



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
612 EAST LAMAR BLVD, SUITE 400  
ARLINGTON, TEXAS 76011-4125

March 4, 2010

Mr. Ross T. Ridenoure  
Senior Vice President and  
Chief Nuclear Officer  
Southern California Edison Company  
San Onofre Nuclear Generating Station  
P.O. Box 128  
San Clemente, CA 92674-0128

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION – UNIT 2 STEAM  
GENERATOR REPLACEMENT PROJECT INSPECTION REPORT  
05000361/2009007

Dear Mr. Ridenoure:

On December 31, 2009, the U.S. Nuclear Regulatory Commission (NRC) completed a steam generator replacement inspection at your San Onofre Nuclear Generating Station, Unit 2 facility. The enclosed inspection report documents the inspection findings, which were discussed on February 2, 2010, with Mr. Wharton and other members of your staff.

The inspections examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents two NRC identified findings of very low safety significance (Green). Both if these findings were determined to involve violations of NRC requirements. However, because of the very low safety significance and because they are entered into your corrective action program, the NRC is treating these findings as noncited violations, consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest these noncited violations, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001, with copies to the Regional Administrator, U.S. Nuclear Regulatory Commission, Region IV, 612 E. Lamar Blvd, Suite 400, Arlington, Texas, 76011-4125; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the San Onofre Nuclear Generating Station facility. In addition, if you disagree with the characterization of any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region IV, and the NRC Resident Inspector at San Onofre Nuclear Generating Station. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, and its enclosure, will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

**/RA/**

Ryan E. Lantz, Chief  
Project Branch D  
Division of Reactor Projects

Docket Nos. 50-361

License Nos. NPF-10

Enclosure:

NRC Inspection Report 05000361/2009007  
w/Attachment: Supplemental Information

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**U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV**

Docket: 50-361

License: NPF-10

Report: 05000361/2009007

Licensee: Southern California Edison Co. (SCE)

Facility: San Onofre Nuclear Generating Station, Unit 2

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

Dates: March 1, 2009 through December 31, 2009

Inspectors: J. Adams, Reactor Inspector  
D. Allen, Senior Reactor Inspector  
I. Anchondo, Reactor Inspector  
T. Buchanan, Reactor Inspector  
J. Braisted, Project Engineer  
C. Denissen, Reactor Inspector  
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C. Proctor, General Scientist  
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M. Young, Reactor Inspector

Approved By: Ryan Lantz, Chief  
Project Branch D  
Division of Reactor Projects

## SUMMARY OF FINDINGS

IR 05000361/2009007; 03/01/2009 – 12/31/2009; San Onofre Nuclear Generating Station, Unit 2 Steam Generator Replacement Report; Steam Generator Replacement Activities; Other Activities.

The report covered a 10-month period of inspection by resident and regional inspectors. Two Green findings, both of which were noncited violations of significance, were identified. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter 0609, "Significance Determination Process." Findings for which the significance determination process does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

### A. NRC-Identified Findings and Self-Revealing Findings

Cornerstone: Barrier Integrity

- Green. The inspectors identified a noncited violation of 10 CFR Part 50, Appendix B, Criterion XIII, "Handling, Storage and Shipping," for the failure of contractor personnel to establish measures to ensure adequate controls for the storage and preservation of material, associated with the admixture and fly ash, to be used in the production of safety-related concrete. Specifically, on December 10, 2009, contractor personnel failed to properly control key materials from being exposed to the elements which could damage or deteriorate the material and adversely impact the properties of safety-related concrete. This finding was entered into the licensee's corrective action program as Nuclear Notification NN 200703527.

The finding is greater than minor because use of incorrect material, or material whose properties may have been altered due to improper storage, if left uncorrected, would have the potential to lead to a more significant safety concern. The finding is associated with the design control attribute of the Barrier Integrity Cornerstone and affects the cornerstone objective to provide reasonable assurance that physical design barriers (containment) protect the public from radionuclide release caused by accidents or events. Using the Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance because the finding did not represent an actual open pathway in the physical integrity of reactor containment and because the concrete for the containment opening had not yet been batched or placed into the containment structure. The finding has a crosscutting aspect in the area of human performance associated with work practices since the licensee failed to ensure supervisory and management oversight of work activities, including contractors, such that nuclear safety is supported [H.4(c)] (Section 4OA5.2).



- Green. The inspectors identified a noncited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instruction, Procedures, and Drawings," for the failure of contractor personnel to follow procedures to ensure proper mixing and batching of safety-related concrete. Specifically, on December 19, 2009, contractor personnel failed to ensure each batch contained the specified proportion of hydration controlling admixture. This finding was entered into the licensee's corrective action program as Nuclear Notification NN 200715236.

The finding is greater than minor because the failure to follow procedures for mixing containment concrete, if left uncorrected, would have the potential to lead to a more significant safety concern. The finding is associated with the design control attribute of the Barrier Integrity Cornerstone and affects the cornerstone objective to provide reasonable assurance that physical design barriers (containment) protect the public from radionuclide release caused by accidents or events. Using the Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance because the finding did not represent an actual open pathway in the physical integrity of reactor containment and because the batch of the concrete in question met the desired design strength as verified by testing. The finding has a crosscutting aspect in the area of human performance associated with work practices since the licensee failed to ensure supervisory and management oversight of work activities, including contractors, such that nuclear safety is supported [H.4(c)] (Section 4OA5.2).

**B. Licensee-Identified Violations**

None

## REPORT DETAILS

### Summary of Plant Status

On September 27, 2009, Unit 2 was shutdown for a scheduled refueling outage (U2C16) and steam generator replacement. The unit remained shutdown for refueling outage U2C16 at the end of the inspection period.

### 4. OTHER ACTIVITIES

#### 4OA5 Other Activities Steam Generator Replacement Activities (50001)

##### .1 Design and Planning Inspections

###### a. Inspection Scope

This inspection report documents inspection activities related to the San Onofre Nuclear Generating Station, Unit 2, steam generator replacement project.

These steam generator replacement inspection activities are not part of the normal baseline inspection program, but are performed on an as-needed basis. Therefore, no sample size is specified. The inspectors completed the applicable portion of Inspection Procedure IP 50001, "Steam Generator Replacement Inspection," with the exception of the post installation verification and testing inspections. These inspections are planned and will be documented at a later date, as necessary.

###### Engineering and Technical Support

Inspections to review engineering and technical support activities were performed prior to, and during, the steam generator replacement outage by resident and regional inspectors. Inspectors reviewed key design aspects and modifications associated with steam generator replacement.

The inspectors reviewed permanent plant modifications (engineering change packages) and documentation, including safety screens and evaluations, to verify that they were performed in accordance with regulatory requirements and plant procedures. The inspectors also reviewed manufacturer records of parts and tubes of the replacement steam generators and reviewed preservice baseline eddy current examination results of new tubes. These inspections are documented in NRC Inspection Report 05000361; 362/2009003, Sections 1R08 and 1R18, and NRC Inspection Report 05000361; 362/2009004, Section 1R17.

Specific documents reviewed during this inspection are listed in the attachment.

###### Lifting and Rigging

The inspectors reviewed activities associated with applicable engineering design, modification, testing and analysis associated with steam generator lifting and rigging, including:

- steam generator component safe load paths
- crane and rigging equipment
- heavy load haul path

The inspectors focused their review on evaluating for any potential impact to the operating unit. Other inspections completed as part of the baseline inspections are documented in NRC Inspection Report 05000361; 362/2009004, Section 1R13.

Specific documents reviewed during this inspection are listed in the attachment.

#### Radiation Protection Program

An inspection to review radiation protection controls was performed during the steam generator replacement outage by regional inspectors. The results of the inspection are documented in NRC Inspection Report 05000361; 362/2009005, Section 2OS1.

#### Security Considerations and Adverse Impact to Other Unit

The inspectors made frequent observations of security practices to verify that the licensee provided appropriate support for affected vital and protected area barriers during outage activities. The inspectors also checked for potential adverse impacts to Unit 3 (the nonoutage unit) caused by outage activities, equipment configurations, etc.

The inspectors reviewed steam generator replacement activities associated with risk management to minimize any adverse impact on the operating unit and common systems. The results of the inspection are documented in NRC Inspection Report 05000361; 362/2009005, Section 1R13.

Specific documents reviewed during this inspection are listed in the attachment.

#### b. Findings

No findings of significance were identified.

### .2 Steam Generator Removal and Replacement Inspections

#### a. Inspection Scope

The inspectors conducted steam generator removal and replacement inspections by performing selective inspections, consistent with the safety significance and inspection resources of the following areas:

#### Welding and Nondestructive Examination Activities

Inspectors reviewed or observed the following welding and nondestructive examination activities during the steam generator replacement outage:

- qualification certifications for the Non-Destructive Examinations (NDE) examiners

- NDE procedures and NDE technician qualification records to verify they meet ASME code requirements
- containment restoration plan and the NDE records to verify ASME code requirements were satisfied
- contractors and Southern California Edison processes to verify they meet ASME code requirements
- radiography films for several large bore pipe welds to verify the welds meet quality requirements
- cable tray restoration activities, including post maintenance testing
- results of mechanical snubber functional testing and associated nonconformance reports and nuclear notifications for safety related snubbers

The inspection results associated with pre-service NDE inspections are documented in NRC Inspection Report 05000361; 362/2009003, Section 1R08.

#### Containment Opening Restoration Activities

The inspectors reviewed licensee activities related to construction activities associated with material, design, fabrication, installation, examination and testing of the containment temporary opening and restoration.

The inspectors completed the following inspection activities:

- observation of restoration activities and review of the modification packages related to equipment hatch supports, containment liner and containment reinforcement bars
- verification of the ASME code versions and sections to ensure compliance and correct application to the code and other industry standards
- review of key containment design aspects found in the updated final safety analysis report to confirm there are no deviations from the safety analysis and licensing basis, including review of 10 CFR 50.59 screenings and evaluations
- review of the liner plate welds strength analysis to verify that the restored liner will be as strong as the original uncut liner
- review of the containment concrete pour analysis to ensure there will be no adverse impact on the liner plate
- review of the design requirements of liner plate stiffeners to ensure the design requirements were adequate to withstand the loads imposed during concrete placement operations

- visual inspections of liner plate stiffeners to confirm proper structural design requirements were implemented
- confirming the use of dedicated new anchor heads during tendon restoration or if reused anchor heads were placed in service that material integrity was verified by inspection
- confirmed that new tendon strands were used and adequate to support containment structural requirements
- review of the tendon duct or sheathing restoration process to ensure the tendon activities were adequate, including grease fill and retensioning, to ensure containment structural integrity was not impacted, including visual inspections of the installed vertical and horizontal replacement tendon sheathing to confirm leak tightness
- review of the engineering evaluations associated with containment opening repairs to re-enforcement bars including CadWeld joint design and weld splices
- confirmed use of weld splices in place of CadWelds satisfied code requirements to ensure it meet all aspects of the original containment structural design
- review of the CadWeld purchasing, installation and testing specifications
- observations of CadWeld sister splices in the field including verification of sister splices were made by each welder for the CadWeld splices (under the same conditions and location) and subsequently tensile-tested to ensure adequate tensile strength of the joint was achieved
- concrete batch plant operations including material storage and handling of concrete components
- material test results (cement, fine and coarse aggregate, water, and admixtures)
- concrete mix and proportion data, including batching results
- concrete transportation and placement

Relative to installation of concrete, the inspectors witnessed placement of concrete in the containment wall to restore the temporary construction opening. The inspectors examined the reinforcing steel to ensure it was installed in accordance with design requirements and was properly cleaned, observed the concrete forms to ensure tightness and cleanliness. The inspectors reviewed placement activities to ensure that activities pertaining to concrete delivery time, free fall, flow distance, layer thickness and concrete consolidation conformed to industry standards established by the American Concrete Institute (ACI). Concrete batch tickets were examined to ensure that the specified concrete was being delivered to the site. The inspectors also observed testing of the plastic concrete for slump, temperature, and molding of the concrete cylinders for

testing. Reviews were performed to ensure concrete testing was performed and the cylinders were molded in accordance with applicable American Society Testing and Materials (ASTM) requirements. In addition, the inspectors reviewed activities to ensure that concrete testing was performed by qualified personnel from an independent testing company, and that concrete placement activities were continuously monitored by licensee and contractor quality control and quality assurance personnel.

The inspectors examined the concrete batch plant to verify proper storage and separation of materials and temperature controls. The inspectors reviewed results of quality control acceptance testing performed on materials (cement, fine and coarse aggregate, and admixtures) used for batching. The inspectors also reviewed records documenting inspection of the concrete batch plant and the concrete truck mixers. Activities were reviewed to determine if the contractor's inspection of the trucks and batch plant were performed in accordance with the guidance of the National Ready Mix Concrete Association, if the batch plant scales were calibrated in accordance with National Ready Mix Concrete Association recommendations, and if mixer efficiency tests were performed on the truck mixers in accordance with ASTM C-94. The inspectors reviewed the concrete mix data to ensure that mix proportions for delivered concrete were selected based on trial concrete mix results, that quality control acceptance criteria for the plastic concrete were based on the trial mixes, and that the trial mix met concrete strength requirements.

#### Lifting, Rigging and Steam Generator Movement and Reconnection Activities

The inspectors observed and reviewed activities throughout the refueling outage associated with heavy lifting and rigging. The inspectors observed the implementation and reviewed documentation related to several structural modifications associated with the heavy lifting activities.

The inspectors also observed and reviewed engineering evaluations concerning the removal and reinstallation of the following structural modifications:

- construction of the outside lift system and runway
- lifting and rigging preparations associated with old steam generators removal
- interference removal and replacement of replacement steam generators
- temporary handling equipment construction and removal
- structural supports to facilitate steam generator replacement
- reactor cavity decking construction and removal
- movement and reconnection of replacement steam generators
- steam generator hold down / skirt bolts

- transfer of old steam generators to temporary storage

The results of this inspection are documented in NRC Inspection Report 05000361; 362/2009004, Sections 1R13 and 1R18.

#### Outage Operating Conditions

The inspectors used Inspection Procedure 71111.20 to verify proper outage conditions. Partial completion of this inspection are documented in NRC Inspection Report 05000361; 362/2009005, Section 1R20.

#### Radiation Protection Controls

An inspection to review radiation protection controls was performed during the steam generator replacement outage by regional inspectors. The results of the inspection are documented in NRC Inspection Report 05000361; 362/2009005, Section 2OS1.

#### Foreign Materials Control

The inspectors performed frequent observations of the steam generator replacement activities to verify the licensee was implementing proper foreign materials controls. In particular, the inspectors observed controls related to reactor coolant system and secondary side openings.

#### Temporary Services

The inspectors reviewed the work package and drawings, and then observed the installation, use, and removal of temporary services in the containment building during the outage. Instructions for the use and controls for construction power, acetylene, oxygen, and argon were reviewed, and the actual installation of each system was compared to the approved system sketches.

#### Additional Post-installation Verification and Testing

The inspectors observed implementation of the licensee's post-installation inspections and verifications of cable splicing and continually checks. Note that post-installation and testing activities are planned to occur after the conclusion of the inspection period for this report.

#### Storage of Old Steam Generators

The inspectors observed the transport of the old steam generators and reviewed the radiological safety plans for the temporary storage of the old steam generators.

Specific documents reviewed during this inspection are listed in the attachment.

### b. Findings

#### 1. Deficiencies Associated with Material Storage of Concrete Batching

Introduction. The inspectors identified a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion XIII, "Handling, Storage and Shipping," for the failure of contractor personnel to establish measures to ensure adequate controls for the storage and preservation of material, specifically the admixture and fly ash, to be used in the production of safety-related concrete.

Description. On December 10, 2009, the inspectors visited the batch plant and observed the following:

- Fly ash was stored in a locked warehouse; however, several pieces of siding were missing and the structure contained openings in the roof, which allowed water and moisture to enter the building.
- The High-Range Water Reducing admixture, HWRA-PS1466, contained in 55 gallon drums, was not being stored in accordance with manufacturer's recommendations, in that; they were being stored outside and not maintained above 40°F. The local area temperature records indicated that temperature dropped below 40°F on December 8, and no additional temperature records were available at the location where material was being stored.
- Contractor personnel surveillances for batch plant activities had been performed on July 10, July 22, and October 23, 2009; however, no other surveillances or receipt inspections for the Boral Micron, fly-ash, and admixtures had been performed or documented between October 23 and December 10, 2009, to ensure that concrete ingredients were controlled, handled, and protected properly.

The inspectors had concerns with these observations and discussed them with the licensee's steam generator replacement project personnel. As a result, additional surveillances from December 12-18, 2009, were initiated by the licensee's quality assurance personnel in accordance with station procedures. The results of these surveillances confirmed the conditions noted by the inspectors above. During these surveillances, the materials in question were verified, receipt inspected, and stored in accordance with the licensee's specification, manufacturer's data sheets, and ACI standards.

Specification SO23-617-10, "Specification for the Purchase of Containment Opening Concrete," Revision 1, Section 8.1, stated, in part, that, "The method of storing of all such materials shall be in accordance with ACI 301 and 304R." In addition, Section 16.3.2.A stated, in part, that, "Buyer's quality control shall insure that the concrete ingredients are stored, controlled, and protected properly." The American Concrete Institute standard 304R-3 referenced in Specification SO23-617-10, Section 2.3, stated that, "All cement should be stored in weather tight, properly ventilated structures, to prevent absorption of moisture." Further, Section 2.4 stated, in part, that "Fly ash, ground slag, or other pozzoloans (cement extenders) should be handled, conveyed and stored in the same manner as cement." Finally, the product data sheet for the HWRA-PS 1466, stated that, "The admixture must be stored at temperatures above 40°F."



Consequently, the licensee initiated Nuclear Notification NN 200703527 to evaluate the issues to identify and correct any human performance errors that may have contributed to these storage measures not being established and controls for the storage and preservation of material not being properly implemented.

Analysis. The failure of contractor personnel to establish measures and ensure adequate controls for the storage and preservation of material, specifically the admixtures and fly ash, to be used in production of safety-related concrete was a performance deficiency. The finding is greater than minor because use of incorrect material, or material whose properties may have been altered due to improper storage, if left uncorrected, would have the potential to lead to a more significant safety concern. The finding is associated with the design control attribute of the Barrier Integrity Cornerstone and affects the cornerstone objective to provide reasonable assurance that physical design barriers (containment) protect the public from radionuclide release caused by accidents or events. Using the Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance because the finding did not represent an actual open pathway in the physical integrity of reactor containment and because the concrete for the containment opening had not yet been batched or placed into the containment structure. The finding has a crosscutting aspect in the area of human performance associated with work practices since the licensee failed to ensure supervisory and management oversight of work activities, including contractors, such that nuclear safety is supported [H.4(c)].

Enforcement. Title 10 of the Code of Federal Regulations, Part 50, Appendix B, Criterion XIII, "Handling, Storage and Shipping," states, in part, that measures shall be established to control the storage and preservation of material and equipment in accordance with work and inspection instructions to prevent damage or deterioration. Specification SO23-617-10, "Specification for the Purchase of Containment Opening Concrete," Revision 1, established the manufacturer recommendations and American Concrete Institute ACI 304R-3 requirements for the storage and preservation of material, specifically the admixtures and fly ash, to be used in production of safety-related concrete. Contrary to the above, on December 10, 2009, the licensee failed to maintain materials to be used in safety-related concrete in accordance with quality controls specified in Specification SO23-617-10. Specifically, the licensee did not properly control key materials from being exposed to the elements which could damage or deteriorate the material, thus adversely affecting the properties of the concrete. Because this finding is of very low safety significance and has been entered into the licensee's corrective action program as Nuclear Notification NN 200703527, this violation is being treated as a noncited violation, consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000361/2009007-01, "Failure to Adequately Store and Preserve Materials for Used in Safety-Related Concrete."

#### Deficiencies Associated with Concrete Mixture

Introduction. The inspectors identified a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instruction, Procedures, and Drawings," for the failure of contractor personnel to follow procedures to ensure proper mixing and batching of safety-related concrete.

Description. On December 19, 2009, the inspectors observed concrete batching operations and delivery to the site associated with Unit 2 containment restoration activities. During the second delivery of concrete (Load 2), the inspectors reviewed the batch ticket at the site and identified incorrect proportions for the hydration controlling admixture (Delvo stabilizer). The batch ticket was signed by contractor quality control personnel prior to leaving the batch plant in accordance with the Specification SO23-617-10, "Specification for the Purchase of Containment Opening Concrete," Revision 1. The batch ticket was also reviewed by field engineering and quality control personnel upon arrival at the site but failed to identify any errors. The inspectors noted a discrepancy with the Load 2 batch ticket in that the quantity of Delvo admixture was incorrect. The inspectors noted the Delvo admixture quantity was approximately 53 percent of the required amount for the Load 2 batch as specified in the approved design mix. The inspectors immediately informed the licensee quality assurance personnel at the site of their concern that the concrete batch did not contain the specified design mix proportions for the Delvo admixture. Contractor engineering personnel informed the inspectors that the batch ticket information was acceptable because it was believed to be a computer error. The inspectors contacted the batch plant, and spoke with the operator to confirm the error, and determined that the Delvo admixture quantity on the batch ticket was, in fact, correct and the admixture quantity in the batch was not proportioned correctly. Because of the prompting by the inspectors, the licensee acknowledged that an error had occurred with the proportioning at the batch plant and documented this condition in Nuclear Notification NN 200715236.

Specification SO23-617-10, Section 12.2.1 stated, in part, that, "Concrete shall be proportioned according to the approved design mixture and that materials shall be measured and mixed in accordance with ASTM C 94." In addition, Section 12.2.4 stated that, "No truck shall leave the batch plant without carrying a completed batch ticket signed by the batch plant operator and countersigned by licensee's or buyer's quality control personnel."

After the inspectors identified the issue, subsequent batch tickets were reviewed in detail. In addition, an engineering evaluation was needed to determine whether the concrete in place was acceptable. This evaluation consisted of re-creating a representative concrete mix of the batch in question (Load 2) and concluded that the concrete in place would meet its design strength based on representative test cylinder break results.

Analysis. The failure to follow procedures, such that the second concrete batch (Load 2) contained incorrect proportions of the Delvo stabilizer admixture, was a performance deficiency. The finding is greater than minor because the failure to follow procedures for mixing containment concrete, if left uncorrected, would have the potential to lead to a more significant safety concern. The finding is associated with the design control attribute of the Barrier Integrity Cornerstone and affects the cornerstone objective to provide reasonable assurance that physical design barriers (containment) protect the public from radionuclide release caused by accidents or events. Using the Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance because the finding did not represent an actual open pathway in the physical integrity of reactor containment and because the

batch of the concrete in question met the desired design strength. The finding has a crosscutting aspect in the area of human performance associated with work practices since the licensee failed to ensure supervisory and management oversight of work activities, including contractors, such that nuclear safety is supported [H.4(c)].

Enforcement. Title 10 of the Code of Federal Regulations, Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," states, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Specification SO23-617-10, "Specification for the Purchase of Containment Opening Concrete," Revision 1, established the quality controls associated with the mixing of containment concrete and stated, in part, that, "Concrete shall be proportioned according to the approved design mixture and that materials shall be measure and mixed in accordance with ASTM C 94."

Contrary to the above, on December 19, 2009, contractor personnel failed to adequately mix and batch concrete in accordance with Specification SO23-617-10, "Specification for the Purchase of Containment Opening Concrete." Specifically, contractor personnel failed to correctly proportion the hydration controlling admixture in concrete Load 2, in accordance with the approved design mixture as specified in Specification SO23-617-10, and the load was subsequently placed in the Unit 2 containment opening. An engineering evaluation was required to assess the concrete properties of the incorrect proportion mixture to assure there was no safety impact to the Unit 2 containment. The result of the evaluation determined the Load 2 concrete was minimally impacted but overall strength requirements were satisfactory.

Because this finding is of very low safety significance and has been entered into the licensee's corrective action program as Nuclear Notification NN 200715236, this violation is being treated as a noncited violation, consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000361/2009007-02, "Incorrect Mixing and Batching Associated with Concrete."

#### **4OA6 Meetings**

##### Exit Meeting Summary

On December 11, 2009, the inspectors presented results of the inservice team inspection to Mr. Al Hochavar, Station Manager, and other members of the licensee staff. The licensee acknowledged the issues presented.

On February 2, 2010, the inspectors presented the inspection results to Mr. Mike Wharton, Manager, Steam Generator Replacement Project, and other members of the licensee's staff. The licensee acknowledged the observations and findings presented. Some proprietary information was reviewed during this inspection but no proprietary information was included in this report.

#### **ATTACHMENT: SUPPLEMENTAL INFORMATION**

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### **Licensee Personnel**

J. Armas, Supervisor, Maintenance Engineering Fluid Process  
D. Axline, Technical Specialist, Nuclear Regulatory Affairs  
D. Bauder, Plant Manager  
J. Carey, Technician, Health Physics  
G. Cook, Manager, Nuclear Regulatory Affairs  
D. Todd, Manager, Site Projects Oversight  
K. Gallion, ALARA Supervisor, Health Physics  
S. Genshaw, Manager, Maintenance Engineering  
C. Harberts, Manager, Steam Generator Replacement Project  
L. Hay, QA Manager, Bechtel  
A. Hochevar, Station Manager, Plant Operations  
E. Hubley, Director, Maintenance & Construction Services  
L. Kelly, Engineer, Nuclear Regulatory Affairs  
J. Madigan, Manager, Health Physics  
A. Matheny, System Engineer  
A. Meichler, Mechanical/System Engineering Supervisor  
M. Mihalik, Areva Project Manager, Steam Generator Replacement Project  
R. Nielsen, Supervisor, Nuclear Oversight  
B. Power, Operations Manager, Catalina Pacific  
C. Ryan, Manager, Maintenance & Construction Services  
D. Schafffer, Civil Engineer  
M. Wharton, Manager, Steam Generator Replacement Project  
G. Vechinski, Inservice Inspection/Steam Generator Support Supervisor

#### **NRC Personnel**

None

### **LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

#### **Opened and Closed**

05000361/ 2009007-01	NCV	Failure to Adequately Store and Preserve Materials for Used in Safety-Related Concrete (Section 40A5)
05000361/ 2009007-02	NCV	Incorrect Mixing and Batching Associated with Concrete (Section 40A5)

### **LIST OF DOCUMENTS REVIEWED**

## Section 4OA5: Other Activities

### Procedures

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
SO123-I-1.13	NUREG 0612 Crane, Rigging and Lifting Controls	17
SO23-617-1-M1414	San Onofre Nuclear Generating Station, Units 2 and 3; Divider Plate Weld Joint Separation Root Cause Evaluation Report	0
25221-PP-63	San Onofre Nuclear Generating Station, Units 2 and 3; Tendon Replacement Methodology Demonstration Program	0
25221-PP-05	San Onofre Nuclear Generating Station, Units 2 and 3; Containment Opening Plan	2
SO23-XXIV-3.8.3	In Process Visual Examination of the Temporary Containment Opening	0
25221-000-GPP-GCPC-00001	Concrete Operations	1
25221-002-C0P-3054-00127-000	Construction Opening Formwork and Concrete Placement	1
25221-002-C0P-3052-00124-000	Install Replacement Reinforcing Bar in the Containment Construction Opening	0
San Onofre 2&3 FSAR Section 3.8.1 Concrete Containment		
25221-000-4MP-T040-S0104	Bechtel Nondestructive Examination Standard Visual Examination VT-AWS D1.1	1
25221-000-4MP-T040-S0088	Bechtel Nondestructive Examination Standard Magnetic Particle Examination MT-AWS D1.1	0
25221-000-4MP-T040-S0124	Bechtel Nondestructive Examination Standard Magnetic Particle Examination MT-ASME	1

## Section 4OA5: Other Activities

25221-000-4MP-T040-S0125	Bechtel Nondestructive Examination Standard Liquid Penetrant Examination PT(SR)-ASME	1
25221-000-4MP-T040-S0126	Bechtel Nondestructive Examination Standard Radiographic Examination RT- ASME III Piping	1
SO23-I-3.3	Reactor Vessel Head Removal and Storage	13
SO123-I-7.14	Maintenance and Inspection of Cranes	10
SO123-XIII-4.600	Fire Protection Procedure	10
SO23-XVII-3.8	Containment Structural Integrity Surveillance	2
SO23-I-2.39	Refueling Interval Functional Test of Mechanical Snubbers Surveillance	17
SO23-I-2.29	Routine Inspection of Mechanical Snubbers Surveillance	16
SO23-I-2.86	Test of Large Bore Hydraulic Snubbers Surveillance	1
SO123-XXI-1.11.13	Maintenance and Construction Services Training Program Description	25

## Nuclear Notifications

### NUMBER

ECP800072651	200638659	200441596	200394201	200409527
200397411	200721336	200718149	200718187	200717920
200718184	200718449	200718433	200676257	200685253
200682436	200695375	200643377	200628449	200639776

**Section 40A5: Other Activities**

200697279      200690422

Maintenance Orders

<u>NUMBER</u>	<u>TITLE</u>	<u>DATE</u>
WPIR 25221-002-COP-3052-00124	Structural Field Welding checklist (SR-5C)	December 10, 2009
WR-1-D1.4	Welder Qualification Test Record	July 16, 2009
WPQR-1392	P1-Rebar (0.87 CE)	September 30, 2003

Drawings

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
35048	Underground Electrical Duct and Manhole System Plan, Unit 2 and 3. Sheet 1.	15
21062	Grading and Paving	13
C0-3000-00002	Unit 2 Construction Opening Tendon Removal and Replacement Pin	2
23199 – Sheet 1	Containment Interior Structure – Structural Steel/Column Arrangement and Details	8
23199 - Sheet 4	Containment Interior Structure – Structural Steel/Column Arrangement and Details	0

**Section 4OA5: Other Activities**

SO23-916-7	Steam Generator Sliding Base Detail	0
0441	San Onofre Replacement Coolant Elbow	2
23056	Containment Structure Wall Liner and Insert Section & Details, Sht.5	0

Design Documents/Calculations/Specifications

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION/DATE</u>
25221-000-COC-7100-00011	Outside Lift System and Runway Erection and Collapse Load Drop Effects	0
25221-000-COC-9000-00003	Temporary Cargo Container OSG Shield Wall Seismic Evaluation	1
C-257-01.04.06	Evaluation of Restored Containment End-of- Life Analysis	0
C-257-04.02.01	Containment Liner PL Design; Shell Liner Plate	5
C-257-07.01.01	Vessel, Tank and Equipment Supports – Reactor Vertical Column Supports	3



**Section 4OA5: Other Activities**

C-257-04.02.05	Containment Liner Plate Acceptance Criteria	0
C-257-06.06	Structure Design-Columns	1
25221-002-P0C-AB00-00001	Temporary Supports for Main Steam Piping for SG E088	0
C-257-01.04.05	Evaluation of Restored Containment-Concrete Modulus Ratio and Tendon Retensioning Forces	0
C-257-04.02.01	Containment Liner Plate Design-Shell Liner Plate	0
CS-C4	Reinforcement Steel Placement	9
25221-PP-05	Containment Opening Plan	2
SO123-XII-20.4	Receiving Inspection	9
Procurement Engineering Package (PEP) 5CS0012	SGRP Containment Opening Concrete	0

## Section 4OA5: Other Activities

Procurement Engineering Package (PEP) 5CS0011	Concrete Type Materials Testing Service	2
S023-617-10	Specification for the purchase of containment opening concrete	1
S0123-201-09	Specification for Ready-Mixed Concrete for SONGS 1, 2 and 3	4
S023-617-13	Specification for the installation and testing of cadweld splices	1
S023-201-1	Specification for furnishing batch plant for San Onfore Generating Station Units 2 and 3,	May 2, 1973
Engineering Change Package (ECP) #061200409-6	Unit 2 Containment Opening	0
FCR 25221-002-C0F-0000- 00194	Document as found spacing dimensions for inner mat rebar at construction opening	

### Surveillances

NUMBER

DATE

Quality Surveillance Report No.  
25221-QSSS-09-032

October 23, 2009

## Section 4OA5: Other Activities

Quality Surveillance Report No.  
25221-QSVS-09-009

December 12,  
2009

Batch Plant Catalina Pacific  
Surveillance Report 25221-002-  
GSM-GCB-00013

July 10, 2009

Batch Plant Catalina Pacific  
Surveillance Report 25221-002-  
GSM-GCB-00014

July 22, 2009

### Work Orders

#### NUMBER

800221591	800222569	800221469	800222569	800203777
800203779	800228343	800228176	800228230	800412976
800393594				

### Miscellaneous

#### NUMBER

#### TITLE

#### REVISION/DATE

Chapter 4-B	SONGS Topical Quality Assurance Manual, Handling, Storage, and Shipping	20
S023-617-10-M17	Concrete Mix Design Testing and Qualification	1
RIDR No. RSO-0142-09	Inspection Summary for Concrete Materials Testing and Qualification, Fine and Coarse Aggregates,	October 3, 2009
RIDR No. RSO-0181-09	Inspection Summary for Concrete Materials Testing and Qualification, Fine and Coarse Aggregates	December 7, 2009

## Section 4OA5: Other Activities

	Certificate of Conformance for Concrete Production Facilities for San Juan Batch Plant South Alley	March 2008 through March 2010
	Catalina Pacific Concrete Statement of Mix Design	August 5, 2008
S023-617-10-M15	Catalina Pacific-Mixer Uniformity Tests	0
20981, 20961, 20042, 19980, 20322, 21441, 19504, 2032, 16747, 20080, 9072, 20430, 20597, 21131, 2004320732	SONGS Material Receiving Reports	March 25 through December 31, 1975
122617/01	Jade-Sterling Steel 2 1/2" Hot Rolled Round Grade 1071 chemistry Data	July 1, 2003
N571824-00	Certificate of Analysis, 3/32" ARC filler 9018cm	January 28, 2002
N605916-00	Certificate of Analysis, 1/8" ARC filler 9018cm	
WPS-P1 Rebar (0.87 CE)	Welding Procedure Specification	0
PQR-1392	Welding Procedure qualification Record	September 30, 2003
AWS D1.4 -98	American Welding Society WPS qualification	1998
CMTR 271238 D	Certificate of Conformance ASTM A615-07 Material 10169443	August 19, 2009
2-MOP-7057-1	Repair/Replacement Plan S/G E089 Main Steam Severance & Reweld	0
2-MOP-7064-4	Repair/Replacement Plan S/G E089 RCS Severance & Reweld	2
Letter from D. S. Collins (NRC) to H. B. Ray (SCE)	San Onofre Nuclear Generating Station, Units 2 and 3 – Related to the Relief Request ISI-3-14 to use Subsequent Edition	October 31, 2005

## Section 4OA5: Other Activities

	and Addenda of the Code, Section XI, for Pressure Testing requirements 9TAC NOS. MC5791)	
ANSI/AWS D1.4-98	Structural Welding Code – Reinforcing Steel	5
ASME B&PV Code Section III Article NB-4000	Fabrication and Installation	1998 Edition 2000 Addenda
ASME B&PV Code Section XI	Welding and Brazing Qualifications	2007 Edition 2000 Addenda
25221-PP-22	Steam Generator Replacement Project Detailed Tendon Program	1
WP&IR: 25221-002-3053- 00126	Liner Plate Restoration	
RRP: 2-C0P-3053-126	Repair/Replacement Plan for Liner Plate Restoration	0
WP&IR: 25221-002-3051- 00125	Work Package and Inspection Record for Tendon Sheathing Restoration	
0707001-QAR-032	Strand Dedication Report	0
	Bechtel Rebar Splice Test Checklist for Splice Number QH1, IW4855	December 6, 2009
	Bechtel Rebar Splice Test Checklist for Splice Number QH2, IW4855	December 6, 2009
	Bechtel Rebar Splice Test Checklist for Splice Number QV1, IW4855	December 6, 2009
	Bechtel Rebar Splice Test Checklist for Splice Number QV2, IW4855	December 6, 2009
	Bechtel Rebar Splice Test Checklist for Splice Number QH1, IW5180	December 6, 2009

## Section 4OA5: Other Activities

	Bechtel Rebar Splice Test Checklist for Splice Number QH2, IW5180	December 6, 2009
	Bechtel Rebar Splice Test Checklist for Splice Number QV1, IW5180	December 6, 2009
	Bechtel Rebar Splice Test Checklist for Splice Number QV2, IW5180	December 6, 2009
	Bechtel Rebar Splice Test Checklist for Splice Number QH1, IW5243	December 6, 2009
	Bechtel Rebar Splice Test Checklist for Splice Number QH2, IW5243	December 6, 2009
RRP: 2-C0P-3052-124	Repair/Replacement Plan for Construction Opening Rebar Restoration	0
WP&IR: 25221-002-3052-00124	Work Package and Inspection Record for Construction Opening Rebar Restoration	
NCR NO. 25221-002-G61-GCX-00097	Bechtel Nonconformance Report for Liner Plate Nelson Studs	November 21, 2009
CPS JOB NO: 090923-0190	State of California OSHA Certificate of Unit Test and/or Examination of Cranes and Derricks Used for Lifting Service	November 2, 2009
CPS JOB NO: 081004-0029	State of California OSHA Certificate of Unit Test and/or Examination of Cranes and Derricks Used for Lifting Service	October 7, 2009
CPS JOB NO: 071005-0121	State of California OSHA Certificate of Unit Test and/or Examination of Cranes and Derricks Used for Lifting Service	October 7, 2009
SO 23-617-13	Specification for the Installation and Testing if Cadweld Splices	1
ECP 800221009	Relocate and Restore Equipment Hatch	0
ECP 060800698-2	Equipment Hatch Column Splice	0

## Section 4OA5: Other Activities

ECP 800072651	Reactor Coolant System Tie in for the Replacement Steam Generators in Unit 1 (ECP 061200409-28)	0
ECP 800072643	Remove Interferences inside Unit 2 Containment for SGRP (ECP-061200409-20)	0
ECP 800072647	Large Bore Secondary Piping for the SGR Project Unit 2 (ECP 061200409-24)	0
CPS JOB NO: 081004-0029	State of California OSHA Certificate of Unit Test and/or Examination of Cranes and Derricks Used for Lifting Service	September 29, 2009
CPS JOB NO: 081004-0028	State of California OSHA Certificate of Unit Test and/or Examination of Cranes and Derricks Used for Lifting Service	September 27, 2009
CPS JOB NO: 081004-0020	State of California OSHA Certificate of Unit Test and/or Examination of Cranes and Derricks Used for Lifting Service	January 14, 2009
CPS JOB NO: 081004-0020	State of California OSHA Certificate of Unit Test and/or Examination of Cranes and Derricks Used for Lifting Service	January 13, 2009
CPS JOB NO: 081004-0020	State of California OSHA Certificate of Unit Test and/or Examination of Cranes and Derricks Used for Lifting Service	January 2, 2009
CPS JOB NO: 071005-0121	State of California OSHA Certificate of Unit Test and/or Examination of Cranes and Derricks Used for Lifting Service	November 29, 2007
CPS JOB NO: 071005-0122	State of California OSHA Certificate of Unit Test and/or Examination of Cranes and Derricks Used for Lifting Service	December 8, 2007
2MT-002-09	Nondestructive Examination Data Report Magnetic Particle Testing of Polar Crane Main Hook	January 13, 2009

## Section 4OA5: Other Activities

(WP&IR) 25221-002-MOP-7063-00002	S21301ME088 S/G Snubber Work Package	
LCS 3.6.100	Prestressed Concrete Containment Tendon Surveillance Program, Units 2 and 3	4
DBD-SO23-TR-ST	Containment Structure	2
LCS 3.7.108	Snubbers, Units 2 and 3	5
MQ-7471	Mechanical Maintenance Snubbers (Task Qualifications: List of Individuals)	2
	Amendment Application Nos. 105 and 90 Change to Technical Specifications 3/4.7.6, "Snubbers," San Onofre Nuclear Generating Station, Units 2 and 3	May 2, 1991
	Safety related snubber interface with SGRP	December 9, 2009
CS-E03	Cable Splicing, Termination, and Supports	21
25221-000-GPP-GCPE-00003	Cable Splicing, Termination, and Supports	0
ANSI/AWS D1.4-98	Structural Welding Code – Reinforcing Steel	November 6, 1997
25221-PP-05	Steam Generator Replacement Project – Detailed Containment Opening Plan	2
ECP 800072665	SGR U2 Containment Opening	0
ECP 800072665	SGR U2 Containment Opening	0
SO23-617-13	Specification for the Installation and Testing of CADWELD Splices	1
SO23-617-12	Specification for the Purchase of CADWELD Splices	0

### Rebar Splice Qualification Test Records



NUMBER

W4169	IW5208	IW4149	IW4170	IW4215
IW4219	IW4220	IW4687	IW5254	IW1416
IW4080				

Bechtel Welding Procedure Specifications

NUMBER

P1-AT-Lh(CVN + 40)

P1-T(RA)(CVN +40)

P3(G3), P1-T(RA)(CVN + 40)

Bechtel Welding Procedure Qualification Records

1242 P1-AT-Lh(CVN +10) Manual Tungsten Arc and Shielded Metal Arc

1282 P3(G3), P1(G1/G2) – T(CVN +10), Manual Gas Tungsten Arc

1320 P1-T(CVN +30) Manual Gas Tungsten Arc

1350 P1-T(ER7OS –S)(CVN +10) Manual Gas Tungsten Arc

1351 P1-A-Lh(CVN +10) Manual Shielded Metal Arc

1352 P1-T(CVN +10) Manual Gas Tungsten Arc

1320 P1-T(CVN +30) Manual Gas Tungsten Arc

1610 P1-T(CVN +10) Manual Gas Tungsten Arc

1619 P3(G3), P1-AT(CVN + 40), Manual Gas Tungsten Arc