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SUBJECT: Provides supplemental info supporting Relief Request B-7 re ASME Code Section XI,Div 1 requirements concerning first 10-yr interval ISI program for facility.

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November 22, 1991

R. M. ROSENBLUM
MANAGER OF
NUCLEAR REGULATORY AFFAIRS

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

Gentlemen:

Subject: **Docket Nos. 50-361, and 50-362**
First Ten-Year Interval Inservice Inspection Program
San Onofre Nuclear Generating Station
Units 2 and 3 (TAC Nos. M54148 and M54149)

References: 1) September 24, 1991, letter from R. M. Rosenblum (SCE) to Document Control Desk (NRC), Subject: Docket Nos. 50-361 and 50-362 First Ten-Year Interval Inservice Inspection Program San Onofre Nuclear Generating Station Units 2 and 3 (TAC Nos. 54148 and 54149)

2) June 26, 1991, letter from Mr. R. M. Rosenblum (SCE) to Document Control Desk (NRC), Subject: Docket Nos. 50-361 and 50-362 First Ten-Year Interval Inservice Inspection Program San Onofre Nuclear Generating Station Units 2 and 3 (TAC Nos. 54148 and 54149)

This letter provides supplemental information supporting Relief Request B-7. Southern California Edison (SCE) committed to provide this information in our September 24, 1991, letter, Reference 1.

DISCUSSION

Relief Request B-7 requests relief from the ASME Code Section XI, Division 1, 1977 Edition with all Addenda through the Summer of 1979, requirements for "1/3-volumetric-plus-surface" examination of pressure retaining welds in all Class 1 and Class 2 Piping, Categories B-J and C-F.

The alternate testing proposed in Relief Request B-7 substitutes a full-volume examination for the Code-required 1/3-volume-plus-surface examination of welds in Code Categories B-J and C-F. The bases for the relief request are that (1)

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the full-volume examination meets or exceeds the sensitivity of the Code-required examination and (2) there is a significant savings in person-hours and person-rem to be realized if relief is granted. The sensitivity of the two methods will be demonstrated in early 1992 as discussed in Reference 2. The savings to be realized through Relief Request B-7 are the subject of this letter.

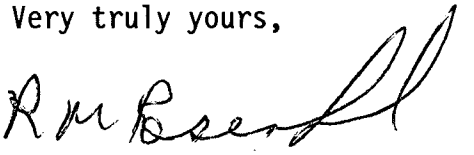
Enclosure 1 to this letter provides the detailed information in support of Relief Request B-7 that we committed to provide in Reference 1. This information is based on data collected while performing inspections during the recent Unit 2 Cycle 6 refueling outage. Included are the identification of specific welds (divided into groups by Code Category, material, location, system, and type of weld) and the justification for the relief request for each group.

Enclosure 1 also provides the details of the recently completed evaluation to determine the savings resulting from performing inspections using the method described in the relief request. The evaluation is based on the inspection contractor's experience that the time and radiation exposure differences required to perform a full-volume examination and to perform a 1/3-volume examination are negligible. The evaluation demonstrates that approval of this relief request will result in a savings of approximately 11,000 person-hours and 24 person-rem. This savings is the time and exposure required to prepare for and perform surface examinations.

In summary, this letter provides supplemental information supporting Relief Request B-7 for each weld grouping identified in Reference 1. A demonstration program, outlined in Reference 2, is scheduled for early 1992. Providing the demonstration program is successful, we believe a strong technical, radiological and economical basis has been provided for Relief Request B-7.

If you have any questions or would like additional information, please let me know.

Very truly yours,



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

DETAILED JUSTIFICATION FOR RELIEF REQUEST B-7

Each of the following sections describe the work required to prepare the welds for inspection and the existing radiation environment for each grouping of welds. Table 1 summarizes the information discussed in these sections, includes the time required for the surface examination of each weld, and displays the preparation times and dose rates in a tabular format. This information is based on data collected while performing inspections during the recent Unit 2 Cycle 6 refueling outage and represents the additional time and dose required to prepare and perform surface examinations.

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

A. Carbon Steel Welds

1. Outside Reactor Shield (67 welds)

The welds in this group are all located inside the containment and in the Reactor Coolant System (RCS) or systems connecting directly to the RCS. These welds were prepared and surfaced examined during construction. The preservice full volumetric examination was conducted a short time later. Therefore, little additional preparation was required to perform the full volumetric examination, which was the only preservice examination performed.

To represent this group of welds, two circumferential welds and the two intersecting longitudinal welds for a distance of 12" at each end in the 30-inch suction piping for Reactor Coolant Pump (RCP) 003 were examined using the Magnetic Particle method. A total of 22.85 feet of weld was prepared and examined. The cost of the pipe preparation and additional examination was 16 person-hours of labor (0.7 person-hours/linear foot of weld) and 60 person-mrem of exposure (3.75 mr/hr). If this data is applied to all of the welds in this group (350 linear feet of weld) as described in Table 1, the savings would be 279 person-hours and 1.045 person-rem for preparation and examination over a 10-year inspection interval.

2. Inside Reactor Shield (18 welds)

There are an additional 18 carbon steel welds located inside the primary reactor shield cavity which are scheduled to be examined using remote ultrasonic techniques from the inside surface of the pipe. Due to the radiation dose rate in the area of these welds (250 to 8000 mrem/hour) and the significant interferences associated with gaining access to these welds, no attempt was made to determine the time and exposure required to prepare and examine these welds. Because of the magnitude of potential personnel exposure and the demonstrated viability of the examination of the outside surface using UT from the inside surface, we determined further evaluation was not necessary.

B. Stainless Steel Welds (120 welds)

The welds in this group are all located inside the containment and in the RCS or systems connecting directly to the RCS. These welds were prepared and surface examined during construction, but only a volumetric exam, requiring no preparation, was performed during the preservice exams. To represent this group of welds, two 3-inch circumferential welds (a total of 1.8 linear feet of weld) in the high pressure safety injection piping for Loop 2A were examined using the Liquid Penetrant method. The cost of the pipe preparation and additional surface examination for these two welds was 2 person-hours of labor (1.1 person-hours/linear foot of weld). No radiation exposure information was recorded for these welds. If this data is applied to all of the welds in this group (348 linear feet of weld) as described in Table 1, the savings would be 443 person-hours. If an average radiation field intensity of 2 mrem/hr is assumed (conservatively low) then an additional 0.886 person-rem over a 10-year inspection interval will be expended in preparing and examining these welds.

In summary, for those Unit 2, ASME Class 1 welds subjected to surface examination, an additional 722 person-hours and 1.931 person-rem would be required to condition the welds for and conduct surface examinations (Magnetic Particle or Liquid Penetrant, as appropriate) over the 10-year interval.

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

A. Carbon Steel Welds

Welds in this group were not surface examined to provide data for this evaluation. This Class 2 piping did not require surface examination under the rules of the Construction Code (Section III, Subsection NC) and was thus left in the as-welded condition with the weld crown typically flat-topped in preparation for thickness measurements. Therefore, the surface conditions of the welds in this group (main steam and main feedwater piping, both inside and outside containment) are bounded by, and in most cases are worse than the surface conditions of the carbon steel RCS piping as discussed in I.A.1 above. Accordingly, the surface preparation of the Class 2 piping welds in this group is assumed to require the same time as an equal length of RCS piping weld. The radiation field (dose rate) is assumed to be 2 mrem/hour inside containment, and zero outside containment.

1. ASME ISI Welds Inside Containment (25 welds)

There are a total of 106 linear feet of carbon steel welds in Class 2 systems inside containment selected for examination in accordance with the requirements of the ASME Section XI Boiler and Pressure Vessel Code. As described in Table 1, the additional time to properly condition and surface examine these welds (Magnetic Particle method) would be 87 person-hours and 0.174 person-rem for the 10-year interval.

2. Augmented ISI Welds Inside Containment (86 welds)

There are a total of 224 linear feet of carbon steel Class 2 welds in high energy systems which have been selected for examination in accordance with the Augmented Inservice Inspection guidelines of Standard Review Plan (SRP) 6.6 "Inservice Inspection of Class 2 and 3 Components." As described in Table 1, the additional time to properly condition and surface examine these welds (Magnetic Particle method) would be 200 person-hours and 0.400 person-rem for the 10-year interval.

3. Augmented ISI Welds Outside Containment (103 welds)

There are a total of 331 linear feet of carbon steel Class 2 welds in high energy systems which have been selected for examination in accordance with the Augmented Inservice Inspection guidelines of SRP 6.6 outside containment. As described in Table 1, the additional time to properly condition and surface examine these welds (Magnetic Particle method) would be 283 person-hours for the 10-year interval.

The total time and dosage which would be expended for conditioning and surface examining these Class 2 carbon steel welds for surface examination is 570 person-hours and .574 person-rem of radiation exposure using the conservative assumptions indicated above.

B. Stainless Steel Welds, ASME ISI Welds Inside Containment (11 welds)

Based on data obtained from surface preparation of ASME Class 2 stainless steel welds outside containment (see Group III (B) below), it requires approximately 4.8 person-hours per linear foot to prepare these welds for examination. These Class 2 welds did not require surface examination from either construction code (Section III, Subsection NC) or preservice examination code (Section XI, 1974 with Addenda through Summer, 1975) requirements. As a result, the welds are in the as-welded condition, and require grinding, hand filing, and flapper wheel buffing to condition them for surface examination. There are approximately 29 linear feet of weld in these Class 2 non-safety system welds. Using the time and dosage calculations as described in Table 1, it will require approximately 146 person-hours and 0.321 person-rem of radiation exposure to prepare and surface examine these 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 by 10CFR50.55A(b)(2)(iv)

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, 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)

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.

A. Inside Containment (51 welds)

Based on data obtained from surface preparation of ASME Class 2 stainless steel welds outside containment (see Group III, B below), it requires approximately 4.8 person-hours per linear foot to prepare these welds for examination. These Class 2 welds did not require surface examination from either construction code (Section III, Subsection NC) or preservice examination code (Section XI, 1974 with Addenda through Summer, 1975) requirements. As a result, the welds are in the as-welded condition, and require grinding, hand filing, and flapper wheel buffing to condition them for surface examination. There are approximately 135 linear feet of weld in these Class 2 safety system welds inside containment. Using the time and dosage calculations described in Table 1, it will require approximately 672 person-hours and 1.478 person-rem of dosage to prepare and surface examine these welds.

B. Outside Containment (768 welds)

During the recent Unit 2 refueling outage, eighteen 8-inch diameter piping welds were selected for surface (Liquid Penetrant) examination in this group. All welds were in the as-welded condition upon initial examination, and, as a result, were unable to be satisfactorily examined. The welds were then surface conditioned, which required grinding and filing to smoothly blend the weld reinforcement into the base metal for successful examination. At the time of this report, fifteen (15) of the welds have been completed. The surface preparation has required 164 person-hours (4.8 person-hours per linear foot of weld) and 361 person-mrem of dose expended (11.5 person-mrem per linear foot of weld). Applying this information to all of the stainless steel welds in this group (1771 linear feet of weld) gives a time of 8,886 person-hours, and a dosage of 19.550 person-rem to prepare and surface examine these welds.

The total time and radiation exposure required to prepare for and perform surface examinations for the Class 2, Category C-F welds in RHR, ECCS, and CHR systems is predicted to be 9,558 person-hours and 21.028 person rem.

TABLE 1

RELIEF REQUEST B-7, UNIT 2 LABOR AND RADIATION EXPOSURE SAVINGS
(No Significant Differences are Expected in Unit 3)

Group	No. of Welds	Linear Feet of Weld	Prep Rate (hr/ ft)	Prep Time (hr)	(c) Exam Time (hr)	Total Time (hr)	Dose Rate (mr/ hr)	Total Expo-sure (person -rem)
I.A.1	67	350.2	0.7	245.1	33.5	278.6	3.75	1.045
I.A.2	18	100.5	---	---	---	---	---	----
I.B	120	348.4	1.1	383.2	60.0	443.2	2.0(d)	0.886
II.A.1	25	106.3	0.7(a)	74.4	12.5	86.9	2.0(d)	0.174
II.A.2	86	224.1	0.7(a)	156.9	43.0	199.9	2.0(d)	0.400
II.A.3	103	331.3	0.7(a)	231.9	51.5	283.4	0.0	0.0
II.B	11	29.3	4.8(b)	140.6	5.5	146.1	2.2(e)	0.321
III.A	51	134.6	4.8(b)	646.1	25.5	671.6	2.2(e)	1.478
III.B	768	1771.3	4.8	8502.2	384.0	8886.2	2.2	19.550
TOTAL	1249	3396		10380.4	615.5	10995.9		23.854

Notes:

(a) All carbon-steel piping is assumed to require the same amount of preparation time based on Group I.A.1 (Class 1) although the Class 2 piping may not have had similar preparation for surface examination at time of construction.

(b) All Class 2 stainless steel piping was left in the as-welded condition and is assumed to require the same degree of preparation as Group III.B where actual data was taken.

(c) Based on experience, 1/2-hour per weld is assumed for examination time.

(d) Based on the lowest typical dose rate in containment, 2.0 mrem/hr is assumed for Groups II.A.1, II.A.2 and I.A.3.

(e) Based on the actual exposure for the welds examined in Group III.B, the same dose rate, 2.2 mrem/hr, was assumed for Groups II.B and III.A.