

ENCLOSURE 2

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket Nos.: 50-361
50-362

License Nos.: NPF-10
NPF-15

Report No.: 50-361/97-08
50-362/97-08

Licensee: Southern California Edison Co.

Facility: San Onofre Nuclear Generating Station, Units 2 and 3

Location: 5000 S. Pacific Coast Hwy.
San Clemente, California

Dates: April 21-25, 1997, with in-office inspection through May 8, 1997

Inspectors: L. E. Ellershaw, Reactor Inspector, Maintenance Branch
C. J. Paulk, Reactor Inspector, Maintenance Branch
J. E. Whittemore, Reactor Inspector, Maintenance Branch

Approved By: Dr. Dale A. Powers, Chief, Maintenance Branch
Division of Reactor Safety

ATTACHMENT: Supplemental Information

EXECUTIVE SUMMARY

San Onofre Nuclear Generating Station, Units 2 and 3
NRC Inspection Report 50-361/97-08; 50-362/97-08

This inspection consisted of a review of the licensee's implementation of its welding, boric acid corrosion prevention, and inservice inspection programs. The inspection report covers a 1-week period on site, with followup in the office by 3 region-based inspectors.

Maintenance

- A violation was identified for the failure to adequately implement procedural measures developed to perform welding activities in a manner to assure that welding induced sensitization of stainless steel would be minimized (Section M1.1).
- Welders employed a poor welding practice when they used the actual components to be welded, rather than a "strike" plate, to determine if sufficient amperage existed prior to production welding (Section M1.1).
- The administrative control of welding materials (i.e., identification, storage, and issuance) was effective and well implemented and considered a program strength (Section M1.1).
- The boric acid corrosion prevention program at the San Onofre facility has been implemented in accordance with licensee procedures and has been effective in identifying and correcting boric acid leaks (Section M1.2).
- Inservice examinations were performed correctly. The authorized nuclear inservice inspector and the inservice inspection program engineer spent sufficient time in the field to verify adequate contractor performance (Section M1.3).
- Licensee and contractor procedures used within the inservice inspection program met regulatory requirements. The documentation of inservice inspection activities was in accordance with regulatory requirements (Section M3).
- The welding procedure specifications were developed and qualified in accordance with either Section IX of the ASME Code or the AWS D1.1, "Structural Welding Code - Steel." All mechanical tests required by Sections III and IX of the ASME Code had been properly documented in the procedure qualification records (Section M3).

REPORT DETAILS

Summary of Plant Status

Unit 2 was operating in Mode 1, and Unit 3 was in a refueling outage for the entire inspection period.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Nuclear Welding General Inspection Procedure (55050)

a. Inspection Scope

The inspectors observed welding on two replacement pressure measurement nozzles being fabricated under Maintenance Order MO 97041119, and Repair Specification 046-97, Revision 1. The inspectors reviewed the controls established by the licensee to assure proper identification, storage, and use of welding filler materials. The inspectors reviewed Procedures SO123-I-11.1, "Welding Filler Material Control," Revision 0, and SO123-V-7.30.5, "Technical Requirements for Weld Filler Material, Field Storage, and Handling," Revision 5.

The inspectors also reviewed the certified material test reports applicable to the following heat/lots of welding filler material (listed below) to verify the material had been properly tested and qualified, and identification had been maintained.

E-7018, 3/32", Heat Number 105221
E-7018, 1/8", Heat Number 63187
E-7018, 5/32", Heat Number T22316
E-7918, 3/16", Heat Number 73598
Inconel UNS NO6052, 3/32", Heat Number NX9579JK
Inconel UNS NO6052, 1/8", Heat Number NX9277JK

The inspectors performed followup for a previously identified issue related to a discrepancy between the weld material used in the plant and the weld material listed in the Updated Final Safety Analysis Report. This issue had been previously identified as inspection followup item (50-361;-362/9605-03).

b. Observations and Findings

On April 23, 1997, the inspectors observed in-process gas tungsten arc welding performed on two replacement pressure measurement nozzles identified as RS-046-97-A and RS-046-97-B. The welding was performed by two licensee welders. Both welders were documented in the current Welder Qualification Record, dated April 21, 1997, as being qualified to perform the gas tungsten arc

welding. Repair Specification RS-046-97 classified the nozzles as ASME Code Section III, Class 1, components. Maintenance Order 97041119 specified that pre- and post-weld nondestructive examinations, fitup, and welding were to be performed on Nozzles RS-046-97-A and RS-046-97-B in accordance with Weld Records WR3-97-217 and WR3-97-218, respectively. The weld records were essentially work packages that contained all pertinent instructions, drawings, and the applicable welding procedure specification. These documents were also used to record performance, completion, and verification of the specified activities.

While observing the welding, the inspectors noted that the welding procedure specification established heat input limits to minimize welding-induced sensitization. The welding procedure specification stated, in part, that "[t]he most influential process variables are travel speed and, to a lesser degree, amperage. Voltage, for the purpose of heat input determination with this process, is conservatively assumed to be constant at 14 volts. The upper limit for heat input in this WPS is 60,000 joules per inch. Only amperage/travel speed combinations under this limit, as determined by the graph in Figure 1 on page 3, shall be used." The graph in Figure 1 provided an easy and convenient method for determining heat input based on amperage and travel speed, and the acceptable/unacceptable limits. Note 4, in the welding procedure specification, stated, "[t]he following measures shall be taken to minimize welding-induced sensitization: Adhere strictly to the specified limits in this WPS for interpass and heat input."

The inspectors observed that the welding power source was set at a constant voltage and the adjustable amperage dial was set by the welder at 60. To verify accuracy of the power source, the inspectors requested that amperage and voltage measurements be taken while welding was in-process. In response, the welder determined that the voltage was approximately 10 volts. However, with the power source amperage dial set at 60, actual current, as measured by a calibrated clamp-on ammeter, was between 88 and 90 amperes. This approximately 50 percent discrepancy did not exceed the welding procedure's allowable amperage range of 40-160 amperes. It did, however, demonstrate the need for assuring that specified amperage was verified prior to welding.

Subsequent to taking these measurements, the welder increased the dial setting to 70 amperes. The inspectors requested that the measurements be taken again. This time, the actual amperage fluctuated between 98 and 105 amperes, with an average value of approximately 102 amperes. The inspectors also monitored the travel speed of the welding process and determined that the speed was approximately 1 inch per minute. This was based on the welder placing a half-circumference weld bead on a weld build up with a diameter of approximately 0.75 inches in approximately 1 minute. By applying these measurements to the formula provided in the welding procedure specification, the inspectors found that the heat input would have been approximately 61,200 joules per inch. This value was in excess of the allowable heat input specified in the procedure. Also, the inspectors

found that, using the graph provided in the welding procedure specification, the actual travel speed to current relationship fell in the unacceptable range.

Additionally, the inspectors were informed that the welders, based on their experience and skill, established electrical characteristics at the time the components were tack welded. However, while performing the welding no one verified the electrical values at any time, until prompted by the inspectors. The inspectors were not made aware of any licensee guidance or provisions for assuring that electrical characteristics were established by use of a "strike" plate prior to welding on the actual component. The inspectors determined the use of an actual component, rather than a "strike" plate, to determine if sufficient amperage existed as a poor practice. The inspectors also determined that there was no prohibition regarding this practice, and the general welding procedures did not appear to address the subject. The inspectors observed that all other essential and nonessential variables specified in Welding Procedure Specification 43-8-GT-1 were being adhered to.

Based on observations, and discussions with the welders, the weld foreman, and the quality control inspector, the inspectors noted that none of the heat input variables had been measured or monitored. While requirements were established in the welding procedure specification, responsibilities were not assigned to assure implementation of those requirements. The inspectors found that the measures established for minimizing welding-induced sensitization (i.e., assuring that the specified limits in the welding procedure specification were adhered to), were not implemented. The inspectors also found that welding-induced sensitization was not a concern, in this instance, because of the low carbon content of the base metals. The inspectors did not find a violation of the ASME code; however, the inspectors found that the licensee's failure to adequately implement welding procedure specification WPS 43-8-GT-1 was a violation (50-362/9708-01).

Upon completion of the welding, Maintenance Order MO 97041119 required final visual and radiographic examinations of the welds prior to machining. The licensee determined that the visual examination results were acceptable; however, the radiographic examinations showed the welds in both nozzles were unacceptable because of incomplete fusion. The welds were rejected and documented accordingly in the nozzle's respective Weld Record on April 24, 1997. The inspectors reviewed the radiographs for each nozzle and noted that the weld in Nozzle RS-046-97-B exhibited barely detectable indications; however, the weld in Nozzle RS-046-97-A exhibited significant lack of fusion.

The inspectors noted that the welding filler material control procedures provided the necessary guidance to assure that welding materials would be properly identified, stored, and used. The inspectors also found that the licensee had established a

single location for the issuance of all safety-related welding materials. Storage areas and holding ovens were clearly marked, and access was limited to the welding material crib attendant and the tool room supervisor. Holding oven temperatures were set and being maintained in accordance with the procedure. The welding material crib attendant exercised very good control over welding material identification, storage conditions, issuance, and return of unused welding materials.

Violation 50-361;-362/9526-02 was issued for Updated Final Safety Analysis Report discrepancies identified during an engineering inspection. Subsequent to the engineering inspection, but prior to the licensee's completion of the corrective actions, the resident staff identified that the weld materials listed in Table 5.2-4 of the Updated Final Safety Analysis Report were not updated to reflect recent changes. This item was designated as Unresolved Item 50-361;-362/9602-05, although it was considered to be another example of Violation 50-361;-363/9526-02. In the resident inspectors' NRC Inspection Report 50-361;-362/96-05, dated July 8, 1996, the unresolved item was administratively closed and re-opened as Inspection Followup Item 50-361;-362/9605-03, "Weld Specification Material Not Updated in UFSAR."

On April 1, 1997, the licensee initiated Change Request SAR23-442 to update Table 5.2-4. The licensee also informed the NRC by letter dated April 22, 1996, of the corrective actions to be taken to address other Updated Final Safety Analysis Report discrepancies. The licensee stated that the corrective actions would be completed by December 1997. In addition to responding to this violation, the licensee also responded to an NRC letter, transmitted in accordance with 10 CFR 50.54(f), as to the fidelity of the plant design and actual plant conditions (including accuracy of the Updated Final Safety Analysis Report).

The inspectors found the licensee's planned actions for the violation to be adequate to address the discrepancy between Table 5.2-4 of the Updated Final Safety Analysis Report and the weld material in the plant. Consequently, Inspection Followup Item 50-361;-362/9605-03 is closed.

c. Conclusions

A violation was identified for the failure to adequately implement measures developed to perform welding activities in accordance with Welding Procedure Specification 43-8-GT-1.

Welders employed a poor welding practice when they used the actual components to be welded, rather than a "strike" plate, to determine if sufficient amperage existed prior to production welding.

The administrative control of welding materials (i.e., identification, storage, and issuance) was effective and well implemented and considered a program strength.

M1.2 Boric Acid Corrosion Prevention Program (62001)

a. Inspection Scope

The inspectors reviewed the boric acid walkdown binder for both units; Procedure SO123-V-8.15, "Mode 3 Boric Acid Leak Inspection," Revision 1, Temporary Change 1-1; and Procedure SO23-V-8.16, "Reactor Coolant System Inconel Nozzle Inspection," Revision 0. The inspectors also performed an inspection of the containment building in response to address Inspection Followup Item 50-361;-362/9501-01, "Implementation of Boric Acid Corrosion Prevention Program."

b. Observations and Findings

During a previous inspection, the NRC reviewed the boric acid corrosion prevention program, but did not evaluate the implementation of the program. Inspection of the implementation of the program was identified as an inspection followup item, (50-361;-362/9501-01).

The inspectors observed no boric acid leaks inside containment that had not been previously identified by the licensee. Most of the leaks identified during walkdowns by licensee personnel had been cleaned and documented in the "Boric Acid Walkdown Binder." Those leaks that had not been cleaned were recently identified by the licensee during inspection of the Inconel nozzles. The inspectors found that the licensee had implemented the program in accordance with their procedures. Accordingly, Inspection Followup Item 50-361;-362/9501-01 is closed.

c. Conclusions

The boric acid corrosion prevention program at the San Onofre facility has been implemented in accordance with licensee procedures and has been effective in identifying and correcting boric acid leaks.

M1.3 Inservice Inspection (73753)

The Unit 3 inservice inspection program was in the second 10-year interval, and the current outage marked the end of the first 40-month period of the second interval. The Unit 3 program adopted Section XI of the 1989 Edition of the ASME Code, without addenda. The NRC had granted six requested exemptions to the code requirements. Two requests for relief had been denied.

a. Inspection Scope

The inspectors observed nondestructive examinations on the following welds and supports.

<u>EXAMINATION TYPE</u>	<u>ASME ITEM CATEGORY</u>	<u>SYSTEM AND LOCATION IDENTIFICATION</u>	<u>COMPONENT OR WELD TYPE</u>
Ultrasonic	B9.11	03-18-130	12" Pipe Weld
Ultrasonic	B9.11	03-18-150	12" Pipe Weld
Liquid Penetrant	B10.10	03-18-640 upper	12" Pipe Support Integral Attachment
Liquid Penetrant	B10.10	03-18-640 lower	12" Pipe Support Integral Attachment
Magnetic Particle	C3.20	03-52-780-1	6" Pipe Support Integral Attachment

b. Observations and Findings

The inspectors found the examinations were performed as required by the procedures. The inservice inspection nondestructive examination contractor's procedures had been adequately reviewed and approved by the licensee's organization. The licensee's inservice inspection engineer (coordinator) accompanied the inspector during three of the examinations. The authorized nuclear inservice inspector accompanied the inspector during two of the above examinations. During followup discussions, it was determined that these individuals routinely spent time in the field observing examinations.

The examiner identified an indication during the magnetic particle examination of Pipe Support 03-52-780-1. The initial evaluation was that the area had not been adequately prepared for examination by the licensee preparation crew. The examiner delayed reporting the indication to allow the licensee weld-preparation crew to better prepare the area for re-examination. The re-examination had not been performed at the end of the inspection.

c. Conclusions

The inservice inspection examinations were performed in accordance with the applicable procedures. Also, the authorized nuclear inservice inspector and the

inservice inspection program engineer spent sufficient time in the field to verify adequate performance of the examination contractor.

M3 Maintenance Procedures and Documentation

a. Inspection Scope (55050, 73753)

The inspectors reviewed the procedures, and inspection reports listed in the attachment to verify adequate program implementation.

The inspectors reviewed the welding procedure specifications and the applicable procedure qualification records listed in the attachment to assure that they had been developed and qualified in accordance with Section IX of the ASME code and the American Welding Society D1.1 "Structural Welding Code - Steel," as applicable.

The inspectors also reviewed the procedures for the conduct of post-weld heat treatment to ascertain whether or not the procedures provided adequate guidance for the craft to conform to the required heating and cooling rates, metal temperature, temperature uniformity, and control limits specified in Section III of the ASME code.

b. Observations and Findings

The inspectors noted that the program description of an ultrasonic testing calibration block didn't match the description of the main steam system material. Main Steam System Weld 03-052-460 connected 6 inch inlet piping for a main steam safety valve to a main steam header. The program specified that Calibration Block UT-68 should be used to calibrate and set up the search unit (i.e., components) for examining this weld. The calibration block material was identified as SA-105 Cl.2 and the main steam piping was SA-333 GR6.

Licensee personnel obtained material certifications for the block and steam piping that verified the program material descriptions were correct. Article 3411 of Appendix III to ASME Section XI, 1989, states that the calibration block material can be different from the material inspected provided the chemical, tensile, and metallurgical properties of the two materials are similar. A review of the material specification tables for the two materials indicated that the material properties were similar. Therefore, the inspectors had no concerns in this area.

The inspectors noted that a Level III examiner certified to perform VT3 examinations, had also signed for performing the review of three VT3 examinations that he had actually performed. The inspectors questioned this practice and were told the review was signed by the work performer because the contractor's procedure required a signature in the review block and another Level III VT3 certified examiner was not available. The ASME Code does not prohibit this practice. The inspectors asked what would be done if any visual examinations

showed potential flaw/defect indications. Both licensee and contractor personnel indicated they would not allow this practice on any examination that yielded indication of a potential flaw/defect. The inspectors discussed this poor practice with the authorized nuclear inservice inspector and determined that no violation of regulatory requirements had occurred.

The inspectors found that the licensee's inservice inspection program and implementing procedures were clear and concise. The contractor's examination procedures were of sufficient quality to perform the examinations with a minimum of interpretation required by the user (examiner). The inspectors verified that ASME code requirements had been included in the current interval plan for the two relief requests that had been denied.

The inspectors verified that all ASME code-required essential and nonessential variables had been addressed in the welding procedure specifications, and that all essential variables had been addressed in the procedure qualification records. Each procedure qualification record contained the results of ASME Code required qualification tests. Welding Procedure Specification 1-II-SM-F4 had been appropriately prequalified in accordance with the AWS D1.1, "Structural Welding Code - Steel."

The inspectors requested information on any recent post-weld heat treatment activities. The welding engineering supervisor recalled that stress-relieving heat treatment was performed on a Unit 2 steam generator nozzle in conjunction with the removal and replacement of main feedwater piping and elbows in approximately February 1995 (see discussion in NRC Inspection Report 50-361;-362/95-01). The inspectors requested the documentation associated with that effort, with emphasis on post-weld heat treatment/stress relieving operations performed on site, and the impact on weld material qualifications.

On April 24, 1997, licensee personnel provided documentation pertaining to steam generator nozzle base metal qualifications, but not the associated weld filler material. On May 6, 1997, the inspectors received the additional information related to the weld filler material and the base metal. The inspectors determined the post-weld heat treatment that the materials had been subjected to was acceptable and within the qualification range of the weld filler material and the base metal.

c. Conclusions

Licensee and contractor procedures used in the inservice inspection program met regulatory requirements. The documentation of inservice inspection activities was in accordance with regulatory requirements.

The welding procedure specifications were developed and qualified in accordance with either Section IX of the ASME code or the AWS D1.1, "Structural Welding

Code - Steel." All mechanical tests required by Sections III and IX of the ASME code had been properly documented in the procedure qualification records.

M4 Maintenance Staff Knowledge and Performance (73753)

The inspectors reviewed copies of the certifications for the contractor examiners. These records indicated that the contract personnel were physically qualified and technically competent to perform the inservice inspection activities for which they were certified. Those personnel involved in testing activities observed by the inspectors were considered to be proficient. The inspectors also considered the licensee's inservice inspection engineer (program coordinator) to be knowledgeable of the program and its requirements.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the onsite portion of the inspection on April 25, 1997. The licensee personnel acknowledged the findings presented.

On May 9, 1997, a followup exit was held via telephone with Mr. G. Gibson and other licensee representatives. The purpose of the followup was to inform the licensee of a change to information provided at the onsite exit. At the onsite exit, an unresolved item was identified that related to the qualification of weld filler material used in steam generator nozzle welds. After in-office review of the additional information, this item was satisfactorily resolved.

The inspectors asked the licensee personnel whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Axline, Licensing Engineer
R. Clark, Manager, Quality Engineering
D. Cole, Supervisor, Non-Destructive Examination/Welding
J. Fee, Manager, Maintenance
G. Gibson, Manager, Compliance
D. Irvine, Manager, Technical Support
A. Mahindrakar, Inservice Inspection Engineer
A. Meichler, Supervisor, Welding Engineering
D. Nunn, Vice President, Engineering and Technical Services
G. Plumlee, Compliance Engineer
S. Shaw, Supervisor, Nuclear Services
K. Slagle, Manager, Nuclear Oversight

NRC

J. Sloan, Senior Resident Inspector

INSPECTION PROCEDURES USED

IP 55050: Nuclear Welding General Inspection Procedure
IP 62001: Boric Acid Corrosion Prevention Program
IP 73753: Inservice Inspection

ITEMS OPENED AND CLOSED

Opened

50-362/9708-01	VIO	failure to assure welding-induced sensitization of stainless steel would be minimized (Section M1.1)
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Closed

50-361,-362/9501-01	IFI	implementation of boric acid corrosion prevention program (Section M1.2)
50-361,-362/9605-03	IFI	discrepancy between weld material identified in Updated Final Safety Analysis Report Table 5.2-4 and weld material installed in the plant (Section M1.1)

DOCUMENTS REVIEWED

Procedures

Number	Revision	Title
SO123-IN-1	4	Inservice Inspection Program
SO123-XVII	7	Inservice Inspection Program Implementation
SO123-XVII-1.1	3	Inservice Inspection Program Maintenance
SO23-XXVII-20.47	1	Magnetic Particle Examination
SO23-XXVII-20.48	0	Liquid Penetrant Examination
SO23-XXVII-20.49	0	Visual Examination to Determine the Condition of Nuclear Parts, Components or Surfaces
SO23-XXVII-20.51	0	Visual Examination Procedure for Operability of Nuclear Components, Supports and Conditions Related to Functional Adequacy
SO23-XXVII-20.54	1	Ultrasonic Examination of Ferritic Piping
SO23-XXVII-20.54	1	Ultrasonic Examination of Nuclear System Austenitic Piping

Nondestructive Examination Reports

387-091MT-003
397-091MT-001
397-091MT-002
397-091PT-001
397-091UT-001
397-091UT-005
397-091UT-007
397-091UT-010
397-091VT-002
397-091VT-004
397-091VT-006
Weld 03-049-300 UT, March 5, 1979
Weld 03-052-450 UT, June 6, 1990
Weld 03-052-460 UT, June 6, 1990
Weld 03-052-470 UT, June 6, 1990
Weld 03-052-480 UT, June 6, 1990

Program Relief Requests

3.3.5, Exemption from Use of Certified Personnel for VT3 Examinations

3.3.6, Exemption from Inspection of Specific Heat Exchanger Welds

Welding Procedure Specifications and Applicable Procedure Qualification Records

Welding Procedure Specification

Procedure Qualification Record

WPS 43-8-GT-1, Revision 0

PQR 25 and 34

WPS 1-II-SM-F4, Revision 0

AWS Structural Welding Code D1.1:
Prequalified

WPS 1-GT, Revision 1

PQR 51, 112, and 153

WPS 8-GT, Revision 0

PQR 5 and 68