conditions at a more moderate power level and in a manner to address the radiation concerns would require significant changes to the steam pressure control system. The NRC staff concludes that exposure of workers to high radiation fields would present a hardship.

The third method that could possibly be used would maintain the RPV at its normal level and use decay heat to produce sufficient steam pressure to conduct the test at nominal operating pressure. The licensee states that, while the decay heat load is too high for the water-solid method discussed above, there may not be sufficient decay heat available to perform the test at 1005 psig within a reasonable time period, if at all. The NRC staff concludes that use of this alternate method would also present a hardship.

The licensee proposes to use the provisions of ASME Code Case N-795, with additional conditions, for performance of a system leakage test of pressure retaining boundaries, including mechanical joints, on which repair/replacement activities have been performed. These conditions include:

a. Attainment of at least 90 percent of the operating pressure prior to the start of the holding time.
b. Holding time of 1 hour for uninsulated components prior to the VT-2 visual examination.
c. Holding time of 8 hours for insulated components prior to the VT-2 visual examination.

The system leakage test would comprise a VT-2 visual examination after the required test condition holding time. The NRC staff notes that the licensee has defined the nominal operating pressure to be a minimum of 1005 psig for components within the reactor coolant pressure boundary at CNS. Therefore, the system leakage test pressure must be at least ~900 psig before the holding time is started.

The leak tightness of components involved in the repair/replacement activities must be ensured. Leakage through an orifice will be related to the differential pressure at the point of leakage, or across the connection, and is expected to scale with the square root of the pressure. Therefore, the leakage rate at the required 90 percent test pressure would be approximately 95 percent the leakage rate at 100 percent power. A 10 percent reduction in the test pressure is not expected to result in the arrest of a leak that would occur at nominal operating pressure. In the unlikely event that leakage would occur subsequent to the VT-2 visual examination at pressures associated with 100 percent rated reactor power, leakage would be detected by the drywell monitoring systems that are required by technical specifications. The NRC staff therefore concludes that the VT-2 examination, after the specified holding time at 90 percent of system normal operating pressure, will adequately assure leak tightness of the components in the reactor coolant pressure boundary.

Based on the above evaluation, the NRC staff concludes that performing a VT-2 visual examination during a system leakage test at normal operating pressure following a maintenance or forced outage would present a hardship. The staff further concludes that performing the VT-2 examination at pressures equal to, or greater than, 900 psig, with holding times of 1 hour for non-insulated components and 8 hours for insulated components, will provide reasonable assurance of leak tightness. It is the NRC's position that structural integrity is ensured through compliance with ASME Code requirements for design, fabrication, and nondestructive examination.

4.0 CONCLUSION

As set forth above, the NRC staff concludes that proposed alternative RP5-01, "Implementation of Code Case N-795," provides reasonable assurance of structural integrity and leak tightness, and that complying with the ASME Code requirement would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes use of the proposed alternative at CNS during the fifth 10-year ISI interval that will commence on March 1, 2016, and is scheduled to end on February 28, 2026, until such time as ASME Code Case N-795 is published in a future revision of Regulatory Guide 1.147, which is incorporated by reference in 10 CFR 50.55a.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: K. Hoffman

Date: February 24, 2016

If you have any questions, please contact Thomas Wengert at 301-415-4037 or via e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

/RA/

Meena K. Khanna, Chief
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosure:
Safety Evaluation

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11.0 AUGMENTED INSERVICE INSPECTION

Augmented Inservice Inspections (AISIs) are not ASME Section XI requirements, but are 1) additional examination areas or 2) increased inspection frequencies or combinations of both. AISI can be requested by the Nuclear Regulatory Commission (NRC), recommended in General Electric (GE) Service Information Letters (SILs), recommended by the Boiling Water Reactor Vessel Internals Program (BWRVIP) or added by CNS management direction.

Most of the BWRVIP recommended examinations have been moved to the Vessels Internals Program and will not be governed under the ISI program. Although the respective augmented section has been removed, the previous assigned number for that section is noted in the table below to reflect how it was identified or is noted in the ISI database.

When examination components fall into the scheduled examination requirements of ISI and are also AISI requirements, then credit for both requirements may be taken by one examination, (i.e., there will be no double examinations). The types of AISI that are required at CNS are identified in the table, below. The tab number corresponds to the tabbed pages that follow, which contain information on the specific examination to be performed.

TAB	DESCRIPTION
11.1	**"Feedwater Nozzle Examinations In Accordance With U.S. NRC NUREG 0619"** – Ultrasonic examinations of the feedwater nozzle safe ends, bores, and inside blend radii, and visual inspection of the feedwater spargers, shall be performed in accordance with NUREG 0619, as amended by the SER on the BWROG position.
11.2	**"IGSCC in Stainless Steel Piping"** – Ultrasonic examination (UT) of austenitic stainless steel piping in accordance with Generic Letter (GL) 88-01. Moved to the CNS Vessel Internals Program under BWRVIP-75-A – Previously identified as 11.4.
11.3	**"Recirculation Pump Shaft & Cover"** – Visual examination of the Reactor Recirculation (RR) pump shafts, pump covers, impeller/shaft attachment region (including bolts), and hydrostatic bearings (including baffle plate) (reference: GE SIL No. 459 and RICSIL No. 038) – Previously identified as 11.9.

11.1 "Feedwater Nozzle Examinations In Accordance With U.S. NRC NUREG 0619"

References:

1. U.S. NRC NUREG 0619, BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking, published November 1980.
2. Letter, G. R. Horn (NPPD) to U.S. NRC, dated January 22, 1991, subject: BWR Feedwater Nozzle Inspections, Cooper Nuclear Station.
3. Letter, G. R. Horn (NPPD) to U.S. NRC, dated August 14, 1991, subject: BWR Feedwater Nozzle Inspections, Cooper Nuclear Station.
4. Letter, P. W. O'Connor (U.S. NRC) to G. R. Horn (NPPD), dated October 2, 1991, subject: Review of NPPD Request Regarding Feedwater Nozzle Examination Methods.
5. Letter, T. Essig (U.S. NRC) to T. J. Rausch (BWROG), dated June 5, 1998, subject: BWROG-Safety Evaluation of Proposed Alternative to BWR Feedwater Nozzle Inspections (TAC M94090)
6. Calculation NEDC 99-020, Fracture Mechanics Evaluation for The Feedwater Nozzles
7. GE-NE-523-A71-0594-A, Revision 1, May 2000, "Alternate BWR Feedwater Nozzle Inspection Requirements"
8. NRC Final Safety Evaluation of BWR Owner's Group Alternate Boiling Water Reactor (BWR) Feedwater Nozzle Inspection (TAC No. MA6787).
9. BWROG-TP-14-012, Revision 0, Feedwater Nozzle Inspection Frequency 2014, Interference Fit Spargers – Definition Clarification, July 2014.

Source Document: U.S. NRC NUREG 0619, BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking, published November 1980, Reference 1. The Control Rod Drive (CRD) Return Nozzle has been cut and capped and is no longer addressed under this document. Examination of the cap weld has been subsumed into the RI-ISI Program and the CNS Vessel Internal Program – BWRVIP-75-A.

In 1980, as a result of a commitment to Reference 1, CNS removed the existing stainless steel cladding from the Reactor Pressure Vessel (RPV) feedwater nozzles and installed new triple sleeve/double piston ring seal feedwater spargers. Also, at that time, CNS implemented the nondestructive examination requirements of NUREG 0619.

NUREG 0619, Table 2, required a dye penetrant (PT) exam of the inside surfaces on one feedwater nozzle every nine refueling cycles. This would have required, as a minimum, removal of one feedwater sparger and a penetrant examination of that nozzle, as well as examinations of accessible portions of the remaining nozzles. Due to ALARA concerns and operational considerations, CNS proposed in Reference 2, to perform an automated ultrasonic examination (UT) of the feedwater nozzles in lieu of the specified dye penetrant examination. CNS also committed to implement automated feedwater sparger seal leakage and fatigue usage/crack growth monitoring. Furthermore, CNS committed in Reference 3 to qualify the automated UT examination techniques to be employed on a full-size BWR nozzle mockup with several narrow notches and at least one actual fatigue crack. Reference 4, documents the NRC approval of this proposal. CNS implemented these UT examinations during the 1991 Refueling Outage. The BWROG later adopted a similar approach.

In Reference 5, the NRC approved the BWROG inspection program, subject to certain conditions. PT of the nozzle inside radius is no longer required. UT examination of zone 4 is no longer required and UT of zone 5 is only required once per interval. The frequency for inspection of Zones 1, 2 and 3 is now dependent upon the sparger design, a plant-specific fracture mechanics model and the examination method used. The requirements for visual inspection of the sparger are unchanged. CNS uses the triple thermal sleeve sparger design. The results of the fracture mechanics evaluation, Reference 6, demonstrate that the postulated crack growth after 30 years remains within allowable limits. The examination method used was automated, full RF recording (no threshold) prior to Refueling Outage RE22, spring, 2005. In RE22 (January 2005), CNS performed examinations in accordance to Appendix VIII as mandated by 10 CFR 50.55a using a manual technique.

As demonstrated by References 3 and 4, and a review of the examination procedures previously used, CNS has been meeting the intent of the NRC SER since Refueling Outage RE16, fall, 1995. Manual ultrasonic examinations were performed in accordance to ASME Section XI, Appendix VIII in Refueling Outage RE22, spring 2005. In Reference 7, the examination will be scheduled on or before 2015.

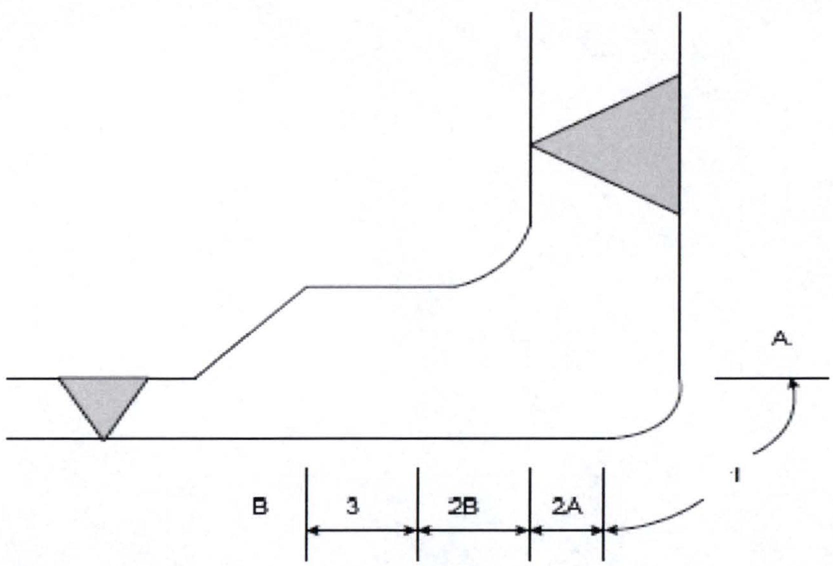
<u>**Associated Documents**</u>:

1) General Electric document GE-NE-523-A71-0594-A, Revision 1, May 2000, "Alternate BWR Feedwater Nozzle Inspection Requirements," Reference 7 and the NRC Final Safety Evaluation of BWR Owner's Group Alternate Boiling Water Reactor (BWR) Feedwater Nozzle Inspection, refer to Reference 8.

2) BWROG-TP-14-012, Revision 0, Feedwater Nozzle Inspection Frequency 2014, Interference Fit Spargers – Definition Clarification, July 2014, refer to Reference 9.

Purpose: NUREG-0619 was issued by the NRC in November 1980, Reference 1 and described a cracking phenomenon of BWR RPV Feedwater (FW) nozzle and CRD nozzle inside radius sections. CNS has modified the Feedwater Nozzles by removal of the nozzle clad and installation of triple-sleeve spargers. The CRD Nozzle was cut and capped. As a result of enhanced technology and more sophisticated techniques for stress and fracture mechanics analysis, the examination of the FW Nozzle Blend Radius is now performed in accordance with NRC approved guidance of GE-NE-523-A71-0594-A Rev.1, Reference 7.

Scope: The scope of this AISI examination program section includes UT of all four of the FW nozzle bores and inside radius sections as depicted in Figure 1 and VT-3 visual examinations for the FW spargers.



The volumetric UT examination region begins at the inside radius-to-vessel intersection point (A). The examination region ends at the point on the inner diameter (ID) corresponding to the point on the outer diameter (OD) where the taper on the nozzle thickness starts at (B).

Figure 1

Method: Volumetric UT examination will be performed on the FW nozzle inside radius sections and VT-3 visual examinations will be performed on the FW spargers.

Industry Code or Standards: ASME Section XI

Frequency: Each inspection interval (10 years) – Feedwater nozzle inside radius ultrasonic examinations, as discussed in NUREG 0619, are scheduled for examination each 10-year inspection interval using either manual or automated techniques in accordance with the alternative inspection guidelines in References 7 and 8. The following is a summary of the information that has formed the basis for this schedule.

Summary

NPPD removed the stainless steel cladding from the RPV feedwater nozzles and installed new triple sleeve double piston ring seal feedwater spargers at CNS in 1980. CNS committed to implement the NDE requirements of NUREG-0619 which requires PT examination of the feedwater nozzle inside radius sections, visual examination of the spargers every four outages and UT of the nozzles every two years.

The BWR Owner's Group (BWROG) submitted report GE-NE-523-A71-0594, Alternate BWR Feedwater Nozzle Inspection Requirements, to the NRC by letter dated October 30, 1995, proposing an alternative to the recommendations in NUREG 0619. The BWROG requested that the NRC approve its proposed alternative feedwater nozzle inspection program.

The NRC issued safety evaluation (TAC M94090), dated June 5, 1998, finding the proposed alternative feedwater nozzle inspection program acceptable, subject to the conditions listed in Section 5.0 of the safety evaluation.

The BWR Owner's Group (BWROG) submitted report GE-NE-A71-0594, Revision 1, dated August 1999 to the NRC for review.

The NRC issued safety evaluation (TAC MA6787) in March 2000 approving the alternative inspection program in GE-NE-A71-0594, Revision 1 as acceptable. The NRC accepted version is denoted with a suffix –A, i.e., GE-NE-A71-0594-A, Revision 1, May 2000.

In accordance to GE-NE-A71-05974-A, Revision 1, the use of modern UT techniques per ASME Section XI, Appendix VIII coupled with plant-specific fracture mechanics assessments that utilize actual plant thermal cycle duty, negates the need for PT examinations and the frequency of UT exams can be reduced. The fracture mechanics analysis was recalculated per (Calculation No. NPPD-13Q-301, 302, and 303; NEDC 99-20). The analysis was performed to the 1989 Edition of the ASME Section XI Code. The analysis supports an examination schedule of one examination each inspection interval, as permitted by GE-NE-A71-05974-A, Revision 1.

GE-NE-A71-05974-A, Revision 1 states beginning with the first examination after compliance to Appendix VIII is required; licensee's examinations will be in accordance to ASME Section XI, Appendix VIII as mandated by 10CFR50.55a. The examination frequency from that point forward will be the ASME Section XI frequency except for those plants with interference fit spargers. CNS uses the new thermal sleeve design therefore the examination frequency will be 10 years as stated in ASME Section XI, Category B-D using either manual or automated techniques. The examination area for the inside radius section is based on ASME Section XI, IWB-2500-1, is Figure IWB-2500-7(b) as augmented by GE-NE-A71-05974-A, Revision 1 (i.e., Zones 1-3).

Modeling is required for examinations qualified to perform the UT technique. EPRI Report IR-2014-557 estimates 100% coverage.

For the spargers, CNS will conduct visual examinations to VT-3 every four (4) outages in accordance with Table 6.1 of GE-NE-A71-05974-A, Revision 1.

- NUREG 0619 feedwater nozzle inside radius section examinations were conducted on all four feedwater nozzles during Refueling Outage RE16, fall, 1995, with the Geris 2000 and supplemented with manual examinations to obtain 100% coverage. No indications that required evaluation were recorded during these examinations.

- NUREG 0619 feedwater nozzle inside radius section examinations were conducted on all four feedwater nozzles during Refueling Outage RE22, spring, 2005. Manual examinations were performed in accordance to ASME Section XI, Appendix VIII. No indications that required evaluation were recorded during these examinations.

- NUREG 0619 VT-3 sparger examinations were last performed during Refueling Outage RE27, fall, 2012.

Acceptance Criteria or Standard: ASME Section XI, IWB-3500

Regulatory Basis: The CNS Updated Safety Analysis Report (USAR), Section 2.7.1 "Inservice Inspection", provides the basis for inspection of the RPV and appurtenances in the ISI Program and has statements, which support the use the examinations that will be performed in accordance with ASME Section XI, Appendix VIII to achieve the level of confidence needed as specified in NUREG-0619.

Responsible Organization: Code Programs is responsible for the development and implementation of the augmented inspection program. Design Engineering is responsible for evaluating conditions of degradation for acceptance or corrective action.

11.3 "Recirculation Pump Shaft & Cover"

References:
1. GE Nuclear Energy SIL No. 459, "Byron-Jackson Recirculation Pump Shaft & Cover Cracking," dated December 15, 1987.
2. GE Nuclear Energy Rapid Information Communication Service Information Letter (RICSIL) No. 038, "Recirculation Pump Hydrostatic Bearing Flange Failure," dated February 8, 1989.

Source Document: GE SIL No. 459, Reference 1 has been used to determine the scope of the visual examinations needed to be performed on the pump shaft, cover and impeller to shaft attachment region, including bolts when the Reactor Recirculation (RR) Pumps are disassembled for maintenance.

Associated Document: GE RICSIL No. No. 038, Reference 2, was used to include visual examination of the hydrostatic bearing flange and baffle plate when the RR Pumps are disassembled for maintenance.

Purpose: GE SIL No. 459, Reference 1 provided a discussion of the following:
Recent observations and measurements of the pumps in operating installations show that some cracks have penetrated to depths greater than 0.3 inches in both the shafts and covers. These depths are greater than previously anticipated based on the expected frequency of thermal cycling. In cover, cracks are axial and could be of sufficient depth to penetrate the closed cooling water (CCW) circuit if cracks and flow passages are at corresponding azimuths. This represents a risk of contaminating a normally clean system and possibly subjecting it to higher pressures. No such occurrences have been reported.

In the shaft, some cracks change orientation from axial to circumferential. This represents an increased risk of shaft failure under normal operating conditions if the cracks propagate to sufficient depth or under abnormal conditions if the shaft is subjected to increased dynamic loading as could occur from cavitation or by a foreign object becoming lodged in the pump. No such failures have been reported in BWR pumps.

During the period in which these recent field observations were made, Byron Jackson performed an analysis of the crack initiation and growth mechanisms. This work included analysis of recent test data from a full scale operating temperature pump shaft and a cover mock-up. The data verified previous conclusions that mixing cold seal purge flow with hot system water initiates cracks. The data also showed that previously unknown low frequency fluctuations support filed observations and indicate that such thermal cracks can penetrate to depths beyond the observed depth of approximately

0.3 inches, but at low propagations rates. Cracking in pumps without seal purge can occur but is expected to be less severe and to occur at a higher position on the shaft and cover.

Then, GE RICSIL No. 038, Reference 2, provided a discussion of the following:
The Byron Jackson pump design used in BWR/3, 4, 5 and 6 employs an internal hydrostatic bearing to support pump shaft radial loads. The hydrostatic bearing is located just above the impeller. The differential head of the pump provides hydrostatic pressurization of the bearing. With the exception of two BWR/6s located in the U.S. and one BWR/6 located outside the U.S., this hydrostatic bearing is designed with a nonrotating bearing baffle plate to minimize turbulence in the bearing orifices. Many plants have a welded design wherein this baffle plate is attached to the outside of the hydrostatic bearing structure with two fillet welds. Circumferential cracking has been observed in and around these fillet welds.

With these concerns about cracking in the components discussed above CNS implemented this AISI program to perform visual examination to determine if these components have cracks when the pumps are disassembled for maintenance.

<u>**Scope**</u>: The components that will be visually examined for thermal fatigue cracks include the pump shaft, cover and impeller to shaft attachment region, including bolts, the hydrostatic bearing flange and baffle plate.

<u>**Method**</u>: Visual Examination.

<u>**Industry Code or Standards**</u>: None

<u>**Frequency**</u>: When or if RR-P-A Pump is disassembled for maintenance.

<u>**Acceptance Criteria or Standard**</u>: Vendor

<u>**Regulatory Basis**</u>: None.

<u>**Responsible Organization**</u>: Code Programs and Plant Maintenance.

12.0 LIST OF APPLICABLE P&IDs, ISOMETRIC AND COMPONENT DRAWINGS

System	P&ID No.	Applicable Isometric No.
Condensate & Feedwater Systems	2004 Sheet 3	2849-4, 2849-50
Circulating, Screen Wash & Service Water System	2006 Sheet 1, Sheet 2, Sheet 3	Jelco 2824-3, X2852-3, 2852-5, 2852-20, 2852-24, 2852-25, 2852-26, 2852-27, X2852-226, X2852-241, X2852-242
Control Building Service Water System	2006 Sheet 4	2851-6, 2851-7, 2852-16, 2852-18, 2852-19, 2852-53, X2852-223
Instrument Air Reactor Building System	2010 Sheet 2	2817-218, 2817-219
Service Air System	2010 Sheet 3	X2817-225, X2850-224
Primary Containment Cooling & Nitrogen Inerting System	2022 Sheet 1 and Sheet 2	Jelco RCO-755-1, RCO-755-2, and RCO-755-3, GE 17C3303 Sheet 4, CNS-PC-19, CNS-PC-20, 0640-012X203/215, IL-E-70-3 Sheet 29, 13095.12-FSK-1-1
Reactor Vessel Instrumentation System	2026 Sheet 1	Jelco X2506-204, X2507-204, X2507-204A, X2507-205, X2507-206, X2507-206A, X2507-207, X2507-208, X2507-218, X2507-219, X2507-220, X2507-300, X2507 -301

System	P&ID No.	Applicable Isometric No.
Reactor Recirculation & Suppression Chamber Vent Systems & Connections	2027 Sheet 1 and Sheet 2	CNS-RR-37, CNS-RR-38 Impell ISO-RL-A, ISO-RL-B CE Drawings. 232-231, 232-239, 232-241-5, 232-242, 232-244, 232-249 GE Drawings. 731E225, BA-3, BN-3, and BH-4 Yarway Drawings 021-043112, 021-102726 X2507-209, X2507-210, X2507-211, X2507-212, X2507-213, X2507-214, X2507-215, X2507-355, X2507-357, X2512-200, 197R576, EDS-113.03, EDS-113.04, EDS-113.05, EDS-0640-012-X203/215, EDS-0640-012-X209/229, EDS-0640-012-213AB
Reactor Building & Drywell Equipment Drain System	2028	Jelco X2512-200, 2506-204, X2507-201, 2628-1, 2628-2, 2628-3, 2628-4, 2628-5, 2628-6, 2713-12, 731E611 Sheet 4, 68-2211-43(CBI), IL-E-70-3 Sheet 20, IL-E-70-3 Sheet 24
Reactor Building Demineralized Water System	2029	2832-5
Reactor Building Closed Cooling Water System	2031 Sheet 1 and Sheet 2	Jelco 2848-1, 2848-2, 2848-7, 2848-8, 2848-9, 2848-14, 2848-15, 2848-16, 2848-21, 2848-22, 2848-50, 2848-51, 2848-52, 2848-54, 2848-55, 2848-56, 2848-57 Jelco X2848-200, X2848-201, X2848-202, X2848-203, X2848-204, X2848-205, X2848-206, SKE-PC-200 Sheet 1, IL-E-70-3 Sheet 34A

System	P&ID No.	Applicable Isometric No.
Reactor Building Service Water System	2036 Sheet 1	Jelco 2851-1, 2851-2, 2851-4, 2852-3, 2852-5, 2852-6, 2852-7, 2852-8, 2852-9, 2852-10, 2852-22, 2852-23, 2852-50, 2852-54, 2852-55, 2852-57
Reactor Building Floor & Roof Drain Systems	2038 Sheet 1	2708-13, 2720-1, 2720-2
Control Rod Drive Hydraulic System	2039	RC Drawing CP-009 Sheet 4 S&W Drawing 13095.19-EP-1A-2 and 13095.19-EP-1B-2
Residual Heat Removal Systems	2040 Sheet 1 and Sheet 2	Jelco 2510-1, 2510-3, 2510-4, 2511-1, 2512-1, 2624-1, 2624-2, 2624-3A, 2624-3B, 2624-3C, 2624-4, 2624-5, 2624-6, 2624 -7, 2625-1, 2625-2, 2625-3, 2625-4, 2626-1, 2626-2, 2626-3, 2626-4 SWECO Drawing H-82454
Reactor Building Main Steam System	2401	GE Drawing 731E611 Sheet 4 Jelco 2506-1, 2506-2, 2506-3, X2506-201, 2601-2, 2601-3, 2614-2, 2628-1, 2628-2, 2628-3, 2628-4, 2628-5, 2628-6, 2629-1, 2629-2, 2629-50, 2507-216, 2507-217, 2507-350, 2507-351, 2507-356
Reactor Water Clean-Up System	2042 Sheet 1	Jelco 2503-1, 2509-1, and X2503-200 GE 141C7063, GE 141C7064, GE-141C7065, GE-141C7090, and 774E826
Reactor Core Isolation Coolant and Reactor Feed Systems	2043	Jelco 2509-1, 2614-1, 2619-1, 2620-1, 2621-1, 2621-2, 2623-1, 2715-5

System	P&ID No.	Applicable Isometric No.
High Pressure Coolant Injection and Reactor Feed Systems and Condensate Supply System	2044, 2049 Sheet 2	Jelco 2509-1 2509-2, 2601-1, 2601-2, 2601-3, 2609-1, 2611-4, 2611-5, 2611-6, 2612-2, 2614-2, 2614-3, 2623-2, 2623-3, X2623-207, 2710-1, 2710-2, 2716-1, EDS 113.01, EDS 113.02
Core Spray System	2045 Sheet 1	Jelco 2501-1, 2502-1, 2602-1, 2602-2, 2603-1 2603-2, 2603-3, 2603-4, 2507-200, IL-E-70-3 Sheet 13
Standby Liquid Control System	2045 Sheet 2	Jelco X2504-200, X2504-201
Diesel Gen. Bldg., Service Water, Starting Air, Fuel Oil, Sump System and Roof Drains	2077	Jelco 2852-24, 2852-25, 2852-26, 2852-27, 2852-55 KVS-47-8 Jelco 2400-1, 2400-3, 2400-4, 2400-6, 2400-7
Reactor Building Traversing Incore Probe Plan & Elevation	2083	2083, 68-2211 Drawing 33, SKE-MISC-131
Stand By Nitrogen Injection System	2084	N/A
Reactor Vessel	N/A	GE 731E-306, 197R576, BA-3, BA-4, BN-3, CE Drawings. 232-231, 235-5, 239, 241-5, 242, 244, 249
Miscellaneous	N/A	Kaiser 110.01

13.0 NONDESTRUCTIVE EXAMINATION PROCEDURE LISTING

The Inservice Inspection Program uses the following CNS NDE related procedures.

No.	Title
0-CNS-VT	Qualification and Certification of Visual Examination (VT) NDE Personnel
3.28.1.1	Visual Inspection Of Pressure Retaining Bolting And Integral Attachments, VT-1
3.28.1.2	Weld Preparation and Marking for ISI
3.28.1.3	Visual Inspection Of Pump Casings And Valve Bodies, VT-3
3.28.1.4	General Visual Examination of Containment Surfaces
3.28.1.5	Visual Examination of Containment Surfaces, VT-3 and VT-1
3.28.1.6	Visual Examination of Containment Bolting VT-1
3.28.5.MT.1	Magnetic Particle Examination Using A/C Yoke for ASME Section XI Inspections
3.28.5.PT.1	Liquid Penetrant Examination for ASME Section XI Inspections
3.28.5.UT.0	Ultrasonic Equipment Linearity Measurements
3.28.5.UT.4	General Ultrasonic Examination
3.28.5.UT.SOC	Socket Weld Ultrasonic Phased Array Weld Examination
7.0.8	Pressure Testing
7.0.8.1	Inservice Leak Testing
7.2.34.1	Snubber Examination (Includes VT-3 of attachments)
7.2.34.2	Pipe Snubber Removal and Installation (Includes guidance for VT-3 of attachments)
7.2.57	ASME Category F-A Component Supports Inspection And Adjustments

Since CNS has limited in-house NDE capability, a combination of vendor and CNS nondestructive examination (NDE) procedures are used as needed. The most current revision of a referenced vendor procedure approved in accordance with CNS Administrative Procedures will be used. CNS reserves the right to use other procedures than those listed provided they meet Code requirements and are approved by CNS and the Authorized Nuclear Inservice Inspector (ANII).

The Performance Demonstration Initiative (PDI) implements ASME Section XI, Appendix VIII, requirements and is implemented via the EPRI NDE Center. It is the current industry standard for UT performance demonstration.

The following additional limitations from 10CFR50.55a also apply:

- Appendix VIII Personnel Qualification. Per 50.55a(b)(2)(xiv), all personnel qualified for performing ultrasonic examinations in accordance with Appendix VIII shall receive 8 hours of annual hands-on training on specimens that contain cracks. CNS may use the annual practice requirements in VII-4240 of Appendix VII of Section XI in place of the 8 hours of annual hands-on training provided that the supplemental practice is performed on material or welds that contain cracks, or by analyzing prerecorded data from material or welds that contain cracks. In either case, training must be completed no earlier than 6 months prior to performing ultrasonic examinations at a licensee's facility.

- Certification of NDE personnel. Per 50.55a(b)(2)(xviii(A), Level I and II nondestructive examination personnel shall be recertified on a 3-year interval in lieu of the 5-year interval specified in the 1997 Addenda and 1998 Edition of IWA-2314, and IWA-2314(a) and IWA-2314(b) of the 1999 Addenda through the latest edition and addenda approved per 10CFR50.55a.

- Substitution Of Alternative Methods. Per 50.55a(b)(2)(xix), the provisions in IWA-4520(b)(2) and IWA-4521 of the 2008 Addenda through the latest edition and addenda approved by 10CFR50.55a, allowing the substitution of ultrasonic examination for radiographic examination specified in the Construction Code are not approved for use.

- Surface Examination. Per 50.55a(b)(2)(xxii), the use of the provision in IWA-2220, "Surface Examination," of Section XI, 2001 Edition through the latest edition and addenda approved per 10CFR50.55a, that allows use of an ultrasonic examination method is prohibited.

14.0 ULTRASONIC CALIBRATION BLOCKS

Ultrasonic calibration blocks listed on the following pages are used in performing examinations required by both the Inservice Inspection (ISI) and Augmented Inservice Inspection (AISI) Programs. They have been designed and procured in accordance with applicable ASME Code and regulatory requirements, and vendor recommendations, to the extent practical. For more detail, see "Ultrasonic Testing Calibration Standards Report, Cooper Nuclear Station, Unit 1, Nebraska Public Power District", Volume 1, Tab 6.

Ultrasonic Calibration Block Table			
Block ID	**Size (in.)**	**Material**	**Notes**
CNS-GE-3-120-C	3	SA-106 GR C	
CNS-GE-6-160-C	6	SA-106 GR B	
CNS-GE-10-120-C	10	SA-106 GR B	
CNS-GE-12-140-C	12	SA-106 GR B	
CNS-GE-14-160-C	14	SA-106 GR B	
CNS-GE-16-160-C	16	SA-106 GR B	
CNS-GE-4-80-S	4	SA-312 TP 304	
CNS-GE-6-80-S	6	SA-312 TP 304	
CNS-GE-10-80-S	10	SA-376 TP 304	
CNS-GE-20-80-S	flat	SA-312 TP 304L	
CNS.CAL.STD.NO.15	RPV	SA-533 GR B	
CNS.CAL.STD.NO.16	RPV	SA-533 GR B	
CNS-GE-6-160-SS	6	SA-312 TP 304	
CNS-GE-4-160-SS	4	SA-312 TP 304	reference block
CNS-GE-16-75-CS	16	SA-106 GR B	
CRD.CAP	6	SA-508 / SB-166	
CNS.CAL.STD.NO.21	6.35	SA-540 GR B24	
CNS.CAL.STD.NO.22	NA	A-285 GR C	reference block
CNS.CAL.STD.NO.23	2.75	SA-540 GR B24	
CNS.CAL.STD.NO.24	NA	A-285 GR C	reference block
CNS.CAL.STD.NO.25	NA	A-285 GR C	reference block

Ultrasonic Calibration Block Table			
Block ID	**Size (in.)**	**Material**	**Notes**
CNS.CAL.STD.NO.26	NA	A-285 GR C	reference block
CNS.CAL.STD.NO.27	NA	A-285 GR C	reference block
CNS.CAL.STD.NO.28	NA	A-285 GR C	reference block
CNS.CAL.STD.NO.29	NA	A-285 GR C	reference block
CNS.CAL.STD.NO.30	NA	A-285 GR C	reference block
CNS.CAL.STD.NO.31	4	SA-312 TP304	reference block
CNS.CAL.STD.NO.32	5	SA-479 TP 304	
CNS.CAL.STD.NO.33	10	SA-376 TP304	
CNS.CAL.STD.NO.34	12	SA-240 TP 304	
CNS.CAL.STD.NO.35	22	SA-240 TP 304	
CNS.CAL.STD.NO.36	24	SA-240 TP 304	
CNS.CAL.STD.NO.37	24	SA-240 TP 304	
CNS.CAL.STD.NO.38	28	SA-240 TP 304	
CNS.CAL.STD.NO.39	20	SA-240 TP 304	
CNS.CAL.STD.NO.40	flat	SA-106 GR B	
CNS.CAL.STD.NO.42	8	SA-106 GR B	
CNS.CAL.STD.NO.43	8	SA-333 GR 6	
CNS.CAL.STD.NO.44	NA	SS	reference block
CNS.CAL.STD.NO.46	NA	SS	reference block
CNS-48-6-80-SS	6	SA-403 GR WP31	
CNS-49-10-80-SS	10	SA-403 GR WP31	

Ultrasonic Calibration Block Table			
Block ID	**Size (in.)**	**Material**	**Notes**
CNS-50-12-80-SS	12	SA-403 GR WP31	
CNS-51-13-1.125-SS	13	SA-312 GR T316	
CNS-52-14-140-SS	14	SA-312 GR T316	
CNS-53-20-80-SS	20	SA-312 GR T316	
CNS-54-22-80-SS	22	SA-312 GR T316	
CNS-55-24-80-SS	24	SA-312 GR T316	
CNS-56-28-1.25-SS	28	SA-312 GR T316	
CNS-57-29-1.935-SS	29	SA-240 T316L	
CNS-58-30-2.25-SS	30	SA-240 T316L	
CNS-59-29-1.620-CS	29	SA-508 CL III	
CNS-60-14-0.972-CS	14	SA-508 CL III	
CNS-61-13-0.844-CS	13	SA-508 CL III	
CNS-62-16-0.375-CS	16	SA-106 GR B	
CNS-63-18-0.438-CS	18	SA-106 GR B	
CNS-64-4-0.531-CS	4	SA-106 GR B	
CNS-65-48-1.250-CS	flat	SA-515 GR 70	
CNS-66-2.490.276.INC	2.49	SB 166 Inconel 600	
CNS-67-2.490-.276-INC	2.49	SB 166 Inconel 600	
CNS-67-2.490-.276-SS	2.49	SA 479 GR 316L	
CNS-68-2.490-.276-SS	2.49	SA 479 GR 316L	
CNS-69-2-80-SS	2.375	A 312 GR TP316L	

Ultrasonic Calibration Block Table			
Block ID	**Size (in.)**	**Material**	**Notes**
CNS-72-8-0.875	8	SA-333 GR 6	
CNS-73-8-100-CS	8	SA-106 GR B	
CNS-75-8-120-CS	8	SA-106 GR B	
CNS-77-10-0.719	10	SA-106 GR B	
CNS-78-10-100-CS	10	SA-106 GR B	
CNS-79-10-0.631	10	SA-333 GR 1	
CNS-83-12-1.00	12	SA-333 GR 1	
CNS-85-12-160-CS	12	SA-333 GR 6	
CNS-89-14-10-CS	14	SA-106 GR B	
CNS-96-18-100-CS	18	SA-106 GR B	
CNS-97-18-160-CS	18	SA-106 GR B	
CNS-100-18-120-CS	18	SA-106 GR B	
CNS-101-18-40-CS	18	SA-106 GR B	
CNS-102-20-40-CS	20	SA-106 GR B	
CNS-103-20-80-CS	20	SA-106 GR B	
CNS-104-24-30-CS	24	SA-106 GR B	
CNS-106-24-80-CS	24	SA-106-GR B	
CNS-107-5.5-0.812-SS	5.5	SA-182 F 316L	
CNS-108-9-1.575-SS	9	SA-182 F 316L	
CNS-109-5.5-0.625-CS	5.5	SA-508 CL 2	
CNS-110-4-80-SS	4	SA-182 F 316L	

Ultrasonic Calibration Block Table			
Block ID	**Size (in.)**	**Material**	**Notes**
CNS-113-24-1.063	24	SA-333 GR 1	
CNS-114-24-1.063	24	SA-155 CL 1	
CNS-115-24-1.593	24	SA-155 CL 1	
CNS.CAL.STD.NO.116	6.25	SA-540 GR B24	Replaced with CNS.CAL.STD.NO.142
CNS-122-3-0.216-CS	3	SA-106 GR B	
CNS-123-2.5-0.203-CS	2.5	SA-106 GR B	
CNS-124-12-0.688-CS	12	SA-106 GR B	
CNS-126-6-0.280-CS	6	SA-106 GR B	
CNS-127-4-0.237-CS	4	SA-106 GR B	
CNS-128-8-0.322-CS	8	SA-106 GR B	
CNS-129-10-0.365-CS	10	SA-106 GR B	
CNS-130-12-0.375-CS	12	SA-106 GR B	
CNS-131-14-0.375-CS	14	SA-106 GR B	
CNS-132-16-0.500-CS	16	SA-106 GR B	
CNS-133-20-0.375-CS	20	SA-106 GR B	
CNS-135-6-0.432-CS	6	SA-333 GR 6	
CNS-136-48-1.750-CS	flat	SA-515-GR 70	
CNS.CAL.STD.NO.142	48.9	A540, GR24	RPV Stud UT Cal Block
CNS.CAL.STD.NO.143	18.13	A540, GR23	RR Pump Stud UT Cal Block
CNS.CAL.STD.NO.144	10.0	SA508, GR2	RPV Flange Ligament
CNS-80-PDIALT-A516-70	0.5-2.0	A516-70	Alternative ASME Calibration Block

Ultrasonic Calibration Block Table			
Block ID	**Size (in.)**	**Material**	**Notes**
CNS-81-PDIALT-T304	0.5-2.0	304 SS	Alternative ASME Calibration Block
CNS-82-PDIALT-T316	0.5-2.0	316 SS	Alternative ASME Calibration Block
4200001626 Sample 1	2.0	A333 Gr1 CS	Socket Weld Elbow Specimen
4200001626 Sample 4	1.5	316 SS	Socket Weld Elbow Specimen

15.0 COMPONENT EXAMINATION SUMMARY LISTING

All components and component supports potentially subject to inservice NDE examination under ASME Section XI, 2007 Edition, 2008 Addenda, are contained in the ISI/CISI Notebooks. Section 5 provides the schedule of examinations for the 5th Interval based on Code Class, Category, Item and applicable percentages.

The tables contained in the ISI/CISI Notebooks identify those components selected for examination during the Fifth Inservice Inspection Interval and provide a tentative schedule by outage for the applicable required examinations to be performed. The examination schedule for a particular outage may be adjusted as necessary to support the outage schedule.

Where regulatory requirements or specific CNS commitments impose additional examinations or use NDE techniques exceeding ASME Section XI requirements, these augmented requirements are shown in the tables. The examination data will be used to satisfy both ASME Section XI and augmented requirements, e.g., GL 88-01, NUREG 0619, GL 94-03, BWRVIP, etc.

16.0 INDEX OF ABBREVIATIONS

SYSTEM/COMPONENT ABBREVIATIONS FOR ASME CLASS 1

SYSTEM/COMPONENT ABBREVIATIONS	SYSTEM/COMPONENTS
AH	Recirculation Loop A Hanger
ASB	Recirculation Loop A Seismic Restraint
ASS	Recirculation Loop A Seismic Restraint
BH	Recirculation Loop B Hanger
BSB	Recirculation Loop B Seismic Restraint
BSS	Recirculation Loop B Seismic Restraint
CHR	Containment Heat Removal
CRD	Control Rod Drive
CRDH	Control Rod Drive Hanger
CRDS	Control Rod Drive Seismic Restraint
CS	Core Spray (Bolting)
CSA	Core Spray Loop A
CSB	Core Spray Loop B
CSH	Core Spray Hanger
CSS	Core Spray Seismic Restraint
CUH	RWCU Hanger
CUS	RWCU Seismic Restraint
CWA	Clean-Up
CWB	RWCU Return
DH	Drain Header
FW	Feedwater
FWA	Feedwater Loop A, Nozzle N4A
FWAB	Feedwater Loops A and B
FWB	Feedwater Loop B, Nozzle N4B
FWC	Feedwater Loop C, Nozzle N4C
FWD	Feedwater Loop D, Nozzle N4D

SYSTEM/COMPONENT ABBREVIATIONS FOR ASME CLASS 1

SYSTEM/COMPONENT ABBREVIATIONS	SYSTEM/COMPONENTS
HA	MS Hanger Loop A
HB	MS Hanger Loop B
HC	MS Hanger Loop C
HD	MS Hanger Loop D
HM	RPV Bottom Head Meridional
HMA	Bottom Head - Meridional Welds
HMB	Bottom Head - Meridional Welds
HMC	Bottom Head - Circumferential Welds
HMD	Bottom Head - Circumferential Welds
HME	Top Head - Meridional Welds
HNC	Bottom Head - Vessel Support Skirt
HPCI	High Pressure Coolant Injection
JPA	Jet Pump Instrumentation - Loop A
JPB	Jet Pump Instrumentation - Loop B
MS	Main Steam (Bolting)
MSA	Main Steam - Loop A
MSB	Main Steam - Loop B
MSC	Main Steam - Loop C
MSD	Main Steam - Loop D
MSDR	Main Steam - Drain
MSH	Main Steam Hanger
MSS	Main Steam Seismic Restraint
NB	Nuclear Boiler
NVE	Nozzle-To-Vessel
NVIR	Nozzle Vessel Inner Radius
PRA	Pressure Retaining Bolting - Studs
PRB	Pressure Retaining Bolting - Nuts
PRC	Pressure Retaining Bolting - Washers

SYSTEM/COMPONENT ABBREVIATIONS FOR ASME CLASS 1

SYSTEM/COMPONENT ABBREVIATIONS	SYSTEM/COMPONENTS
PRD	Pressure Retaining Bolting - Bushings
PRE	Pressure Retaining Bolting - Ligaments
PRF	Ring Girder Anchor Bolts
PRG	RPV Skirt-To-Ring Girder Bolts
PSA	HPCI Steam
PWA	HPCI Water
RAH/RAD	Recirculation - Loop A Discharge
RAS	Recirculation - Loop A Suction
RBH/RBD	Recirculation - Loop B Discharge
RBS	Recirculation - Loop B Suction
RCA	CRD Return
RCIC	Reactor Core Isolation Cooling (Bolting)
RF	Reactor Feedwater Bolting
RFH	Reactor Feedwater Hanger
RFS	Reactor Feedwater Seismic Restraint
RHA	20" RHR Supply
RHB	RHR - Loop A
RHC	RHR - Loop B
RHD	6" RHR Head Spray
RHH	RHR Hanger
RHR	Residual Heat Removal (Bolting)
RHS	RHR Seismic Restraint
RR	Reactor Recirculation (Bolting)
RRA	Recirculation - Loop B
RRB	Recirculation - Loop B
RRC	Recirculation - Loop B
RRD	Recirculation - Loop B
RRE	Recirculation - Loop B

SYSTEM/COMPONENT ABBREVIATIONS FOR ASME CLASS 1

SYSTEM/COMPONENT ABBREVIATIONS	SYSTEM/COMPONENTS
RRF	Recirculation - Loop A
RRG	Recirculation - Loop A
RRH	Recirculation - Loop A
RRJ	Recirculation - Loop A
RRK	Recirculation - Loop A
RRP	Reactor Recirculation Pump
RSA	RCIC - Steam
RVD	Reactor Vessel Drain
RVI	Reactor Vessel Instrumentation
RWA	RCIC - Water
RWCU	Reactor Water Cleanup (Bolting)
SC	Shell Course
SLC	Standby Liquid Control
SLH	Standby Liquid Control Hanger
SSA	MS Seismic Restraint Loop A
SSB	MS Seismic Restraint Loop B
SSC	MS Seismic Restraint Loop C
SSD	MS Seismic Restraint Loop D
VCB	RPV Circumferential Welds
VLA	RPV Shell Course 1 Longitudinal Welds
VLB	RPV Shell Course 2 Longitudinal Welds
VLC	RPV Shell Course 3 Longitudinal Welds
VLD	RPV Shell Course 4 Longitudinal Welds

SYSTEM/COMPONENT ABBREVIATIONS FOR ASME CLASS 2

SYSTEM/COMPONENT ABBREVIATIONS	SYSTEM/COMPONENT
BHS	Bleed Steam Hanger
BSS	Bleed Steam Seismic Restraint
CAD	Containment Atmospheric Dilution
CDS	Condensate Supply
CND	Condensate
CS	Core Spray
HPCI	High Pressure Coolant Injection
HPEX	HPCI Exhaust
MS	Main Steam
MSH	Main Steam Hanger
MSS	Main Steam Seismic Restraint
N	Nitrogen Primary Containment Bolting
OG	Off Gas
PNC	Nitrogen Primary Containment System
PSA	HPCI Steam
PVH	Process Vent Hanger
PVS	Process Vent Seismic Restraint
RAS	RHR Loop A, Steam
RAW	RHR Loop A, Suction Bypass, Torus Test Line and Torus Spray
RBS	RHR Loop B, Steam
RBW	RHR Loop B, Water
RCC/REC	Reactor Equipment Cooling
RCIC	Reactor Core Isolation Cooling
RCT	RHR Cross Tie
RHA	RHR 20" Supply
RHB	RHR Loop A - Water
RHC	RHR Loop B - Water
RHD	6" RHR Head Spray

SYSTEM/COMPONENT ABBREVIATIONS FOR ASME CLASS 2

SYSTEM/COMPONENT ABBREVIATIONS	SYSTEM/COMPONENT
RHE	Containment Spray Loop B
RHF	RHR Heat Exchanger Flange Bolting
RHG	Containment Spray Loop A
RHH	RHR Hanger
RHR	RHR Heat Exchangers
RHRA	RHR Pump A Strainer, Bolting
RHRB	RHR Pump B Strainer, Bolting
RHRC	RHR Pump C Strainer, Bolting
RHRD	RHR Pump D Strainer, Bolting
RHS	RHR Seismic Restraint
RPA	RHR Pump, A Loop
RPB	RHR Pump, B Loop
RPC	RHR Pump, C Loop
RPD	RHR Pump, D Loop
RSA	RCIC - Steam
RWA	RCIC - Water
RWCU	Reactor Water Cleanup
SDN	Scram Discharge Volume, North Header
SDS	Scram Discharge Volume, South Header
SGTS	Standby Gas Treatment System
SW	Service Water
TDA	Torus Drain, Loop A
TDB	Torus Drain, Loop B
TH	Torus Hanger

SYSTEM/COMPONENT ABBREVIATIONS FOR ASME CLASS 3

SYSTEM/COMPONENT ABBREVIATIONS	SYSTEM/COMPONENTS
FPC	Fuel Pool Cooling and Cleanup
HPCI	High Pressure Coolant Injection
REC	Reactor Equipment Cooling
SLC	Standby Liquid Control
SW	Service Water
VR	Radioactive Vents

MISCELLANEOUS COMPONENT ABBREVIATIONS

COMPONENT ABBREVIATIONS	COMPONENT DESCRIPTION
B	Branch
BHD	Bottom Head
BLT	Bolting
BU	Bushings
C	Circumferential
CAP	Cap
CH	Channel Side
COU	Coupling
DOM	Dome
DR	Distributor Ring
DREB	Distributor Ring End Bottom
DRET	Distributor Ring End Top
E	Elbow
F	Flange
FH	Flued Head
H	Hanger
HOU	CRD Housing
HSL	Hanger - Shear Lug
IA	Elbow Inside Arc Seam
L	Lug
LIG	Ligaments
LL	Lifting Lug
LS	Longitudinal Seam
M	Meridional
N	Nozzle
NIR	Nozzle Inner Radius
NT	Nut
OA	Elbow Outside Arc Seam

MISCELLANEOUS COMPONENT ABBREVIATIONS

COMPONENT ABBREVIATIONS	COMPONENT DESCRIPTION
OR	Orifice
P	Pipe
PC	Containment
PED	Concrete Pedestal
PU	Pump
R, RED	Reducer
RE	Reducing Elbow
RGB	Ring Girder Bolts
RP	Reinforcing Plate
RT	Reducing Tee
SAD	Saddle
SB	Snubber
SE	Safe End
SH	Shell Side
SHB	Shell Bottom
SHF	Shell Flange
SHT	Shell Top
SK	RPV Support Skirt
SOL	Sock-O-Let
SP	Support
SS	Shock Suppressor
SSL	Snubber - Shear Lug
ST	Stud
STB	CRD Stub Tube
STN	Stanchion
THD	Top Head
TS	Tube Sheet
TSB	Tube Sheet Bottom

MISCELLANEOUS COMPONENT ABBREVIATIONS

COMPONENT ABBREVIATIONS	COMPONENT DESCRIPTION
TST	Tube Sheet Top
V, VA	Valve
VE	Vessel
4W	Four-Way Cross
WA	Washer
WE	Weldolet
VEL	Velocity Limiter

HANGER AND SUPPORT ABBREVIATIONS

FIELD	ABBREVIATION	DESCRIPTION
ABS	Attachment to Building Structure	
	B	Bolted
	W	Welded
APRC	Attachment to Pressure Retaining Component	
	B	Bolted
	HG	Hanger
	NA	Not Attached
	PC	Primary Containment Penetration
	PI	Pipe
	PU	Pump
	VA	Valve
	VE	Vessel
	W	Welded
BS	Building Structure	
	CB	Concrete Beam
	CC	Concrete Ceiling
	CF	Concrete Floor
	CW	Concrete Wall
	CWC	Concrete Wall and Ceiling
	CWF	Concrete Wall and Floor
	DW	Drywell
	EP	Embedment Plate

HANGER AND SUPPORT ABBREVIATIONS

FIELD	ABBREVIATION	DESCRIPTION
	FH	Flued Head
	SSL	Stainless Steel Liner
	SS	Structural Steel
	TRS	Torus
HSK	Sketch/Drawing Number of Hanger	
	BZ Prefix	Stone & Webster Drawing Vendor
	KE Prefix	Kaiser Engineers Drawing Vendor
	B Prefix	Berg Patterson Drawing Vendor
	SK Prefix	ITT Grinnell Drawing Vendor
	Suffix E0855	EDS Drawing Vendor
	Suffix N	NPPD Drawing
IAS	Intermediate Attachment of Support	
	B	Bolted
	W	Welded
SD	Support Design	
	HS	Horizontal Support
	LS	Lateral Support
	VS	Vertical Support
SF	Support Function	
	DW	Dead Weight
	DWS	Dead Weight Sliding
	HS	Horizontal Support

HANGER AND SUPPORT ABBREVIATIONS

FIELD	ABBREVIATION	DESCRIPTION
	INS	Insulation Protection
	SS	Stanchion Sliding
	VS	Vertical Support
ST	Support Type	
	CS	Constant Support
	CST	Constant Support Trapeze
	HS	Hydraulic Snubber
	MS	Mechanical Snubber
	PVV	Pumps, Valves and Vessel Supports
	RB	Rigid Brace
	RBF	Restraint Box Frame
	RBT	Rigid Brace Trapeze
	RH	Rod Hanger
	RHT	Rod Hanger Trapeze
	RPR	Rod Hanger Pipe Roll
	RSF	Restraint Structural Frame
	STN	Stanchion
	SWB	Sway Brace
	SWS	Sway Strut
	VL	Velocity Limiter
	VS	Variable Spring
	VST	Variable Spring Trapeze

HANGER AND SUPPORT ABBREVIATIONS

FIELD	ABBREVIATION	DESCRIPTION
BLDG	Building/Location	
	CONT	Containment
	CTRL	Control Building
	DW	Drywell
	HP	HPCI Pump Room
	NEQ	Northeast Quad
	NPC	North Pipe Chase
	R-RB	Reactor Building
	SEQ	Southeast Quad
	SPC	South Pipe Chase
	SWB	Service Water Building
	TB	Torus Bottom
	TT	Torus Top
	TURB	Turbine Building
	SWQ	Southwest Quad
	NWQ	Northwest Quad

JOINT-TYPE ABBREVIATIONS

JOINT-TYPE ABBREVIATIONS	DESCRIPTION
BW	Butt Weld
LW	Lap Joint
SW	Socket Weld
TW	T-Joint
CLAD	Clad
NIR	Nozzle Inner Radius
NVE	Nozzle to Vessel

MATERIAL SPECIFICATION ABBREVIATIONS

Material Specification Abbreviations (Note 1)	Material Specification Description
P-1	Seamless carbon steel: ASTM-A-106-GR-B and USAS B36.10
P-2	Seamless carbon steel: ASTM-A-33-GR-1 and USAS B36.10 - by electric furnace process with Charpy "V" notch tests @-20° F and 15 ft-lbs.
P-3	Electric fusion welded carbon steel: ASTM-A-155-CL-1 KC-70 plate to ASTM-A-516-GR-70 plate, fire box quality.
P-4	Electric fusion welded carbon steel: ASTM-A-155-CL-1 KC-50 plate to ASTM-A-285-GR-B plate, fire box quality.
P-5	Seamless carbon steel: ASTM-A-53 GR-B and USAS B36.10.
P-6	Electric resistance welded carbon steel: ASTM-A-53-GR-B Type E and USAS B36.10.
P-7	Seamless carbon steel (galvanized): ASTM-A-53 GR-B and USAS B36.10.
P-8	Electric fusion welded carbon steel: ASTM-A-155-CL-II C-50 plate to ASTM-A285-GR-B plate, fire box quality, designed to ASA B31.1.0 & Para. UG-28 of ASME Section VIII with 0.120" corrosion allowance.
P-9	Electric resistance welded carbon steel: ASTM-A-135-GR-A and USAS B36.10.
P-10	Seamless galvanized carbon steel: ASTM-A-120 and USAS B36.10
P-11	Seamless alloy steel: ASTM-A-335-GR-P-11 and USAS B36.10.
P-12	Seamless & welded austenitic stainless steel: ASTM-A-312-GR-TP304 and USAS B36.10.

MATERIAL SPECIFICATION ABBREVIATIONS

Material Specification Abbreviations (Note 1)	Material Specification Description
P-13	Electric fusion butt-welded straight seam carbon steel AWWA-C-201 & ASTM-A-134 plate to ASTM-A-283-GR-C pipe.
P-14	Seamless and welded austenitic stainless steel: ASTM-A-312-GR-TP316 and USAS B36.19.
P-15	Seamless austenitic stainless steel pipe: ASTM-A-376-GR-TP304 plate.
P-16	Electric fusion welded austenitic chromium nickel alloy steel pipe: ASTM-A-358-GR-TP304.
P-17	Austenitic stainless steel plate: SA-358 Class 1, A240 TP304
P-18	SB-166 Inconel
P-19	SA-312 GR TP316
P-20	Nuclear grade stainless steel pipe: 316 NG
P-21	Seamless and welded austenitic stainless steel pipe: SA-312-GR-TP316L
F-1	Wrought carbon steel: ASTM-A-234-GR-WPB and USAS B16.9
F-2	Wrought carbon steel: ASTM-A-234-GR-WPC and USAS B16.9
F-3	Electric fusion welded: ASTM-A-234-GR-WPBW plate to ASTM-A-516-GR-70 fire box quality
F-4	Electric fusion welded: ASTM-A-234-GR-WPBW plate to ASTM-A-285-GR-B fire box quality
F-5	Wrought alloy steel" ASTM-A-234-GR-WP-11
F-6	Forged carbon steel: ASTM-A-234-GR-WPB forgings to ASTM-A-105-GR-2 and USAS B16.11

MATERIAL SPECIFICATION ABBREVIATIONS

Material Specification Abbreviations (Note 1)	Material Specification Description
F-7	Wrought carbon steel: ASTM-A-105-GR-2 and USAS B16.11 and MSS-SP-49
F-8	Galvanized malleable iron: ASTM-A-197 and USAS B16.3 and B2.1
F-9	Cast bronze: ASTM-B-61 and USAS B16.15 and B2.1
F-10	Cast iron: ASTM-A-126-A and USAS B16.12
F-11	Cast Iron: ASTM-A-126-A and USAS B16.1
F-12	Wrought carbon steel: ASTM-A-234-GR-WPBW and USAS B16.9 or ASTM-A-234-GR-WPB forging to A105-GR-II and USAS B16.9
F-13	Wrought carbon steel ASTM-A-234-GR-WPBW and USAS B16.9 to match B36.10 pipe
F-14	Galvanized Cast Iron: ASTM A & B and USAS B16.1
F-15	Malleable iron: ASTM-A-197 and USAS B16.3 and USAS B2.1
F-16	Forged alloy steel: ASTM-A-234-GR-WP-11 to ASTM-A-182-GR-F-11 and USAS B16.11
F-17	Forged alloy steel: ASTM-A-403 to ASTM-A-182-GR-F-304 and USAS B16.11
F-18	Forged alloy steel: ASTM-A-403 to ASTM-A-182-GR-F-304 and USAS B16.11
F-19	Wrought austenitic steel: ASTM-A-403 to and USAS B16.9 Grade WP-304
F-20	Wrought austenitic steel: ASTM-A-403 to and USAS B16.9 Grade WP-316

MATERIAL SPECIFICATION ABBREVIATIONS

Material Specification Abbreviations (Note 1)	Material Specification Description
F-21	Forged alloy steel: ASTM-A-403 to ASTM-A-182-GR-F-316 and USAS B16.11
F-22	Wrought carbon steel, seamless or welded, for low temperature service: ASTM-A-420-GR-WPLI and USAS B-16.11
F-23	Forged carbon steel: ASTM-A-420 to ASTM-A-350-GR-LFI and USAS B16.11
F-24	A-325-GR-LC
F-25	SA-216
F-26	Wrought austenitic stainless steel: SA-403-GR-WP316L
F-27	Forged austenitic stainless steel for high temperature service: SA-182-GR-F316L
RPV-1	A-508/SA-508 Class 2
RPV-2	A-533/SA-533
S-1	RPV Stud: SA-540-GR-B24

NOTE 1: Material specification abbreviations generally correspond with the CNS Material Specification Codes used by the Architect-Engineer during construction. Specifications greater than P-17 or F-22, and RPV-1, RPV-2, and S-1, were added for completeness. The Component Examination Summary Tables and the ISI database uses the actual material specifications to the extent practicable.

17.0 RI-ISI LIVING PROGRAM EVALUATION

Introduction

The objective of the RI-ISI program is to provide an alternative method for selection and categorizing piping and components into HSS and LSS groups for the purpose of developing a RI-ISI program as alternative to the ASME Section XI requirement for Examination Categories B-F, B-J, C-A, C-B, C-F-1, and C-F-2. CNS is a Class 1 and 2 applications that uses Code Case N-716-1. The NRC approved this code case in August 2014 in Regulatory Guide 1.147 Revision 17. The code case was placed in Table 1 and approved with no conditions.

Purpose

The RI-ISI program outlines an acceptable alternative approach to the existing Section XI requirements for the scope and frequency of piping examination.

Scope

Code Case N-716-1 provides alternative requirements to IWB-2420, IWB-2430, Table IWB-2500-1 Examination Category B-F and B-J, IWC-2420, IWC-2430, and Table IWC-2500-1 (excluding Examination Categories C-C and C-H), for inservice inspection of Class 1 piping welds or Class 2 components, IWB-2200 and IWC-2200 for preservice inspection of Class 1 piping welds or Class 2 component, or as additional requirements for Class 3 or non-class components. The following summarized the ASME Section XI scope included in the N-716-1 evaluations:

Table 1: N-716-1 Evaluation Scope

System	Code Class	Exam Category
CS - Core Spray	1, 2	B-F, B-J, C-F-2
HPCI - High Pressure Coolant Injection	2	C-F-2
MS – Main Steam	1, 2	B-J, C-F-2
MSDR – Main Steam Drains	1	B-J
NB – Nuclear Boiler	1	B-F, B-J
NBDR – Nuclear Boiler Drains	1	B-F, B-J
NBI – Nuclear Boiler Instrumentation	1	B-F, B-J
PC - Primary Containment	2	C-F-2, C-G
RCIC - Reactor Core Isolation Cooling	2	C-F-2
REC - Reactor Equipment Cooling	2	C-F-2
RF - Reactor Feedwater	1	B-J
RHR - Residual Heat Removal	1, 2	B-J, C-F-2, C-A, C-B
RR - Reactor Recirculation	1	B-F, B-J
RWCU - Reactor Water Cleanup	1	B-J
SDV - Scram Discharge Volume	2	C-F-2
SLC - Standby Liquid Control	1	B-F, B-J

Frequency
The inspection periods and inspection interval are defined in 3.2. The piping segments and inspection strategy (i.e., frequency, number of examinations, and examination methods) are defined in Section 5.

During the Fifth 10-Year ISI Interval, CNS will implement 100% of the inspection locations selected for examination per Code Case N-716-1. Examinations shall be performed such that the period percentage requirements of ASME Section XI are met. All Category C-A and C-B welds are considered LSS and do not require examination.

Periodic Updates
As part of the implementation of this code case, in accordance with Section 7 (N-716-1) "For the 2007 Edition through the latest Edition and Addenda, examination selections made in accordance with this Case shall be reevaluated on the basis of inspection periods that coincide with the inspection program requirements of IWA-2431. For the inspection program, the third period reevaluation will serve as the subsequent inspection interval reevaluation." This is the start of a new inservice inspection interval and the first time implementing Code Case N-716-1. As the reevaluations are performed over the course of the 5th Inservice Inspection Interval this section shall be updated accordingly.

Corrective Action Program
Any corrective action required as the result of RI-ISI examinations shall be handled in accordance with CNS Corrective Action Program.

Inservice Inspection Requirements
The examinations shall be completed during each 10-year inspection interval with the following exceptions:

a) If during the inspection interval, a reevaluation using the RI-ISI process is conducted and scheduled items are no longer required to be examined, these items may be eliminated.
b) If during the inspection interval, a reevaluation using the RI-ISI process is conducted and items are required to be added to the examination program those items shall be added in accordance with IWB-2412(b) or IWC-2412(b).

LSS components are exempt from volumetric, surface, and VT-1 and VT-3 Visual Examination requirements of Section XI. HSS vessels, pumps, valves, and pressure-retaining bolting shall be selected and examined in accordance with Section XI. Ten percent of the HSS piping welds shall be selected for examination. The existing plant IGSCC (Generic Letter 88-01, Categories B through G) inspection program may be credited toward the 10% requirement, provided the requirements of N716-1 are met. The existing plant flow accelerated corrosion program and localized corrosion program, excluding crevice corrosion, may not be credited toward the 10% requirement. The selection of HSS components for examination is based on Section 4 of Code Case N-716-1.

Preservice Inspections

For plants implementing N-716-1 after initial startup, the PSI requirements apply only to the HSS components affected by a repair/replacement activity.

a) Vessels, pumps, valves, and pressure-retaining bolting require preservice inspection at least once prior to initial service. The examination volumes, areas, techniques, and procedures shall be in accordance with the applicable requirements of Section XI.
b) Piping weld examinations, with the exception of VT-2 visual examinations listed in N-716-1 Table 1, shall be performed in accordance with the requirements defined in N716 Table 1 at least once prior to initial service. Examinations shall include all piping welds, with the exception of VT-2 visual examinations listed in N-716-1 Table 1, classified as HSS in accordance with N-716-1.

Successive Examinations

Successive examinations shall be in accordance with Section 6 of Code Case N-716-1.

Additional Examinations

Additional examinations shall be in accordance with Section 6 of Code Case N-716-1.

Examination Coverage

Code Case N-716-1 provides additional requirements for examination coverage within the Notes to Table 1. If none of these Notes apply to a specific examination listed in Table 1, then examination coverage will be in accordance with ASME Section XI.

References:

1. ASME Section XI Code Case N-716-1, "Alternative Piping Classification and Examination Requirements," Approved January, 2013.

2. Cooper ISI Weld Database

3. EPRI Letter from Mr. Pat O'Regan to Mr. Steve Welp of Calvert Cliffs Nuclear Power Plant, Inc. dated February 28, 2002

4. Cooper PRA Inputs
   a. ISI IE CDFs and LERFs.xslx
   b. CNS PSA-012, rev 2, "Internal Flood Evaluation Summary and Notebook," February 2015.
   c. CNS PSA-014, rev 2, "Quantification Notebook," October 2011.
   d. CNS PSA-001, rev 2, "Initiating Events Notebook," January 2008.
   e. NEDC 08-004, rev 0, "Failure Probability of Fire Protection Piping," February 2008.

f. PSA-ES086, rev 0, "Impact on CDF of Fire Protection System (FPS) Piping Critical Breaks in Control Building," April 2008.
g. PRA-ES096, rev 0, "Dispositioning of CNS PRA Findings and Observations (F&Os)," February 2010.

5. EPRI TR-112657, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," Final Report, Revision B-A, December 1999.

6. Cooper ISI Flow Diagrams
2022, rev N78, "Primary Containment"
2026 Sht 1, rev N64, "Nuclear Boiler Instrumentation"
2027 Sht 1, rev N69, "Reactor Recirculation"
2027 Sht 2, rev N13, "Reactor Recirculation"
2040 Sht 1, rev N82, "Residual Heat Removal"
2040 Sht 2, rev N18, "Residual Heat Removal"
2041, rev N85, "Residual Heat Removal"
2042 Sht 1, rev N34, "Nuclear Boiler Drain"
2043, rev N54, "Reactor Feedwater/Main Steam/Reactor Core Isolation Cooling"
2044, rev N72, "Reactor Feedwater/Main Steam/Reactor Core Isolation Cooling"
2045 Sht 1, rev N58, "Core Spray"
2045 Sht 2, rev N21, "Standby Liquid Control"

7. Cooper Isometric Drawings
232-242, Rev 7, "Nuclear Boiler"
232-244, Rev 2, "Nuclear Boiler"
73E611 Sheet 4, Rev N02, "Main Steam"
2501-1, Rev N14, "Core Spray"
2502-1, Rev N07, "Core Spray"
2503-1, Rev N13, "Reactor Water Cleanup"
2506-1, Rev N07, "Main Steam"
2506-2, Rev N04, "Main Steam"
2506-3, Rev N11, "Main Steam Drains"
2509-1, Rev N19, "Reactor Feedwater"
2509-2, Rev N13, "Reactor Feedwater"
2510-1, Rev N09, "Residual Heat Removal"
2510-3, Rev N09, "Residual Heat Removal"
2510-4, Rev N09, "Residual Heat Removal"
2512-1, Rev N05, "Reactor Recirculation"
20977-H, Rev N05, "Reactor Feedwater"
21026-H, Rev N02, "Residual Heat Removal"
CB&I 20, Rev 10, "Nuclear Boiler Instrumentation"
CNS-CS-3, Rev N02, "Core Spray"
CNS-CS-4, Rev N02, "Core Spray"
CNS-RR-37, Rev N04, "Reactor Recirculation"
CNS-RR-38, Rev N03, "Reactor Recirculation"

X-2501-201, Rev N00, "Core Spray"
X-2503-200, Rev N01, "Reactor Water Cleanup"
X-2504-200, Rev N04, "Standby Liquid Control"
X-2504-201, Rev N02, "Standby Liquid Control"
X-2507-218, Rev N11, "Nuclear Boiler Instrumentation"
X-2507-219, Rev N07, "Nuclear Boiler Instrumentation"
X-2510-200, Rev N03, "Residual Heat Removal"
X-2510-202, Rev N06, "Residual Heat Removal"
X-2510-203, Rev N02, "Residual Heat Removal"
X-2510-204, Rev N08, "Residual Heat Removal"
X-2512-200, Rev N04, "Nuclear Boiler Drains"
X-2512-201, Rev N05, "Reactor Recirculation"
X-2512-300, Rev N04, "Reactor Recirculation"

8. Structural Integrity Calculation No. 1401334.301, "Degradation Mechanism Evaluation for Cooper," Revision 0.

9. IDDEAL Solutions Report, "Cooper Nuclear Station History Review, Supporting Implementation of Code Case N-716-1", dated July 16, 2015.

10. EPRI Report 1021467, "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs."

11. Regulatory Guide 1.200, Rev 2 "An Approach For Determining The Technical Adequacy Of Probabilistic Risk Assessment Results For Risk-Informed Activities."

12. Regulatory Guide 1.174, Rev 1 "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis."

13. NUREG/CR-6928, "Industry-Average Performance for Components and Initiating Events at U.S. Commercial Nuclear Power Plants," February 2007.

13. IDDEAL Solutions Report, "Cooper Nuclear Station Code Case N-716-1 Application" dated 8/10/2015.

14. IDDEAL Solutions Report, "Final Version for N716 Database 070315", Excel report

18.0 Commitment Management

Ongoing regulatory and internal CNS commitments applicable to the ISI Program are incorporated into program documents and plant processes where appropriate.

Ongoing regulatory commitments are those made to the NRC and recorded in the CNS Regulatory Commitment Tracking System (RCTS) per AP 0.42.1. These commitments are identified and annotated in CNS documents and procedures as required by APs 0.42.1.

See the table below for a list of the ISI Program ongoing regulatory commitments.

Source	Commitment	Implementation
GL 86-01	*Inspect Scram Discharge Volume (SDV) as Class 2.*	6.MISC.502/ 6.MISC.504 (10 year)
NUREG 0619	*Inspect Feedwater (FW) Nozzles, safe ends, etc.*	Augmented ISI Program, Section 11.
GL 88-01 subsumed BWRVIP-75-A and Risk-Informed ISI (CAT R-A)	*Inspect stainless steel piping. Subsumed by RI-34 and BWRVIP-75-A.*	CNS ISI Program 5th Interval addresses BWRVIP-75-A stainless steel welds per Code Case N-716-1 as scheduled in Section 5.
NLS2008071-12	*Enhance the Inservice Inspection - IWF Program to include Class MC piping and component supports. Enhance the Program to clarify that the successive inspection requirements of IWF-2420 and the additional examination requirements of IWF-2430 will be applied. [LRA Section B.1.20]*	Implemented in 4th Interval. Class MC supports included in 5th Interval. See Section 5 for schedule of examinations. Reference LO-2008-0263-019. Closed by NRC in IR 2013-008.
NLS2010044-01	*During the period of extended operation, NPPD will perform periodic volumetric examinations of Class 1 socket weld connections. Three Class 1 socket welds will receive volumetric examination during each 10 Year ISI interval. The examination method will be a volumetric examination of the base metal 1/2" beyond the toe of the socket fillet weld which wallows for the use of qualified ultrasonic examination techniques as close as possible to the fillet weld. The volumetric examinations will be performed by certified examiners following*	See Section 5 for schedule of examinations. Reference LO-2013-0519-003.

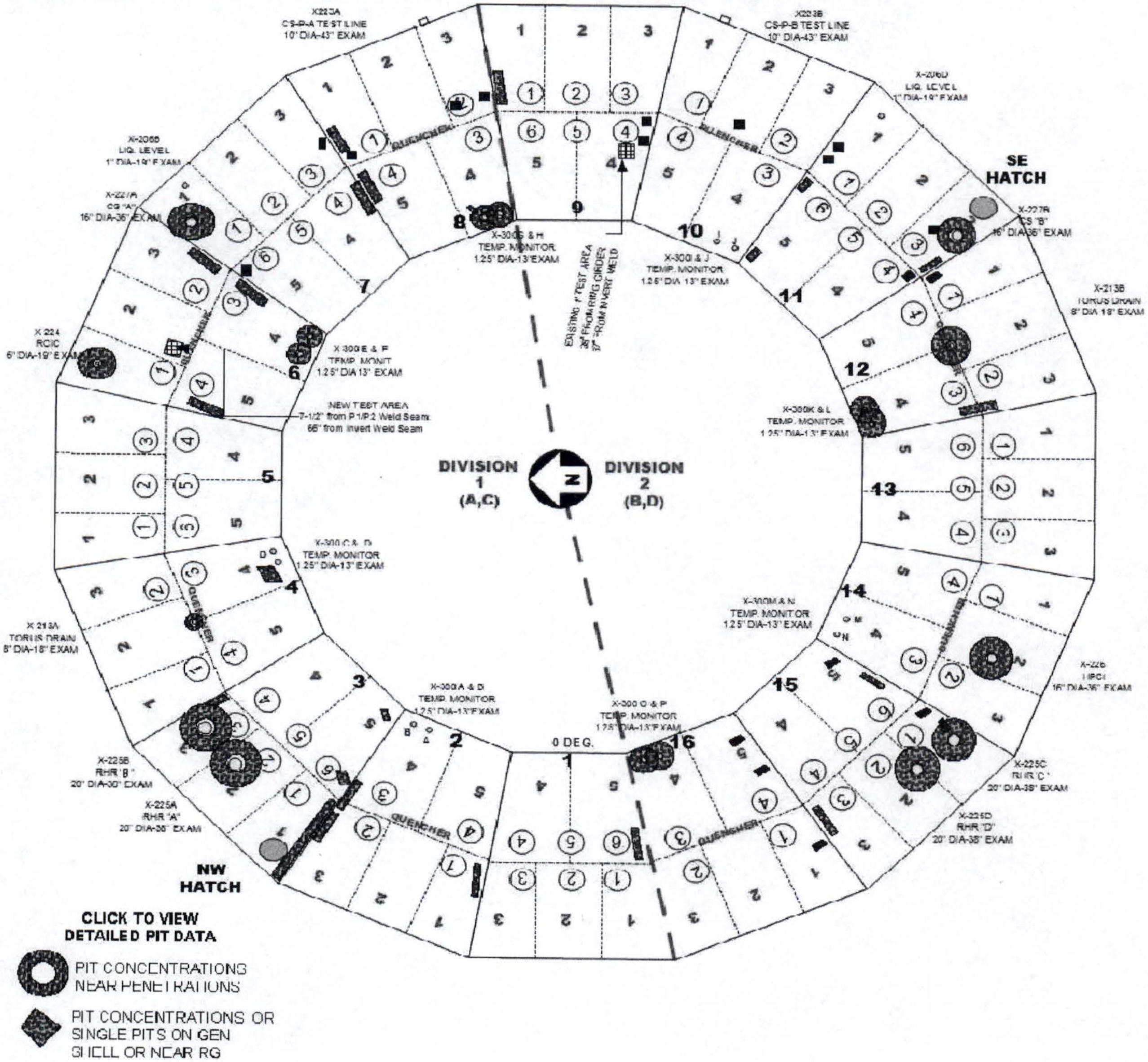
	guidelines set forth in ASME Section V, Article 4 consistent with the guidelines for examination volume of 1/2" beyond the toe of the weld as established in MRP-146, "Materials Reliability Program: Management of Thermal Fatigue in normally stagnant non-isolable reactor coolant system branch lines.	
NLS2008071-05 (Reference LO-2010-00259-010)	*Enhance the Containment Inservice Inspection Program to add examination of required accessible areas using a visual examination method and surface areas not accessible on the side requiring augmented examination to be examined using an ultrasonic thickness measurement method in accordance with IWE-2500(b). Enhance the program to document material loss in a local area exceeding 10% of the minimum containment wall thickness or material loss in a local area projected to exceed 10% of the nominal containment wall thickness before the next examination in a accordance with IWE-3511.3 for volumetric inspections. [LRA Section B1.10] - Commitment updated in NLS2009040 added: To ensure the (drywell sand cushion drain) lines are obstruction free, a vacuum test of all eight sand bed drain lines will be performed prior to the period of extended operation (PEO). (RAI B1.10-1).*	IWE-3511.3 was revised to .IWE-3522 in the 2007 Edition, 2008 Addenda which states: *Examinations of Class MC pressure-retaining components and of metallic shell and penetration liners of Class CC pressure-retaining components that detect material loss in a local area exceeding 10% of the nominal wall thickness, or material loss in a local area projected to exceed 10% of the nominal wall thickness prior to the next examination, shall be documented. Such local areas shall be accepted by engineering evaluation or corrected by repair / replacement activities in accordance with IWE-3122. Supplemental examinations in accordance with IWE-3200 shall be performed when specified as a result of the engineering evaluation.* CNS will follow the Code requirements which meet the intent of this Commitment.
NLS2010050-03	*NPPD will complete an analysis following each Torus inspection that demonstrates that the projected pitting of the Torus up to the time that the Torus is recoated, will not result in reduction of Torus wall thickness below minimum acceptable values.*	LO-. Results of the periodic evaluation will justify operation to next inspection.
NLS2010050-02 (Reference LO-2010-0259-006)	*NPPD will removed sludge and inspect the wetted portion of the Torus every refueling outage from now until the Torus is recoated. ***Commitment revised 8/18/15 as follows: NPPD will remove sludge and inspect the wetted portion of the Torus every refueling outage from now until the end of the*	Section 5 of the ISI/CISI Program contain the schedule of examinations.

	period of extended operation.	
LO-2013-0519-001 (Reference B.130 Aging Management Program)	*Implement changes to the 5th 10-Year ISI Program to ensure the ASME Section XI Class 1 pressure test procedure conducted each outage includes visual examinations (VT-2) on Class I socket weld fittings to monitor for aging degradation issues as a condition of License Renewal. The VT-2 examinations will be performed by certified examiners using ASME Section XI approved visual inspection procedures consistent with ASME Section XI.*	CNS ASME Class 1 system leakage test performed each outage under 6.MISC.502 (6.MISC.504 end of Interval) include all Class 1 boundaries for performance of VT-2 examinations including small bore socket weld locations within this boundary.

Ongoing CNS Internal Commitments

Ongoing internal commitments result from CNS Corrective Action Program (CAP) activities, audits, surveillances, self-assessments, and selected operating experience documents. These commitments are identified and annotated in CNS procedures. Commitments implemented by other program related documents are identified and incorporated by reference in that document.

Figure 19 - Torus Interior Pitting Locations (See Torus Identified Internal Pitting table for details)



Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
3	1	3-P1-1	N/A	2	0.050	S	9" RG	In	45.25"IW		Near RG		3/2 RG		2001
3	1	3-P1-2	N/A	2	0.055	S	3.5" RG	In	44.5" IW		Near RG		3/2 RG		2001
3	1	3-P1-3	N/A	2	0.061	S	11.25"RG	In	52.5"IW		Near RG		3/2 RG		2001
3	2	3-P2-10	N/A	1	0.020	S	220	Deg	22.5		RHR-A	X-225A			2001
3	2	3-P2-11	N/A	1	0.050	D	218	Deg	29	YES	RHR-A	X-225A	CNS PIR S/N 4-14626		2001
3	2	3-P2-12	N/A	1	0.047	D	328	Deg	31.5	YES	RHR-A	X-225A	CNS PIR S/N 4-14626		2001
3	2	3-P2-13	N/A	1	0.012	S	220	Deg	28		RHR-A	X-225A			2001
3	2	3-P2-14	N/A	1	0.016	S	215	Deg	27.5		RHR-A	X-225A			2001
3	2	3-P2-15	N/A	1	0.009	S	315	Deg	14.5		RHR-A	X-225A			2001
3	2	3-P2-16	N/A	1	0.024	S	265	Deg	13		RHR-A	X-225A			2001
3	2	3-P2-17	N/A	1	0.002	S	260	Deg	11.25		RHR-A	X-225A			2001
3	2	3-P2-18	N/A	1	0.019	S	255	Deg	9.5		RHR-A	X-225A			2001
3	2	3-P2-19	N/A	1	0.040	D	210	Deg	11.38	YES	RHR-A	X-225A	CNS PIR S/N 4-14626		2001
3	2	3-P2-20	N/A	1	0.032	D	260	Deg	30.5	YES	RHR-A	X-225A	CNS PIR S/N 4-14626		2001
3	2	3-P2-21	N/A	1	0.037	D	265	Deg	31.5	YES	RHR-A	X-225A	CNS PIR S/N 4-14626		2001
3	2	3-P2-22	N/A	1	0.039	D	210	Deg	18	YES	RHR-A	X-225A	CNS PIR S/N 4-14626		2001
3	2	3-P2-23	N/A	1	0.011	S	210	Deg	14		RHR-A	X-225A			2001
3	2	3-P2-24	SM	1	0.007	S	205	Deg	22.5		RHR-A	X-225A	; 3 PITS	3	2001
3	2	3-P2-25	SM	1	0.032	D	210	Deg	39	YES	RHR-A	X-225A	; 2 PITS CNS PIR S/N 4-14626	2	2001
3	2	3-P2-26	N/A	1	0.029	S	302	Deg	38		RHR-A	X-225A			2001
3	2	3-P2-27	N/A	1	0.008	S	299	Deg	26		RHR-A	X-225A			2001
3	2	3-P2-28	N/A	1	0.038	D	273	Deg	19	YES	RHR-A	X-225A	CNS PIR S/N 4-14626		2001
3	2	3-P2-29	SM	1	0.016	S	279	Deg	37		RHR-A	X-225A	; 3 PITS	3	2001
3	2	3-P2-30	N/A	1	0.021	S	279	Deg	37.5		RHR-A	X-225A			2001
3	2	3-P2-4	N/A	1	0.028	S	300	Deg	29.5		RHR-A	X-225A			2001
3	2	3-P2-5	N/A	1	0.005	S	330	Deg	26		RHR-A	X-225A			2001
3	2	3-P2-6	N/A	1	0.017	S	300	Deg	24		RHR-A	X-225A			2001
3	2	3-P2-7	N/A	1	0.046	D	285	Deg	19	YES	RHR-A	X-225A	CNS PIR S/N 4-14626		2001
3	2	3-P2-8	N/A	1	0.030	D	270	Deg	18	YES	RHR-A	X-225A	CNS PIR S/N 4-14626		2001
3	2	3-P2-9	N/A	1	0.012	S	270	Deg	37		RHR-A	X-225A			2001
4	2	4-P2-1	N/A	1	0.022	S	170	Deg	14		Torus Drain	X-213A			2001
4	2	4-P2-2	N/A	1	0.027	S	150	Deg	13.75		Torus Drain	X-213A			2001
4	2	4-P2-3	N/A	1	0.013	S	180	Deg	24		Torus Drain	X-213A			2001
4	2	4-P2-4	SM	1	0.026	S	160	Deg	18		Torus Drain	X-213A	; GROUP OF 2	2	2001
4	2	4-P2-5	N/A	1	0.029	S	160	Deg	2		Torus Drain	X-213A			2001
4	2	4-P2-6	N/A	1	0.018	S	105	Deg	2.5		Torus Drain	X-213A			2001
4	4	4-P4-1	N/A	1	0.033	D	160	Deg	9	YES	Torus Drain	X-213A	CNS PIR S/N 4-14626		2001
4	4	4-P4-2	N/A	1	0.045	D	160	Deg	21.5	YES	Torus Drain	X-213A	CNS PIR S/N 4-14626		2001

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
4	4	4-P4-3	SM	1	0.034	D	105	Deg	28	YES	Torus Drain	X-213A	; GROUP OF 2 CNS PIR S/N 4-14626	2	2001
6	1	6-P1-1	N/A	1	0.018	S	19	Deg	14		RCIC	X-224			2001
6	1	6-P1-10	N/A	1	0.052	D	116	Deg	12.5	YES	RCIC	X-224	CNS PIR S/N 4-14626		2001
6	1	6-P1-11	SM	1	0.018	S	121	Deg	12.5		RCIC	X-224		2	2001
6	1	6-P1-12	N/A	1	0.022	S	126	Deg	10.25		RCIC	X-224	; 2 PITS, 1 3/8" dia		2001
6	1	6-P1-13	N/A	1	0.025	S	126	Deg	24		RCIC	X-224			2001
6	1	6-P1-14	N/A	1	0.023	S	121	Deg	25		RCIC	X-224			2001
6	1	6-P1-15	N/A	1	0.023	S	131	Deg	20		RCIC	X-224			2001
6	1	6-P1-16	SM	1	0.028	S	131	Deg	14.5		RCIC	X-224	; 2 PITS, 2.50" dia	2	2001
6	1	6-P1-17	N/A	1	0.011	S	97	Deg	24		RCIC	X-224			2001
6	1	6-P1-18	SM	1	0.010	S	102	Deg	22.5	YES	RCIC	X-224	; 3 PITS, 2.50" dia CNS PIR S/N 4-14626	3	2001
6	1	6-P1-19	SM	1	0.008	S	102	Deg	24.5		RCIC	X-224		1	2001
6	1	6-P1-2	N/A	1	0.031	D	39	Deg	13	YES	RCIC	X-224	CNS PIR S/N 4-14626		2001
6	1	6-P1-20	SM	1	0.019	S	107	Deg	23.25		RCIC	X-224	; 5 PITS, 2.25" dia	5	2001
6	1	6-P1-21	SM	1	0.013	S	107	Deg	25.25		RCIC	X-224	; 5 PITS, 2.50" dia	5	2001
6	1	6-P1-22	SM	1	0.021	S	107	Deg	26.5		RCIC	X-224	; 4 PITS,2.50" dia	4	2001
6	1	6-P1-23	SM	1	0.034	D	107	Deg	29.25	YES	RCIC	X-224	; 5 PITS, 1.50" dia CNS PIR S/N 4-14626	5	2001
6	1	6-P1-24	SM	1	0.019	S	107	Deg	31		RCIC	X-224	; 6 PITS, 2.50" dia	6	2001
6	1	6-P1-25	SM	1	0.008	S	111	Deg	14		RCIC	X-224	; 4 PITS,2.50" dia	4	2001
6	1	6-P1-26	SM	1	0.023	S	111	Deg	17		RCIC	X-224	; 5 PITS, 2.50" dia	5	2001
6	1	6-P1-27	SM	1	0.009	S	111	Deg	19.5		RCIC	X-224	; 4 PITS,2.50" dia	4	2001
6	1	6-P1-28	SM	1	0.019	S	111	Deg	22		RCIC	X-224	; 8 PITS, 2.50" dia	8	2001
6	1	6-P1-29	SM	1	0.017	S	111	Deg	26.5		RCIC	X-224	; 2 PITS, 1.25" dia	2	2001
6	1	6-P1-3	SM	1	0.015	S	68	Deg	28.5		RCIC	X-224	; 3 PITS, 1.25" dia	3	2001
6	1	6-P1-30	SM	1	0.014	S	111	Deg	30		RCIC	X-224	; 4 PITS,2.50" dia	4	2001
6	1	6-P1-31	SM	1	0.016	S	111	Deg	32.5		RCIC	X-224	; 5 PITS, 2.50" dia	5	2001
6	1	6-P1-32	N/A	1	0.011	S	116	Deg	13		RCIC	X-224			2001
6	1	6-P1-33	N/A	1	0.009	S	116	Deg	14.5		RCIC	X-224			2001
6	1	6-P1-34	N/A	1	0.011	S	116	Deg	16.5		RCIC	X-224			2001
6	1	6-P1-35	SM	1	0.007	S	116	Deg	18.75		RCIC	X-224	; 7 PITS, 2.50" dia	7	2001
6	1	6-P1-36	SM	1	0.016	S	116	Deg	20.75		RCIC	X-224	; 4 PITS, 1.50" dia	4	2001
6	1	6-P1-37	SM	1	0.022	S	116	Deg	22.5		RCIC	X-224	; 2 PITS, 1.50" dia	3	2001
6	1	6-P1-38	SM	1	0.008	S	116	Deg	25		RCIC	X-224	; 4 PITS,2.50" dia	4	2001
6	1	6-P1-39	SM	1	0.014	S	116	Deg	28.5		RCIC	X-224	; 5 PITS, 2.50" dia	5	2001
6	1	6-P1-4	SM	1	0.020	S	68	Deg	28.5		RCIC	X-224	; 4 PITS, 1.75" dia	4	2001
6	1	6-P1-40	SM	1	0.010	S	126	Deg	26		RCIC	X-224	; 2 PITS, 1.50" dia	2	2001
6	1	6-P1-41	SM	1	0.011	S	126	Deg	28		RCIC	X-224	; 3 PITS, 2.50" dia	3	2001
6	1	6-P1-42	SM	1	0.021	S	126	Deg	31.5		RCIC	X-224	; 4 PITS,2.50" dia	4	2001
6	1	6-P1-43	SM	1	0.010	S	136	Deg	23		RCIC	X-224	; 7 PITS, 2.50" dia	7	2001

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
6	1	6-P1-44	SM	1	0.027	S	136	Deg	25.5		RCIC	X-224	; 4 PITS,2.50" dia	4	2001
6	1	6-P1-45	SM	1	0.018	S	136	Deg	27.25		RCIC	X-224	; 7 PITS, 2.50" dia	7	2001
6	1	6-P1-46	N/A	1	0.016	S	136	Deg	32.5		RCIC	X-224			2001
6	1	6-P1-47	N/A	1	0.019	S	145	Deg	16.5		RCIC	X-224			2001
6	1	6-P1-48	SM	1	0.014	S	145	Deg	21		RCIC	X-224	; 6 PITS, 2.50" dia	6	2001
6	1	6-P1-49	SM	1	0.018	S	145	Deg	28.5		RCIC	X-224	; 8 PITS, 2.125" dia	8	2001
6	1	6-P1-5	N/A	1	0.020	S	73	Deg	36.75		RCIC	X-224			2001
6	1	6-P1-50	N/A	1	N/A	S	179	Deg	14.5		RCIC	X-224	; 16 GROUPS, 3 PER, EACH 2.50" dia	48	2001
6	1	6-P1-51	N/A	1	N/A	S	262	Deg	13.5		RCIC	X-224	; 16 GROUPS, 3 PER, EACH 2.50" dia	48	2001
6	1	6-P1-52	N/A	1	N/A	S	358	Deg	10		RCIC	X-224	; 15 GROUPS, 3 PER, EACH 2.50" dia	45	2001
6	1	6-P1-6	N/A	1	0.023	S	87	Deg	27		RCIC	X-224			2001
6	1	6-P1-7	N/A	1	0.038	D	116	Deg	22.75	YES	RCIC	X-224	CNS PIR S/N 4-14626		2001
6	1	6-P1-8	SM	1	0.025	S	111	Deg	24		RCIC	X-224	; 4 PITS,2.25" dia	4	2001
6	1	6-P1-9	N/A	1	0.041	D	116	Deg	3.75	YES	RCIC	X-224	CNS PIR S/N 4-14626		2001
7	1	7-P1-10	N/A	1	N/A	S	47	Deg	16		CS-A	X-227A		1	2001
7	1	7-P1-11	N/A	1	N/A	S	105	Deg	16		CS-A	X-227A		1	2001
7	1	7-P1-12	N/A	1	N/A	S	163	Deg	16		CS-A	X-227A		1	2001
7	1	7-P1-13	N/A	1	N/A	S	131	Deg	16		CS-A	X-227A		1	2001
7	1	7-P1-14	N/A	1	N/A	S	54	Deg	17		CS-A	X-227A		1	2001
7	1	7-P1-15	SM	1	0.036	D	98	Deg	17.5	YES	CS-A	X-227A	; 2 PITS CNS PIR S/N 4-14626	2	2001
7	1	7-P1-16	N/A	1	0.031	D	149	Deg	17.5	YES	CS-A	X-227A	CNS PIR S/N 4-14626		2001
7	1	7-P1-17	N/A	1	N/A	S	198	Deg	17.5		CS-A	X-227A		1	2001
7	1	7-P1-18	N/A	1	0.045	D	240	Deg	17.5	YES	CS-A	X-227A	CNS PIR S/N 4-14626		2001
7	1	7-P1-19	SM	1	0.026	S	105	Deg	18		CS-A	X-227A	; 2 PITS	2	2001
7	1	7-P1-2	SM	1	N/A	S	22	Deg	9		CS-A	X-227A	; 4 GROUPS, 3 PER, 2-1/2" dia	12	2001
7	1	7-P1-20	N/A	1	0.030	D	131	Deg	18	YES	CS-A	X-227A	CNS PIR S/N 4-14626		2001
7	1	7-P1-21	N/A	1	N/A	S	133	Deg	18.5		CS-A	X-227A		1	2001
7	1	7-P1-22	SM	1	N/A	S	62	Deg	18.5		CS-A	X-227A	; 2 PITS	2	2001
7	1	7-P1-23	SM	1	N/A	S	105	Deg	18.5		CS-A	X-227A	; 4 GROUPS, 2-1/2" dia	16	2001
7	1	7-P1-24	N/A	1	N/A	S	174	Deg	18.5		CS-A	X-227A		1	2001
7	1	7-P1-25	SM	1	N/A	S	218	Deg	18.5		CS-A	X-227A	; 2 PITS	2	2001
7	1	7-P1-26	SM	1	N/A	S	160	Deg	19		CS-A	X-227A	; 3 GROUPS, 3 PITS PER	9	2001
7	1	7-P1-27	N/A	1	N/A	S	196	Deg	19		CS-A	X-227A		1	2001
7	1	7-P1-28	SM	1	N/A	S	232	Deg	19		CS-A	X-227A	; 2 PITS	2	2001
7	1	7-P1-29	N/A	1	N/A	S	25	Deg	20.5		CS-A	X-227A		1	2001
7	1	7-P1-3	N/A	1	0.032	D	243	Deg	1.25	YES	CS-A	X-227A	CNS PIR S/N 4-14626		2001
7	1	7-P1-30	N/A	1	N/A	S	116	Deg	20.5		CS-A	X-227A		1	2001
7	1	7-P1-31	SM	1	N/A	S	149	Deg	20.5		CS-A	X-227A	; 2 PITS	2	2001
7	1	7-P1-32	SM	1	N/A	S	211	Deg	20.5		CS-A	X-227A	; 20 GROUPS, 2 PITS PER	40	2001

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
7	1	7-P1-33	N/A	1	N/A	S	98	Deg	21		CS-A	X-227A		1	2001
7	1	7-P1-34	SM	1	N/A	S	131	Deg	21		CS-A	X-227A	; 4 PITS	4	2001
7	1	7-P1-35	SM	1	N/A	S	160	Deg	21.5		CS-A	X-227A	; 2 PITS	2	2001
7	1	7-P1-36	SM	1	N/A	S	182	Deg	29		CS-A	X-227A	; 3 GROUPS, 3 PITS PER	9	2001
7	1	7-P1-37	N/A	1	0.048	D	185	Deg	18	YES	CS-A	X-227A	CNS PIR S/N 4-14626		2001
7	1	7-P1-38	N/A	1	0.042	D	182	Deg	19	YES	CS-A	X-227A	CNS PIR S/N 4-14626		2001
7	1	7-P1-39	N/A	1	N/A	S	189	Deg	21		CS-A	X-227A		1	2001
7	1	7-P1-4	N/A	1	N/A	S	225	Deg	3		CS-A	X-227A		1	2001
7	1	7-P1-40	SM	1	N/A	S	196	Deg	24		CS-A	X-227A	; 4 GROUPS, 9 PITS	9	2001
7	1	7-P1-41	N/A	1	N/A	S	185	Deg	14		CS-A	X-227A	; 2 GROUPS, 7 PITS	7	2001
7	1	7-P1-42	SM	1	N/A	S	218	Deg	21		CS-A	X-227A	; 2 GROUPS, 9 PITS	9	2001
7	1	7-P1-43	N/A	1	N/A	S	225	Deg	8		CS-A	X-227A		1	2001
7	1	7-P1-44	N/A	1	0.038	D	232	Deg	15	YES	CS-A	X-227A	CNS PIR S/N 4-14626		2001
7	1	7-P1-45	SM	1	N/A	S	262	Deg	15		CS-A	X-227A	; 6 GROUPS, 23 PITS	23	2001
7	1	7-P1-46	N/A	1	0.049	D	254	Deg	22.5	YES	CS-A	X-227A	CNS PIR S/N 4-14626		2001
7	1	7-P1-47	SM	1	N/A	S	254	Deg	28		CS-A	X-227A	; 2 GROUPS, 2 PER, 2-1/2" dia	4	2001
7	1	7-P1-48	N/A	1	0.036	D	254	Deg	26.25	YES	CS-A	X-227A	CNS PIR S/N 4-14626		2001
7	1	7-P1-49	N/A	1	0.039	D	258	Deg	29	YES	CS-A	X-227A	CNS PIR S/N 4-14626		2001
7	1	7-P1-5	N/A	1	0.047	D	225	Deg	7	YES	CS-A	X-227A	CNS PIR S/N 4-14626		2001
7	1	7-P1-50	SM	1	N/A	S	218	Deg	30		CS-A	X-227A	; 23 GROUPS, 63 PITS (approx)	63	2001
7	1	7-P1-6	SM	1	N/A	S	89	Deg	7.25		CS-A	X-227A	; 2 PITS	2	2001
7	1	7-P1-7	SM	1	N/A	S	73	Deg	9		CS-A	X-227A	; 2 PITS	2	2001
7	1	7-P1-8	SM	1	N/A	S	232	Deg	13.5		CS-A	X-227A	; 2 GROUPS, 2 PER, 2-1/2" dia	4	2001
7	1	7-P1-9	SM	1	N/A	S	80	Deg	14		CS-A	X-227A	; 4 PITS	4	2001
7	5	7-P5-1	N/A	2	0.056	D	3" RG	In	47" IW	YES	Near RG		CNS PIR S/N 4-14626		2001
8	4	8-P4-1	N/A	1	0.027	S	0	Deg	5.5		Temp. Monit.	X-300-G	X-300-G		2001
8	4	8-P4-2	N/A	1	0.034	D	0	Deg	4.5	YES	Temp. Monit.	X-300-H	X-300-H CNS PIR S/N 4-14626		2001
8	4	8-P4-3	N/A	1	0.017	S	290	Deg	5.25		Temp. Monit.	X-300-H	X-300-H		2001
9	3	9-P3-1	N/A	2	0.062	D	10" RG	In	31" IW	YES	Near RG		CNS PIR S/N 4-14626		2001
11	1	11-P1-1	N/A	2	0.052	D	10" RG	In	37"IW	YES	Near RG		CNS PIR S/N 4-14626		2001
11	3	11-P3-1	N/A	1	0.028	S	196	Deg	23		CS-B	X227B			2001
11	3	11-P3-10	SM	1	0.038	D	218	Deg	29	YES	CS-B	X227B	CNS PIR S/N 4-14626	2	2001
11	3	11-P3-11	SM	1	0.044	D	211	Deg	34	YES	CS-B	X227B	; 2 PITS CNS PIR S/N 4-14626	2	2001
11	3	11-P3-12	SM	1	0.028	S	222	Deg	33.5		CS-B	X227B	; 3 PITS	3	2001
11	3	11-P3-13	SM	1	0.034	D	222	Deg	34	YES	CS-B	X227B	; 4 PITS CNS PIR S/N 4-14626	4	2001
11	3	11-P3-14	SM	1	0.051	D	232	Deg	33	YES	CS-B	X227B	; 3 PITS CNS PIR S/N 4-14626	3	2001
11	3	11-P3-15	SM	1	0.042	D	240	Deg	33.5	YES	CS-B	X227B	; 2 PITS CNS PIR S/N 4-14626	2	2001
11	3	11-P3-16	SM	1	0.045	D	225	Deg	29.5	YES	CS-B	X227B	; 5 PITS CNS PIR S/N 4-14626	5	2001
11	3	11-P3-17	SM	1	0.043	D	231	Deg	26.5	YES	CS-B	X227B	; 2 PITS; 1.63" to P3-21 CNS PIR S/N 4-14626	2	2001

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
11	3	11-P3-18	SM	1	0.041	D	232	Deg	14	YES	CS-B	X227B	; 3 PITS CNS PIR S/N 4-14626	3	2001
11	3	11-P3-19	SM	1	0.014	S	243	Deg	14		CS-B	X227B	; 4 PITS	4	2001
11	3	11-P3-2	SM	1	0.022	S	207	Deg	20		CS-B	X227B	; 4 PITS	4	2001
11	3	11-P3-20	SM	1	0.030	D	247	Deg	15.5	YES	CS-B	X227B	; 4 PITS CNS PIR S/N 4-14626	4	2001
11	3	11-P3-21	SM	1	0.035	D	232	Deg	25	YES	CS-B	X227B	; 2 PITS; 1.63" to P3-17 CNS PIR S/N 4-14626	2	2001
11	3	11-P3-22	SM	1	0.044	D	240	Deg	27	YES	CS-B	X227B	; 6 PITS CNS PIR S/N 4-14626	6	2001
11	3	11-P3-23	SM	1	0.036	D	240	Deg	30	YES	CS-B	X227B	; 3 PITS CNS PIR S/N 4-14626	3	2001
11	3	11-P3-24	SM	1	0.032	D	251	Deg	30	YES	CS-B	X227B	; 4 PITS CNS PIR S/N 4-14626	4	2001
11	3	11-P3-25	SM	1	0.031	D	254	Deg	27	YES	CS-B	X227B	; 5 PITS CNS PIR S/N 4-14626	5	2001
11	3	11-P3-26	SM	1	0.036	D	251	Deg	23.5	YES	CS-B	X227B	; 3 PITS CNS PIR S/N 4-14626	3	2001
11	3	11-P3-27	SM	1	0.048	D	276	Deg	30	YES	CS-B	X227B	; 2 PITS CNS PIR S/N 4-14626	2	2001
11	3	11-P3-28	SM	1	0.045	D	272	Deg	26	YES	CS-B	X227B	; 2 PITS; 1.94" to P3-30 CNS PIR S/N 4-14626	2	2001
11	3	11-P3-29	SM	1	0.041	D	272	Deg	22	YES	CS-B	X227B	; 2 PITS; 1.94" to P3-30 CNS PIR S/N 4-14626	2	2001
11	3	11-P3-3	N/A	1	0.023	S	207	Deg	23.5		CS-B	X227B			2001
11	3	11-P3-30	SM	1	0.038	D	272	Deg	24.5	YES	CS-B	X227B	; 2 PITS; 1.94" to P3-28 & 29 CNS PIR S/N 4-14626	2	2001
11	3	11-P3-31	N/A	1	0.037	D	291	Deg	8	YES	CS-B	X227B	CNS PIR S/N 4-14626		2001
11	3	11-P3-32	N/A	1	0.047	D	305	Deg	8.5	YES	CS-B	X227B	CNS PIR S/N 4-14626		2001
11	3	11-P3-33	SM	1	0.043	D	316	Deg	8	YES	CS-B	X227B	; 2 PITS CNS PIR S/N 4-14626	2	2001
11	3	11-P3-34	N/A	1	0.045	D	320	Deg	12	YES	CS-B	X227B	CNS PIR S/N 4-14626		2001
11	3	11-P3-35	N/A	1	0.035	D	323	Deg	34	YES	CS-B	X227B	CNS PIR S/N 4-14626		2001
11	3	11-P3-36	N/A	1	0.033	D	327	Deg	14.5	YES	CS-B	X227B	CNS PIR S/N 4-14626		2001
11	3	11-P3-37	N/A	1	0.015	S	341	Deg	12		CS-B	X227B	; 3 PITS		2001
11	3	11-P3-38	N/A	1	0.036	D	352	Deg	14.5	YES	CS-B	X227B	; 2 PITS CNS PIR S/N 4-14626		2001
11	3	11-P3-39	N/A	1	0.035	D	360	Deg	11	YES	CS-B	X227B	; 2 PITS CNS PIR S/N 4-14626		2001
11	3	11-P3-4	SM	1	0.018	S	202	Deg	15.5		CS-B	X227B	; 3 PITS	3	2001
11	3	11-P3-5	N/A	1	0.019	S	214	Deg	15.75		CS-B	X227B			2001
11	3	11-P3-6	SM	1	0.036	D	214	Deg	18	YES	CS-B	X227B	; 3 PITS CNS PIR S/N 4-14626	3	2001
11	3	11-P3-7	SM	1	0.024	S	214	Deg	21		CS-B	X227B	; 3 PITS	3	2001
11	3	11-P3-8	SM	1	0.034	D	218	Deg	22	YES	CS-B	X227B	; 3 PITS CNS PIR S/N 4-14626	3	2001
11	3	11-P3-9	SM	1	0.024	S	218	Deg	26		CS-B	X227B	; 2 PITS	2	2001
12	2	12-P2-1	N/A	1	0.014	S	300	Deg	12		Torus Drain	X-213B			2001
12	2	12-P2-2	N/A	1	0.006	S	330	Deg	14.5		Torus Drain	X-213B			2001
12	2	12-P2-3	N/A	1	0.021	S	30	Deg	8.5		Torus Drain	X-213B			2001
12	2	12-P2-4	N/A	1	0.019	S	120	Deg	12.5		Torus Drain	X-213B			2001
12	2	12-P2-5	N/A	1	0.049	D	60	Deg	20.5	YES	Torus Drain	X-213B	CNS PIR S/N 4-14626		2001
12	2	12-P2-6	SM	1	N/A	S	90-270	Deg	33		Torus Drain	X-213B		20	2001
14	2	14-P2-1	SM	1	0.024	S	0	Deg	33		HPCI	X-226	; 4 PITS, 2.40" DIA.	4	2001
14	2	14-P2-2	N/A	1	0.023	S	279	Deg	32		HPCI	X-226			2001

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
14	2	14-P2-3	SM	1	0.036	D	262	Deg	31	YES	HPCI	X-226	; 3 PITS, 1.00" DIA. CNS PIR S/N 4-14626	3	2001
14	2	14-P2-4	N/A	1	0.009	S	215	Deg	25		HPCI	X-226			2001
14	2	14-P2-5	N/A	1	0.039	D	186	Deg	12.5	YES	HPCI	X-226	CNS PIR S/N 4-14626		2001
14	2	14-P2-6	N/A	1	0.042	D	203	Deg	30	YES	HPCI	X-226	CNS PIR S/N 4-14626		2001
14	2	14-P2-7	SM	1	0.035	D	151	Deg	28	YES	HPCI	X-226	; 3 PITS, 1.00" DIA. CNS PIR S/N 4-14626	3	2001
14	3	14-P3-1	N/A	1	0.027	S	58	Deg	10		HPCI	X-226			2001
14	3	14-P3-10	N/A	1	0.023	S	23	Deg	38		HPCI	X-226			2001
14	3	14-P3-2	N/A	1	0.021	S	122	Deg	12		HPCI	X-226			2001
14	3	14-P3-3	N/A	1	0.023	S	70	Deg	32		HPCI	X-226			2001
14	3	14-P3-4	N/A	1	0.039	D	122	Deg	31	YES	HPCI	X-226	CNS PIR S/N 4-14626		2001
14	3	14-P3-5	N/A	1	0.019	S	41	Deg	12.5		HPCI	X-226			2001
14	3	14-P3-6	N/A	1	0.046	D	41	Deg	49	YES	HPCI	X-226	CNS PIR S/N 4-14626		2001
14	3	14-P3-7	N/A	1	0.007	S	35	Deg	13		HPCI	X-226			2001
14	3	14-P3-8	N/A	1	0.035	D	61	Deg	14.5	YES	HPCI	X-226	CNS PIR S/N 4-14626		2001
14	3	14-P3-9	N/A	1	0.032	D	29	Deg	9	YES	HPCI	X-226	CNS PIR S/N 4-14626		2001
15	1	15-P1-1	N/A	1	0.019	S	198	Deg	18.5		RHR-C	X-225C			2001
15	1	15-P1-10	N/A	1	0.015	S	203	Deg	31		RHR-C	X-225C			2001
15	1	15-P1-11	N/A	1	0.018	S	206	Deg	34		RHR-C	X-225C			2001
15	1	15-P1-12	N/A	1	0.018	S	206	Deg	32		RHR-C	X-225C			2001
15	1	15-P1-13	N/A	1	0.023	S	209	Deg	31		RHR-C	X-225C			2001
15	1	15-P1-14	N/A	1	0.026	S	302	Deg	15		RHR-C	X-225C			2001
15	1	15-P1-15a	N/A	1	0.030	D	285	Deg	20	YES	RHR-C	X-225C	CNS PIR S/N 4-14626		2001
15	1	15-P1-15b	N/A	1	0.030	D	285	Deg	20	YES	RHR-C	X-225C	CNS PIR S/N 4-14626		2001
15	1	15-P1-16	N/A	1	0.020	S	285	Deg	24		RHR-C	X-225C			2001
15	1	15-P1-17	N/A	1	0.016	S	267	Deg	25		RHR-C	X-225C			2001
15	1	15-P1-18	N/A	1	0.033	D	267	Deg	20	YES	RHR-C	X-225C	CNS PIR S/N 4-14626		2001
15	1	15-P1-2	N/A	1	0.033	D	157	Deg	17	YES	RHR-C	X-225C	CNS PIR S/N 4-14626		2001
15	1	15-P1-3	N/A	1	0.032	D	76	Deg	9	YES	RHR-C	X-225C	CNS PIR S/N 4-14626		2001
15	1	15-P1-4	N/A	1	0.024	S	227	Deg	14		RHR-C	X-225C			2001
15	1	15-P1-5	N/A	1	0.009	S	139	Deg	24		RHR-C	X-225C			2001
15	1	15-P1-6	N/A	1	0.034	D	139	Deg	27.5	YES	RHR-C	X-225C	CNS PIR S/N 4-14626		2001
15	1	15-P1-7	N/A	1	0.034	D	221	Deg	28	YES	RHR-C	X-225C	CNS PIR S/N 4-14626		2001
15	1	15-P1-8	N/A	1	0.020	S	209	Deg	30		RHR-C	X-225C			2001
15	1	15-P1-9	N/A	1	0.031	D	206	Deg	31	YES	RHR-C	X-225C	CNS PIR S/N 4-14626		2001
15	2	15-P2-1	N/A	1	0.021	S	227	Deg	20		RHR-D	X-225D	**RHR-D**		2001
15	2	15-P2-2	N/A	1	0.023	S	209	Deg	25		RHR-D	X-225D	**RHR-D**		2001
3	3	3-P3-001	N/A	1	0.013	S	90°	Deg	10.5		RHR-B	x-225B	RHR 'A' & 'C'		2005
3	3	3-P3-002	N/A	1	0.014	S	90°	Deg	11"		RHR-B	x-225B	RHR 'A' & 'C'		2005
3	3	3-P3-003	N/A	1	0.018	S	90°	Deg	10"		RHR-B	x-225B	RHR 'A' & 'C'		2005

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
3	3	3-P3-004	N/A	1	0.018	S	90°	Deg	11.5"		RHR-B	x-225B	RHR 'A' & 'C'		2005
3	3	3-P3-005	N/A	1	0.021	S	91°	Deg	9.75"		RHR-B	x-225B	RHR 'A' & 'C'		2005
3	3	3-P3-006	N/A	1	0.008	S	91°	Deg	9"		RHR-B	x-225B	RHR 'A' & 'C'; *1-1/2" X 3/8"		2005
3	3	3-P3-007	N/A	1	0.017	S	91°	Deg	11"		RHR-B	x-225B	RHR 'A' & 'C'		2005
3	3	3-P3-008	N/A	1	0.006	S	91°	Deg	8.75"		RHR-B	x-225B	RHR 'A' & 'C'; 3/16" X 1"		2005
3	3	3-P3-010	N/A	1	0.012	S	92°	Deg	9"		RHR-B	x-225B	RHR 'A' & 'C'		2005
3	3	3-P3-011	SM	1	0.015	S	92°	Deg	12"		RHR-B	x-225B	RHR 'A' & 'C'; GROUP OF FOUR – 2"	4	2005
3	3	3-P3-012	N/A	1	0.003	S	170°	Deg	14"		RHR-B	x-225B	RHR 'A' & 'C'		2005
3	3	3-P3-013	N/A	1	0.032	D	165°	Deg	13"	YES	RHR-B	x-225B	RHR DEEP PIT – reported 1/23/05 CR-CNS-2005-01188		2005
3	3	3-P3-09	N/A	1	0.020	S	92°	Deg	9"		RHR-B	X-225B	RHR 'A' & 'C'		2005
4	D	4-FD-001	N/A	1	<0.030	S	0°	Deg	18"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-002	N/A	1	<0.030	S	20°	Deg	17"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-003	N/A	1	<0.030	S	25°	Deg	15-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-0034	N/A	1	<0.030	S	170°	Deg	16-3/4"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-004	N/A	1	<0.030	S	25°	Deg	15"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-005	N/A	1	<0.030	S	25°	Deg	17"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-006	N/A	1	<0.030	S	30°	Deg	3-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-007	N/A	1	<0.030	S	40°	Deg	12"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-008	N/A	1	<0.030	S	45°	Deg	12"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-009	N/A	1	<0.030	S	50°	Deg	15-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-010	N/A	1	<0.030	S	55°	Deg	15-1/4"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-011	N/A	1	<0.030	S	55°	Deg	13"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-012	N/A	1	<0.030	S	60°	Deg	12-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-013	N/A	1	<0.030	S	65°	Deg	18"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-014	N/A	1	<0.030	S	70°	Deg	18"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-015	N/A	1	<0.030	S	70°	Deg	14-3/4"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-016	N/A	1	<0.030	S	80°	Deg	17-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-017	N/A	1	<0.030	S	80°	Deg	18"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-018	N/A	1	<0.030	S	90°	Deg	13-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-019	N/A	1	<0.030	S	95°	Deg	14"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-020	N/A	1	<0.030	S	95°	Deg	1/16"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-021	N/A	1	<0.030	S	100°	Deg	14-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-022	N/A	1	<0.030	S	105°	Deg	14-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-023	N/A	1	<0.030	S	110°	Deg	1-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-024	N/A	1	<0.030	S	115°	Deg	16"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-025	N/A	1	<0.030	S	115°	Deg	16"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-026	N/A	1	<0.030	S	115°	Deg	17-3/4"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-027	N/A	1	<0.030	S	140°	Deg	13"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-028	N/A	1	<0.030	S	145°	Deg	12"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-029	N/A	1	<0.030	S	150°	Deg	4"		Torus Drain	X-213A	Torus Drain		2005

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
4	D	4-FD-030	N/A	1	<0.030	S	150°	Deg	17"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-031	N/A	1	<0.030	S	165°	Deg	16-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-032	N/A	1	<0.030	S	165°	Deg	14"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-033	N/A	1	<0.030	S	170°	Deg	17-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-035	N/A	1	<0.030	S	180°	Deg	1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-036	N/A	1	<0.030	S	180°	Deg	14-3/4"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-037	N/A	1	<0.030	S	185°	Deg	14"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-038	N/A	1	<0.030	S	190°	Deg	1"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-039	N/A	1	<0.030	S	190°	Deg	16"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-040	N/A	1	<0.030	S	195°	Deg	14"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-041	N/A	1	<0.030	S	210°	Deg	17-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-042	N/A	1	<0.030	S	212°	Deg	12"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-043	N/A	1	<0.030	S	220°	Deg	14-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-044	N/A	1	<0.030	S	240°	Deg	16"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-045	N/A	1	<0.030	S	250°	Deg	17-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-046	N/A	1	<0.030	S	275°	Deg	16"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-047	N/A	1	<0.030	S	275°	Deg	12"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-048	N/A	1	<0.030	S	280°	Deg	9"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-049	N/A	1	<0.030	S	280°	Deg	6"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-050	N/A	1	<0.030	S	280°	Deg	16"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-051	N/A	1	<0.030	S	285°	Deg	12"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-052	N/A	1	<0.030	S	300°	Deg	6"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-053	N/A	1	<0.030	S	300°	Deg	10"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-054	N/A	1	<0.030	S	330°	Deg	14-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-055	N/A	1	<0.030	S	335°	Deg	12-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-056	N/A	1	<0.030	S	335°	Deg	9-1/4"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-057	N/A	1	<0.030	S	340°	Deg	10-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-058	N/A	1	<0.030	S	345°	Deg	11-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-059	N/A	1	<0.030	S	345°	Deg	13-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-060	N/A	1	<0.030	S	345	Deg	17"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-061	N/A	1	<0.030	S	350°	Deg	10"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-062	N/A	1	<0.030	S	347-1/2°	Deg	1-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-063	N/A	1	<0.030	S	355°	Deg	16-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-064	N/A	1	<0.030	S	357°	Deg	16-1/2"		Torus Drain	X-213A	Torus Drain		2005
4	D	4-FD-065	N/A	1	<0.030	S	359°	Deg	17-1/2"		Torus Drain	X-213A	Torus Drain		2005
6	1	6-P1-001	N/A	1	<0.030	S	0°	Deg	5"		RCIC	X-224	RCIC		2005
6	1	6-P1-002	N/A	1	<0.030	S	0°	Deg	9"		RCIC	X-224	RCIC		2005
6	1	6-P1-003	N/A	1	<0.030	S	58°	Deg	13"		RCIC	X-224	RCIC		2005
6	1	6-P1-004	LG	1	<0.030	S	58°	Deg	19"		RCIC	X-224	RCIC; 3 total pits, 2.5" pit group	3	2005
6	1	6-P1-005	N/A	1	<0.030	S	68°	Deg	19"		RCIC	X-224	RCIC; *Tiger stripe bottom tip falls into 19" region – documented as one pit		2005

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
6	1	6-P1-006	N/A	1	<0.030	S	58°	Deg	15"		RCIC	X-224	RCIC		2005
6	1	6-P1-007	N/A	1	<0.030	S	58°	Deg	12.5"		RCIC	X-224	RCIC		2005
6	1	6-P1-008	N/A	1	<0.030	S	58°	Deg	5.5"		RCIC	X-224	RCIC		2005
6	1	6-P1-009	N/A	1	<0.030	S	68°	Deg	15"		RCIC	X-224	RCIC		2005
6	1	6-P1-010	N/A	1	<0.030	S	77.5°	Deg	5"		RCIC	X-224	RCIC		2005
6	1	6-P1-011	N/A	1	<0.030	S	77.5°	Deg	8"		RCIC	X-224	RCIC		2005
6	1	6-P1-012	N/A	1	<0.030	S	87°	Deg	3"		RCIC	X-224	RCIC		2005
6	1	6-P1-013	LG	1	<0.030	S	87°	Deg	15"		RCIC	X-224	RCIC; 3 pits total, 2.5" group D	3	2005
6	1	6-P1-014	N/A	1	<0.030	S	87°	Deg	14.5"		RCIC	X-224	RCIC;		2005
6	1	6-P1-015	SM	1	<0.030	S	97°	Deg	19"		RCIC	X-224	RCIC; 2 pits total, 1.5" group D	2	2005
6	1	6-P1-016	N/A	1	<0.030	S	97°	Deg	10.5"		RCIC	X-224	RCIC;		2005
6	1	6-P1-017	SM	1	<0.030	S	106.5°	Deg	8"		RCIC	X-224	RCIC; 10 pits, ½" group D	10	2005
6	1	6-P1-018	SM	1	<0.030	S	106.5°	Deg	11"		RCIC	X-224	RCIC; 2 pits, ½" group D	2	2005
6	1	6-P1-019	N/A	1	<0.030	S	116°	Deg	17"		RCIC	X-224	RCIC;		2005
6	1	6-P1-020	SM	1	<0.030	S	116°	Deg	12"		RCIC	X-224	RCIC; 3 pits total, 1.5" group D	3	2005
6	1	6-P1-021	LG	1	<0.030	S	116°	Deg	11-19"		RCIC	X-224	RCIC; 50 pits total, 12"x16" group D	50	2005
6	1	6-P1-022	SM	1	<0.030	S	155°	Deg	15"		RCIC	X-224	RCIC; 4 pits total, 1/4" group D	4	2005
6	1	6-P1-023	SM	1	<0.030	S	174°	Deg	17"		RCIC	X-224	RCIC; 4 pits total, 2" group D	4	2005
6	1	6-P1-024	SM	1	<0.030	S	194°	Deg	16"		RCIC	X-224	RCIC; 4 pits 1.5" group D	4	2005
6	1	6-P1-025	SM	1	<0.030	S	194°	Deg	9.5"		RCIC	X-224	RCIC; 1.5" group D		2005
6	1	6-P1-026	N/A	1	<0.030	S	223°	Deg	11"		RCIC	X-224	RCIC		2005
6	1	6-P1-027	SM	1	<0.030	S	223°	Deg	17"		RCIC	X-224	RCIC; 7 pits total, 2" group D	7	2005
6	1	6-P1-028	SM	1	<0.030	S	232.5°	Deg	6"		RCIC	X-224	RCIC; 2 pits total, 1/2" group D	2	2005
6	1	6-P1-029	SM	1	<0.030	S	252°	Deg	9"		RCIC	X-224	RCIC; 20 pits, 1.5" group D	20	2005
6	1	6-P1-030	SM	1	<0.030	S	271°	Deg	3"		RCIC	X-224	RCIC; 5 pits, 2" group D	5	2005
6	1	6-P1-031	SM	1	<0.030	S	271°	Deg	10"		RCIC	X-224	RCIC; 5 pits, 1" group D	5	2005
6	1	6-P1-032	SM	1	<0.030	S	271°	Deg	14"		RCIC	X-224	RCIC; 9 pits total, 1.5" group D	9	2005
6	1	6-P1-033	SM	1	<0.030	S	271°	Deg	17"		RCIC	X-224	RCIC; 4 pits total, 1" group D	4	2005
6	1	6-P1-034	LG	1	<0.030	S	290.5°	Deg	8"		RCIC	X-224	RCIC; 4 pits total, 3-1/4" group D	4	2005
6	1	6-P1-035	SM	1	<0.030	S	290.5°	Deg	16"		RCIC	X-224	RCIC; 15 pits total, 2" group D	15	2005
6	1	6-P1-036	N/A	1	<0.030	S	310°	Deg	8"		RCIC	X-224	RCIC		2005
6	1	6-P1-037	N/A	1	<0.030	S	339°	Deg	12.5"		RCIC	X-224	RCIC		2005
6	1	6-P1-038	SM	1	<0.030	S	349°	Deg	19"		RCIC	X-224	RCIC; 3 pits, 2" group D	3	2005
6	1	6-P1-039	SM	1	<0.030	S	349°	Deg	5"		RCIC	X-224	RCIC; 3 pits, 1" group D	3	2005
6	1	6-P1-040	N/A	1	<0.030	S	358.5°	Deg	7.5"		RCIC	X-224	RCIC		2005
6	4	6-P4-001	SM	1	<0.030	S	186°	Deg	6"		Temp. Monit.	X-300E	Temp Monitor; 2 pits total, ½" group D	2	2005
6	4	6-P4-002	SM	1	<0.030	S	186°	Deg	12"		Temp. Monit.	X-300E	Temp Monitor;3 pits total, 1" group D	3	2005
6	4	6-P4-003	LG	1	<0.030	S	186°	Deg	12"		Temp. Monit.	X-300E	Temp Monitor;20 pits, 3" group D	20	2005

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Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
6	4	6-P4-004	N/A	1	<0.030	S	256°	Deg	9.5"		Temp. Monit.	X-300E	Temp Monitor		2005
6	4	6-P4-005	SM	1	<0.030	S	279°	Deg	12"		Temp. Monit.	X-300E	Temp Monitor;5 pits, 2" group D	5	2005
6	4	6-P4-006	SM	1	<0.030	S	349°	Deg	12"		Temp. Monit.	X-300E	2 pits total, ½" group D	2	2005
6	4	6-P4-007	N/A	1	<0.030	S	93°	Deg	13"		Temp. Monit.	X-300F	Temp Monitor		2005
6	4	6-P4-008	N/A	1	<0.030	S	116°	Deg	10"		Temp. Monit.	X-300F	Temp Monitor		2005
6	4	6-P4-009	SM	1	<0.030	S	116°	Deg	13"		Temp. Monit.	X-300F	Temp Monitor;3 pits total, ¾" group D	3	2005
7	1	7-P1-001	N/A	1	<0.030	S	95°	Deg	11.5"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-0010	N/A	1	<0.030	S	125°	Deg	34"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-002	N/A	1	<0.030	S	115°	Deg	22.5"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-003	N/A	1	<0.030	S	120°	Deg	20"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-004	N/A	1	<0.030	S	125°	Deg	18"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-005	N/A	1	<0.030	S	125°	Deg	17.5"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-006	N/A	1	<0.030	S	125°	Deg	16"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-007	N/A	1	<0.030	S	125°	Deg	6"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-008	N/A	1	<0.030	S	125°	Deg	9.5"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-009	N/A	1	<0.030	S	125°	Deg	22"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-011	N/A	1	<0.030	S	120°	Deg	29.5"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-012	N/A	1	<0.030	S	130°	Deg	16.5"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-013	N/A	1	<0.030	S	130°	Deg	31"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-014		1	<0.030	S	135°	Deg	5"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-015		1	<0.030	S	135°	Deg	20"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-016		1	<0.030	S	136°	Deg	30.5"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-017	SM	1	<0.030	S	136°	Deg	36"		CS-A	X-227A	CS-'A'; 7 pits total, 2" group D	7	2005
7	1	7-P1-018		1	<0.030	S	140°	Deg	19"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-019		1	<0.030	S	140° - 160°	Deg	33"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-020	LG	1	<0.030	S	170°	Deg	29"		CS-A	X-227A	CS-'A'; 20 pits total, 3" group D	20	2005
7	1	7-P1-021		1	<0.030	S	175°	Deg	18"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-022	SM	1	<0.030	S	180°	Deg	21"		CS-A	X-227A	CS-'A'; 3 pits total, 1-1/2" group D	3	2005
7	1	7-P1-023		1	<0.030	S	180°	Deg	34"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-024	SM	1	<0.030	S	180°	Deg	33"		CS-A	X-227A	CS-'A'; 6 pits, 2" group D	6	2005
7	1	7-P1-025	SM	1	<0.030	S	185°	Deg	30"		CS-A	X-227A	CS-'A'; 3 pits total, 1/2" group D	3	2005
7	1	7-P1-026	SM	1	<0.030	S	185°	Deg	36"		CS-A	X-227A	CS-'A'; 6 pits, 1-1/2" group D	6	2005
7	1	7-P1-027	LG	1	<0.030	S	190°	Deg	28"		CS-A	X-227A	CS-'A'; 9 PITS, 3"	9	2005
7	1	7-P1-028	LG	1	<0.015	S	200°	Deg	20"		CS-A	X-227A	CS-'A'; 9 PITS, 3"	9	2005

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Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
7	1	7-P1-029	N/A	1	<0.030	S	300°	Deg	18"		CS-A	X-227A	CS-'A'		2005
7	1	7-P1-030	SM	1	<0.015	S	310°	Deg	20"		CS-A	X-227A	CS-'A'; 5 PITS, 1.5"	5	2005
7	1	7-P1-031	SM	1	<0.030	S	310°	Deg	29"		CS-A	X-227A	CS-'A'; 3 PITS, 1.25"	3	2005
7	1	7-P1-032	SM	1	<0.030	S	350°	Deg	23"		CS-A	X-227A	CS-'A'; 3 PITS, 0.75"	3	2005
7	1	7-P1-033	SM	1	<0.030	S	310°	Deg	36"		CS-A	X-227A	CS-'A'; 2 PITS, 0.50"	2	2005
8	3	8-P3-001	SM	1	<0.030	S	170	Deg	38		CS A Test Line	X-223A	CS Test Line; 2 Pits, .5" D		2005
8	4	8-P4-001	LG	1	<0.030	S	5	Deg	12		Temp. Monit.	X-300-G	Temp. Monitor; 6 Pits, 3" D	6	2005
8	4	8-P4-002	N/A	1	<0.030	S	160	Deg	12		Temp. Monit.	X-300-G	Temp. Monitor		2005
8	4	8-P4-003	SM	1	<0.030	S	170	Deg	9		Temp. Monit.	X-300-G	Temp. Monitor; 10 Pits, .75" D	10	2005
8	4	8-P4-004	SM	1	<0.030	S	170	Deg	11		Temp. Monit.	X-300-G	Temp. Monitor; 2 Pits, .5" D	2	2005
8	4	8-P4-005	SM	1	<0.030	S	170	Deg	4		Temp. Monit.	X-300-G	Temp. Monitor; 5 Pits, 1.5" D	5	2005
9	1	9-P1-001	N/A	2	0.045	N/A	9.5" (8/9 RG)	In	60" (IW)		Near RG				2005
9	1	9-P1-002	N/A	2	0.052	S	5" (8/9 RG)	In	49" (IW)		Near RG				2005
9	1	9-P1-003	N/A	2	0.041	N/A	6.5" (8/9 RG)	In	46.5" (IW)		Near RG				2005
9	1	9-P1-004	N/A	2	0.074	S	1.5" (8/9 RG)	In	38" (IW)		Near RG				2005
10	1	10-P1-001	SM	1	<0.030	S	175	Deg	31" to 37"		CS B Test Line	X-223B	CS Test Line, tiger striping at waterline		2005
11	1	11-P1-001	N/A	2	0.049	n/a	10" (10/11 RG)	In	36" (IW)		Near RG				2005
11	3	11-P3-001	N/A	1	<0.030	S	0	Deg	26		CS-B	X227B	CS-'B'		2005
11	3	11-P3-002	N/A	1	<0.030	S	0	Deg	32		CS-B	X227B	CS-'B'		2005
11	3	11-P3-003	N/A	1	<0.030	S	5	Deg	28		CS-B	X227B	CS-'B'		2005
11	3	11-P3-004	N/A	1	<0.030	S	10	Deg	34		CS-B	X227B	CS-'B'		2005
11	3	11-P3-005	N/A	1	<0.030	S	15	Deg	34		CS-B	X227B	CS-'B'		2005
11	3	11-P3-006	N/A	1	<0.030	S	300	Deg	26		CS-B	X227B	CS-'B'		2005
11	3	11-P3-007	N/A	1	<0.030	S	200	Deg	32		CS-B	X227B	CS-'B'		2005
11	3	11-P3-008	N/A	1	<0.030	S	290	Deg	20		CS-B	X227B	CS-'B'		2005
11	3	11-P3-009	N/A	1	<0.030	S	290	Deg	24		CS-B	X227B	CS-'B'		2005
11	3	11-P3-010	N/A	1	<0.030	S	290	Deg	30		CS-B	X227B	CS-'B'		2005
11	3	11-P3-011	N/A	1	<0.030	S	280	Deg	26		CS-B	X227B	CS-'B'		2005
11	3	11-P3-012	N/A	1	<0.030	S	280	Deg	35		CS-B	X227B	CS-'B'		2005
11	3	11-P3-013	N/A	1	<0.030	S	280	Deg	15		CS-B	X227B	CS-'B'		2005

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Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
11	3	11-P3-014	N/A	1	<0.030	S	270	Deg	12		CS-B	X227B	CS-'B'		2005
11	3	11-P3-015	N/A	1	<0.030	S	7	Deg	31		CS-B	X227B	CS-'B'		2005
11	3	11-P3-016	N/A	1	<0.030	S	7	Deg	27		CS-B	X227B	CS-'B'		2005
11	3	11-P3-017	N/A	1	<0.030	S	10	Deg	13		CS-B	X227B	CS-'B'		2005
11	3	11-P3-018	N/A	1	<0.030	S	250	Deg	11		CS-B	X227B	CS-'B'		2005
11	3	11-P3-019	N/A	1	<0.030	S	250	Deg	11		CS-B	X227B	CS-'B'		2005
11	3	11-P3-020	N/A	1	<0.030	S	290	Deg	12		CS-B	X227B	CS-'B'		2005
11	3	11-P3-021	N/A	1	<0.030	S	290	Deg	14		CS-B	X227B	CS-'B'		2005
11	3	11-P3-022	N/A	1	<0.030	S	185	Deg	11		CS-B	X227B	CS-'B'		2005
11	3	11-P3-023	N/A	1	<0.030	S	185	Deg	10		CS-B	X227B	CS-'B'		2005
11	3	11-P3-024	N/A	1	<0.030	S	180	Deg	12		CS-B	X227B	CS-'B'		2005
11	3	11-P3-025	N/A	1	<0.030	S	180	Deg	14		CS-B	X227B	CS-'B'		2005
11	3	11-P3-026	N/A	1	<0.030	S	180	Deg	18		CS-B	X227B	CS-'B'		2005
12	2	12-P2-001	N/A	1	<0.030	S	0°	Deg	18"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-002	N/A	1	<0.030	S	0°	Deg	14"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-003	N/A	1	<0.030	S	0°	Deg	1"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-004	N/A	1	<0.030	S	45°	Deg	8"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-005	N/A	1	<0.030	S	45° /	Deg	9"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-006	N/A	1	<0.030	S	50°	Deg	9"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-007	N/A	1	<0.030	S	55°	Deg	1"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-008	N/A	1	<0.030	S	60°	Deg	12"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-009	N/A	1	<0.030	S	65°	Deg	7"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-010	N/A	1	<0.030	S	100°	Deg	7," 5"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-011	N/A	1	<0.030	S	100°	Deg	6"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-012	N/A	1	<0.030	S	180°	Deg	4"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-013	N/A	1	<0.030	S	260°	Deg	4"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-014	N/A	1	<0.030	S	260°	Deg	8"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-015	N/A	1	<0.030	S	270°	Deg	9"		Torus Drain	X-213B	Torus Drain		2005
12	2	12-P2-016	N/A	1	<0.030	S	275°	Deg	12"		Torus Drain	X-213B	Torus Drain		2005
12	4	12-P4-001	N/A	1	<0.030	S	0°	Deg	12"		Temp. Monit.	X-300K	Temp Monitor		2005
12	4	12-P4-002	N/A	1	<0.030	S	280°	Deg	8"		Temp. Monit.	X-300K	Temp Monitor		2005
12	4	12-P4-003	N/A	1	<0.030	S	185°	Deg	6"		Temp. Monit.	X-300L	Temp Monitor		2005
12	4	12-P4-004	N/A	1	<0.030	S	290°	Deg	8"		Temp. Monit.	X-300L	Temp Monitor		2005
14	2	14-P2-001	N/A	1	<0.030	S	0°	Deg	36"		HPCI	X-226	HPCI		2005
14	2	14-P2-002	N/A	1	<0.030	S	0°	Deg	12"		HPCI	X-226	HPCI		2005
14	2	14-P2-003	N/A	1	<0.030	S	5°	Deg	12"		HPCI	X-226	HPCI		2005
14	2	14-P2-004	N/A	1	<0.030	S	10°	Deg	24"		HPCI	X-226	HPCI		2005

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Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
14	2	14-P2-005	N/A	1	<0.030	S	20°	Deg	16"		HPCI	X-226	HPCI		2005
14	2	14-P2-006	N/A	1	<0.030	S	25°	Deg	23"		HPCI	X-226	HPCI		2005
14	2	14-P2-007	N/A	1	<0.030	S	16°	Deg	14"		HPCI	X-226	HPCI		2005
14	2	14-P2-008	N/A	1	<0.030	S	90°	Deg	33"		HPCI	X-226	HPCI		2005
14	2	14-P2-009	N/A	1	<0.030	S	90°	Deg	22"		HPCI	X-226	HPCI		2005
14	2	14-P2-010	N/A	1	<0.030	S	145°	Deg	24"		HPCI	X-226	HPCI		2005
14	2	14-P2-011	N/A	1	<0.030	S	150°	Deg	30"		HPCI	X-226	HPCI		2005
14	2	14-P2-012	N/A	1	<0.030	S	190°	Deg	24"		HPCI	X-226	HPCI		2005
14	4	14-P4-001	N/A	1	<0.030	S	0°	Deg	13"		Temp. Monit.	x-300M	Temp Monitor		2005
15	1	15.P1-012	N/A	1	<0.030	S	180°	Deg	27"		RHR-C	X-225C			2005
15	1	15-P1-001	N/A	1	0.000	S	0°	Deg	37"		RHR-C	X-225C			2005
15	1	15-P1-002	N/A	1	0.000	S	6°	Deg	30"		RHR-C	X-225C			2005
15	1	15-P1-003	N/A	1	<0.030	S	120°	Deg	31"		RHR-C	X-225C			2005
15	1	15-P1-004	N/A	1	<0.030	S	120°	Deg	31"		RHR-C	X-225C			2005
15	1	15-P1-005	N/A	1	<0.030	S	140°	Deg	6"		RHR-C	X-225C			2005
15	1	15-P1-006	N/A	1	<0.030	S	140°	Deg	4"		RHR-C	X-225C			2005
15	1	15-P1-007	N/A	1	<0.030	S	170°	Deg	19"		RHR-C	X-225C			2005
15	1	15-P1-008	N/A	1	0.007	S	175°	Deg	28"		RHR-C	X-225C			2005
15	1	15-P1-009	N/A	1	0.003	S	175° /	Deg	33"		RHR-C	X-225C			2005
15	1	15-P1-010	N/A	1	0.003	S	175°	Deg	32"		RHR-C	X-225C			2005
15	1	15-P1-011	N/A	1	<0.030	S	175°	Deg	32"		RHR-C	X-225C			2005
15	1	15-P1-013	N/A	1	<0.030	S	180°	Deg	28"		RHR-C	X-225C			2005
15	1	15-P1-014	N/A	1	<0.030	S	180°	Deg	36"		RHR-C	X-225C			2005
15	1	15-P1-015	N/A	1	<0.030	S	180°	Deg	37"		RHR-C	X-225C			2005
15	1	15-P1-016	N/A	1	<0.030	S	180°	Deg	23"		RHR-C	X-225C			2005
15	1	15-P1-017	N/A	1	<0.030	S	180°	Deg	20"		RHR-C	X-225C			2005
15	1	15-P1-018	N/A	1	0.003	S	180°	Deg	31"		RHR-C	X-225C			2005
15	1	15-P1-019	N/A	1	0.002	S	180°	Deg	28"		RHR-C	X-225C			2005
15	1	15-P1-020	N/A	1	<0.030	S	180°	Deg	28"		RHR-C	X-225C			2005
15	1	15-P1-021	N/A	1	<0.030	S	190°	Deg	17"		RHR-C	X-225C			2005
15	1	15-P1-022	N/A	1	<0.030	S	190°	Deg	19"		RHR-C	X-225C			2005
15	1	15-P1-023	N/A	1	<0.030	S	210°	Deg	11"		RHR-C	X-225C			2005
15	2	15.P2-012	N/A	1	0.000	S	180°	Deg	27"		RHR-D	X-225D	RHR 'D'		2005
15	2	15-P2-001	N/A	1	0.001	S	4°	Deg	38"		RHR-D	X-225D	RHR 'D'		2005
15	2	15-P2-002	N/A	1	<0.030	S	130°	Deg	6"		RHR-D	X-225D	RHR 'D'		2005
15	2	15-P2-003	N/A	1	<0.030	S	130°	Deg	6.5"		RHR-D	X-225D	RHR 'D'		2005
15	2	15-P2-004	N/A	1	<0.030	S	130°	Deg	9"		RHR-D	X-225D	RHR 'D'		2005
15	2	15-P2-005	N/A	1	<0.030	S	135°	Deg	15"		RHR-D	X-225D	RHR 'D'		2005
15	2	15-P2-006	N/A	1	0.005	S	140°	Deg	23"		RHR-D	X-225D	RHR 'D'		2005
15	2	15-P2-007	N/A	1	<0.030	S	170°	Deg	13"		RHR-D	X-225D	RHR 'D'		2005

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
15	2	15-P2-008	N/A	1	<0.030	S	180°	Deg	16"		RHR-D	X-225D	RHR 'D'		2005
15	2	15-P2-009	N/A	1	<0.030	S	180°	Deg	37"		RHR-D	X-225D	RHR 'D'		2005
15	2	15-P2-010	N/A	1	0.000	S	183°	Deg	36"		RHR-D	X-225D	RHR 'D'		2005
15	2	15-P2-011	N/A	1	<0.030	S	185° /	Deg	38"		RHR-D	X-225D	RHR 'D'		2005
15	2	15-P2-013	N/A	1	<0.030	S	0°	Deg	37"		RHR-D	X-225D	RHR 'D'		2005
1	4	1-P4-1	N/A	2	0.073	S	2"	in.	8"		Near RG		**1/16 RG**		2008
2	1	2-P1-1	N/A	2	0.055	S	8" IW	in	10"		Near RG		**1/2 RG**		2008
2	1	2-P1-2	N/A	2	0.054	S	8" IW	in	19"		Near RG		**1/2 RG**		2008
2	3	2-P3-1	N/A	2	0.058	S	5.5' IW	in	13.5"		Near RG		**2/3 RG**		2008
2	3	2-P3-2	N/A	2	0.092	D	38" IW	in	3"	YES	Near RG		**2/3 RG pit located on weld actual pit depth may be lower** CR-CNS-2008-2770		2008
2	3	2-P3-3	N/A	2	0.060	S	43" IW	in	13.5"		Near RG		**2/3 RG**		2008
2	3	2-P3-4	N/A	2	0.059	S	42" IW	in	13.5		Near RG		**2/3 RG**		2008
2	4	2-P4-1	N/A	2	0.060	S	60" IW	in	5"		Near RG		**2/3 RG**		2008
2	4	2-P4-2	N/A	2	0.060	S	60" IW	in	5"		Near RG		**2/3 RG**		2008
2	4	2-P4-3	N/A	2	0.050	S	53" IW	in	7.5"		Near RG		**2/3 RG**		2008
2	4	2-P4-4	N/A	2	0.065	S	51" IW	in	9"		Near RG		**2/3 RG**		2008
2	4	2-P4-5	N/A	2	0.059	S	51" IW	in	9"		Near RG		**2/3 RG**		2008
2	5	2-P5-1	N/A	2	0.054	S	6' IW	in	15"		Near RG		**1/2 RG**		2008
2	5	2-P5-2	N/A	2	0.055	S	5' IW	in	13.5"		Near RG		**1/2 RG**		2008
2	5	2-P5-3	N/A	2	0.057	S	28" IW	in	12.5		Near RG		**1/2 RG**		2008
2	5	2-P5-4	N/A	2	0.049	N/A	10" IW	in	12"		Near RG		**1/2 RG**		2008
2	5	2-P5-5	N/A	2	0.064	S	10" IW	in	12"		Near RG		**1/2 RG**		2008
2	5	2-P5-6	N/A	2	0.063	S	5" IW	in	9"		Near RG		**1/2 RG**		2008
2	5	2-P5-7	N/A	2	0.081	S	0.25" IW	in	9"		Near RG		**1/2 RG**		2008
2	5	2-P5-8	N/A	2	0.037	N/A	1" IW	in	6"		Near RG		**1/2 RG**		2008
2	5	2-P5-9	N/A	2	0.063	S	2" IW	in	10"		Near RG		**1/2 RG**		2008
3	1	3-P1-1	N/A	2	0.058	S	6" from RG	in.	6' from IW		Near RG		2/3 RG		2008
3	1	3-P1-2	N/A	2	0.052	S	8" from RG	in.	4.5' from IW		Near RG		2/3 RG		2008
3	1	3-P1-3	N/A	2	0.055	S	2" from RG	in.	4' from IW		Near RG		2/3 RG		2008
3	1	3-P1-4	N/A	2	0.061	S	2" from RG	in.	4' from IW		Near RG		2/3 RG		2008
3	1	3-P1-5	N/A	2	0.088	S	5" from RG	in.	4' from IW		Near RG		2/3 RG		2008

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
3	1	3-P1-6	N/A	2	0.059	S	5" from RG	in.	4' from IW		Near RG		2/3 RG		2008
3	1	3-P1-7	N/A	2	0.053	S	5" from RG	in.	4' from IW		Near RG		2/3 RG		2008
3	2	3-P2-1	N/A	1	0.054	D	170	deg	17" from pipe wall	YES	RHR-A	X-225A	X-225A CR-CNS-2008-2770		2008
3	2	3-P2-10	N/A	1	0.010	S	180	deg	32		RHR-A	X-225A	X-225A		2008
3	2	3-P2-11	N/A	1	0.006	S	185	deg	19		RHR-A	X-225A	X-225A		2008
3	2	3-P2-12	N/A	1	0.022	S	185	deg	29		RHR-A	X-225A	X-225A failed repair		2008
3	2	3-P2-13	N/A	1	0.022	S	180	deg	32		RHR-A	X-225A	X-225A		2008
3	2	3-P2-14	N/A	1	0.006	S	185	deg	30.5		RHR-A	X-225A	X-225A failed repair		2008
3	2	3-P2-15	N/A	1	0.010	S	190	deg	31		RHR-A	X-225A	X-225A failed repair		2008
3	2	3-P2-16	N/A	1	0.013	S	185	deg	34		RHR-A	X-225A	X-225A		2008
3	2	3-P2-17	N/A	1	0.030	D	180	deg	37	YES	RHR-A	X-225A	X-225A CR-CNS-2008-2770		2008
3	2	3-P2-18	N/A	1	0.047	D	190	deg	36	YES	RHR-A	X-225A	X-225A CR-CNS-2008-2770		2008
3	2	3-P2-19	N/A	1	0.030	S	195	deg	36		RHR-A	X-225A	X-225A failed repair		2008
3	2	3-P2-2	N/A	1	0.007	S	170	deg	18"		RHR-A	X-225A	X-225A		2008
3	2	3-P2-20	N/A	1	0.008	S	200	deg	35		RHR-A	X-225A	X-225A failed repair		2008
3	2	3-P2-21	N/A	1	0.032	D	210	deg	30	YES	RHR-A	X-225A	X-225A CR-CNS-2008-2770		2008
3	2	3-P2-22	N/A	1	0.010	S	200	deg	35		RHR-A	X-225A	X-225A		2008
3	2	3-P2-23	N/A	1	0.037	D	5	deg	38	YES	RHR-A	X-225A	X-225A Adj to Pit 03-02-05; 1.5" clear distance CR-CNS-2008-2770		2008
3	2	3-P2-24	N/A	1	0.024	S	230	deg	22		RHR-A	X-225A	X-225A		2008
3	2	3-P2-25	N/A	1	0.039	D	255	deg	15	YES	RHR-A	X-225A	X-225A CR-CNS-2008-2770		2008
3	2	3-P2-26	N/A	1	0.023	S	260	deg	8.5		RHR-A	X-225A	X-225A		2008
3	2	3-P2-27	N/A	1	0.025	S	265	deg	24.5		RHR-A	X-225A	X-225A		2008
3	2	3-P2-28	N/A	1	0.019	S	250	deg	27		RHR-A	X-225A	X-225A		2008
3	2	3-P2-29	N/A	1	0.013	S	230	deg	27		RHR-A	X-225A	X-225A		2008
3	2	3-P2-3	N/A	1	0.011	S	1	deg	35"		RHR-A	X-225A	X-225A failed repair		2008
3	2	3-P2-30	N/A	1	0.029	S	270	deg	33		RHR-A	X-225A	X-225A		2008
3	2	3-P2-31	N/A	1	0.031	D	270	deg	6	YES	RHR-A	X-225A	X-225A CR-CNS-2008-2770		2008
3	2	3-P2-32	N/A	1	0.025	S	270	deg	31		RHR-A	X-225A	X-225A		2008
3	2	3-P2-33	N/A	1	0.022	S	270	deg	31		RHR-A	X-225A	X-225A		2008
3	2	3-P2-34	N/A	1	0.016	S	280	deg	39		RHR-A	X-225A	X-225A		2008
3	2	3-P2-35	N/A	1	0.021	S	290	deg	13.5		RHR-A	X-225A	X-225A		2008
3	2	3-P2-36	N/A	1	0.012	S	295	deg	14		RHR-A	X-225A	X-225A		2008
3	2	3-P2-37	N/A	1	0.021	S	340	deg	30		RHR-A	X-225A	X-225A		2008
3	2	3-P2-38	N/A	1	0.022	S	315	deg	38		RHR-A	X-225A	X-225A		2008

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
3	2	3-P2-4	N/A	1	0.005	S	1	deg	31		RHR-A	X-225A	X-225A failed repair		2008
3	2	3-P2-5	N/A	1	0.050	D	5	deg	38	YES	RHR-A	X-225A	X-225A Adj to Pit 03-02-23; 1.5" clear distance (failed repair) CR-CNS-2008-2770		2008
3	2	3-P2-6	N/A	1	0.008	S	355	deg	19		RHR-A	X-225A	failed repair		2008
3	2	3-P2-7	N/A	1	0.009	S	1	deg	20		RHR-A	X-225A	X-225A failed repair		2008
3	2	3-P2-8	N/A	1	0.035	D	90	deg	9	YES	RHR-A	X-225A	X-225A CR-CNS-2008-2770		2008
3	2	3-P2-9	N/A	1	0.012	S	170	deg	26		RHR-A	X-225A	X-225A		2008
3	3	3-P3-1	N/A	1	0.027	S	1	deg	11		RHR-B	x-225B	X-225B		2008
3	3	3-P3-10	N/A	1	0.007	S	48	deg	19		RHR-B	x-225B	X-225B		2008
3	3	3-P3-11	N/A	1	0.024	S	48	deg	16		RHR-B	x-225B	X-225B		2008
3	3	3-P3-12	N/A	1	0.037	D	48	deg	24	YES	RHR-B	x-225B	X-225B CR-CNS-2008-2770		2008
3	3	3-P3-13	N/A	1	0.016	S	50	deg	17		RHR-B	x-225B	X-225B		2008
3	3	3-P3-14	N/A	1	0.020	S	60	deg	20.5		RHR-B	x-225B	X-225B		2008
3	3	3-P3-15	N/A	1	0.040	D	70	deg	19	YES	RHR-B	x-225B	X-225B CR-CNS-2008-2770		2008
3	3	3-P3-16	N/A	1	0.023	S	75	deg	14		RHR-B	x-225B	X-225B		2008
3	3	3-P3-17	N/A	1	0.008	S	315	deg	52		RHR-B	x-225B	X-225B		2008
3	3	3-P3-18	N/A	1	0.006	S	315	deg	50		RHR-B	x-225B	X-225B		2008
3	3	3-P3-19	N/A	1	0.010	S	315	deg	47		RHR-B	x-225B	X-225B		2008
3	3	3-P3-2	SM	1	0.021	S	320-10	deg	15-38		RHR-B	x-225B	X-225B Apprx 50 small pit groups containing 120 pits 1/8 - 1/4 dia. Depth < 30 mil, ave 5 mil, 2'x2.5' area near X-225B	120	2008
3	3	3-P3-20	N/A	1	0.008	S	315	deg	43		RHR-B	x-225B	X-225B		2008
3	3	3-P3-21	SM	1	0.017	S	313	deg	50		RHR-B	x-225B	X-225B Apprx 3 small pit groups containing 12 pits 1/8 - 1/4 dia. Depth < 30 mil, ave 5 mil, 5"x5" area near X-225B	12	2008
3	3	3-P3-22	N/A	1	0.045	D	313	deg	45	YES	RHR-B	x-225B	X-225B CR-CNS-2008-2770		2008
3	3	3-P3-23	N/A	1	0.008	S	320	deg	40.5		RHR-B	x-225B	X-225B		2008
3	3	3-P3-24	N/A	1	0.010	S	325	deg	40.5		RHR-B	x-225B	X-225B		2008
3	3	3-P3-25	N/A	1	0.033	D	325	deg	39.5	YES	RHR-B	x-225B	X-225B CR-CNS-2008-2770		2008
3	3	3-P3-26	N/A	1	0.016	S	325	deg	39.5		RHR-B	x-225B	X-225B		2008
3	3	3-P3-27	N/A	1	0.006	S	315	deg	37		RHR-B	x-225B	X-225B		2008
3	3	3-P3-28	N/A	1	0.002	S	330	deg	30		RHR-B	x-225B	X-225B		2008
3	3	3-P3-29	SM	1	0.010	S	330	deg	27		RHR-B	x-225B	X-225B Apprx 20 small pit groups containing 30 pits 1/8 - 1/4 dia. Depth < 30 mil, ave 5 mil, 14"x17" area near X-225B	30	2008
3	3	3-P3-3	N/A	1	0.007	S	15	deg	36		RHR-B	X-225B	X-225B		2008
3	3	3-P3-30	N/A	1	0.007	S	300	deg	15		RHR-B	X-225B	X-225B		2008

Torus Identified Internal Pitting

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3	3	3-P3-31	N/A	1	0.022	S	300	deg	13		RHR-B	X-225B	X-225B		2008
3	3	3-P3-32	N/A	1	0.041	D	300	deg	11	YES	RHR-B	X-225B	X-225B CR-CNS-2008-2770		2008
3	3	3-P3-33	N/A	1	0.015	S	310	deg	16		RHR-B	x-225B	x-225B		2008
3	3	3-P3-34	N/A	1	0.043	D	310	deg	24	YES	RHR-B	x-225B	x-225B CR-CNS-2008-2770		2008
3	3	3-P3-35	N/A	1	0.042	D	310	deg	29	YES	RHR-B	x-225B	X-225B CR-CNS-2008-2770		2008
3	3	3-P3-36	N/A	1	0.030	S	310	deg	35		RHR-B	x-225B	x-225B		2008
3	3	3-P3-37	N/A	1	0.050	D	305	deg	34	YES	RHR-B	x-225B	x-225B CR-CNS-2008-2770		2008
3	3	3-P3-38	N/A	1	0.048	D	305	deg	27	YES	RHR-B	x-225B	X-225B CR-CNS-2008-2770		2008
3	3	3-P3-39	N/A	1	0.029	S	305	deg	20		RHR-B	x-225B	x-225B		2008
3	3	3-P3-4	N/A	1	0.017	S	20	deg	15		RHR-B	X-225B	X-225B		2008
3	3	3-P3-40	N/A	1	0.014	S	275	deg	26		RHR-B	x-225B	x-225B		2008
3	3	3-P3-41	SM	1	0.017	S	270	deg	12		RHR-B	x-225B	X-225B Apprx 30 small pit groups containing 50 pits 1/8 - 1/4 dia. Depth < 30 mil, ave 5 mil, 18"x10" area near X-225B	50	2008
3	3	3-P3-42	SM	1	0.010	S	255	deg	25.5		RHR-B	x-225B	X-225B Apprx 2 small pit groups containing 4 pits 1/8 - 1/4 dia. Depth < 30 mil, ave 5 mil, 4"x4" area near X-225B	4	2008
3	3	3-P3-43	SM	1	0.022	S	250	deg	23		RHR-B	x-225B	X-225B Apprx 8 small pit groups containing 15 pits 1/8 - 1/4 dia. Depth < 30 mil, ave 5 mil, 6"x12" area near X-225B	15	2008
3	3	3-P3-44	N/A	1	0.002	S	250	deg	19		RHR-B	x-225B	x-225B		2008
3	3	3-P3-45	N/A	1	0.045	D	230	deg	19	YES	RHR-B	x-225B	X-225B CR-CNS-2008-2770		2008
3	3	3-P3-46	N/A	1	0.017	S	230	deg	22		RHR-B	x-225B	x-225B		2008
3	3	3-P3-47	N/A	1	0.014	S	225	deg	27		RHR-B	x-225B	x-225B		2008
3	3	3-P3-48	N/A	1	0.028	S	220	deg	20		RHR-B	x-225B	x-225B		2008
3	3	3-P3-49	N/A	1	0.018	S	210	deg	32		RHR-B	x-225B	x-225B		2008
3	3	3-P3-5	N/A	1	0.008	S	25	deg	32		RHR-B	X-225B	X-225B		2008
3	3	3-P3-50	N/A	1	0.008	S	205	deg	35		RHR-B	x-225B	x-225B		2008
3	3	3-P3-51	N/A	1	0.016	S	175	deg	18		RHR-B	x-225B	x-225B		2008
3	3	3-P3-52	N/A	1	0.019	S	170	deg	22		RHR-B	x-225B	x-225B		2008
3	3	3-P3-53	N/A	1	0.018	S	178	deg	19.5		RHR-B	x-225B	x-225B		2008
3	3	3-P3-54	N/A	1	0.014	S	178	deg	22		RHR-B	x-225B	x-225B		2008
3	3	3-P3-55	N/A	1	0.016	S	178	deg	17		RHR-B	x-225B	x-225B		2008
3	3	3-P3-56	N/A	1	0.014	S	180	deg	29		RHR-B	x-225B	x-225B		2008
3	3	3-P3-57	N/A	1	0.014	S	182	deg	27		RHR-B	x-225B	x-225B		2008
3	3	3-P3-58	N/A	1	0.024	S	182	deg	37		RHR-B	x-225B	x-225B		2008
3	3	3-P3-59	N/A	1	0.059	D	170	deg	32.5	YES	RHR-B	x-225B	X-225B CR-CNS-2008-2770		2008
3	3	3-P3-6	N/A	1	0.013	S	30	deg	36		RHR-B	X-225B	X-225B		2008

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
3	3	3-P3-60	N/A	1	0.024	S	182	deg	13		RHR-B	x-225B	x-225B		2008
3	3	3-P3-61	N/A	1	0.017	S	110	deg	12		RHR-B	x-225B	x-225B		2008
3	3	3-P3-62	N/A	1	0.046	D	130	deg	22	YES	RHR-B	x-225B	x-225B CR-CNS-2008-2770		2008
3	3	3-P3-63	N/A	1	0.027	S	230	deg	37		RHR-B	x-225B	x-225B		2008
3	3	3-P3-64	N/A	1	0.013	S	230	deg	34		RHR-B	x-225B	x-225B		2008
3	3	3-P3-65	N/A	1	0.002	S	182	deg	18		RHR-B	x-225B	x-225B		2008
3	3	3-P3-66	N/A	1	0.028	S	170	deg	24		RHR-A	X-225A	X-225A		2008
3	3	3-P3-67a	SM	1	0.011	S	170	deg	29		RHR-A	X-225A	X-225A Pit group; 3 pits near X-225A	3	2008
3	3	3-P3-67b	SM	1	0.011	S	171	deg	30		RHR-A	X-225A	X-225A Pit group; 2 pits near X-225A	2	2008
3	3	3-P3-67c	SM	1	0.011	S	172	deg	31		RHR-A	X-225A	X-225A Pit group; 3 pits near X-225A	3	2008
3	3	3-P3-68	N/A	1	0.003	S	175	deg	37		RHR-A	X-225A	X-225A		2008
3	3	3-P3-69	N/A	1	0.045	D	170	deg	36	YES	RHR-A	X-225A	X-225A CR-CNS-2008-2770		2008
3	3	3-P3-7	N/A	1	0.014	S	45	deg	26		RHR-B	X-225B	X-225B		2008
3	3	3-P3-70	N/A	1	0.024	S	130	deg	29		RHR-A	X-225A	X-225A		2008
3	3	3-P3-71	N/A	1	0.055	D	130	deg	31.5	YES	RHR-A	X-225A	X-225A CR-CNS-2008-2770		2008
3	3	3-P3-72a	SM	1	0.000	S	120	deg	26		RHR-A	X-225A	X-225A Pit group; 3 pits near X-225A	3	2008
3	3	3-P3-72b	SM	1	0.000	S	121	deg	27		RHR-A	X-225A	X-225A Pit group; 2 pits near X-225A	2	2008
3	3	3-P3-73a	SM	1	0.006	S	120	deg	18		RHR-A	X-225A	X-225A Pit group; 2 pits near X-225A	2	2008
3	3	3-P3-73b	SM	1	0.006	S	121	deg	19		RHR-A	X-225A	X-225A Pit group; 2 pits near X-225A	2	2008
3	3	3-P3-74	N/A	1	0.014	S	115	deg	14.5		RHR-A	X-225A	X-225A		2008
3	3	3-P3-75	N/A	1	0.014	S	115	deg	12		RHR-A	X-225A	X-225A		2008
3	3	3-P3-76a	SM	1	0.011	S	105	deg	7.5		RHR-A	X-225A	X-225A Pit group; 3 pits near X-225A	3	2008
3	3	3-P3-76b	SM	1	0.011	S	106	deg	8.5		RHR-A	X-225A	X-225A Pit group; 3 pits near X-225A	3	2008
3	3	3-P3-8	N/A	1	0.015	S	15	deg	22.5		RHR-B	X-225B	X-225B		2008
3	3	3-P3-9	N/A	1	0.009	S	45	deg	21		RHR-B	X-225B	X-225B		2008
3	3	3-P3-77	N/A	2	0.051	S	15" iw	in.	4" rg		Near RG		3/4 RG		2008
3	3	3-P3-78	N/A	2	0.049	N/A	36"iw	in.	2.5"		Near RG		3/4 RG Does not exceed repair threshold value		2008
3	3	3-P3-79	N/A	2	0.070	S	36"	in.	2.5"		Near RG		3/4 RG		2008
3	4	3-P4-1	N/A	2	0.061	S	6 ft iw	ft	6 rg		Near RG		**3/4 RG**		2008
3	4	3-P4-2	N/A	2	0.059	S	6 ft iw	ft	6 rg		Near RG		**3/4 RG**		2008
3	4	3-P4-3	N/A	2	0.068	S	1 iw	in.	4 rg		Near RG		**3/4 RG**		2008
3	5	3-P5-1	N/A	2	0.065	S	4' IW	in.	4		Near RG		2/3 RG		2008
3	5	3-P5-2	N/A	2	0.048	N/A	4' IW	in.	10		Near RG		2/3 RG Does not exceed repair threshold value		2008
3	5	3-P5-3	N/A	2	0.054	S	4' IW	in.	10		Near RG		2/3 RG		2008
3	5	3-P5-4	N/A	2	0.068	S	3.5' IW	in.	6		Near RG		2/3 RG		2008
3	5	3-P5-5	N/A	2	0.055	S	32" IW	in.	1		Near RG		2/3 RG		2008
3	5	3-P5-6	N/A	2	0.053	S	7" IW	in.	6		Near RG		2/3 RG		2008
4	1	4-P1-N/A	N/A	2	0.046	N/A	N/A	N/A	N/A		Torus Drain		Does not exceed repair threshold value		2008

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
4	1	4-P1-N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		Torus Drain		No indications exceeding threshold values		2008
4	2	4-P2-1	N/A	1	0.010	S	315	deg	9"		Torus Drain	X-213A	X-213A		2008
4	2	4-P2-2	N/A	1	0.020	S	335	deg	10"		Torus Drain	X-213A	X-213A 4 pits		2008
4	2	4-P2-3	N/A	1	0.015	S	335	deg	17"		Torus Drain	X-213A	X-213A 2 pits		2008
4	2	4-P2-4	N/A	1	0.010	S	30	deg	18"		Torus Drain	X-213A	X-213A		2008
4	2	4-P2-5	N/A	1	0.010	S	40	deg	14"		Torus Drain	X-213A	X-213A		2008
4	2	4-P2-6	N/A	1	0.010	S	50	deg	15"		Torus Drain	X-213A	X-213A		2008
4	2	4-P2-7	N/A	1	0.015	S	60	deg	18"		Torus Drain	X-213A	X-213A 3 pits		2008
4	2	4-P2-8	N/A	1	0.015	S	60	deg	8"		Torus Drain	X-213A	X-213A		2008
4	2	4-P2-9	N/A	1	0.010	S	90	deg	13"		Torus Drain	X-213A	X-213A		2008
4	2	4-P2-N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		Torus Drain		No indications exceeding threshold values		2008
4	3	4-P3-N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		Torus Drain		No indications exceeding threshold values		2008
4	4	4-P4-1	N/A	1	0.015	S	115	deg	18"		Torus Drain	X-213A	X-213A 2 pits		2008
4	4	4-P4-2	N/A	1	0.010	S	115	deg	15"		Torus Drain	X-213A	X-213A		2008
4	4	4-P4-3	N/A	1	0.010	S	150	deg	15"		Torus Drain	X-213A	X-213A		2008
4	4	4-P4-4	N/A	1	0.049	D	180	deg	12"	YES	Temp. Monit.	X-300D	X-300D CR-CNS-2008-02650		2008
4	5	4-P5-1	N/A	1	0.010	S	200	deg	17"		Torus Drain	X-213A	X-213A		2008
4	5	4-P5-2	N/A	1	0.011	S	225	deg	16"		Torus Drain	X-213A	X-213A		2008
4	5	4-P5-3	N/A	1	0.010	S	230	deg	16"		Torus Drain	X-213A	X-213A		2008
4	5	4-P5-4	N/A	1	0.015	S	250	deg	1"		Torus Drain	X-213A	X-213A 2 pits		2008
5	4	5-P4-1	N/A	2	0.062	S	6' IW	N/A	12" RG		Near RG		5/6 rg		2008
5	4	5-P4-2	N/A	2	0.046	N/A	6' IW	N/A	12" RG		Near RG		5/6 RG Does not exceed repair threshold value		2008
5	4	5-P4-3	N/A	2	0.057	S	9' 6" IW	N/A	12" RG		Near RG		5/6 rg		2008
6	1	6-P1-10	N/A	1	0.007	S	20	deg	15.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-11	N/A	1	0.002	S	20	deg	12.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-12	N/A	1	0.009	S	25	deg	14.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-13	N/A	1	0.004	S	25	deg	11.25"		RCIC	X-224	**X-224**		2008
6	1	6-P1-14	N/A	1	0.002	S	26	deg	10.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-15	N/A	1	0.001	S	25	deg	16"		RCIC	X-224	**X-224**		2008
6	1	6-P1-16	N/A	1	0.001	S	25	deg	17.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-17	N/A	1	0.001	S	25	deg	18"		RCIC	X-224	**X-224**		2008
6	1	6-P1-18	N/A	1	0.016	S	27	deg	10.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-19	N/A	1	0.003	S	35	deg	7.25"		RCIC	X-224	**X-224**		2008
6	1	6-P1-20	N/A	1	0.030	S	95	deg	18.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-21	N/A	1	0.030	S	120	deg	18.75		RCIC	X-224	**X-224**		2008
6	1	6-P1-22	N/A	1	0.030	S	170	deg	17.5		RCIC	X-224	**X-224**		2008
6	1	6-P1-23	N/A	1	0.030	S	185	deg	17"		RCIC	X-224	**X-224**		2008
6	1	6-P1-24	N/A	1	0.030	S	190	deg	13"		RCIC	X-224	**X-224**		2008

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
6	1	6-P1-25	N/A	1	0.030	S	190	deg	16"		RCIC	X-224	**X-224**		2008
6	1	6-P1-26	N/A	1	0.030	S	195	deg	18"		RCIC	X-224	**X-224**		2008
6	1	6-P1-27	N/A	1	0.030	S	200	deg	1.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-28	N/A	1	0.030	S	250	deg	15"		RCIC	X-224	**X-224**		2008
6	1	6-P1-29	N/A	1	0.030	S	255	deg	19.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-3	N/A	1	0.012	S	5	deg	19"		RCIC	X-224	**X-224**		2008
6	1	6-P1-30	N/A	1	0.030	S	310	deg	5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-31	N/A	1	0.030	S	330	deg	13.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-4	N/A	1	0.010	S	7	deg	1.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-5	N/A	1	0.013	S	7	deg	12.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-6	N/A	1	0.000	S	1	deg	13.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-7	N/A	1	0.000	S	1	deg	13.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-8	N/A	1	0.006	S	15	deg	3"		RCIC	X-224	**X-224**		2008
6	1	6-P1-9	N/A	1	0.008	S	20	deg	5.5"		RCIC	X-224	**X-224**		2008
6	1	6-P1-1	N/A	2	0.076	S	40" IW	In.	5.5" R/G		Near RG		**5/6 R/G**		2008
6	1	6-P1-2	N/A	2	0.073	S	23" IW	In.	2" R/G		Near RG		**5/6 R/G**		2008
6	3	6-P3-N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		HPCI		**X-226**		2008
6	4	6-P4-1	N/A	1	0.030	S	300	deg	2"		Temp. Monit.	X-300E	**X-300E**		2008
6	4	6-P4-2	N/A	1	0.030	S	120	deg	1.5		Temp. Monit.	X-300E	**X-300E**		2008
6	4	6-P4-3	N/A	1	0.030	S	180	deg	2"		Temp. Monit.	X-300F	**X-300F**		2008
7	1	7-P1-1	N/A	2	0.069	S	7.5" IW	In.	7.5" R/G		Near RG		7/6 RG		2008
7	1	7-P1-2	N/A	2	0.053	S	6" IW	In.	8" R/G		Near RG		7/6 R/G		2008
7	1	7-P1-3	N/A	2	0.055	S	4.5" IW	In.	7.5" R/G		Near RG		7/6 RG		2008
7	1	7-P1-4	N/A	2	0.061	S	3" IW	In.	5.5" R/G		Near RG		7/6 R/G		2008
7	1	7-P1-5	N/A	2	0.063	S	9"IW	In.	11.5 R/G		Near RG		7/6 RG		2008
7	1	7-P1-N/A	N/A	2	0.019	N/A	N/A	N/A	N/A		Near RG		**N/A**		2008
7	1	7-P1-N/A	N/A	2	0.022	N/A	N/A	N/A	N/A		Near RG		**N/A**		2008
7	1	7-P1-6	N/A	3	0.041	N/A	50	Deg	22		Liquid Level		X-206B		2008
7	3	7-P3-1	N/A	2	0.060	S	35.5 IW	In.	11.5 R/G		Near RG		7/8 RG		2008
7	3	7-P3-2	N/A	2	0.061	S	27 IW	In.	9.5 R/G		Near RG		7/8 R/G		2008
7	3	7-P3-3	N/A	2	0.064	S	13 IW	In.	11.5 R/G		Near RG		7/8 RG		2008
7	4	7-P4-NA	N/A	3	0.000						Gen Shell		0		2008
7	5	7-P5-1	N/A	2	0.056	S	29.5 IW	In.	7" R/G		Near RG		7/6 RG		2008

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
7	5	7-P5-2	N/A	2	0.064	S	6"IW	In.	11.5" R/G		Near RG		7/6 R/G		2008
7	5	7-P5-3	N/A	2	0.062	S	5.5" IW	In.	9" R/G		Near RG		7/6 R/G		2008
8	1	8-P1-N/A	N/A	3	0.071	N/A	48" IW	In.	36" from RG		Gen Shell		0		2008
8	3	8-P3-N/A	N/A	3	0.080	N/A	48" IW	In.	18" from RG		Gen Shell		0		2008
8	3	8-P3-N/A	N/A	3	0.089	N/A	36" IW	In.	96" from RG		Gen Shell		0		2008
8	3	8-P3-N/A	N/A	3	0.090	N/A	36" IW	In.	96" from RG		Gen Shell		0		2008
9	5	9-P5-NA	N/A	3	0.075	N/A	48" IW	In.	2" FROM 4/5 WS		Gen Shell		0		2008
11	1	11-P1-N/A	N/A	3	0.086	N/A	10" 1-2 WS	N/A	48" WL		Gen Shell		0		2008
11	4	11-P4-1	N/A	2	0.060	S	54" IW	In.	6.25" RG		Near RG		11/12 r/g		2008
11	4	11-P4-2	N/A	2	0.062	S	50.5" IW	In.	7.75" RG		Near RG		11/12 r/g		2008
11	4	11-P4-3	N/A	2	0.067	S	45.5" IW	In.	7.75" RG		Near RG		11/12 r/g		2008
11	4	11-P4-4	N/A	2	0.073	S	46" IW	In.	7" RG		Near RG		11/12 r/g		2008
11	4	11-P4-5	N/A	2	0.061	S	7" IW	In.	3.25" RG		Near RG		11/12 r/g		2008
11	4	11-P4-6	N/A	2	0.078	S	27/8" IW	In.	5.75" RG		Near RG		11/12 r/g		2008
11	4	11-P4-7	N/A	2	0.063	S	3.5" IW	In.	7-3/4" RG		Near RG		11/12 r/g		2008
11	5	11-P5-1	N/A	2	0.075	S	47" IW	In.	3.5" RG		Near RG		11/10 rg		2008
11	5	11-P5-2	N/A	2	0.059	S	43" IW	In.	4.5" RG		Near RG		11/10 rg		2008
11	5.	11-P5-3	N/A	2	0.062	S	45.5" IW	In.	9.5" RG		Near RG		11/10 rg		2008
11	5	11-P5-4	N/A	2	0.055	S	32" IW	In.	3.5" RG		Near RG		11/10 rg		2008
12	1	12-P1-1	N/A	2	0.052	S	57 IW	In	8 RG		Near RG		12/11 r/g		2008
12	1	12-P1-2	N/A	2	0.066	S	59.5 IW	In	7 RG		Near RG		12/11 rg		2008
12	1	12-P1-3	N/A	2	0.055	S	50.5 IW	In	6.75 RG		Near RG		12/11 rg		2008
12	1	12-P1-4	N/A	2	0.053	S	50.5	In	7 RG		Near RG		12/11 rg		2008
12	1	12-P1-5	N/A	2	0.058	S	44.5 IW	In	9.25 RG		Near RG		12/11 rg		2008
12	1	12-P1-6	N/A	2	0.068	S	46 IW	In	10.5 RG		Near RG		12/11 rg		2008
12	2	12-P2-1	N/A	1	0.002	S	1	deg	16		Torus Drain	X-213B	X-213B		2008

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
12	2	12-P2-10	N/A	1	0.002	S	325	deg	4		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-11	N/A	1	0.002	S	315	deg	1		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-12	N/A	1	0.002	S	10	deg	4.25		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-13	N/A	1	0.002	S	12	deg	6		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-14	N/A	1	0.002	S	90	deg	0.25		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-2	N/A	1	0.002	S	2	deg	16		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-3	N/A	1	0.002	S	275	deg	9.75		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-4	N/A	1	0.002	S	276	deg	9.5		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-5	N/A	1	0.002	S	290	deg	9.5		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-6	N/A	1	0.002	S	300	deg	13		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-7	N/A	1	0.002	S	315	deg	9		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-8	N/A	1	0.002	S	325	deg	10		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-9	N/A	1	0.002	S	350	deg	17.5		Torus Drain	X-213B	X-213B		2008
12	2	12-P2-NA	N/A	3	0.000	S		In			Gen Shell		0		2008
12	3	12-P3-1	N/A	2	0.057	S	12 IW	In	6.75 RG		Near RG		12/13 rg		2008
12	3	12-P3-2	N/A	2	0.055	S	56 IW	In	9 RG		Near RG		12/13 rg		2008
12	3	12-P3-3	N/A	2	0.053	S	45.5 IW	In	9.5 RG		Near RG		12/13 rg		2008
12	3	12-P3-4	N/A	2	0.054	S	43 IW	In	8 RG		Near RG		12/13 rg		2008
12	4	12-P4-10	N/A	1	0.002	S	135	deg	13.5		Torus Drain	X-213B	X-213B		2008
12	4	12-P4-11	N/A	1	0.002	S	135	deg	4.5		Torus Drain	X-213B	X-213B		2008
12	4	12-P4-12	N/A	1	0.002	S	110	deg	6.75		Torus Drain	X-213B	X-213B		2008
12	4	12-P4-13	N/A	1	0.002	S	170	deg	4		Torus Drain	X-213B	X-213B		2008
12	4	12-P4-14	N/A	1	0.002	S	165	deg	4.5		Torus Drain	X-213B	X-213B		2008
12	4	12-P4-4	N/A	1	0.002	S	5	deg	8		Temp. Monit.	X-300 L	X-300 L		2008
12	4	12-P4-5	N/A	1	0.004	S	85	deg	12		Temp. Monit.	X-300 L	X-300 L		2008
12	4	12-P4-6	N/A	1	0.006	S	60	deg	12		Temp. Monit.	X-300 L	X-300 L		2008
12	4	12-P4-7	N/A	1	0.005	S	70	deg	3		Temp. Monit.	X-300 L	X-300 L		2008
12	4	12-P4-8	N/A	1	0.002	S	25	deg	7		Temp. Monit.	X-300 K	X-300 K		2008
12	4	12-P4-9	N/A	1	0.002	S	100	deg	16		Torus Drain	X-213B	X-213B		2008
12	4	12-P4-1	N/A	2	0.059	S	23 IW	In	12 RG		Near RG		12/13 rg		2008
12	4	12-P4-2	N/A	2	0.058	S	32 IW	In	11.5 RG		Near RG		12/13 rg		2008
12	4	12-P4-3	N/A	2	0.058	S	74 IW	In	10.5 RG		Near RG		12/13 rg		2008
12	5	12-P5-1	N/A	1	0.002	S	190	deg	7.5		Torus Drain	X-213B	X-213B		2008
12	5	12-P5-2	N/A	1	0.002	S	235	deg	2		Torus Drain	X-213B	X-213B		2008

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
12	5	12-P5-3	N/A	1	0.002	S	230	deg	4		Torus Drain	X-213B	X-213B		2008
12	5	12-P5-0	N/A	3	<0.030	S					Gen Shell		0		2008
14	2	14-P2-10	N/A	1	0.017	S	200	deg	26"		HPCI	X-226	X-226		2008
14	2	14-P2-2	N/A	1	0.017	S	180	deg	30"		HPCI	X-226	X-226		2008
14	2	14-P2-2	N/A	1	0.017	S	200	deg	26"		HPCI	X-226	X-226		2008
14	2	14-P2-3	N/A	1	0.017	S	180	deg	30"		HPCI	X-226	X-226		2008
14	2	14-P2-4	N/A	1	0.017	S	190	deg	24"		HPCI	X-226	X-226		2008
14	2	14-P2-5	N/A	1	0.017	S	190	deg	26"		HPCI	X-226	X-226		2008
14	2	14-P2-6	N/A	1	0.017	S	190	deg	26"		HPCI	X-226	X-226		2008
14	2	14-P2-7	N/A	1	0.018	S	190	deg	28"		HPCI	X-226	X-226		2008
14	2	14-P2-8	N/A	1	0.018	S	190	deg	29"		HPCI	X-226	X-226		2008
14	3	14-P3-1	N/A	1	0.019	S	30	deg	14"		HPCI	X-226	X-226		2008
14	3	14-P3-2	N/A	1	0.020	S	30	deg	13"		HPCI	X-226	X-226		2008
14	3	14-P3-3	N/A	1	0.019	S	60	deg	15"		HPCI	X-226	X-226		2008
14	3	14-P3-4	N/A	1	0.018	S	150	deg	32"		HPCI	X-226	X-226		2008
14	3	14-P3-5	N/A	1	0.019	S	150	deg	32"		HPCI	X-226	X-226		2008
15	1	15-P1-1	N/A	1	0.025	S	235	deg	20.5"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-10	N/A	1	0.010	S	170	deg	30.5"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-11	N/A	1	0.010	S	120	deg	16.75"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-12	N/A	1	0.004	S	110	deg	24.75"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-13	N/A	1	0.003	S	110	deg	12"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-14	N/A	1	0.022	S	112	deg	10 3/8"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-15	N/A	1	0.025	S	75	deg	14.5"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-16	N/A	1	0.010	S	75	deg	29.75"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-17	N/A	1	0.015	S	60	deg	30"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-18	N/A	1	0.010	S	50	deg	29.75"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-19	N/A	1	0.015	S	50	deg	10.25"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-2	N/A	1	0.020	S	235.5	deg	20.5		RHR-C	X-225C	X-225C		2008
15	1	15-P1-20	N/A	1	0.005	S	2	deg	9.5"		RHR-C	X-225C	X-225C 4 pits	4	2008
15	1	15-P1-21	N/A	1	0.005	S	2	deg	16"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-22	N/A	1	0.003	S	2	deg	29"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-23	N/A	1	0.005	S	360 / 0	deg	27.75"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-24	N/A	1	0.010	S	355	deg	23.5"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-25	N/A	1	0.005	S	350	deg	21.5"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-26	N/A	1	0.003	S	345	deg	23.75"		RHR-C	X-225C	X-225C 3 pits	3	2008
15	1	15-P1-27	N/A	1	0.010	S	335	deg	31"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-28	N/A	1	0.015	S	320	deg	34.5"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-29	N/A	1	0.015	S	300	deg	28"		RHR-C	X-225C	X-225C		2008

Torus Identified Internal Pitting

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15	1	15-P1-3	N/A	1	0.010	S	234	deg	21.75"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-30	N/A	1	0.003	S	225	deg	27 7/8"		RHR-D	X-225D	X-225D		2008
15	1	15-P1-31	N/A	1	0.010	S	315	deg	33.5"		RHR-D	X-225D	X-225D		2008
15	1	15-P1-32	N/A	1	0.010	S	312	deg	32.5"		RHR-D	X-225D	X-225D		2008
15	1	15-P1-33	N/A	1	0.010	S	312	deg	13.75"		RHR-D	X-225D	X-225D		2008
15	1	15-P1-4	N/A	1	0.005	S	230	deg	25.75"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-5	N/A	1	0.003	S	200	deg	25.25"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-6	N/A	1	0.015	S	190	deg	20.75"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-7	N/A	1	0.039	D	170	deg	15.5"	YES	RHR-C	X-225C	X-225C CR-CNS-2008-2770		2008
15	1	15-P1-8	N/A	1	0.020	S	165	deg	16.75"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-9	N/A	1	0.010	S	170	deg	35.25"		RHR-C	X-225C	X-225C		2008
15	1	15-P1-0	N/A	3	0.000	N/A					Gen Shell		0		2008
15	2	15-P2-1	N/A	1	0.003	S	115	deg	19"		RHR-D	X-225D	X-225D		2008
15	2	15-P2-2	N/A	1	0.005	S	45	deg	23.75"		RHR-D	X-225D	X-225D		2008
15	2	15-P2-0	N/A	3	0.000	N/A					Gen Shell		0		2008
15	4	15-P4-1	N/A	2	0.051	S	3.25" iw	in	5.25" rg		Near RG		15/16 RG		2008
15	4	15-P4-0	N/A	3	0.000	N/A					Gen Shell		0		2008
16	1	16-P1-1	N/A	2	0.065	S	21" IW	in	8" RG		Near RG		15/16 RG		2008
16	1	16-P1-2	N/A	2	0.060	S	37.5" IW	in	6 3/8" RG		Near RG		15/16 RG		2008
16	1	16-P1-3	N/A	2	0.059	S	57" IW	in	12" RG		Near RG		15/16 RG		2008
16	1	16-P1-4	N/A	2	0.054	S	87" IW	in	7.5" RG		Near RG		15/16 RG		2008
16	1	16-P1-0	N/A	3	0.000						Gen Shell		0		2008
16	3	16-P3-1	N/A	2	0.064	S	63" IW	in	3.5" RG		Near RG		16/1 RG		2008
16	3	16-P3-2	N/A	2	0.066	S	33.5" IW	in	8.25" RG		Near RG		16/1 RG		2008
16	3	16-P3-0	N/A	3	0.000	S		in			Gen Shell		0		2008
16	4	16-P4-10	N/A	1	0.004	S	235	deg	12.5"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-11	N/A	1	0.009	S	240	deg	13"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-12	N/A	1	0.005	S	250	deg	12"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-13	N/A	1	0.005	S	265	deg	11"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-14	N/A	1	0.005	S	265	deg	12.5"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-15	N/A	1	0.005	S	270	deg	12.75"		Temp. Monit.	X-300 P	X-300 P		2008

Torus Identified Internal Pitting

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16	4	16-P4-16	N/A	1	0.010	S	250	deg	9.25"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-17	N/A	1	0.028	S	210	deg	13"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-18	N/A	1	0.028	S	180	deg	13"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-19	N/A	1	0.028	S	210	deg	11"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-2	N/A	1	0.001	S	360 / 0	deg	7"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-20	N/A	1	0.028	S	210	deg	5"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-21	N/A	1	0.028	S	225	deg	3"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-22	N/A	1	0.028	S	150	deg	8"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-23	N/A	1	0.028	S	90	deg	3"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-24	N/A	1	0.010	S	60	deg	13"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-25	N/A	1	0.010	S	30	deg	11"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-3	N/A	1	0.001	S	359	deg	3.75"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-4	N/A	1	0.001	S	25	deg	6.25"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-5	N/A	1	0.001	S	45	deg	6.25"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-6	N/A	1	0.005	S	170	deg	4.25"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-7	N/A	1	0.010	S	190	deg	12"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-8	N/A	1	0.003	S	215	deg	13"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-9	N/A	1	0.010	S	220	deg	12.75"		Temp. Monit.	X-300 P	X-300 P		2008
16	4	16-P4-1	N/A	2	0.066	S	96" IW	in	11.25" RG		Near RG		16/1 RG		2008
16	4	16-P4-0	N/A	3	0.000	S					Gen Shell		0		2008
1	1	375-B1-I	SM	3	0.005	NA					Gen Shell			30	2011
2	3	364-B2-I		3	0.040	NA					Gen Shell			1	2011

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2	3	365-B2-I		3	0.052	NA					Gen Shell			1	2011
3	5	356-B3-I	SM	3	0.005	NA					Gen Shell		Overall for Plate 5	10	2011
3	5	355-B3-I		2	0.060	NA	7" RG	In	45		Near RG		Same as marked old indication	1	2011
4	4	336-B4-I	LG	3	0.005	NA	20" PW 4/5	In	44" WL		Gen Shell		76"from ringe girder 4/5 44"dwn from waterline	200	2011
5	5	316-B5-I	LG	3	0.045	NA					Gen Shell		Avg 45 mils	60	2011
5	2	293-B5-I	LG	3	0.035	NA					Gen Shell		Average pitting at IW	40	2011
5	4	306-B5-I	LG	3	0.005	NA					Gen Shell		Overall for plate 4	35	2011
5	3	297-B5-I	SM	3	0.005	NA					Gen Shell			25	2011
5	1	282-B5-I		3	0.060	NA					Gen Shell			1	2011
5	1	283-B5-I		3	0.050	NA					Gen Shell			1	2011
5	1	284-B5-I		3	0.055	NA					Gen Shell			1	2011
5	1	286-B5-I		3	0.070	NA					Gen Shell			1	2011
5	2	291-B5-I		3	0.050	NA					Gen Shell			1	2011
5	2	292-B5-I		3	0.055	NA					Gen Shell			1	2011
5	4	301-B5-I		3	0.058	NA					Gen Shell		midway down from waterline 18" from ring girder	1	2011
5	4	302-B5-I		3	0.065	NA					Gen Shell		midway down from waterline 18" from ring girder	1	2011
5	4	303-B5-I		3	0.065	NA					Gen Shell		midway down from waterline 18" from ring girder	1	2011
5	3	296-B5-I	SM	3	0.005	NA					Gen Shell			4	2011
5	5	310-B5-I		3	0.063	NA					Gen Shell			1	2011
5	5	311-B5-I		3	0.070	NA					Gen Shell			1	2011
5	5	312-B5-I		3	0.075	NA					Gen Shell			1	2011
5	5	313-B5-I		3	0.070	NA					Gen Shell			1	2011
5	5	314-B5-I		3	0.070	NA					Gen Shell			1	2011
7	1	249-B7-I	SM	1	0.017	S	180	Deg	30" PN		CS-A	X-227A	CS-A X-227A defect in old coating repair	6	2011
8	1	226-B8-I		3	0.062	NA					Gen Shell			1	2011
8	1	227-B8-I		3	0.060	NA					Gen Shell			1	2011
8	1	228-B8-I		2	0.056	S	3.5 RG	In	8 IW		Near RG			1	2011
8	2	230-B8-I		3	0.058	NA					Gen Shell		Location half way up from IW (first one found in that gen location)	1	2011
8	2	231-B8-I		3	0.070	NA					Gen Shell			1	2011
8	2	232-B8-I		3	0.070	NA					Gen Shell			1	2011
8	2	233-B8-I		3	0.060	NA					Gen Shell			1	2011
8	3	237-B8-I		3	0.078	NA					Gen Shell			1	2011
8	3	238-B8-I		2	0.070	S	8.5 RG	In	47.5 IW		Near RG			1	2011
8	3	239-B8-I		2	0.070	S	7 RG	In	49 IW		Near RG			1	2011

Torus Identified Internal Pitting

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9	2	203-B9-I	LG	3	0.050	NA					Gen Shell		Avg 50 mils at IW	45	2011
9	5	221-B9-I	LG	3	0.045	NA					Gen Shell		Overall pit count and depth in area	40	2011
9	1	197-B9-I		3	0.065	NA					Gen Shell			1	2011
9	1	198-B9-I		3	0.056	NA					Gen Shell			1	2011
9	2	201-B9-I		3	0.075	NA					Gen Shell			1	2011
9	2	202-B9-I		3	0.056	NA					Gen Shell			1	2011
9	3	205-B9-I		3	0.062	NA					Gen Shell			1	2011
9	3	206-B9-I		3	0.075	NA					Gen Shell			1	2011
9	3	207-B9-I		3	0.065	NA					Gen Shell		Coating to the right gives high dft reading	1	2011
9	4	212-B9-I		3	0.060	NA					Gen Shell			1	2011
9	4	213-B9-I		3	0.065	NA					Gen Shell		Previously noted larger than 66 mils	1	2011
9	4	214-B9-I		2	0.045	NA					Near RG			1	2011
9	4	215-B9-I		3	0.064	NA					Gen Shell			1	2011
9	5	218-B9-I		3	0.065	NA					Gen Shell			1	2011
9	5	219-B9-I		3	0.061	NA					Gen Shell			1	2011
9	5	220-B9-I		3	0.067	NA					Gen Shell			1	2011
10	5	187-B10--	LG	3	0.005	NA					Gen Shell		Gen area of pitting average mil of 5 to 10	50	2011
10	5	188-B10--		3	0.048	NA					Gen Shell			1	2011
10	2	170-B10--	SM	3	0.058	NA	72 PW 2/3	In	24		Gen Shell			5	2011
10	2	171-B10--	SM	3	0.073	NA	72 PW 2/3	In	0		Gen Shell			3	2011
11	1	137-B11--		3	0.065	NA					Gen Shell			1	2011
11	1	139-B11--		2	0.072	S	10 RG	In	43 IW		Near RG			1	2011
11	1	140-B11--		2	0.055	S	11.5 RG	In	36 IW		Near RG			1	2011
11	3	152-B11--	SM	3	0.005	NA	20 PW 2/3	In	40 IW		Gen Shell			25	2011
11	3	147-B11--	SM	3	0.057	NA	16 RG	In	155 IW		Gen Shell		Included in line 147	3	2011
11	3	146-B11--	SM	3	0.030	NA	15 RG	In	155 IW		Gen Shell			2	2011
11	3	148-B11--	SM	3	0.050	NA	7 PW 2/3	In	139 IW		Gen Shell			2	2011
12	1	100-B12--		3	0.040	NA					Gen Shell			1	2011
12	1	101-B12--		3	0.052	NA					Gen Shell			1	2011
12	1	102-B12--		3	0.064	NA					Gen Shell			1	2011
12	1	104-B12--		2	0.033	NA	4.5 RG	In	36 IW		Near RG		4.5" from RG11/12 & 36" from IW / Overall area of plate 1 exhibits general surface corrosion	1	2011
12	3	120-B12--		2	0.000	NA					Near RG			1	2011
12	3	122-B12--		3	0.021	NA					Gen Shell			1	2011
14	1	65-B14--		2	0.031	NA					Near RG		Overall Isolated areas of corrosion	1	2011

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
14	2	68-B14--		3	0.030	NA					Gen Shell			1	2011
14	3	73-B14--		3	0.030	NA					Gen Shell			1	2011
14	3	74-B14--		3	0.065	NA					Gen Shell			1	2011
15	1	36-B15--		3	0.067	NA					Gen Shell			1	2011
15	1	37-B15--		3	0.079	NA					Gen Shell			1	2011
15	2	42-B15--		3	0.085	NA					Gen Shell			1	2011
15	3	43-B15--		3	0.030	NA					Gen Shell			1	2011
15	3	44-B15--		3	0.000	NA					Gen Shell		20 mils	1	2011
15	5	51-B15--		2	0.060	S	6 RG	In	50 IW		Near RG			1	2011
15	3	59-B15--		3	0.060	NA					Gen Shell			1	2011
16	1	3-B16--		3	0.000	NA					Gen Shell			1	2011
16	1	5-B16--		3	0.048	NA					Gen Shell			1	2011
16	1	6-B16--		3	0.057	NA					Gen Shell			1	2011
16	1	7-B16--		2	0.058	S	6 RG	In	85 IW		Near RG			1	2011
16	1	8-B16--		3	0.042	NA					Gen Shell			1	2011
16	2	12-B16--		3	0.062	NA					Gen Shell			1	2011
16	2	13-B16--		3	0.060	NA					Gen Shell			1	2011
16	3	16-B16--		3	0.065	NA					Gen Shell			1	2011
16	4	21-B16--		3	0.065	NA					Gen Shell			1	2011
16	4	22-B16--		3	0.072	NA					Gen Shell			1	2011
16	5	24-B16--		3	0.062	NA					Gen Shell			1	2011
16	5	25-B16--		3	0.064	NA					Gen Shell			1	2011
16	5	26-B16--		3	0.070	NA					Gen Shell			1	2011
16	5	28-B16--		2	0.055	S	10.25 RG	In	26 IW		Near RG		Left of RG 15/16	1	2011
16	5	29-B16--		2	0.058	S	10 RG	In	36.5 IW		Near RG		Left of RG 15/16	1	2011
16	2	14-B16--	SM	3	0.030	NA					Gen Shell			10	2011
1	5	83-B1-I	N/A	2	0.055	S	10 RG	In	8" IW		Near RG		R/G 1/16	1	2012
1	5	84-B1-I	N/A	2	0.052	S	8 RG	In	6" IW		Near RG		R/G 1/16	1	2012
2	1	8-B2-I	N/A	2	0.055	S	10 RG	In	121 IW		Near RG		right of 1/2 RG; Match # on Shell with Indication ID: 2-1-1	1	2012
2	1	9-B2-I	N/A	2	0.060	S	12 RG	In	111 IW		Near RG		right of 1/2 RG; Match # on Shell with Indication ID: 2-1-2	1	2012
2	1	10-B2-I	N/A	2	0.058	S	6 RG	In	63 IW		Near RG		right of 1/2 RG; Match # on Shell with Indication ID: 2-1-3	1	2012
2	1	11-B2-I	N/A	2	0.056	S	5 RG	In	46 IW		Near RG		right of 1/2 RG; Match # on Shell with Indication ID: 2-1-4	1	2012
2	1	12-B2-I	N/A	2	0.064	S	10 RG	In	39 IW		Near RG		right of 1/2 RG; Match # on Shell with Indication ID: 2-1-5	1	2012
2	1	13-B2-I	N/A	2	0.055	S	11 RG	In	39 IW		Near RG		right of 1/2 RG; Match # on Shell with Indication ID: 2-1-6	1	2012

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
2	3	14-B2-I	N/A	2	0.050	S	9 RG	In	130 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-7	1	2012
2	3	15-B2-I	N/A	2	0.061	S	8 RG	In	62 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-8	1	2012
2	3	16-B2-I	N/A	2	0.060	S	8 RG	In	62 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-9	1	2012
2	3	17-B2-I	N/A	2	0.058	S	10 RG	In	59 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-10	1	2012
2	3	18-B2-I	N/A	2	0.062	S	9 RG	In	59 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-11	1	2012
2	3	19-B2-I	N/A	2	0.066	S	10 RG	In	49 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-15	1	2012
2	3	20-B2-I	N/A	2	0.061	S	7 RG	In	42 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-16	1	2012
2	3	21-B2-I	N/A	2	0.053	S	11 RG	In	36 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: , 2-3-17	1	2012
2	3	22-B2-I	N/A	2	0.052	S	11 RG	In	35 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-18	1	2012
2	3	23-B2-I	N/A	2	0.054	S	11 RG	In	34 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-19	1	2012
2	3	24-B2-I	N/A	2	0.056	S	10 RG	In	30 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-20	1	2012
2	3	25-B2-I	N/A	2	0.052	S	10 RG	In	28 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-21	1	2012
2	3	26-B2-I	N/A	2	0.054	S	10 RG	In	53 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-12	1	2012
2	3	27-B2-I	N/A	2	0.061	S	11 RG	In	56 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-13	1	2012
2	3	28-B2-I	N/A	2	0.062	S	11 RG	In	54 IW		Near RG		left of 2/3 RG; Match # on Shell with Indication ID: 2-3-14	1	2012
3	5	69-B3-I	N/A	2	0.050	S	7 RG	In	45" IW		Near RG		Areas off 2/3 R/G	1	2012
6	3	107-B6-I	N/A	2	0.065	S	7 RG	In	85 IW		Near RG		Left of 6/7 RG; Match # on Shell with ID: 6-3-1	1	2012
6	3	108-B6-I	N/A	2	0.055	S	10 RG	In	76 IW		Near RG		Left of 6/7 RG; Match # on Shell with ID: 6-3-2	1	2012
6	3	109-B6-I	N/A	2	0.061	S	11 RG	In	43 IW		Near RG		Left of 6/7 RG; Match # on Shell with ID: 6-3-3	1	2012
6	3	110-B6-I	N/A	2	0.060	S	11 RG	In	35 IW		Near RG		Left of 6/7 RG; Match # on Shell with ID: 6-3-4	1	2012
6	3	111-B6-I	N/A	2	0.063	S	10 RG	In	34 IW		Near RG		Left of 6/7 RG; Match # on Shell with ID: 6-3-5	1	2012
6	4	115-B6-I	N/A	2	0.065	S	9 RG	In	82 IW		Near RG		Right of 6/7 RG; Match # on Shell with ID: 6-4-6	1	2012
6	4	116-B6-I	N/A	2	0.069	S	8 RG	In	31 IW		Near RG		Right of 6/7 RG; Match # on Shell with ID: 6-4-7	1	2012
6	4	117-B6-I	N/A	2	0.073	S	7 RG	In	11 IW		Near RG		Right of 6/7 RG; Match # on Shell with ID: 6-4-8	1	2012
6	5	121-B6-I	N/A	2	0.057	S	8 RG	In	108 IW		Near RG		Left of 6/5 RG; Match # on Shell with ID: 6-5-9	1	2012
6	5	122-B6-I	N/A	2	0.057	S	5 RG	In	39 IW		Near RG		Left of 6/5 RG; Match # on Shell with ID: 6-5-10	1	2012
6	5	123-B6-I	N/A	2	0.053	S	7 RG	In	37 IW		Near RG		Left of 6/5 RG; Match # on Shell with ID: 6-5-11	1	2012
7	3	145-B7-I	N/A	2	0.054	S	10 RG	In	108 IW		Near RG		Left of 7/8 RG; Match # on Shell ID: 7-3-1	1	2012

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
7	4	146-B7-I	N/A	2	0.052	S	3 RG	In	134 IW		Near RG		Right of 7/8 RG; Match # on Shell ID: 7-4-2	1	2012
7	4	147-B7-I	N/A	2	0.064	S	11 RG	In	119 IW		Near RG		Right of 7/8 RG; Match # on Shell ID: 7-4-3	1	2012
7	4	148-B7-I	N/A	2	0.051	S	3 RG	In	86 IW		Near RG		Right of 7/8 RG; Match # on Shell ID; 7-4-4	1	2012
7	4	149-B7-I	N/A	2	0.072	S	8 RG	In	36 IW		Near RG		Right of 7/8 RG; Match # on Shell ID; 7-4-5	1	2012
7	4	150-B7-I	N/A	2	0.058	S	9 RG	In	16 IW		Near RG		Right of 7/8 RG; Match # on Shell ID; 7-4-6	1	2012
7	4	151-B7-I	N/A	2	0.056	S	7 RG	In	11 IW		Near RG		Right of 7/8 RG; Match # on Shell ID; 7-4-7	1	2012
7	5	152-B7-I	N/A	2	0.069	S	3 RG	In	31 IW		Near RG		Left of 7/6 RG; Match # on Shell ID; 7-5-8	1	2012
8	1	161-B8-I	N/A	2	0.058	S	6 RG	In	109 IW		Near RG		Right of 8/7 RG; Match # on Shell ID: 8-1-1	1	2012
8	1	162-B8-I	N/A	2	0.066	S	12 RG	In	68 IW		Near RG		Right of 8/7 RG; Match # on Shell ID: 8-1-2	1	2012
8	5	169-B8-I	N/A	2	0.060	S	8 RG	In	117 IW		Near RG	X-300G	Left of 8/7 RG; Match # on Shell ID: 8-5-3	1	2012
8	5	170-B8-I	N/A	2	0.061	S	10 RG	In	47 IW		Near RG		Left of 8/7 RG; Match # on Shell ID: 8-5-4	1	2012
8	5	171-B8-I	N/A	2	0.052	S	9 RG	In	46 IW		Near RG		Left of 8/7 RG; Match # on Shell ID; 8-5-5	1	2012
8	5	172-B8-I	N/A	2	0.069	S	9 RG	In	33 IW		Near RG		Left of 8/7 RG; Match # on Shell ID; 8-5-6	1	2012
8	4	177-B8-0	N/A	1	0.036	D	130	Deg	11 PN	YES	X-300G		Failed coating on 2005 Repair; Match # on Shell ID: 10-31-12. 2nd shallower pit wihtin 1.5" CR-CNS-2012-08522	1	2012
9	4	186-B9-I	N/A	2	0.055	S	10 RG	In	6 IW		Near RG		TS @ Waterline ID #9-4-1 10" Right RG 6" Up	1	2012
9	4	187-B9-I	N/A	2	0.054	S	12 RG	In	41 IW		Near RG		TS @ Waterline ID # 9-4-2	1	2012
11	1	208-B11--	N/A	2	0.055	S	11 RG	In	77 IW		Near RG		ID #11-1-1	1	2012
11	1	209-B11--	N/A	2	0.056	S	11 RG	In	35 IW		Near RG		ID #11-1-2	1	2012
11	1	210-B11--	N/A	2	0.054	S	11 RG	In	48 IW		Near RG		ID #11-1-3	1	2012
11	3	215-B11--	N/A	2	0.056	S	8 RG	In	3 IW		Near RG		ID #11-3-4	1	2012
11	3	216-B11--	N/A	2	0.052	S	11 RG	In	16 IW		Near RG		ID #11-3-5	1	2012
11	3	218-B11--	N/A	2	0.059	S	7 RG	In	37 IW		Near RG		ID #11-3-7	1	2012
11	3	219-B11--	N/A	2	0.062	S	8 RG	In	3 IW		Near RG		ID #11-3-8	1	2012
11	3	220-B11--	N/A	2	0.068	S	10 RG	In	4 IW		Near RG		ID #11-3-9	1	2012
11	5	225-B11--	N/A	2	0.061	S	12 RG	In	86 IW		Near RG		GTS @ Waterline General Isolated Corrosion ID #11-5-10	5	2012
15	1	242-B15--	N/A	2	0.062	S	12 RG	In	10 IW		Near RG	X-225C	Right of 15/14 RG; Match # on Shell ID: 15-1-1	1	2012
15	3	243-B15--	N/A	2	0.054	S	9 RG	In	28 IW		Near RG	X-225C	Left of 15/16 RG; Match # on Shell ID: 15-3-2	1	2012
15	3	244-B15--	N/A	2	0.057	S	8 RG	In	21 IW		Near RG	X-225C	Left of 15/16 RG; Match # on Shell ID: 15-3-3	1	2012
15	3	245-B15--	N/A	2	0.062	S	11 RG	In	20 IW		Near RG		Left of 15/16 RG; Match # on Shell ID: 15-3-4	1	2012
15	3	246-B15--	N/A	2	0.060	S	11 RG	In	20 IW		Near RG		Left of 15/16 RG; Match # on Shell ID: 15-3-5	1	2012
15	3	247-B15--	N/A	2	0.054	S	6 RG	In	15 IW		Near RG		Left of 15/16 RG; Match # on Shell ID: 15-3-6	1	2012
15	5	256-B15--	N/A	2	0.054	S	8 RG	In	59 IW		Near RG		Left of 15/14 RG; Match # on Shell ID: 15-5-7	1	2012
15	5	257-B15--	N/A	2	0.060	S	7 RG	In	59 IW		Near RG		Left of 15/14 RG; Match # on Shell ID: 15-5-8	1	2012
15	5	258-B15--	N/A	2	0.057	S	8 RG	In	54 IW		Near RG		Left of 15/14 RG; Match # on Shell ID: 15-5-9	1	2012
15	5	259-B15--	N/A	2	0.066	S	3 RG	In	51 IW		Near RG		Left of 15/14 RG; Match # on Shell ID: 15-5-10	1	2012
15	5	260-B15--	N/A	2	0.060	S	6 RG	In	44 IW		Near RG		Left of 15/14 RG; Match # on Shell ID: 15-5-11	1	2012

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
15	5	261-B15--	N/A	2	0.053	S	6 RG	In	41 IW		Near RG		Left of 15/14 RG; Match # on Shell ID: 15-5-12	1	2012
15	1	284-B15-2	N/A	1	0.022	S	90	Deg	13 PN		X-225C		13" out, 90 degrees; Match # on Shell ID: 3	1	2012
15	1	285-B15-2	N/A	1	0.035	D	310	Deg	31 PN	YES	X-225C		31" out, 310 degrees; Match # on Shell ID: 4 CR-CNS-2012-08579	1	2012
15	1	286-B15-2	N/A	1	0.028	S	315	Deg	34 PN		X-225C		34" out, 315 degrees; Match # on Shell ID: 5	1	2012
16	5	95-B16--	N/A	2	0.059	S	10 RG	In	36" IW		Near RG		t/S at waterline G/ISO corrosion	1	2012
1	1	453-B1-I	NA	2	0.0503	S	7 RG	In	130 IW		Near RG		1-1-1 7" off RG and 130" from IW	1	2014
1	1	454-B1-I	NA	2	0.0677	S	8 RG	In	2 IW		Near RG		1-1-2 8" off RG and 2" from IW	1	2014
1	1	455-B1-I	NA	3	0.0687	NA					Gen Shell		Random pit depth	1	2014
1	1	456-B1-I	NA	3	0.0283	NA					Gen Shell		Random pit depth	1	2014
1	1	457-B1-I	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
1	2	459-B1-I	NA	3	0.0657	NA					Gen Shell		Random pit depth	1	2014
1	2	460-B1-I	NA	3	0.0757	NA					Gen Shell		Random pit depth	1	2014
1	2	461-B1-I	NA	3	0.0677	NA					Gen Shell		Random pit depth	1	2014
1	3	463-B1-I	NA	2	0.074	S	10 RG	In	73 IW		Near RG		1-3-1 10" off RG and 73" from IW	1	2014
1	3	464-B1-I	NA	2	0.0527	S	10 RG	In	15 IW		Near RG		1-3-2 10" off RG and 15" from IW	1	2014
1	3	465-B1-I	NA	3	0.0593	NA					Gen Shell		Random pit depth	1	2014
1	3	466-B1-I	NA	3	0.056	NA					Gen Shell		Random pit depth	1	2014
1	3	467-B1-I	NA	3	0.0587	NA					Gen Shell		Random pit depth	1	2014
1	4	469-B1-I	NA	2	0.0543	S	8 RG	In	10 IW		Near RG		1-4-1 8" off RG and 10" from IW	1	2014
1	4	470-B1-I	NA	3	0.05	NA					Gen Shell		Random pit depth	1	2014
1	4	471-B1-I	NA	3	0.079	NA					Gen Shell		Random pit depth	1	2014
1	4	472-B1-I	NA	3	0.0643	NA					Gen Shell		Random pit depth	1	2014
1	5	474-B1-I	NA	2	0.0527	S	9 RG	In	1 IW		Near RG		1-5-1 9" off RG and 1" from IW	1	2014
1	5	475-B1-I	NA	3	0.036	NA					Gen Shell		Random pit depth	1	2014
1	5	476-B1-I	NA	3	0.0507	NA					Gen Shell		Random pit depth	1	2014
1	5	477-B1-I	NA	3	0.055	NA					Gen Shell		Random pit depth	1	2014
2	1	416-B2-I	NA	2	0.0533	S	5 RG	In	97 IW		Near RG		2-1-1 5" off RG and 97" from IW	1	2014
2	1	417-B2-I	NA	2	0.052	S	6 RG	In	32 IW		Near RG		2-1-2 6" off RG and 32" from IW	1	2014
2	1	418-B2-I	NA	3	0.0657	NA					Gen Shell		Random pit depth	1	2014
2	1	419-B2-I	NA	3	0.0577	NA					Gen Shell		Random pit depth	1	2014
2	1	420-B2-I	NA	3	0.078	NA					Gen Shell		Random pit depth	1	2014
2	2	422-B2-I	NA	3	0.0913	S	32 PW	In	131 IW		Gen Shell		2-2-1 32" from WS of Plate 1/2 and 131" from IW	1	2014
2	2	423-B2-I	NA	3	0.0637	NA					Gen Shell		Random pit depth	1	2014
2	2	424-B2-I	NA	3	0.0677	NA					Gen Shell		Random pit depth	1	2014
2	3	426-B2-I	NA	2	0.097	D	4 RG	In	58 IW	YES	Near RG		Repair# 2-3-1. Located 4" from RG2/3 and 58" up from IW. CR-CNS-2014-06799	1	2014
2	3	427-B2-I	NA	2	0.0727	S	4 RG	In	53 IW		Near RG		2-3-2 4" off RG and 53" from IW	1	2014
2	3	428-B2-I	NA	3	0.0617	NA					Gen Shell		Random pit depth	1	2014
2	3	429-B2-I	NA	3	0.0623	NA					Gen Shell		Random pit depth	1	2014

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
2	3	430-B2-I	NA	3	0.0587	NA					Gen Shell		Random pit depth	1	2014
2	4	433-B2-0	NA	1	<0.030	S	0-360	Deg	Various		Temp. Monit.	X-300A	Repair # 2-4-1 With-in 13" Radius	1	2014
2	4	434-B2-I	NA	2	0.0503	S	11 RG	In	44 IW		Near RG		2-4-2 11" off RG and 44" from IW	1	2014
2	4	435-B2-I	NA	2	0.0533	S	6 RG	In	32 IW		Near RG		2-4-3 6" off RG and 32" from IW	1	2014
2	4	436-B2-I	NA	3	0.047	NA					Gen Shell		Random pit depth	1	2014
2	4	437-B2-I	NA	3	0.041	NA					Gen Shell		Random pit depth	1	2014
2	4	438-B2-I	NA	3	0.0453	NA					Gen Shell		Random pit depth	1	2014
2	5	448-B2-I	NA	2	0.061	S	7 RG	In	120 IW		Near RG		2-5-1 7" off R/G 120" up from 6	1	2014
2	5	449-B2-I	NA	2	0.06	S	3 RG	In	65 IW		Near RG		2-5-2 3" off R/G and 65" up from 6	1	2014
2	5	450-B2-I	NA	2	0.05	S	3 RG	In	32 IW		Near RG		2-5-3 3" off R/G 32" up from 6	1	2014
3	1	359-B3-I	NA	2	0.0473	NA					Near RG		Random pit depth	1	2014
3	1	360-B3-I	NA	3	0.0677	NA					Gen Shell		Random pit depth	1	2014
3	1	361-B3-I	NA	3	0.0727	NA					Gen Shell		Random pit depth	1	2014
3	2	362-B3-2	NA	1	<0.030	S	0-360	Deg	Various		RHR-A	X-225A	3-2-1 29 areas of edge rust	29	2014
3	2	364-B3-I	NA	3	0.0633	NA					Gen Shell		Random pit depth	1	2014
3	2	365-B3-I	NA	3	0.0717	NA					Gen Shell		Random pit depth	1	2014
3	2	366-B3-I	NA	3	0.0787	NA					Gen Shell		Random pit depth	1	2014
3	3	367-B3-2	NA	1	<0.030	S	0-360	Deg	Various		RHR-C	X-225B	3-3-1 16 areas of edge rust	16	2014
3	3	368-B3-2	NA	1	<0.030	S	0-360	Deg	Various		RHR_C	X-225B	3-3-2 96" up from 6		2014
3	3	369-B3-I	NA	2	0.0457	NA					Near RG		Random pit depth	1	2014
3	3	370-B3-I	NA	3	0.048	NA					Gen Shell		Random pit depth	1	2014
3	3	371-B3-I	NA	3	0.0537	NA					Gen Shell		Random pit depth	1	2014
3	4	373-B3-I	NA	2	0.0427	NA					Near RG			1	2014
3	4	374-B3-I	NA	2	0.0587	S	6 RG	In	64 IW		Near RG		3-4-1 6" off R/G 64" up from 6	1	2014
3	4	375-B3-I	NA	2	0.0503	S	6 RG	In	61 IW		Near RG		3-4-2 6" off R/G 61" up from 6	1	2014
3	4	376-B3-I	NA	2	0.058	S	5 RG	In	40 IW		Near RG		3-4-3 5" off R/G 40" up from 6	1	2014
3	4	377-B3-I	NA	2	0.0617	S	4 RG	In	36 IW		Near RG		3-4-4 4" off R/G 36" up from 6	1	2014
3	4	378-B3-I	NA	2	0.0583	S	4 RG	In	28 IW		Near RG		3-4-5 4" off R/G 28" up from 6	1	2014
3	5	381-B3-I	NA	2	0.05	S	11 RG	In	104 IW		Near RG		3-5-1 11" off R/G 104 up from 6	1	2014
3	5	382-B3-I	NA	2	0.0467	NA					Near RG		Random pit depth	1	2014
3	5	383-B3-I	NA	2	0.048	NA					Near RG		Random pit depth	1	2014
4	1	332-B4-I	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
4	1	333-B4-I	NA	3	0.033	NA					Gen Shell		Random pit depth	1	2014
4	1	334-B4-I	NA	3	0.0377	NA					Gen Shell		Random pit depth	1	2014
4	2	340-B4-1	NA	1	<0.030	S	0-360	Deg	Various		TorusDrain	X-213A	4-2-1 9 edge rust areas	9	2014
4	2	337-B4-I	NA	3	0.07	NA					Gen Shell		Random pit depth	1	2014
4	2	338-B4-I	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
4	2	339-B4-I	NA	3	0.0323	NA					Gen Shell		Random pit depth	1	2014
4	3	342-B4-I	NA	3	0.0407	NA					Gen Shell		Random pit depth	1	2014
4	3	343-B4-I	NA	3	0.055	NA					Gen Shell		Random pit depth	1	2014

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
4	3	344-B4-I	NA	3	0.071	NA					Gen Shell		Random pit depth	1	2014
4	4	351-B4-0	NA	1	<0.030	S	0-360	Deg	Various		Temp. Monit.	X-300D	4-4-4 2 edge rust areas	2	2014
4	4	346-B4-I	NA	2	0.067	S	8 RG	In			Near RG		4-4-1 8" off R/G 32" up from pipe on shell	1	2014
4	4	347-B4-I	NA	2	0.0683	S	7 RG	In			Near RG		4-4-2 7" off R/G 27" up from pipe on shell	1	2014
4	4	348-B4-I	NA	2	0.0563	S	5 RG	In	82 IW		Near RG		4-4-3 5" off R/G 82" up from 6	1	2014
4	5	353-B4-I	NA	2	0.0613	S	5 RG	In	10 IW		Near RG		4-5-1 5" off R/G 10" up from 6	1	2014
4	5	354-B4-I	NA	3	0.048	NA					Gen Shell		Random pit depth	1	2014
4	5	355-B4-I	NA	3	0.0527	NA					Gen Shell		Random pit depth	1	2014
5	1	135-B5-I	NA	3	0.0663	NA					Gen Shell		Random pit depth	1	2014
5	1	136-B5-I	NA	3	0.064	NA					Gen Shell		Random pit depth	1	2014
5	1	137-B5-I	NA	3	0.065	NA					Gen Shell		Random pit depth	1	2014
5	2	139-B5-I	NA	3	0.084	NA					Gen Shell		Random pit depth	1	2014
5	2	140-B5-I	NA	3	0.0807	NA					Gen Shell		Random pit depth	1	2014
5	2	141-B5-I	NA	3	0.057	NA					Gen Shell		Random pit depth	1	2014
5	3	143-B5-I	NA	3	0.075	NA					Gen Shell		Random pit depth	1	2014
5	3	144-B5-I	NA	3	0.0437	NA					Gen Shell		Random pit depth	1	2014
5	3	145-B5-I	NA	3	0.0357	NA					Gen Shell		Random pit depth	1	2014
5	4	147-B5-I	NA	2	0.0647	S	7 RG	In	127 IW		Near RG		Repair# 5-4-1 7" off R/G 127" up from 6 oclk	1	2014
5	4	148-B5-I	NA	2	0.0623	S	10 RG	In	76 IW		Near RG		Repair# 5-4-2 10" off Gusset 76" up from 6 oclk	1	2014
5	4	149-B5-I	NA	3	0.095	S		In	24 IW		Gen Shell		Repair# 5-4-3 24" right of R/G 24" up from 6	1	2014
5	5	150-B5-I	NA	2	0.0493	NA					Near RG		Random pit depth	1	2014
5	5	151-B5-I	NA	2	0.0507	S	10.5 RG	In	56 IW		Near RG		Repair #5-5-1 10.5" off R/G 56" from 6 o'clock	1	2014
5	5	152-B5-I	NA	2	0.052	S	9 RG	In	50 IW		Near RG		Repair #5-5-2 9" off R/G 50" from 6 o'clock	1	2014
5	5	153-B5-I	NA	2	0.0503	S	6 RG	In	40 IW		Near RG		Repair #5-5-3 6" off R/G 40" from 6 o'clock	1	2014
5	5	154-B5-I	NA	2	0.0533	S	8 RG	In	42 IW		Near RG		Repair #5-5-4 8" off R/G 42" from 6 o'clock	1	2014
5	5	155-B5-I	NA	2	0.0527	S	9 RG	In	27 IW		Near RG		Repair #5-5-5 9" off R/G 27" off the 6 o'clock	1	2014
6	1	161-B6-2	NA	1	<0.030	S	0-360	Deg	Various		RCIC	X-224	6-1-1 25 areas of edge rust	25	2014
6	1	163-B6-I	NA	3	0.0467	NA					Gen Shell		Random pit depth	1	2014
6	1	164-B6-I	NA	3	0.051	NA					Gen Shell		Random pit depth	1	2014
6	1	165-B6-I	NA	3	0.048	NA					Gen Shell		Random pit depth	1	2014
6	2	167-B6-I	NA	3	0.0557	NA					Gen Shell		Random pit depth	1	2014
6	2	168-B6-I	NA	3	0.0777	NA					Gen Shell		Random pit depth	1	2014
6	2	169-B6-I	NA	3	0.0627	NA					Gen Shell		Random pit depth	1	2014
6	3	171-B6-I	NA	2	0.0613	S	9 RG	In	3 IW		Near RG		repair# 6-3-1 9" off R/G 3" up from 6	1	2014
6	3	172-B6-I	NA	3	0.0517	NA					Gen Shell		Random pit depth	1	2014
6	3	173-B6-I	NA	3	0.0477	NA					Gen Shell		Random pit depth	1	2014
6	4	175-B6-0	NA	1	<0.030	S	0-360	Deg	Various		Temp. Monit.	X-300F	6-4-1 around temp gauges 8 areas of edge rust	8	2014

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	Comments Updated Nov 2014 RE28	Pits in Grps	Insp Year
6	4	177-B6-I	NA	3	0.043	NA					Gen Shell		Random pit depth	1	2014
6	4	179-B6-I	NA	3	0.0307	NA					Gen Shell		Random pit depth	1	2014
6	4	180-B6-I	NA	3	0.0723	NA					Gen Shell		Random pit depth	1	2014
6	5	181-B6-I	NA	2	0.053	S	9 RG	In	55 IW		Near RG		repair# 6-5-1 9" off R/G 55" up from 6	1	2014
6	5	182-B6-I	NA	2	0.0463	NA					Near RG		Random pit depth	1	2014
6	5	183-B6-I	NA	3	0.0583	NA					Gen Shell		Random pit depth	1	2014
7	1	185-B7-2	NA	1	<0.030	S	0-360	Deg	Various		CS-A	X-227A	7-1-1 42 edge rust areas	42	2014
7	1	186-B7-I	NA	2	0.0687	S	11.5 RG	In	22 IW		Near RG		7-1-2 11.5" off R/G 22" up from 6	1	2014
7	1	187-B7-I	NA	3	0.051	NA					Gen Shell		Random pit depth	1	2014
7	1	188-B7-I	NA	3	0.0697	NA					Gen Shell		Random pit depth	1	2014
7	2	190-B7-I	NA	3	0.0717	NA					Gen Shell		Random pit depth	1	2014
7	2	191-B7-I	NA	3	0.0677	NA					Gen Shell		Random pit depth	1	2014
7	2	192-B7-I	NA	3	0.0577	NA					Gen Shell		Random pit depth	1	2014
7	3	195-B7-I	NA	3	0.064	NA					Gen Shell		Random pit depth	1	2014
7	3	196-B7-I	NA	3	0.061	NA					Gen Shell		Random pit depth	1	2014
7	3	197-B7-I	NA	3	0.047	NA					Gen Shell		Random pit depth	1	2014
7	4	200-B7-I	NA	3	0.0617	NA					Gen Shell		Random pit depth	1	2014
7	4	201-B7-I	NA	3	0.0573	NA					Gen Shell		Random pit depth	1	2014
7	4	202-B7-I	NA	3	0.0703	NA					Gen Shell		Random pit depth	1	2014
7	5	205-B7-I	NA	3	0.0617	NA					Gen Shell		Random pit depth	1	2014
7	5	206-B7-I	NA	3	0.0687	NA					Gen Shell		Random pit depth	1	2014
7	5	207-B7-I	NA	3	0.0553	NA					Gen Shell		Random pit depth	1	2014
8	1	213-B8-I	NA	3	0.0467	NA					Gen Shell		Random pit depth	1	2014
8	1	214-B8-I	NA	3	0.06	NA					Gen Shell		Random pit depth	1	2014
8	1	215-B8-I	NA	3	0.0483	NA					Gen Shell		Random pit depth	1	2014
8	2	216-B8-I	NA	3	0.0487	NA					Gen Shell		Random pit depth	1	2014
8	2	217-B8-I	NA	3	0.0457	NA					Gen Shell		Random pit depth	1	2014
8	2	218-B8-I	NA	3	0.0697	NA					Gen Shell		Random pit depth	1	2014
8	3	507-B8-2	NA	1		S	125	Deg	40 PN		CS-A	X-223A	8-3-3 1 area fo edge rust	1	2014
8	3	508-B8-2	NA	1		S	130	Deg	40 PN		CS-A	X-223A	8-3-4 40" off pen	3	2014
8	3	509-B8-2	NA	1		S	160	Deg	37 PN		CS-A	X-223A	8-3-5 37" off pen	1	2014
8	3	510-B8-2	NA	1		S	170	Deg	43 PN		CS-A	X-223A	8-3-6 43" off pen	3	2014
8	3	511-B8-2	NA	1		S	180	Deg	42 PN		CS-A	X-223A	8-3-7 42" off pen	3	2014
8	3	512-B8-2	NA	1		S	225	Deg	31 PN		CS-A	X-223A	8-3-8 31" off pen WL	3	2014
8	3	220-B8-I	NA	2	0.0633	S	5 RG	In	60 IW		Near RG		8-3-1 5" off gusset and 60" off 6 o'clock position IW	1	2014
8	3	221-B8-I	NA	3	0.0903	S		In	57 IW		Gen Shell		8-3-2 31" off RG and 57" off 6 o'clock position IW	1	2014
8	3	222-B8-I	NA	3	0.039	NA					Gen Shell		Random pit depth	1	2014
8	3	223-B8-I	NA	3	0.0693	NA					Gen Shell		Random pit depth	1	2014

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
8	4	227-B8-0	NA	1	<0.030	S	0-360	Deg	3 PN		Temp. Monit.	X-300G	8-4-3 Located in a 3' area adjacent to X-300H	3	2014
8	4	225-B8-I	NA	2	0.0593	S	5 RG	In	54 IW		Near RG		8-4-1 5" off gusset and 54" off 6 o'clock position IW	1	2014
8	4	226-B8-I	NA	2	0.051	S	5 RG	In	43 IW		Near RG		8-4-2 5" off gusset and 43" off 6 o'clock position IW	1	2014
8	4	229-B8-I	NA	3	0.0413	NA					Gen Shell			1	2014
8	4	230-B8-I	NA	3	0.04	NA					Gen Shell			1	2014
8	4	231-B8-I	NA	3	0.038	NA					Gen Shell			1	2014
8	5	232-B8-I	NA	2	0.0593	S	6 RG	In	75 IW		Near RG		8-5-1 6" off RG and 75" off 6 o'clock position IW	1	2014
8	5	233-B8-I	NA	3	0.0437	NA					Gen Shell			1	2014
8	5	234-B8-I	NA	3	<0.030	NA					Gen Shell			1	2014
8	5	235-B8-I	NA	3	0.0263	NA					Gen Shell			1	2014
8	5	236-B8-I	NA	3	<0.030	NA					Gen Shell		General rust grade	5	2014
9	1	239-B9-I	NA	2	0.063	S	9 RG	In	84 IW		Near RG		9-1-1 9" off R/G 84" up from 6	1	2014
9	1	240-B9-I	NA	2	0.0477	NA					Near RG		Random pit depth	1	2014
9	1	241-B9-I	NA	2	0.0557	S	7 RG	In	49 IW		Near RG		9-1-2 7" right of R/G 49" up from 6	1	2014
9	1	242-B9-I	NA	3	0.0473	NA					Gen Shell		Random pit depth	1	2014
9	2	244-B9-I	NA	3	0.0693	NA					Gen Shell		Random pit depth	1	2014
9	2	245-B9-I	NA	3	0.0623	NA					Gen Shell		Random pit depth	1	2014
9	2	246-B9-I	NA	3	0.0623	NA					Gen Shell		Random pit depth	1	2014
9	3	249-B9-I	NA	3	0.0663	NA					Gen Shell		Random pit depth	1	2014
9	3	250-B9-I	NA	3	0.062	NA					Gen Shell		Random pit depth	1	2014
9	3	251-B9-I	NA	3	0.0637	NA					Gen Shell		Random pit depth	1	2014
9	4	252-B9-I	NA	2	0.0563	S	10 RG	In	74 IW		Near RG		9-4-1 10" off R/G 74" up from 6	1	2014
9	4	253-B9-I	NA	3	0.0637	NA					Gen Shell		Random pit depth	1	2014
9	4	254-B9-I	NA	3	0.0567	NA					Gen Shell		Random pit depth	1	2014
9	5	257-B9-I	NA	3	0.0517	NA					Gen Shell		Random pit depth	1	2014
9	5	258-B9-I	NA	3	0.0577	NA					Gen Shell		Random pit depth	1	2014
9	5	259-B9-I	NA	3	0.0693	NA					Gen Shell		Random pit depth	1	2014
10	1	440-B10-2	NA	1	<0.030	S	0-360	Deg	Various		CS-B	X-223B	10-1-1 4 edge rust areas	4	2014
10	1	441-B10-2	NA	1	<0.030	S	240	Deg	43 PN		CS-B	X-223B	10-1-2 43" off pen 240 degree az	3	2014
10	1	442-B10-2	NA	1	<0.030	S	190	Deg	28 PN		CS-B	X-223B	10-1-3 28' off pen at WL	3	2014
10	1	443-B10-2	NA	1	<0.030	S	170	Deg	35 PN		CS-B	X-223B	10-1-4 35" off pen	3	2014
10	1	444-B10-2	NA	1	<0.030	S	140	Deg	30 PN		CS-B	X-223B	10-1-5 30" off pen	3	2014
10	1	445-B10-2	NA	1	<0.030	S	130	Deg	31 PN		CS-B	X-223B	10-1-6 31" off pen	3	2014
10	1	446-B10-2	NA	1	<0.030	S	120	Deg	40 PN		CS-B	X-223B	10- 1-7 40" off pen and falls below 43" inspection radius	3	2014
10	1	262-B10--	NA	3	0.0683	NA					Gen Shell		Random pit depth	1	2014
10	1	263-B10--	NA	3	0.054	NA					Gen Shell		Random pit depth	1	2014

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10	1	264-B10--	NA	3	0.0607	NA					Gen Shell		Random pit depth	1	2014
10	1	265-B10--	NA	3	<0.030	NA					Gen Shell		General rust grade		2014
10	2	266-B10--	NA	3	0.0677	NA					Gen Shell		Random pit depth	1	2014
10	2	267-B10--	NA	3	0.054	NA					Gen Shell		Random pit depth	1	2014
10	2	268-B10--	NA	3	0.057	NA					Gen Shell		Random pit depth	1	2014
10	3	271-B10--	NA	3	0.0473	NA					Gen Shell		Random pit depth	1	2014
10	3	272-B10--	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
10	3	273-B10--	NA	3	0.0527	NA					Gen Shell		Random pit depth	1	2014
10	3	274-B10--	NA	3	<0.030	NA					Gen Shell		General rust grade	3	2014
10	4	277-B10--	NA	2	0.064	S	6 RG	In	74 IW		Near RG		10-4-1 6" of gusset RG and 74" from IW	1	2014
10	4	278-B10--	NA	3	0.0257	NA					Gen Shell		Random pit depth	1	2014
10	4	279-B10--	NA	3	0.0517	NA					Gen Shell		Random pit depth	1	2014
10	4	280-B10--	NA	3	0.0667	NA					Gen Shell		Random pit depth	1	2014
10	5	282-B10--	NA	2	0.0547	S	7 RG	In	76 IW		Near RG		10-5-1 7" from RG and 76" from IW	1	2014
10	5	283-B10--	NA	2	0.062	S	7 RG	In	20 IW		Near RG		10-5-2 7" from RG and 20" from IW	1	2014
10	5	284-B10--	NA	3	0.071	NA					Gen Shell		Random pit depth	1	2014
10	5	285-B10--	NA	3	0.0687	NA					Gen Shell		Random pit depth	1	2014
10	5	286-B10--	NA	3	0.053	NA					Gen Shell		Random pit depth	1	2014
10	5	287-B10--	NA	3	<0.030	NA					Gen Shell		General rust grade	3	2014
11	1	78-B11--	NA	2	0.0577	S	0 RG	In	78 IW		Near RG		11-1-1 repair # 78" up from 6 oclk	1	2014
11	1	79-B11--	NA	2	0.0597	S	0 RG	In	68 IW		Near RG		11-1-2 repair 68" up from 6 oclk	1	2014
11	1	80-B11--	NA	2	0.0827	S	8 RG	In	58 IW		Near RG		11-1-3 8" from gusset and 58"up from 6 oclk	1	2014
11	1	81-B11--	NA	2	0.071	S	0 RG	In	42 IW		Near RG		11-1-4 42" up from 6 oclk	5	2014
11	1	82-B11--	NA	2	0.0833	S	0 RG	In	38 IW		Near RG		11-1-5 11 38" up from 6	1	2014
11	1	83-B11--	NA	2	0.0637	S	0 RG	In	36 IW		Near RG		11-1-6 36" up from 6	1	2014
11	1	84-B11--	NA	2	0.0657	S	0 RG	In	30 IW		Near RG		11-1-7 30" up from 6	1	2014
11	1	87-B11--	NA	3	0.057	NA					Gen Shell		Random pit depth	1	2014
11	1	88-B11--	NA	3	0.069	NA					Gen Shell		Random pit depth	1	2014
11	1	89-B11--	NA	3	0.0787	NA					Gen Shell		Random pit depth	1	2014
11	2	91-B11--	NA	3	0.0797	NA					Gen Shell		Random pit depth	1	2014
11	2	92-B11--	NA	3	0.0697	NA					Gen Shell		Random pit depth	1	2014
11	2	93-B11--	NA	3	0.0663	NA					Gen Shell		Random pit depth	1	2014
11	3	95-B11-2	NA	1	<0.030	S	0-360	Deg	Various		CS-B	X-227B	repair# 11-3-1 29 areas of edge rust	29	2014
11	3	96-B11-2	NA	1	0.024	S	45	Deg	14 PN		CS-B	X-227B	repair# 11-3-2 14" off pen	1	2014
11	3	97-B11-2	NA	1	0.021	S	30	Deg	32 PN		CS-B	X-227B	repair# 11-3-3 32" off pen	4	2014
11	3	98-B11-2	NA	1	0.0297	S	20	Deg	30 PN		CS-B	X-227B	repair# 11-3-4 30" off pen	1	2014
11	3	99-B11-2	NA	1	0.0223	S	15	Deg	32 PN		CS-B	X-227B	repair#11-3-5 32"off pen	1	2014
11	3	100-B11-2	NA	1	0.021	S	350	Deg	18 PN		CS-B	X-227B	repair# 11-3-6 18" off pen	1	2014
11	3	101-B11-2	NA	1	0.0243	S	340	Deg	26 PN		CS-B	X-227B	repair#11-3-7 26" off pen	1	2014
11	3	102-B11-2	NA	1	<0.030	S	265	Deg	5.5 PN		CS-B	X-227B	repair# 11-3-8 5 1/2" off pen	1	2014

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
11	3	103-B11-2	NA	1	0.04	D	270	Deg	8 PN	YES	CS-B	X-227B	Repair# 11-3-9. Near Pen X-227B CS-B, 2" from insert plate. Metal Loss with no coating 40mils. CR-CNS-2014-06796	1	2014
11	3	104-B11-2	NA	1	<0.030	S	195	Deg	7 PN		CS-B	X-227B	repair # 11-3-10 7"off penetration	1	2014
11	3	105-B11-2	NA	1	<0.030	S	195	Deg	2 PN		CS-B	X-227B	repair# 11-3-11 2" off penetration	1	2014
11	3	106-B11-2	NA	1	<0.030	S	160	Deg	20 PN		CS-B	X-227B	repair# 11-3-12 20" off penetration	1	2014
11	3	107-B11-2	NA	1	0.0217	S	225	Deg	36 PN		CS-B	X-227B	repair# 11-3-13 36" off pen	1	2014
11	3	111-B11--	NA	2	0.078	S	2 RG	In	42 IW		Near RG		repair# 11-3-14 2" off R/G 42" up from 6 oclk	1	2014
11	3	112-B11--	NA	2	0.0577	S	14 RG	In	36 IW		Near RG		repair# 11-3-15 14" off R/G 36" up from 6 oclk	1	2014
11	3	113-B11--	NA	2	0.0647	S		In			Near RG		repair# 11-3-16	1	2014
11	3	114-B11--	NA	2	0.041	NA					Near RG		Random pit depth	1	2014
11	3	115-B11--	NA	2	0.0617	S	11 RG	In	23 IW		Near RG		repair# 11-3-17 11" off R/G 23" up from 6	1	2014
11	3	116-B11--	NA	2	0.056	S	11 RG	In	19 IW		Near RG		repair# 11-3-18 11" off R/G 19" up from 6	1	2014
11	3	117-B11--	NA	2	0.0533	S	15 RG	In	17 IW		Near RG		repair# 11-3-19 15" off R/G 17" up from 6	1	2014
11	3	118-B11--	NA	2	0.057	S	14 RG	In	13 IW		Near RG		repair# 11-3-20 14" off R/G 13" up from 6	1	2014
11	3	108-B11--	NA	3	0.0487	NA					Gen Shell		Random pit depth	1	2014
11	3	109-B11--	NA	3	0.056	NA					Gen Shell		Random pit depth	1	2014
11	3	110-B11--	NA	3	0.0677	NA					Gen Shell		Random pit depth	1	2014
11	4	119-B11--	NA	2	0.0583	S	4 RG	In	40 IW		Near RG		repair#11-4-1 4" off R/G 40" up from 6	1	2014
11	4	120-B11--	NA	2	0.0613	S	9 RG	In	27 IW		Near RG		repair# 11-4-2 9"off R/G 27" up from 6	1	2014
11	4	121-B11--	NA	2	0.0583	S	12 RG	In	12 IW		Near RG		repair# 11-4-3 12"off R/G 12" up from 6	1	2014
11	4	122-B11--	NA	2	0.05	S	5 RG	In	11 IW		Near RG		repair# 11-4-4 5" off R/G 11" up from 6	1	2014
11	4	123-B11--	NA	2	0.0513	S	6 RG	In	5 IW		Near RG		repair# 11-4-5 6" off R/G 5" up from 6	1	2014
11	4	124-B11--	NA	2	0.0537	S	9 RG	In	7 IW		Near RG		repair# 11-4-6 9"off R/G 7" up from 6	1	2014
11	5	127-B11--	NA	2	0.053	S	10 RG	In	125 IW		Near RG		repair# 11-5-1 10"off R/G 125" up from 6	1	2014
11	5	128-B11--	NA	2	0.0543	S	4 RG	In	109 IW		Near RG		repair# 11-5-2 4" off R/G 109" up from 6	1	2014
11	5	129-B11--	NA	2	0.0627	S	1 RG	In	52 IW		Near RG		repair# 11-5-3 1" off R/G 52" up from 6	1	2014
12	1	290-B12--	NA	2	0.0587	S	10 RG	In	70 IW		Near RG		12-1-1 10" off RG and 70" from IW	1	2014
12	1	291-B12--	NA	2	0.0517	S	3 RG	In	50 IW		Near RG		12-1-2 3" off RG and 50" from IW	1	2014
12	1	292-B12--	NA	3	0.0643	NA					Gen Shell		Random pit depth	1	2014
12	1	293-B12--	NA	3	0.059	NA					Gen Shell		Random pit depth	1	2014
12	1	294-B12--	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
12	1	295-B12--	NA	3	<0.030	NA					Gen Shell		General rust grade	5	2014
12	2	387-B12-1	NA	1	<0.030	S	0-360	Deg	Various		TorusDrain	X-213B	12-2-2 Repairs are in the 18" Radius	17	2014
12	2	296-B12--	NA	2	0.0757	S	4 RG	In	66 IW		Near RG		12-2-1 4" from the Plate 2/3 weld and 66" from the IW	1	2014
12	2	297-B12--	NA	3	0.06	NA					Gen Shell		Random pit depth	1	2014
12	2	298-B12--	NA	3	0.0447	NA					Gen Shell		Random pit depth	1	2014
12	3	300-B12--	NA	2	0.0497	NA					Near RG		Random pit depth	1	2014
12	3	301-B12--	NA	3	0.0807	NA					Gen Shell		Random pit depth	1	2014
12	3	302-B12--	NA	3	0.054	NA					Gen Shell		Random pit depth	1	2014

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
12	3	303-B12--	NA	3	0.0767	NA					Gen Shell		Random pit depth	1	2014
12	4	305-B12-0	NA	1	<0.030	S	0-360	Deg	Various		Temp. Monit.	X-300L	12-4-1 Located in a 13" Radius of X-300L	5	2014
12	4	306-B12-0	NA	1	<0.030	S	0-360	Deg	Various		Temp. Monit.	X-300K	12-4-2 Located in a 13" Radius of X-300K	5	2014
12	4	307-B12--	NA	2	0.0493	NA					Near RG		Random pit depth	1	2014
12	4	308-B12--	NA	2	0.0543	S	5 RG	In	58 IW		Near RG		12-4-3 5" from the gusset and 58" from the IW	1	2014
12	4	309-B12--	NA	3	0.0537	NA					Gen Shell		Random pit depth	1	2014
12	4	310-B12--	NA	3	0.0593	NA					Gen Shell		Random pit depth	1	2014
12	4	311-B12--	NA	3	0.0487	NA					Gen Shell		Random pit depth	1	2014
12	5	314-B12--	NA	3	0.055	NA					Gen Shell		Random pit depth	1	2014
12	5	315-B12--	NA	3	0.0627	NA					Gen Shell		Random pit depth	1	2014
12	5	316-B12--	NA	3	0.0693	NA					Gen Shell		Random pit depth	1	2014
13	1	482-B13--	NA	3	0.0323	NA					Gen Shell		Random pit depth	1	2014
13	1	483-B13--	NA	3	0.029	NA					Gen Shell		Random pit depth	1	2014
13	1	484-B13--	NA	3	0.0487	NA					Gen Shell		Random pit depth	1	2014
13	2	486-B13--	NA	3	0.0527	NA					Gen Shell		Random pit depth	1	2014
13	2	487-B13--	NA	3	0.0223	NA					Gen Shell		Random pit depth	1	2014
13	2	488-B13--	NA	3	0.0233	NA					Gen Shell		Random pit depth	1	2014
13	3	491-B13--	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
13	3	492-B13--	NA	3	0.0417	NA					Gen Shell		Random pit depth	1	2014
13	3	493-B13--	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
13	4	496-B13--	NA	3	0.0327	NA					Gen Shell		Random pit depth	1	2014
13	4	497-B13--	NA	3	0.0387	NA					Gen Shell		Random pit depth	1	2014
13	4	498-B13--	NA	3	0.0237	NA					Gen Shell		Random pit depth	1	2014
13	5	501-B13--	NA	3	0.044	NA					Gen Shell		Random pit depth	1	2014
13	5	502-B13--	NA	3	0.0417	NA					Gen Shell		Random pit depth	1	2014
13	5	503-B13--	NA	3	0.0243	NA					Gen Shell		Random pit depth	1	2014
14	1	39-B14--	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
14	1	40-B14--	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
14	1	41-B14--	NA	3	0.029	NA					Gen Shell		Random pit depth	1	2014
14	2	42-B14-2	NA	1	<0.030	S	0-360	Deg	Various		HPCI	X-226	27 edge rust failed repairs 14-2-1	27	2014
14	2	43-B14-2	NA	1	<0.030	S	136	Deg	36 PN		HPCI	X-226	18" up from penetration TS 14-2-2	1	2014
14	2	44-B14-2	NA	1	0.0297	S	172	Deg	36 PN		HPCI	X-226	Repair 14-2-3 36" up from penetration	1	2014
14	2	45-B14-2	NA	1	0.031	D	193	Deg	36 PN	YES	HPCI	X-226	Repair# 14-2-4. Near Pen X-226 HPSI 36" from penetration nozzel on Az 172 deg. CR-CNS-2014-06799	1	2014
14	2	46-B14-2	NA	1	0.021	S	222	Deg	36 PN		HPCI	X-226	Repair 14-2-5 36" from penetration	1	2014
14	2	47-B14-2	NA	1	<0.030	S	229	Deg	36 PN		HPCI	X-226	Repair 14-2-6	1	2014
14	2	48-B14-2	NA	1	<0.030	S	287	Deg	36 PN		HPCI	X-226	Repair 14-2-7	1	2014

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
14	2	49-B14-2	NA	1	0.0263	S	340	Deg	7 PN		HPCI	X-226	Repair 14-2-8 7" off penetration	1	2014
14	2	50-B14-2	NA	1	<0.030	S	350	Deg	19 PN		HPCI	X-226	Repar 14-2-9 19" up from penetration	1	2014
14	2	52-B14--	NA	3	0.045	NA					Gen Shell		Random pit depth	1	2014
14	2	53-B14--	NA	3	0.031	NA					Gen Shell		Random pit depth	1	2014
14	2	54-B14--	NA	3	0.0263	NA					Gen Shell		Random pit depth	1	2014
14	3	56-B14--	NA	3	0.0433	NA					Gen Shell		Random pit depth	1	2014
14	3	57-B14--	NA	3	0.0447	NA					Gen Shell		Random pit depth	1	2014
14	3	58-B14--	NA	3	0.0343	NA					Gen Shell		Random pit depth	1	2014
14	4	63-B14-0	NA	1	<0.030	S	0-360	Deg	Various		Temp. Monit.	X-300N	14-4-3 4 areas of failed repair	4	2014
14	4	64-B14-0	NA	1	<0.030	S	0-360	Deg	Various		Temp. Monit.	X-300M	14-4-4 2 failed repair edge rust	2	2014
14	4	60-B14--	NA	2	0.0513	S	10 RG	In	0 IW		Near RG		at 6 oclock 10" right of RG 14-4-1	1	2014
14	4	61-B14--	NA	2	0.0553	S	9 RG	In	32 IW		Near RG		Repair 14-4-2 9"off RG 32" up from 6 ws	1	2014
14	4	66-B14--	NA	3	0.0703	NA					Gen Shell		Random pit depth	1	2014
14	4	67-B14--	NA	3	0.053	NA					Gen Shell		Random pit depth	1	2014
14	4	68-B14--	NA	3	0.0307	NA					Gen Shell		Random pit depth	1	2014
14	5	71-B14--	NA	3	0.048	NA					Gen Shell		Random pit depth	1	2014
14	5	72-B14--	NA	3	0.0523	NA					Gen Shell		Random pit depth	1	2014
14	5	73-B14--	NA	3	0.0467	NA					Gen Shell		Random pit depth	1	2014
15	1	10-B15-2	NA	1	0.0223	S	320	Deg	24 PN		RHR-B	X-225C	7" right 14/15 RG 24"up from penetration	1	2014
15	1	11-B15-2	NA	1	<0.030	S	0-360	Deg	Various		RHR-B	X-225C	3 edge rust on old coating repairs	3	2014
15	1	13-B15--	NA	3	0.03	NA					Gen Shell		Random pit depth	1	2014
15	1	14-B15--	NA	3	0.0303	NA					Gen Shell		Random pit depth	1	2014
15	1	15-B15--	NA	3	0.0493	NA					Gen Shell		Random pit depth	1	2014
15	2	12-B15-2	NA	1	<0.030	S		Deg	Various		RHR-D	X-225D	4 edge rust on old coating repairs	4	2014
15	2	21-B15-2	NA	1	<0.030	S					RHR-B	X-225C		1	2014
15	2	34-B15--	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
15	2	35-B15--	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
15	2	38-B15--	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
15	3	17-B15--	NA	3	0.0313	NA					Gen Shell		Random pit depth	1	2014
15	3	18-B15--	NA	3	0.0203	NA					Gen Shell		Random pit depth	1	2014
15	3	19-B15--	NA	3	0.0243	NA					Gen Shell		Random pit depth	1	2014
15	4	22-B15--	NA	2	0.0467	NA					Near RG		Random pit depth	1	2014
15	4	24-B15--	NA	3	0.0493	NA					Gen Shell		Random pit depth	1	2014
15	4	25-B15--	NA	3	0.0523	NA					Gen Shell		Random pit depth	1	2014
15	5	28-B15--	NA	3	0.0487	NA					Gen Shell		Random pit depth	1	2014
15	5	29-B15--	NA	3	0.0587	NA					Gen Shell		Random pit depth	1	2014
15	5	30-B15--	NA	3	0.055	NA					Gen Shell		Random pit depth	1	2014
16	1	320-B16--	NA	2	0.0457	NA					Near RG		Random pit depth	1	2014
16	1	321-B16--	NA	3	0.0497	NA					Gen Shell		Random pit depth	1	2014

Torus Identified Internal Pitting

Bay	Panel	Pit ID	Pit Group	Reg	Metal Loss (in)	Pit Type	Coordinate X or Azimuth	Units (In. or Deg)	Y Coord or Dist from Pen (In.)	Rep Eng.	Location	Pen. Number	**Comments** Updated Nov 2014 RE28	Pits in Grps	Insp Year
16	1	322-B16--	NA	3	0.063	NA					Gen Shell		Random pit depth	1	2014
16	2	324-B16--	NA	3	0.061	NA					Gen Shell		Random pit depth	1	2014
16	2	325-B16--	NA	3	0.0157	NA					Gen Shell		Random pit depth	1	2014
16	2	326-B16--	NA	3	<0.030	NA					Gen Shell		Random pit depth	1	2014
16	3	388-B16--	NA	2	0.0647	S	8 RG	In	82 IW		Near RG		16-3-1 8" off RG and 82" from IW	1	2014
16	3	389-B16--	NA	2	0.057	S	9 RG	In	70 IW		Near RG		16-3-2 9" off RG and 70" from IW	1	2014
16	3	390-B16--	NA	2	0.065	S	8 RG	In	64 IW		Near RG		16-3-3 8" off RG and 64" from IW	1	2014
16	3	391-B16--	NA	2	0.0577	S	8 RG	In	49 IW		Near RG		16-3-4 8" off gusset and 49" from IW	1	2014
16	3	392-B16--	NA	2	0.0547	S	5 RG	In	45 IW		Near RG		16-3-5 5" off gusset and 45" from IW	1	2014
16	3	393-B16--	NA	2	0.0553	S	12 RG	In	25 IW		Near RG		16-3-6 12' off gusset and 25" from IW	1	2014
16	3	394-B16--	NA	3	0.0877	NA					Gen Shell		Random pit depth	1	2014
16	3	395-B16--	NA	3	0.06	NA					Gen Shell		Random pit depth	1	2014
16	3	396-B16--	NA	3	0.0643	NA					Gen Shell		Random pit depth	1	2014
16	4	398-B16-0	NA	1	<0.030	S	0-360	Deg	Various		Temp. Monit.	X-300P	16-4-1 Repairs are in the 13" Radius	7	2014
16	4	399-B16-0	NA	1	<0.030	S	0-360	Deg	Various		Temp. Monit.	X-300O	16-4-2 Repairs are in the 13" Radius	7	2014
16	4	400-B16--	NA	2	0.0633	S	9 RG	In	108 IW		Near RG		16-4-3 9" off RG and 108 from IW	1	2014
16	4	401-B16--	NA	2	0.052	S	10 RG	In	48 IW		Near RG		16-4-4 10" off gusset and 48" from IW	1	2014
16	4	402-B16--	NA	2	0.0563	S	6 RG	In	7 IW		Near RG		16-4-5 6" off gusset and 7" from IW	1	2014
16	4	403-B16--	NA	3	0.065	NA					Gen Shell		Random pit depth	1	2014
16	4	404-B16--	NA	3	0.07	NA					Gen Shell		Random pit depth	1	2014
16	4	405-B16--	NA	3	0.0583	NA					Gen Shell		Random pit depth	1	2014
16	5	407-B16--	NA	2	0.0563	S	5 RG	In	94 IW		Near RG		16-5-1 5" off RG and 94" from IW	1	2014
16	5	408-B16--	NA	2	0.0603	S	10 RG	In	77 IW		Near RG		16-5-2 10" off gusset and 77" from IW	1	2014
16	5	409-B16--	NA	2	0.06	S	10 RG	In	29 IW		Near RG		16-5-3 10"off RG and 29" from IW	1	2014
16	5	410-B16--	NA	3	0.059	NA					Gen Shell		Random pit depth	1	2014
16	5	411-B16--	NA	3	0.0543	NA					Gen Shell		Random pit depth	1	2014
16	5	412-B16--	NA	3	0.0567	NA					Gen Shell		Random pit depth	1	2014

Figure 19.2 - Torus Exterior Indication Locations Top View (see Torus Exterior Indication table below for details)

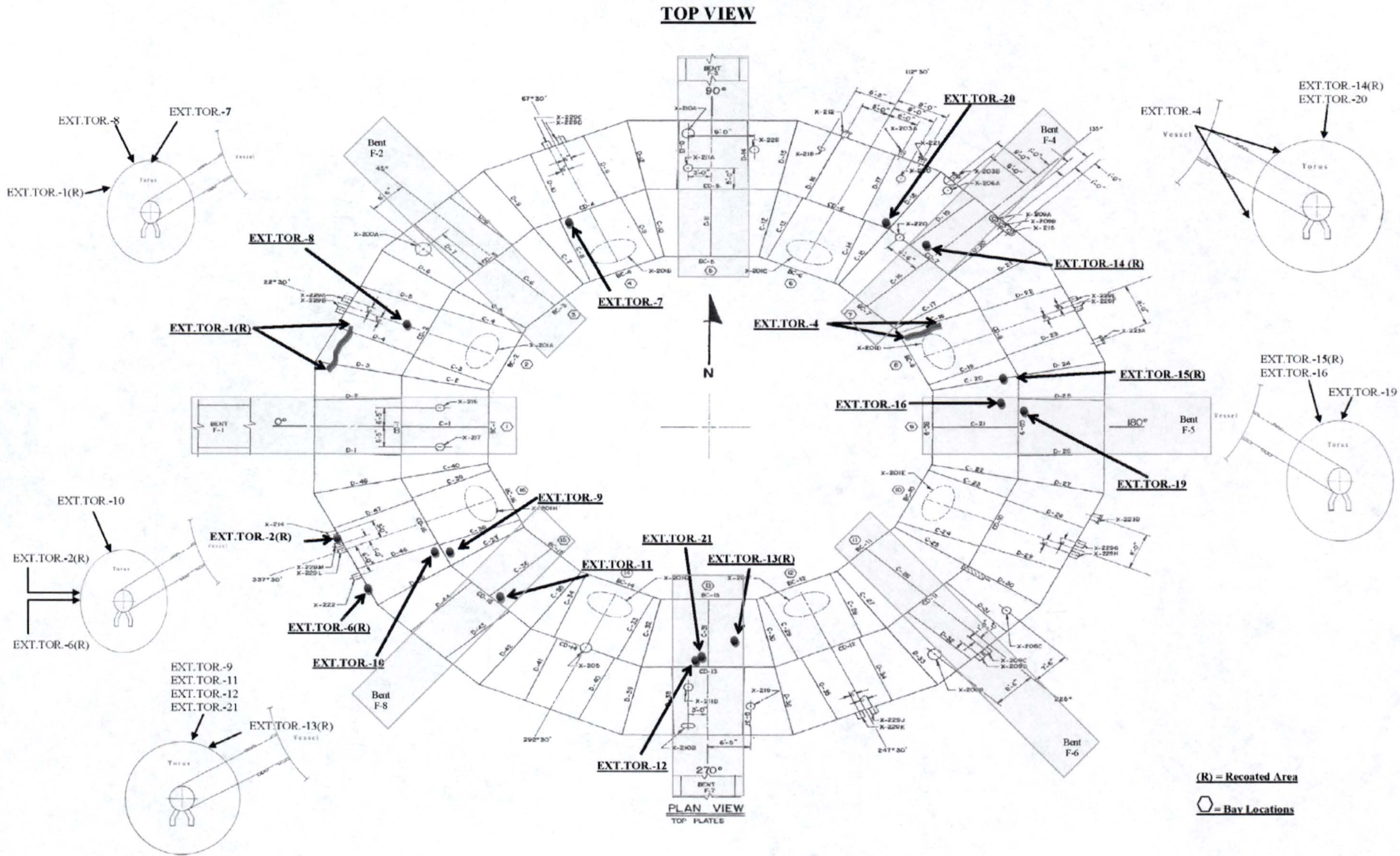
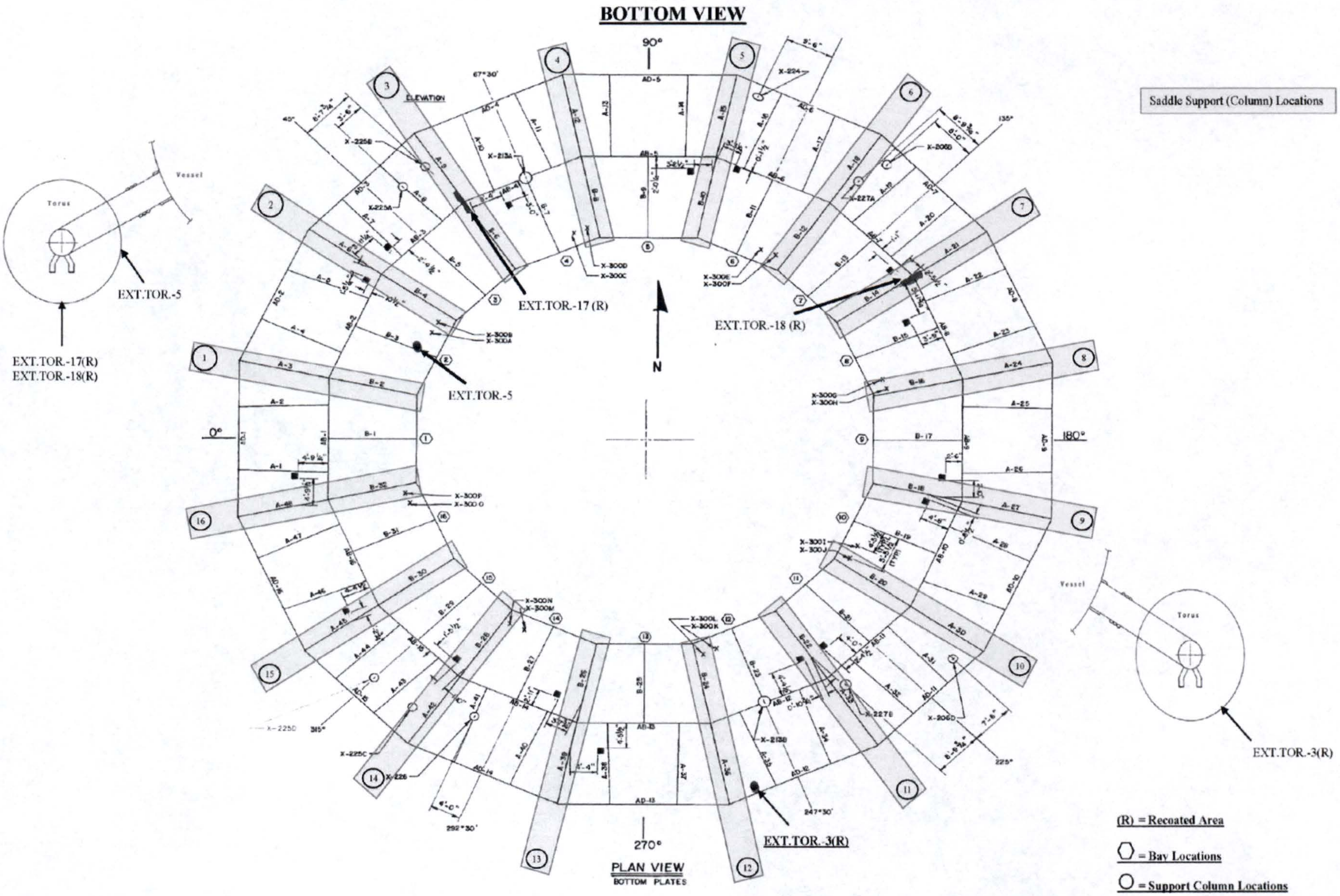


Figure 19.3 - Torus Exterior Indications Bottom View (see Torus Exterior Indication table below for details)



Torus Exterior Indication table

Outage	Report	ID (per Report)	CR-CNS	Location	Items Description	Comments
RE26	VT-2011-021	EXT.TOR.-1 (RECOATED)	2011-2269	Located on the side of the torus outer radius between lower columns 1 and 2 at EL 875'	Paint is flaking and blistering. One(1) to three (3) feet wide x 7 feet long. Bare metal was identified in several areas. Hydraulic snubber BS-S-116A is located directly above this area and the reservoir was full.	WO 4819959 was initiated to further assess the condition of the base materials and repair as necessary. VT-1 of the bare metal surface showed no signs of base metal degradation. Area was recoated.
RE26	VT-2011-021	EXT.TOR.-2 (RECOATED)	2011-2269	Located on the side of the torus outer radius between lower columns 15 and 16 at EL 870'.	Appears to be 2 temporary weld attachments approximately 1" - 2" in diameter. Each contains arc strikes and under-cutting, worst case ~ 1/32" depth. No cracks or linear indications emanating from the arc strike	WO 4819959 was initiated to further assess the condition of the base materials and repair as necessary. VT-1 of the bare metal surface showed no signs of base metal degradation. Area was recoated.
RE26	VT-2011-021	EXT.TOR.-3 (RECOATED)	2011-2269	Located on the side of the torus outer radius adjacent to lower columns 12 (between 11 and 12) at EL 868'	Area appears to have the exterior coating and several areas of primer removed in a 10" wide x 36" long area. It appears to be only surface coatings damage from previous maintenance activities and therefore does not appear to be a service induced flaw	WO 4819959 was initiated to further assess the condition of the base materials and repair as necessary. VT-1 of the bare metal surface showed no signs of base metal degradation. Area was recoated.
RE26	VT-2011-021	EXT.-TOR.-4	2011-2269	Located adjacent to lower columns 7 (between 7 and 8) on the inside circumference of the Torus at approximately EL 868' to 880'	Exterior coating appears to be degraded over a band about 2 to 3 feet wide. In addition there is a wide area of what appears to be similar to lime deposits running down the outside circumference of the torus.	Stained area was determined to be acceptable as is. No additional actions required.
RE26	VT-2011-021	EXT.-TOR.-5	2011-2269	Centrally located between lower columns 1 and 2 on the inside circumference of the Torus at EL 875'	Outer coatings degradation observed on an area approximately 3' wide by 7' long (running in a horizontal direction). This indication was previously identified in refuel outage RE24 and was evaluated and found to be acceptable.	Previously identified indication was determined to be acceptable as primer is still intact. No additional Actions required.
RE26	VT-2011-021	EXT.TOR.-6 (RECOATED)	2011-2269	Located on the outer radius side of the torus, between columns 15 and 16 on the outer circumference of the Torus EL 870'	Two (2) areas 4' x 8' in size with the top coat missing, but the primer is still visible. Coating at this location appears to have been heated by welding from the interior of the Torus causing discoloration of the coating. Inspections on the inside of the Torus confirmed the installation of piping hangers to the inside of the Torus.	WO 4819959 was initiated to assess and recoat as necessary. VT-1 of the bare metal surface showed no signs of base metal degradation. Area was recoated.

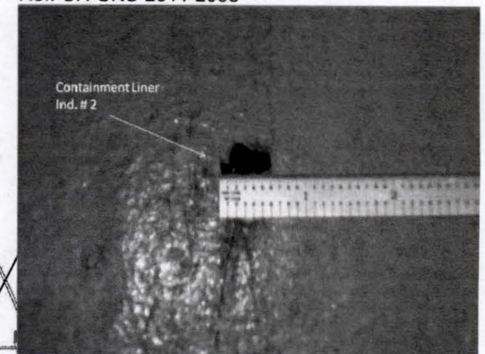
Outage	Report	ID (per Report)	CR-CNS	Location	Items Description	Comments
RE26	VT-2011-021	EXT.-TOR.-12	2011-2505	Located 3 feet west of the center line of Bent F7. 15" west of weld C-31 and 17" north of weld CD-13	The indication was identified to be an Arc Strike that was measured to be 0.8" x 0.2" with a depth of 0.01".This indication has previously been reported and is being monitored in CNS procedure 6.PC.402 Rev 8, Step 4.2.4.4. The indication was determined to have no discernible differences from previous examinations	Calculation NEDC 94-276 determined that the previously identified indication was acceptable as is (Step 4.2.4.1of procedure 6.PC.402 Rev8) and does not compromise the integrity of the vessel
RE26	VT-2011-021	EXT.TOR.-13 (RECOATED)	2011-2505	Located under the east edge of Bent F7 and 67" north of the Torus Top Dead Center.	The area was identified to be a concrete like material that is 16" by 28". This concrete like material was identified to be on top of the initial torus coating and has since been recoated. There are a few small areas where the concrete has detached from the Torus shell, which removed some of the original coating and in some areas exposed the primer. The remaining areas of concrete appear to be tightly adhering to the surface of the Torus and do not appear to be causing any additional degradation of the base material. Also, the areas where the primer has been exposed appear to be intact and do not show any signs of additional degradation	WO 4819959 was initiated to further assess the condition of the base materials and repair as necessary. VT-1 of the bare metal surface showed no signs of base metal degradation. Area was recoated.
RE26	VT-2011-021	EXT.TOR.-14 (RECOATED)	2011-2505	Located on the top of the torus, directly under valve SW-CVP-TCV451B, at the centerline of Bent F4 and 4 feet 2 inches northeast of the Torus centerline weld	The area was identified to be a coating stain 3" in length with a coating degradation 2" in diameter. Damage appears to be caused by leakage from valve SW-CVP-TCV451B. The damage appears to be limited to the top coat and has not yet propagated to the base material	WO 4819959 was initiated to further assess the condition of the base materials and repair as necessary. VT-1 of the bare metal surface showed no signs of base metal degradation. Area was recoated.
RE26	VT-2011-021	EXT.TOR.-15 (RECOATED)	2011-2505	Located on the top of the torus, 5 feet north of Bent F5 and 4 feet 6 inches west of the top of the Torus centerline weld near hanger SW-H160	The area was identified to be a concrete like material 2" in length. The concrete like material appears to be on top of the initial torus coating and has since been recoated. The concrete is tightly adhering to the surface of the Torus and does not appear to be causing any additional degradation	WO 4819959 was initiated to further assess the condition of the base materials and repair as necessary. VT-1 of the bare metal surface showed no signs of base metal degradation.

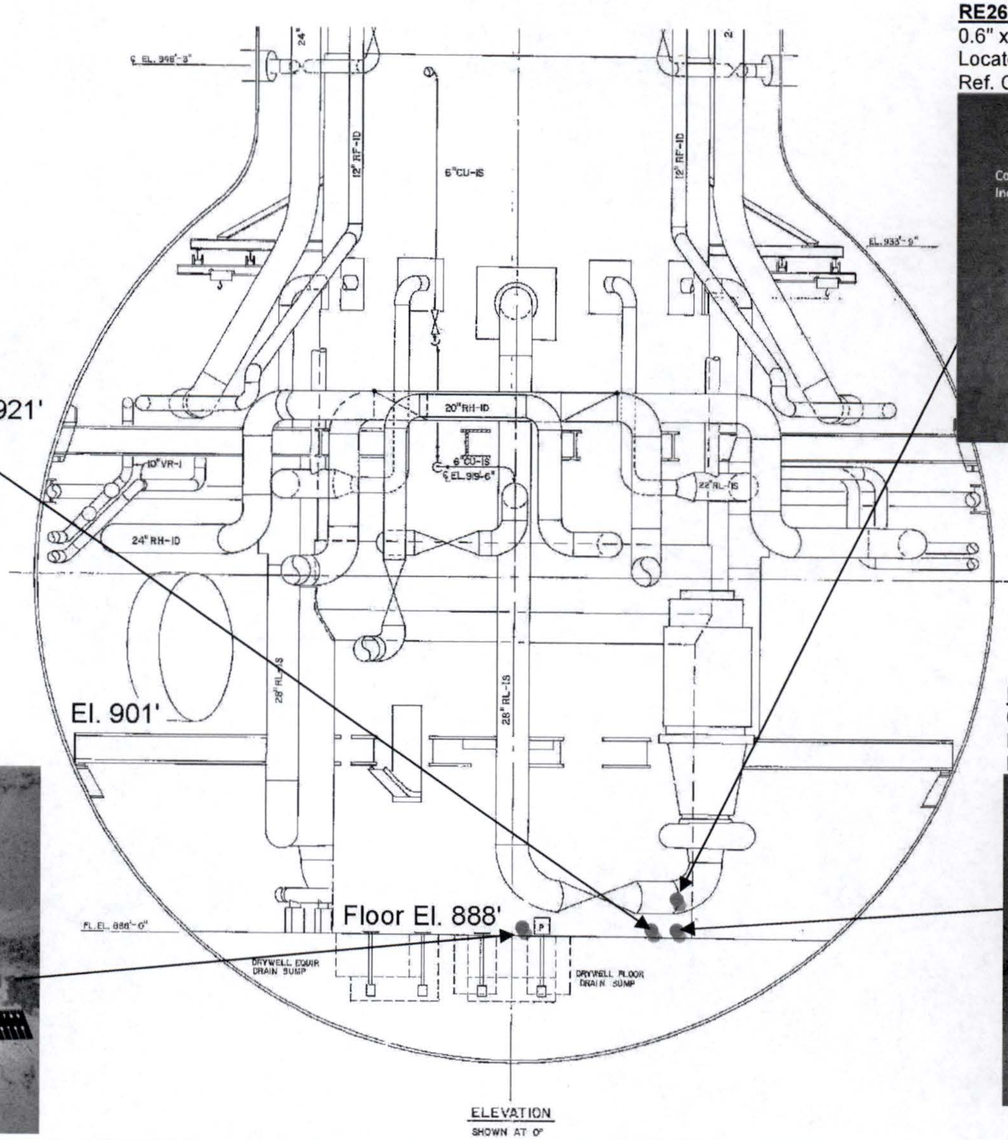
Outage	Report	ID (per Report)	CR-CNS	Location	Items Description	Comments
RE26	VT-2011-021	EXT.TOR.-16	2011-2505	Located on the top of the torus, 2 feet north of centerline of Bent F5. 18.25" north of weld C21 and 30.75" east of CD-9 and 4.3 inches west of weld CD-9.	The indication was identified to be an Arc Strike that was measured to be 1.2" x 0.4" with a depth of 0.06". Location has been previously reported and is being monitored in CNS procedure 6.PC.402 Rev 8, Step 4.2.4.3	Calculation NEDC 94-276 determined that the previously identified indication was acceptable as is (Step 4.2.4.1of procedure 6.PC.402 Rev8) and does not compromise the integrity of the vessel
RE27	VT-F12-036 & VT-F12-081	EXT.TOR.-17 (RECOATED)	2012-8060	Located under the torus in Bay 3 on support column # 3.	Area of rust and flaking paint was identified that required surface prep to exam base material.	After surface prep activities, the area was re-examined (VT-F12-081) and found to have no indications. Area was recoated.
RE27	VT-F12-036 & VT-F12-081	EXT.TOR.-18 (RECOATED)	2012-8060	Located under the torus in Bay 7 on support column # 7.	Area of rust and flaking paint was identified that required surface prep to exam base material.	After surface prep activities, the area was re-examined (VT-F12-081) and found to have no indications. Area was recoated.
RE27	VT-F12-036	EXT.TOR.-19	2012-8060	Located under the top torus Bent F5. 7.5" east of weld CD-9 and 15" north of weld C-21.	The indication was identified to be an Arc Strike and was measured to be 0.25" in diameter with a depth of 0.01". The arc strike is located on the upper portion of the Torus shell which has a nominal thickness of 0.616 inch. There have been other indications of arc strikes on the Torus shell, which are have been documented in 6.PC.402, notification 10083373 and CR 1-01968	Per calculation NEDC 94-276, which evaluated similar types of localized indications and concluded that if the indication is <2.5 inches in diameter and less than half the nominal shell thickness adjacent to the indication, the indication is code allowable, acceptable as is, and does not compromise the integrity of the vessel
RE27	VT-F12-036	EXT.TOR.-20	2012-8060	Located 6 inches from Bent F4. 0.7" east of weld CD-6 and 7.0" north of weld D-16.	The indication was identified to be an Arc Strike and was measured to be 0.10" in diameter with a depth of 0.04". The arc strike is located on the upper portion of the Torus shell which has a nominal thickness of 0.616 inch. There have been other indications of arc strikes on the Torus shell, which are have been documented in 6.PC.402, notification 10083373 and CR 1-01968	Per calculation NEDC 94-276, which evaluated similar types of localized indications and concluded that if the indication is <2.5 inches in diameter and less than half the nominal shell thickness adjacent to the indication, the indication is code allowable, acceptable as is, and does not compromise the integrity of the vessel
RE27	VT-F12-036	EXT.TOR.-21	2012-8060	Located under Bent F2. 12.75" west of C-31 and 18.5" north of CD-13.	The indication was identified to be an Arc Strike and was measured to be 0.20" in diameter with a depth of 0.01". The arc strike is located on the upper portion of the Torus shell which has a nominal thickness of 0.616 inch. There have been other indications of arc strikes on the Torus shell, which are have been documented in 6.PC.402, notification 10083373 and CR 1-01968	Per calculation NEDC 94-276, which evaluated similar types of localized indications and concluded that if the indication is <2.5 inches in diameter and less than half the nominal shell thickness adjacent to the indication, the indication is code allowable, acceptable as is, and does not compromise the integrity of the vessel

Figure 19.4 Drywell Indications @ 0°

RE26 - Ind. # 6
0.6" x 2.5" Paint Chip Area
Located @ 40° Az and 888' (floor to wall)
Ref. CR-CNS-2011-3139

RE26 - Ind. # 2
0.6" x 0.4" Paint Chip Area
Located @ 45° Az and 891' (3' above floor)
Ref. CR-CNS-2011-2958





RE27-DW-005
1.5" x 1.0" Paint Chip Area
Located @ 003° Az and 888' (floor to wall)
Ref. CR-CNS-2011-3139

RE26 - Ind. # 5
0.8" x 1.5" Paint Chip Area
Located @ 45° Az and 888' (floor to wall)
Ref. CR-CNS-2011-3139

Figure 19.5 Drywell Indications @ 90 °

RE26 - Ind. # 3
Missing Coating
Located @ 90° Az and 12' above 901' EL
Ref. CR-CNS-2011-2958

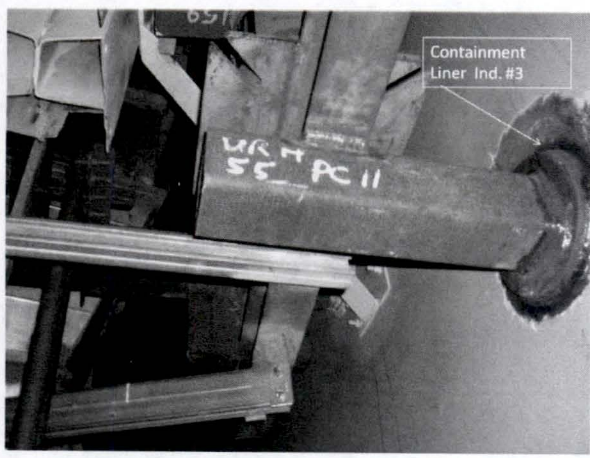
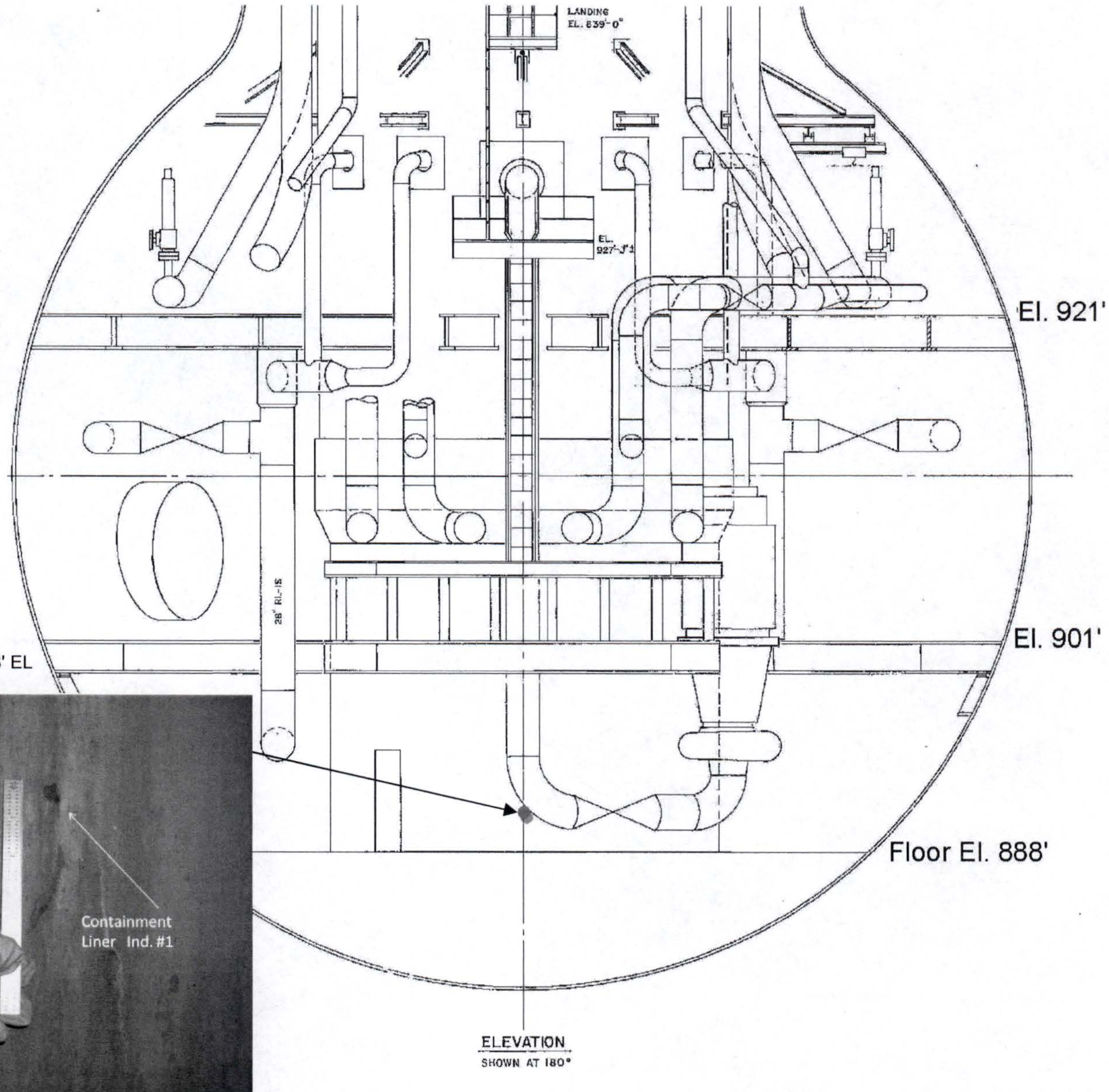


Figure 19.6 Drywell Indications @ 180 °



RE26 - Ind. # 1
0.6" x 0.5" Paint Chip Area
Located @ 180° Az and 3' above 888' EL
Ref. CR-CNS-2011-2958

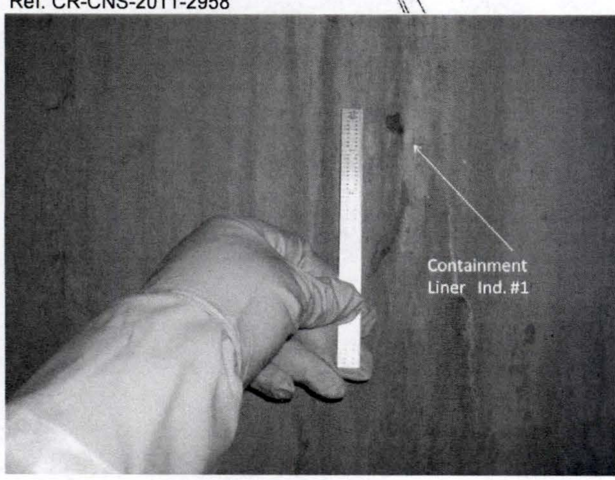
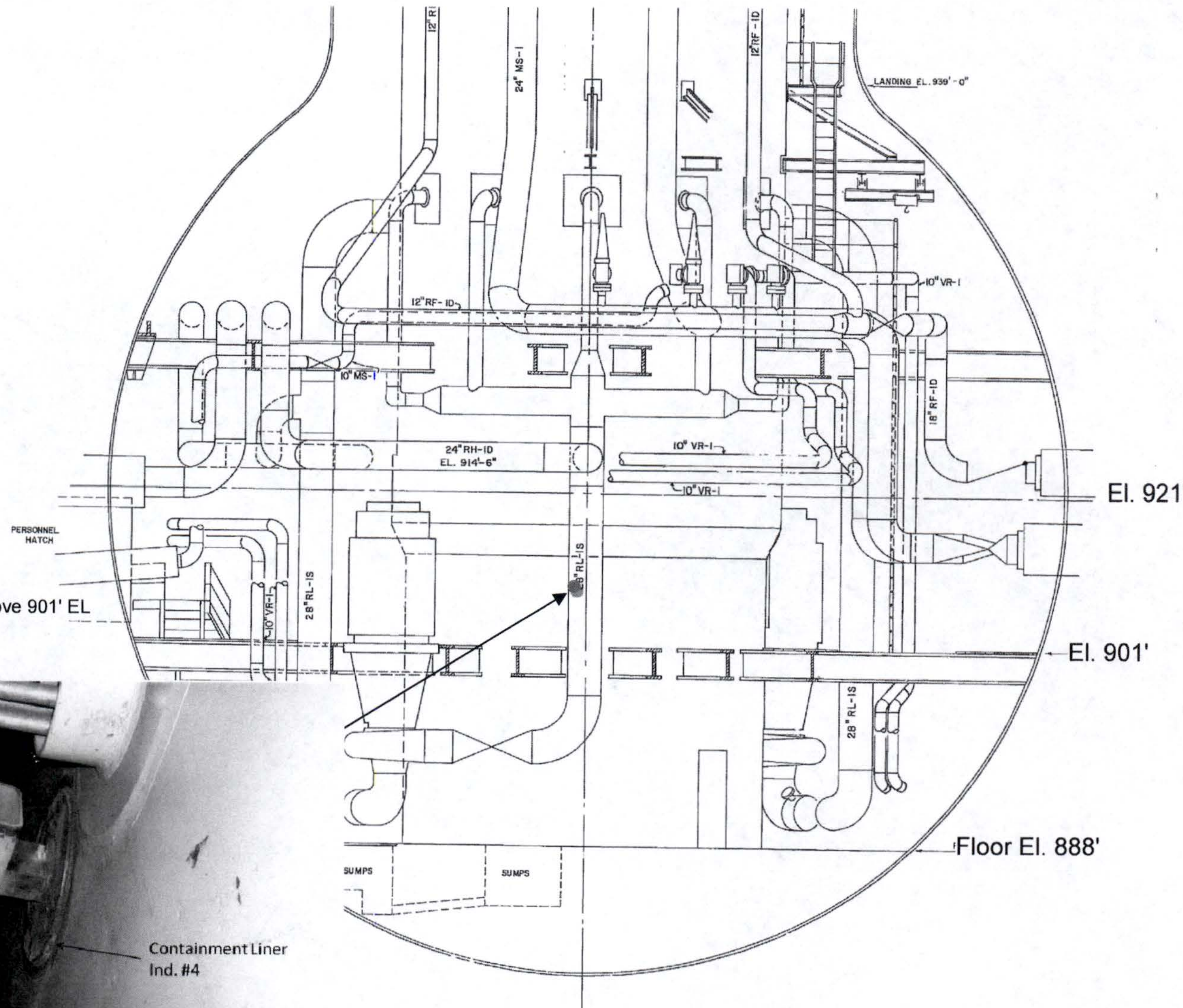
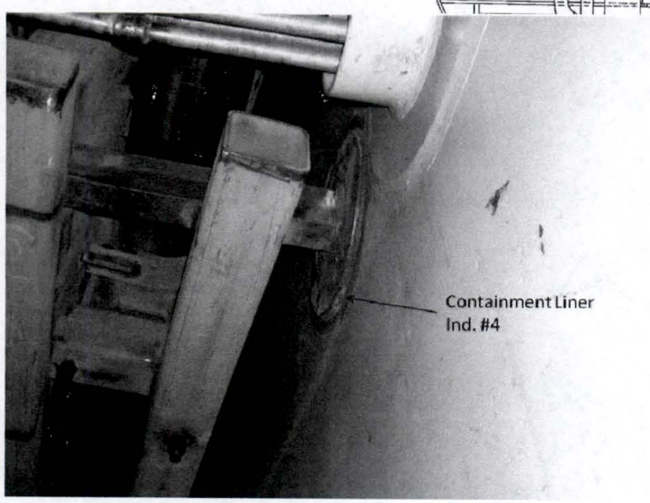


Figure 19.7 Drywell Indications @ 270 °

RE26 - Ind. # 4
Missing Coating
Located @ 270° Az and 12' above 901' EL
Ref. CR-CNS-2011-2958



ELEVATION
SHOWN AT 270°



20.0 Inservice Inspection (ISI) and Containment Inspection (CISI) History

20.1 ISI Program History

CNS was constructed in accordance with the requirements of American National Standards Institute (ANSI)/ASME B31.1-1967 and B31.7-1969. In 1968, the ASME published the Draft Code for Inservice Inspection of Nuclear Reactor Coolant Systems, providing rules for Inservice Inspection of reactor coolant systems. The first official publication was January 1, 1970. Compliance with the ASME code requirements (i.e., Section XI) was made mandatory by Atomic Energy Commission (AEC) for nuclear plants with construction permits after April 1, 1970. Although the new rule became effective after the construction of CNS was essentially completed, the requirements of the rule were incorporated into Appendix J of the CNS Final Safety Analysis Report (FSAR). The requirements applied only to Class 1 systems.

Inspection requirements for Class 2 systems were added to ASME Section XI in the Winter 1972 Addenda. Pump and valve testing and repair and replacement requirements were added in the Summer 1973 Addenda. Inspection requirements for Class 3 systems were added in the 1974 Edition. The requirements for inspection of Class 2 and Class 3 systems, pump and valve testing, and repair and replacement were not invoked by the regulations until 1976.

In general, nuclear power plants are responsible for preparation of plans and schedules and filing of these plans and schedules with the Nuclear Regulatory Commission (NRC). Additionally, the ten-year interval plan is unaffected by changes in the ASME Section XI requirements (unless mandated by changes to 10CFR50.55a), however these changes could come into effect with subsequent ten-year interval plan submittals. For example, at the end of the first ten-year interval in July 1984, CNS updated the ISI and Inservice Testing (IST) programs to the ASME Section XI 1980 Edition, Winter 1981 Addenda, as required by 10CFR50.55a, (f) and (g).

The program plan may also include a separate augmented section for Non-Code required examinations. These "augmented" examinations typically result from external commitments made to the NRC through docketed correspondence (e.g., responses to NRC Bulletins, Generic Letters (GL), and Inspection Reports (IR)) or internal commitments resulting from vendor correspondence, CNS experience, or industry operating experience.

First Interval
The commercial operation date for Cooper Nuclear Station is July 1, 1974.

The three inspection periods during the first inspection interval were as follows:

Inspection Period	ISI Period Dates
1	July 1, 1974 to October 30, 1977
2	November 1, 1977 to March 30, 1981
3	April 1, 1981 to June 30, 1984

Due to the Recirculation Piping Replacement outage from 1984 to 1985, the third period was extended to May 31, 1985 as allowed by IWA-2430(e).

Second Interval

In 1993 CNS began preparing for the next update of the ISI Program. Consultants were brought in to assess the status of the second interval examinations and draft the update for the third interval. In 1994 the NRC issued a confirmatory to CNS on a variety of issues. One issue was the adequacy of the ISI Program. Safety related piping in the Reactor Equipment Cooling (REC) and Service Water (SW) systems had not been included in the program. CNS personnel had misunderstood the piping classification requirements needed to implement the program. The Burns and Roe piping classification system used during construction did not match the ASME Section XI criteria for Class 3 systems. One of the contributing factors to this error was a lack of industry participation by the program engineer.

As part of the corrective action, the second interval program was completely revised. New relief requests were generated, submitted to the NRC and approved. Any examinations or tests that had not been performed were completed during the Fall 1995 outage.

The three inspection periods during the second inspection interval were as follows:

Inspection Period	ISI Period Dates
1	June 1, 1985 to September 30, 1988
2	October 1, 1988 to January 31, 1992
3	April 1, 1992 to August 31, 1995

The plant remained shut down to resolve the CAL issues from May 1994 to February 1995. Consequently the third period of the second interval was extended to February 29, 1996 as allowed by IWA-2430(c).

The third ten-year interval program was developed and submitted to the NRC. Implementation began March 1, 1996.

The three inspection periods during the third inspection interval were as follows.

Inspection Period	ISI Period Dates
1	March 1, 1996 to June 30, 1999
2	July 1, 1999 to October 30, 2002
3	November 1, 2002 to February 28, 2006

The NRC, in their inspection report for the 1997 outage, noted the improvements in the conduct of the ISI Program. In addition, CNS was one of the first plants to develop and implement a Primary Containment inspection program in response to the September 1996 change to 10CFR50.55a. (Under this CFR revision, the requirements of ASME Section XI, Subsection IWE, 1992 Edition, 1992 Addenda which applies to Class MC components (i.e., Containment) were incorporated by reference into 10CFR50.55a.) Although rolled under the ISI Program, the CNS CISI Program for Class MC maintains a separate ten-year interval plan, a different ten-year interval, and a separate process for Class MC relief requests.

In November 1999, 10CFR50.55a was again revised to include Appendices VII and VIII to ASME Section XI. Appendix VII supplemented the training requirements for the Level I, II, and III NDE inspectors and Appendix VIII revised the ultrasonic testing (UT) requirements to incorporate the performance demonstration initiative.

Fourth Interval

The Fourth Interval Inservice Inspection Program was developed in accordance with the requirement of 10 CFR 50.55a and the 2001 Edition through the 2003 Addenda of the ASME Section XI Code. When the fourth interval started CNS was on 18 months cycles. In RE27 CNS began 24 months cycles. The three inspection periods were as follows:

Inspection Period	ISI Period Dates
1	March 1, 2006 to June 30, 2009*
2	July 1, 2009 to September 14, 2012**
3	September 15, 2012 to March 31, 2016***

* In accordance with IWB-2412(b), certain examinations from the Third Interval were performed during the Fall of 2006 (RE23) however were credited to the Third Interval
**The second period dates were revised from November 1, 2012 to September 15, 2012 to align with the CNS refueling schedule. Examinations scheduled to start pre-outage (i.e., September 15, 2012 with an outage start date of October 13, 2012) and during RE27 were credited to the Third Period.
***RE27 was the first outage in the Third Period and the start of the 24 month cycles.

20.2 CISI Program History

First Interval

On September 9, 1996, 10CFR50.55a was amended to incorporate the requirements of ASME Section XI Code 1992 Edition through the 1992 Addenda of Subsection IWE and IWL (Containment Program).

Subsection IWE contains the requirements for liners and penetrations of light water cooled nuclear power plants and IWL contains the requirements for ISI of reinforced concrete containments (not applicable at CNS). The rule at the time required licensees to incorporate the new requirements into their ISI programs and to complete examinations equal to the required First Period Inspections within five years (i.e., no later than September 9, 2001). Subsection IWE requires that examinations be performed at the required inspection periods of 3, 7 and 10 calendar years of plant service within the interval. Therefore, the First Period Examinations were completed by September 8, 2001 to meet 10CFR50.55a requirements. The three inspection periods during the first inspection interval were as follows:

Inspection Period	IWE Period Dates
1	September 9, 1996 to September 8, 2001
2	September 9, 2001 to January 8, 2005
3	January 9, 2005 to May 8, 2008

Second Interval

On October 1, 2004, 10 CFR 50.55a was revised to incorporate by reference the 2001 Edition of ASME Section XI up to and including the 2003 Addenda. The CISI Program was updated to meet the requirements of the 2001 Edition through the 2003 Addenda. The three inspection periods during the second inspection interval were as follows:

Inspection Period	IWE Period Dates
1	May 9, 2008 to September 8, 2011
2	September 9, 2011 to January 8, 2015
3	January 9, 2015 to March 31, 2016*

*Request for Alternative RC3-01 was NRC approved to align the CISI Third Interval with the ISI Fifth Interval which will start on April 1, 2016.