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SUBJECT: Forwards revised ISI Relief Request B-7 for 18 RCS welds & new Relief Request B-8 from ASME Code Articles IWB-2400 & IWC-2400, "Insp Schedule" for 1231 Class 1 & 2 welds for approval.

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March 20, 1992

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

Gentlemen:

Subject: First Ten-Year Interval Inservice Inspection Program
San Onofre Nuclear Generating Station
Units 2 and 3

References:

1. September 24, 1991 letter from R. M. Rosenblum (SCE) to the Document Control Desk (NRC), Subject: First Ten-Year Interval Inservice Inspection Program, San Onofre Nuclear Generating Station, Units 2 and 3

2. November 22, 1991 letter from R. M. Rosenblum (SCE) to the Document Control Desk (NRC), Subject: First Ten-Year Interval Inservice Inspection Program, San Onofre Nuclear Generating Station, Units 2 and 3

3. June 26, 1991 letter from R. M. Rosenblum (SCE) to the Document Control Desk (NRC), Subject: First Ten-Year Interval Inservice Inspection Program, San Onofre Nuclear Generating Station, Units 2 and 3

This letter provides a revised Inservice Inspection Relief Request B-7 and a new Relief Request B-8. Revised Relief Request B-7 (Enclosure 1) is limited to 18 welds in the reactor coolant system piping which are inside the primary reactor shield cavity. Relief is no longer requested from the ASME Code requirements for surface examination of the remaining 1231 piping welds which were initially included in Relief Request B-7. The new Relief Request B-8 (Enclosure 2) is for relief from the schedule requirements of ASME Code Articles IWB-2400 and IWC-2400, "Inspection Schedule," for the 1231 Class 1 and 2 welds which had previously been included in Relief Request B-7.

BACKGROUND

In reference 1, Relief Request B-7 requested relief from the ASME Code Section XI, Division 1, 1977 Edition with all Addenda

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through the Summer of 1979, requirements for "1/3-volumetric-plus-surface" examination of pressure retaining welds in Class 1 and 2 piping, Categories B-J and C-F.

The alternate testing proposed in Relief Request B-7 was to substitute a full-volume examination for the Code-required "1/3-volumetric-plus-surface" examination of welds in Code Categories B-J and C-F. Southern California Edison (SCE) believed the full-volumetric examination would detect surface flaws required by the ASME Code based on previous detection of surface indications at San Onofre and the fact that subparagraphs IWB-3514.2(b) and IWB-3514.3(b) of the 1977 Edition of the ASME Code, Section XI, with Addenda through Summer 1979, provide for the use of ultrasonic (UT) techniques when a surface indication exceeds the allowable standards for surface examination.

In support of this alternate testing, SCE committed in reference 3 to perform a demonstration program using rigorous test acceptance criteria to justify use of the full-volume examination performed from the pipe exterior surface to detect outside diameter, surface-connected, crack-like defects. Specifically, the demonstration program included small surface flaws located in the weld metal of various stainless steel test blocks. This surface flaw detection demonstration program was conducted the week of March 16, 1992. However, this demonstration was not successful in validating the acceptability of the full-volumetric examination technique for the stainless steel test blocks.

DISCUSSION

Relief Request B-7

Because the demonstration of the full-volume technique was not successful, SCE withdraws the previous Relief Request B-7 submitted by reference 1 and encloses a revised Relief Request B-7. We are now requesting use of a full-volume examination in lieu of "1/3-volumetric-plus-surface" examination for only 18 ASME Code Class 1 welds in the reactor coolant system piping for each unit which are located inside the primary reactor shield cavity. The proposed volumetric examination of the exterior pipe surface is performed from the interior pipe surface, which provides the necessary sensitivity for detection of exterior surface indications.

Therefore, SCE will perform surface examinations on Category B-J and C-F welds as required by the ASME Code except for the 18 reactor coolant system welds in each unit as discussed in the enclosed Relief Request B-7.

Relief Request B-8

Relief Request B-8 requests relief from the ASME Code, Articles IWB-2400 and IWC-2400, "Inspection Schedule," for examination of Class 1 and 2 welds, respectively. The ASME Code requires completion of a minimum of 50 percent of the required "1/3-volumetric-plus-surface" examinations by the end of the second inspection period in the first inspection interval. Full volumetric (in lieu of just 1/3-volumetric) examination of approximately 80 percent of the Code Category B-J and C-F welds selected for inspection during the first 10-year interval in each unit has been completed. However, we have not completed the Code-required surface examinations of 50 percent of those welds selected for volumetric examination during the first interval. Therefore, SCE requests relief from the schedule requirement until completion of the next (Cycle 7) refueling outage for each unit, at which time SCE will have completed the examination of all the Code required piping welds using both volumetric and surface examination techniques. Surface examinations of accessible welds will be performed as practical during Cycle 6 operation. Credit will be taken for completed volumetric examinations.

Surface examinations at San Onofre Units 2 and 3 have demonstrated the integrity of the piping systems inspected. In piping welds that require only a surface examination, in accordance with Code requirements, surface examinations have been performed on approximately 118 welds on each unit in Code Categories B-F, B-J, B-O, and C-F. As a result of these examinations in both units, only one reportable indication which exceeded allowable acceptance standards of Section XI was detected and required corrective action.

Within the examination categories affected by this relief request, surface examinations have been performed on 18 Unit 2 Code Category C-F and 4 Unit 2 Code Category B-J welds with no reportable indications. In addition, surface examinations of an additional 18 Code Category C-F welds will be performed on piping welds in each unit prior to entering Mode 2. Unit 2 is now in Mode 5, and Unit 3 is in Mode 4. Results of these inspections will be reported by a telephone call to the NRC Project Manager for San Onofre Units 2 and 3 prior to entering Mode 2 in the affected unit.

As noted in Section III of the Attachment to Relief Request B-8, the number of welds currently selected for examination is based on a very conservative interpretation of the Code. Because we are withdrawing our relief request to allow a full-volume UT examination to be used in lieu of a "1/3-volumetric-plus-surface" examination, we may reevaluate our current program and reduce the number of welds selected for examination and subject to Relief Request B-8. This would be the subject of a separate letter.

There is no safety significance in performing the inspections as requested in Relief Request B-7 because volumetric examination from the interior pipe surface provides the sensitivity to detect exterior surface indications. Also, there is no safety significance in performing the inspections on the schedule requested by Relief Request B-8 because of the significant number of welds which have been inspected using full volumetric techniques, the number of surface examinations which have been performed and will be performed on welds prior to entering Mode 2 for both units, and the short duration (one refueling cycle) until all of the first ten-year interval inspections will be completed for both units.

As discussed with the NRC Project Manager for San Onofre Units 2 and 3, your approval of the enclosed Inservice Inspection Relief Requests B-7 and B-8 is requested as soon as possible to not delay plant entry into Mode 2 for Unit 3 (March 24, 1992) and Unit 2 (April 1, 1992).

Sincerely,

HE Morgan

cc: J. B. Martin, Regional Administrator, NRC Region V
C. W. Caldwell, NRC Senior Resident Inspector, San Onofre Units 1, 2, & 3
G. Kalman, NRC Senior Project Manager, San Onofre Units 1, 2, & 3

ENCLOSURE 1

RELIEF REQUEST B-7

Enclosure 1

RELIEF REQUEST NO. B-7

SYSTEM: Reactor Coolant System

COMPONENT/AREA: Reactor vessel nozzle extension piece-to-pipe welds, extension piece-to-elbow welds, and intersecting longitudinal welds in these pipes and elbows which are located inside the primary reactor shield cavity, alongside the unshielded reactor vessel.

6 Circumferential carbon steel welds for each Unit
12 Longitudinal carbon steel welds for each Unit
---
18 Total welds for Relief Request B-7 in each Unit

EXAMINATION CATEGORY: B-J

CLASS: 1

FUNCTION: To provide a pressure boundary to the Class 1 Reactor Coolant System

EXAMINATION REQUIREMENT: Volumetric and surface examination of applicable circumferential and longitudinal pressure retaining piping welds as per ASME Section XI Figure No. IWB-2500-8 for Class 1 components

BASIS FOR RELIEF: Relief is requested from the above method of examination, referred to as "1/3-volumetric-plus-surface" examination.

1. A full-volumetric UT preservice examination was performed from the inside of the pipe. The results of a "1/3-volumetric-plus-surface" examination will not be comparable to the preservice examination. The preservice examination (PSE) for San Onofre Units 2 and 3 was performed in accordance with the requirements specified by the ASME Code, Section XI, 1974 Edition with Addenda through the Summer, 1975; the Code edition approved by 10CFR50.55a at the time the PSE was performed. This Code required the examination of 100% of the volume of the weld and heat affected zone for longitudinal and circumferential piping welds in Class 1 systems larger than 1 inch in nominal pipe size. Ultrasonic (UT) examination techniques were used to satisfy these requirements.

2. Access to the affected welds is by either removing the refueling cavity seal ring, and entering the area from above, or crawling alongside the primary coolant piping through the penetrations in the primary shield wall. Although these welds did receive surface examinations during construction, the high humidity environment in which they are located is expected to have resulted in surface oxidation which would require removal prior to performing a successful surface examination.

3. The total effort to perform all required surface examinations without Relief Request B-7 is estimated to increase radiation exposure received in the performance of the required examinations. This increase of person-rem per outage for these examinations is not consistent with ALARA objectives. These welds are located in a high radiation area next to the reactor vessel, with dose rates ranging from 100 mrem-hour to 8 rem/hour at some hot spots, with an average dose rate in the area of examination being approximately 250 mrem/hour. (This average dose rate is lower than previously submitted in reference 1 based on a more representative assessment of the dose rates in the area of examination.)

   As discussed in reference 2, due to the dose rate in the area of these welds and the significant interferences associated with gaining access to these welds, we did not determine the time and exposure required to prepare and examine them.

4. A full volumetric UT examination from the inside of the pipe was performed during the Cycle 3 refueling outage, for both Units 2 and 3, on two hot leg circumferential welds and four hot leg longitudinal welds. This examination was performed using the guidance in Regulatory Guide 1.150 "Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations." The remaining 12 welds in each Unit will be examined in this manner during the respective Cycle 7 refueling outage. The results of these examinations support the viability of full-volumetric examinations in lieu of 1/3-volumetric-plus-surface examinations. Specifically, the radiographic punch marks, which are no more than 3/64-inch (0.047 inches) deep, were detected. These marks are less than the minimum Code allowed flaw depth (about 0.2 inches).

ALTERNATE
EXAMINATION: All 18 circumferential and longitudinal pressure retaining piping welds on each Unit will receive a 100 percent volumetric UT examination in lieu of a "1/3-volumetric-plus-surface" examination. These examinations will be performed using the guidance of Regulatory Guide 1.150 "Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations." Examinations shall be conducted from inside the piping using half-vee examination techniques as a minimum, applied in two directions parallel to the weld, and two directions perpendicular to the weld, except when access is limited by weld configuration or geometry.

ENCLOSURE 2

RELIEF REQUEST B-8

Enclosure 2

RELIEF REQUEST NO. B-8

SYSTEM: All Class 1 and 2 piping systems

COMPONENT/AREA: Pressure retaining circumferential and longitudinal butt welds in pipes and fittings (with the exception of dissimilar metal welds in Class 2 piping)

EXAMINATION CATEGORY: B-J (nominal pipe size 4 inches and greater) and C-F

CLASS: 1 and 2 (See Attachment)

FUNCTION: To provide a pressure boundary to Class 1 and 2 systems

EXAMINATION REQUIREMENT: Volumetric and surface examination of circumferential and longitudinal pressure retaining piping welds as per ASME Section XI, Figure Nos. IWB-2500-8 and IWC-2520-7 for Class 1 and 2 components respectively. IWB-2400 and IWC-2400, Inspection Schedule, Tables IWB-2412-1 and IWC-2412-1 require a minimum of 50% of the selected Class 1 and 2 welds, respectively, to be inspected by the end of the second inspection period of the first inspection interval.

BASIS FOR RELIEF: Relief is requested from the schedule requirements specified in Paragraph IWB-2400 and Table IWB-2412-1 for Class 1 components and Paragraph IWC-2400 and Table IWC-2412-1 for Class 2 components for the surface examination only of the above method of examination, referred to as "1/3-volumetric-plus-surface" examination.

1. Of the 1231 welds in Unit 2 currently selected for our program and affected by this relief request (Unit 3 has approximately the same number of welds selected.), a full-volumetric UT inservice examination has been performed on approximately 979 welds in each unit. No indications have been found which exceeded the allowable acceptance standards of Section XI in either unit and no failures have occurred in this piping during eight years of service for each Unit.

2. Surface examinations (MT or PT, as appropriate) have been performed in San Onofre Units 2 and 3 on welds that require only surface examinations in accordance with Code requirements. These examinations have been performed on approximately 118 welds in Unit 2 and approximately the same number in Unit 3. These welds are in Code categories B-F, B-J, B-O and C-F. One reportable indication, which exceeded the allowable

acceptance standards of Section XI was detected in Unit 2 and corrective action was taken. No indications have been found which exceeded the allowable acceptance standards of Section XI in Unit 3 and no pressure boundary failures have occurred in this piping during eight years of service for either Unit.

3. This relief request is required because an attempt to demonstrate that full-volumetric UT examinations are a satisfactory substitute for 1/3-volumetric-plus-surface examinations was not successful. However, this demonstration, performed on stainless steel weld specimens, did result in successful detection of three surface-connected flaws (all of which were less than five percent through-wall penetration). These flaws were oriented circumferentially along the toe of the welds. This limited success demonstrates that the full-volume UT covers a significant majority of the weld volume inspected and provides some assurance of the integrity of the welds inspected. We believe these results are also applicable to carbon steel welds, which are typically less difficult to inspect than stainless steel welds.

4. The benefits of the full-volumetric UT are additionally supported by subparagraphs IWB-3514.2(b) and IWB-3514.3(b) of the 1977 Edition of the ASME Code, Section XI, with Addenda through Summer, 1979. This section of the Code provides for the use of UT techniques for flaw size evaluation when the indication(s) exceed the allowable standards for surface examination. Table IWB-3514-2 or Table IWB-3514-3, as appropriate, provides the governing standards for volumetric examination of these welds using UT techniques.

5. Within the examination categories affected by this relief request, surface examinations have been performed on 18 Unit 2 Code Category C-F welds and 4 Unit 2 Code Category B-J welds with no reportable indications after suitable surface preparation. To supplement this information, 18 additional surface examinations in accessible piping will be completed and results reported to the NRC prior to entering Mode 2 in each Unit.

ALTERNATE
EXAMINATION: Sufficient inservice surface examinations will be conducted during the third (last) period of the 10-Year examination interval to satisfy Code requirements for 1/3-volumetric-plus-surface examinations. The volumetric requirements of these examinations are being completed in compliance with the Code required schedules as specified in Paragraph IWB-2400 and Table IWB-2412-1 for Class 1 components and Paragraph IWC-2400 and Table IWC-2412-1 for Class 2 components.

Class 1 and Class 2 Piping Welds
First 10-Year Inservice Inspection Program
Subject to Relief Request B-8

NOTE: the following numbers are taken from the San Onofre Unit 2 program. The Unit 3 program is similar but not identical.

I. ASME Code Class 1, Category B-J Welds

A. Carbon Steel Welds Outside Reactor Shield Cavity:

	31 Circumferential
	36 Longitudinal
	67 Welds

B. Stainless Steel Welds

1. RPV Closure Head Instruments:	20 Circumferential
2. Pressurizer Fittings:	1 Circumferential
3. Pressurizer Surge Line:	4 Circumferential
4. Pressurizer Safety Valve piping:	4 Circumferential
5. Safe End Welds on the RCS:	8 Circumferential
6. Safety Injection Piping:	
a. 12" piping:	33 Circumferential
b. 8" piping:	20 Circumferential
c. 4" piping:	2 Circumferential
7. Shutdown Cooling Inside Containment:	
a. 18" piping:	2 Circumferential
b. 16" piping:	4 Circumferential
c. 10" piping:	4 Circumferential
8. Pressurizer Spray Line Piping:	
a. Spray Line from RCS Loop 1A:	10 Circumferential
b. Combined Spray Line:	4 Circumferential
c. Spray Line from RCS Loop 1B:	4 Circumferential
	120 Welds

SUBTOTAL FOR ASME CODE CLASS 1 CATEGORY B-J = 187 WELDS

II. ASME Code Class 2, Category C-F Welds

A. Carbon Steel Welds

1. Category C-F Welds Inside Containment

a. Nozzle-to-Pipe Welds:	2 Circumferential
b. 40" piping:	1 Circumferential
c. 20" piping:	8 Circumferential
d. 18" piping:	3 Circumferential
e. 6" piping:	8 Circumferential
f. other:	3 Longitudinal
	---
	25 Welds

2. Category C-F Augmented ISI Inside Containment

a. Nozzle-to-Pipe Welds:	2 Circumferential
b. 40" piping:	6 Circumferential
c. 20" piping:	4 Circumferential
d. 6" piping:	59 Circumferential
e. other:	15 Longitudinal
	---
	86 Welds

3. Category C-F Augmented ISI Outside Containment

a. Circumferential welds:	95 Circumferential
b. Longitudinal welds:	8 Welds
	---
	103 Welds

B. Stainless Steel Welds

1. C-F Welds Inside Containment

a. Regenerative Heat Exchanger:	9 Circumferential
b. Letdown Delay Mechanism:	2 Circumferential
	---
	11 Welds

SUBTOTAL FOR ASME CLASS 2 CATEGORY C-F = 225 WELDS

III. ASME Code Class 2, Category C-F Welds in Residual Heat Removal (RHR), Emergency Core Cooling (ECCS), and Containment Heat Removal (CHR) Systems Requiring Examination as Specified by 10CFR50.55a(b)(2)(iv) [a]

1. C-F Welds in Safety Systems Inside Containment	
a. Circumferential welds:	31 Circumferential
b. Longitudinal welds:	20 Longitudinal
	51 Welds
2. C-F Welds in Safety Systems Outside Containment	
a. Circumferential welds:	536 Circumferential
b. Longitudinal welds:	231 Longitudinal
c. Valve Body	1
	768 Welds

SUBTOTAL FOR CLASS 2 SPECIFIED BY 10CFR50.55a(b)(2)(iv) = 819 WELDS

TOTAL OF ASME CLASS 1 AND 2 WELDS SUBJECT TO RELIEF = 1231 WELDS

Note (a): The welds in this category have been selected to meet the requirements of 10CFR50.55a(b)(2)(iv) to examine welds in Class 2 RHR, ECCS and CHR systems in accordance with the extent specified in paragraph IWC-1220, Table IWC-2520 Category C-F and paragraph IWC-2411 of the 1974 Edition of Section XI with Addenda through Summer, 1975 Addenda.

Paragraph IWC-1220 specifies which components may be exempted from examination is summarized as follows:

1. Components 4" and less in nominal pipe size

2. Components in systems where both the design temperature is equal to or less than 200°F and the design pressure is less than or equal to 275 psig.

3. Components other than emergency core cooling systems which do not function during normal reactor operation.

Table IWC-2520 specifies that the following non-exempted welds in Category C-F shall be examined:

1. Circumferential butt welds at structural discontinuities (defined as including weld joints at pipe-to-vessel nozzle joints, pipe-to-valve body joints, pipe-to-pump casing joints and pipe-to-fitting joints)

Note (a): continued

2. Circumferential butt welds in piping within 3 pipe diameters of the centerline of rigid pipe anchors, or anchors at the penetration of the primary reactor containment, or at rigidly anchored components.

3. Longitudinal weld joints in pipe fittings

4. Branch connection weld joints

5. Pump casing and valve body welds

Paragraph IWC-2411 states that the required examinations shall be completed by the end of the service lifetime, but divided among the number of inspection intervals. Paragraph IWC-2420 of the 1977 Edition of Section XI, however, states that components examined during the first inspection interval should be examined, to the extent practical, during each succeeding inspection interval. Because of the seemingly contradictory nature of the requirements, we have conservatively chosen to examine all welds during each inspection interval. This decision to examine all welds during each inspection interval is being reassessed and will be the subject of future correspondence if we alter our approach.