UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

August 10, 2006

John S. Keenan
Senior Vice President - Generation
and Chief Nuclear Officer
Pacific Gas and Electric Company
P.O. Box 770000
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San Francisco, CA 94177-0001

SUBJECT: NRC INSPECTION REPORT 050-275/06-008; 050-323/06-008; 072-026/06-001

Dear Mr. Keenan:

Between December 13, 2005 and July 13, 2006, the U.S. Nuclear Regulatory Commission conducted an inspection at your Diablo Canyon Power Plant. The inspection involved site visits by inspectors on three separate occasions. The purpose of these inspections were to review the preparation and construction of the Independent Spent Fuel Storage Installation (ISFSI) components at Diablo Canyon. The ISFSI components inspected consisted of the Cask Transfer Facility (CTF), ISFSI pad, ISFSI cut slope stabilization, and transport route. The enclosed inspection report documents the results of that inspection, which were discussed at the exit with Mr. Fledderman and other members of your staff on July 13, 2006.

This inspection included a review of excavation preparation for the ISFSI pad and CTF foundation, concrete mix design documents, inspection of the concrete batch plant, inspection of concrete forms and reinforcing steel, and observation of concrete mixing, delivery, sampling, and placement. The inspection determined that you were constructing your ISFSI components in conformance with the requirements of the standards established by the American Concrete Institute (ACI) and the American Society for Testing and Materials (ASTM), as required by your site specific license. No violations were identified during the inspections.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC website at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact the undersigned at (817) 860-8191 or Mr. Ray Kellar at (817) 860-8164.

Sincerely,

D. Blair Spitzberg, Ph.D., Chief
Fuel Cycle and Decommissioning Branch

Dockets: 50-275
50-323
72-026

Licenses: DPR-80
DPR-82
SNM-2511

Enclosure:
Inspection Report 050-275/06-008; 050-323/06-008; 072-026/06-001

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SUNSI Review Completed: RLK ADAMS: ■ Yes☐ No Initials: RLK
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RIV:DNMS:FCDB	RI:DRP/B	SRI:DRP/B
RL Kellar	TA McConnell	TW Jackson
Ray Kellar	Tim McConnell by Ray Kellar	Tony Jackson by Ray Kellar
8/4/06	on email 8/3/06	on email 7/31/06

C:DRP/B	C:FCDB
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Bill Jones by Ray Kellar on	8/10/06
email 8/4/06	

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.:	050-275; 050-323; 072-026
License No.:	DPR-80; DPR-82; SNM-2511
Report No.:	050-275/06-008; 050-323/06-008; 072-026/06-01
Licensee:	Pacific Gas and Electric Company (PG&E)
Facility:	Diablo Canyon Power Plant, Units 1 and 2
Location:	7.5 miles NW of Avila Beach Avila Beach, California
Dates:	December 13, 2005 - July 13, 2006
Inspectors:	R.L. Kellar, P.E., Health Physicist, DNMS T.W. Jackson, Senior Resident Inspector, DRS T.A. McConnell, Resident Inspector, DRS
Approved By:	D. Blair Spitzberg, Ph.D., Chief Fuel Cycle & Decommissioning Branch, Region IV
Attachments:	1. Supplemental Inspection Information 2. Inspector Notes

EXECUTIVE SUMMARY

Diablo Canyon Power Plant
NRC Inspection Report 050-275/06-008; 050-323/06-008; 072-026/06-001

Pacific Gas & Electric (PG&E) was granted a site-specific license by the Nuclear Regulatory Commission (NRC) on March 22, 2004, that authorized the construction and operation of the Diablo Canyon Independent Spent Fuel Storage Installation (ISFSI). The ISFSI was designed to hold up to 140 storage casks. Initially, PG&E will construct two ISFSI pads that are each approximately 68 feet wide by 105 feet long and 7.5 feet thick. A Cask Transfer Facility (CTF) will also be constructed that will be used to transfer the canister loaded with spent fuel from the transport cask to the storage cask, which will then be placed on the ISFSI pad. PG&E selected the Holtec HI-STORM 100A system, which has been designed for high seismic applications.

The ISFSI pad and CTF are designated as Important-To-Safety (ITS). Components for these structures are required to be purchased to quality requirements. The concrete structures were designed and required to be constructed in accordance with American Concrete Institute (ACI) 349, "Code Requirements for Nuclear Safety Related Concrete Structures." The inspection included a review of the concrete mix design, concrete material requirements, reinforcing bar specifications, and concrete batch plant along with direct observations of the concrete mixing, placement, sampling, consolidation, curing and testing operations. Approximately 2,064 cubic yards of concrete were placed for the first ISFSI pad. The concrete was determined to fulfill the safety requirements of ACI 349. There were several minor deviations identified during the inspection that were not considered to be safety significant. The licensee entered each of the minor deviations into the corrective action system for evaluation. The determination that the deviations were not safety significant was based on the expectation that the concrete will meet or exceed the required minimum compressive strength of 5,000 psi. NRC Unresolved Item (URI) 72-026/0601-01 was opened to track and confirm that the minimum concrete compressive strength requirements are achieved. NRC RIV Policy Guide 4090.10 defines an URI as a matter about which more information is required to ascertain whether it is an acceptable item, a violation, or a deviation. The NRC will review the final concrete compressive strength test results to assess whether the specified minimum concrete compressive strengths were achieved.

Additional structures that are integral to the ISFSI were reviewed during the inspection. The transport roadway had been analyzed to be capable of supporting the loaded transporter during a seismic event. Construction and testing activities associated with a relocated portion of the transport route were observed. A portion of the hillside located above the ISFSI pads was removed during construction. The cut slope stabilization activities, including rock bolt installation and shotcrete application, were observed by the inspectors. No violations were identified during the inspection.

On-Site Fabrication of Components and Construction of an ISFSI (60853)

- The basemat for the Cask Transfer Facility (CTF) was installed in accordance with design drawings. The concrete installation and testing observed met the requirements of ACI 349 (Attachment 2, Page 1).

- Concrete mixing and delivery for the mudmat and first ISFSI pad were completed in conformance with the requirements of ACI 349 and ASTM C 94. Minor deviations were documented in the licensee's corrective action system. Observations included mixer batch times, concrete conveying, measurement of aggregate materials, cement, and mixing water (Attachment 2, Pages 2-7).

- The concrete placement preparations and placement activities for the mudmat and first ISFSI pad met the requirements of ACI 349. Observations included concrete deposition, placement rate, and the physical conditions of the formwork and reinforcement (Attachment 2, Pages 7-9).

- Concrete quality attributes for the mudmat and first ISFSI pad including cement, slag and admixture certifications, along with water and aggregate test results, were in conformance with the requirements of ACI 349. Minor deviations were documented in the licensee's corrective action system (Attachment 2, Pages 10-14).

- The mechanical connection and tensile test results of the concrete reinforcement met the requirements of ACI 349. Observed clearances between the reinforcing bars and the outside concrete faces exceeded the minimum requirements of ACI 349 (Attachment 2, Pages 14-15).

- Concrete sampling and curing for the mudmat and first ISFSI pad were conducted in conformance with the requirements of ACI 349. Minor deviations were documented in the licensee's corrective action system. Direct observations included sampling of the concrete by certified ACI technicians and making of the concrete test cylinders (Attachment 2, Pages 16-17).

- The condition of the rock foundation interface for the bottom of the ISFSI pads and the CTF were observed to meet Final Safety Analysis Report (FSAR) requirements. Geoscience personnel mapped the excavated areas and confirmed that the material condition of the foundation surface met design requirements (Attachment 2, Page18).

- The documentation for the embedment steel assemblies used to anchor the concrete casks to the first ISFSI pad, was reviewed and found to have been purchased in accordance with safety related requirements and were inspected upon receipt by the licensee (Attachment 2, Page 18).

- Portions of the cut slope stabilization activities located above the ISFSI pads that consisted of the application of shotcrete and installation of rock anchors to stabilize larger rock blocks were determined to have been conducted in accordance with FSAR requirements (Attachment 2, Page 19).

- Portions of the roadway compaction tests for the transport route relocation were observed and found to have been conducted in accordance with FSAR requirements (Attachment 2, Page 19).

ATTACHMENT 1
Supplemental Inspection Information

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

J. Fledderman, Director, Strategic Projects
T. Grebel, Manager, Strategic Projects Licensing Manager
R. Hagler, Used Fuel Project Engineer
G. Heggli, Licensing Engineer
J. Hodges, Quality Verification Supervisor
R. O'Sullivan, Senior Civil Engineer
B. Patton, ISFSI Project Manager
M. Porter, ISFSI Construction Planner
L. Pulley, Humboldt Bay ISFSI Manager
L. Strickland, Used Fuel Storage Project Manager
D. Taggert, Quality Verification Manager
R. VanderLinden, ISFSI Construction Manager

Contract Personnel

M. DeWitt, Quality Verification
D. O'Conner, Quality Verification

INSPECTION PROCEDURES USED

60853 On Site Fabrication of Components and Construction of an ISFSI

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

URI 72-026/0601-01 Review the concrete compressive strength test results to confirm that the concrete compressive strength of the CTF basemat and initial ISFSI pad meet the specified compressive strength of 5,000 psi at 90 days.

Closed

None

Discussed

None

LIST OF ACRONYMS

ACI	American Concrete Institute
AR	Action Request
ASTM	American Society of Testing and Materials
CFR	Code of Federal Regulations
CTF	Cask Transfer Facility
FSAR	Final Safety Analysis Report
ISFSI	Independent Spent Fuel Storage Installation
NRC	Nuclear Regulatory Commission
PG&E	Pacific Gas & Electric
URI	Unresolved Item

ATTACHMENT 2

CONCRETE STANDARDS FOR ISFSIs

Attachment 2
DIABLO CANYON ISFSI CONSTRUCTION

Category: Cask Transfer Facility **Topic:** Cask Transfer Facility Basemat Construction

Reference: Specification 10055-C-NPG, Section 3.20.8

Requirement: The Cask Transfer Facility (CTF) reinforced concrete structure shall be constructed in accordance with the requirements of ACI-349 and design drawings.

Finding: This requirement was met for the CTF basemat concrete. On June 27 - 28, 2006, the resident inspectors observed the licensee's preparations and concrete placement activities for the CTF basemat. The placement and sizes of the reinforcing bars were found to meet the requirements shown on Design Drawing L1. Prior to the concrete placement the inspectors verified that all foreign material had been removed from the reinforcing bars and the area where the concrete was to be placed. The concrete mudmat was observed to have been sufficiently wetted with no standing water present prior to concrete placement as required by ACI 349. Concrete tests observed during the concrete placement activities included measurements of concrete slump and temperature. All the concrete tests observed were being performed by an individual that was certified as a Grade 1, ACI field testing technician. Portions of the concrete mixing, placement, consolidation, finishing and final curing activities were observed.

Documents Reviewed: Design Report 420DC-06.45, "Diablo Canyon Power Plant ISFSI Project 5000 PSI - 1-1/2 MSA "Q" Class Concrete Mix Design # DC6649A," Dated June 26, 2006; Drawing L1, "Cask Transfer Facility Plan View and Details," Revision 0; Procedure TP TB-0612, "Used Fuel Storage Project Quality Related Concrete Activities," Revision 1; Procedure TP TB-0613, "Used Fuel Storage Project Quality Related Reinforcing Steel Activities," Revision 0

Category: Concrete Curing **Topic:** Curing Requirements

Reference: ACI 349, Sect 5.11.1

Requirement: Concrete (other than high-early-strength) shall be maintained above 50 F and in a moist condition for at least the first 7 days after placement, except when cured in accordance with 5.11.3 (Accelerated Curing).

Finding: This requirement was achieved. Engineering Specification 10055-C-NPG and TP TB-0612, Section 5.8 required that the concrete be cured for seven days using a moist cure method. The mudmat and Cask Transfer Facility (CTF) concrete were documented to be moist cured for seven days. The requirements for the amount of time that the ISFSI pad was required to be cured had been modified in TP TB-0612 to require a minimum moist cure of 14 days. The inspectors witnessed the start of the moist cure period for the mudmat, first ISFSI pad and CTF basemat concrete applications, which involved ponding water on the concrete.

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Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2;

Temporary Procedure TP TB-0612, "Used Fuel Storage Project Quality Related Concrete Activities," Revision 0

Category: Concrete Mix & Delivery **Topic:** Central Mix Batch Times

Reference: ASTM C 94, Section 11.3.1

Requirement: For central mixed concrete, the mixing time shall be counted from the time that all the solid materials are in the drum. Where no mixer performance tests have been made, the acceptable mixing time shall consist of 1 minute for the first cubic yard and 15 seconds for each additional cubic yard or fraction thereof that is batched.

Finding: During the mixing of the concrete for the mudmat, the inspector witnessed several of the concrete batches and observed that the mixing time for the concrete met the requirements of ASTM C 94, as specified above.

Prior to the concrete placement of the first ISFSI pad, the licensee performed mixer performance tests for the central mix plant to develop site-specific mix times for the central mix batch plant. This information was documented on Attachment 8.6 of Procedure TP TB-0612. The mixer performance tests indicated that a mixing time of 90-seconds for each batch was satisfactory. The inspector verified the 90-second mixing time for several of the concrete batches used in the first ISFSI pad and agreed that the 90-second mixing time would produce a uniform concrete mix, based on uniformity test results.

ASTM C 94, Section 17.1 required that the technician performing the strength tests be certified as ACI concrete laboratory testing technician grade I or II, or by an equivalent written and performance test program. During a review of the mixer performance test results, the inspector identified that the individual that had performed the strength testing of the uniformity samples was not currently qualified to the requirements specified in Section 17.1 of ASTM C 94. The individual had been interviewed by the inspector and appeared knowledgeable in the testing process and had performed the concrete compressive strength tests before. The technician not being certified is a deviation from the ASTM C 94 standard requirement and was entered into the licensee corrective action system as Action Request (AR) A0672928. The NRC will make a final decision on the acceptability of the work performed by the technician based on the concrete meeting the final compressive strength requirement of 5,000 psi at 90-days. The 7-day concrete compressive strength test results for the first ISFSI pad were reported to vary between 4,310 and 6,050 psi. The 90-day concrete compressive strength test results will be tracked by URI 72-026/0601-01.

Documents Reviewed: Attachment 8.6, "Mixer Uniformity" to Temporary Procedure TP TB-0612, "Used Fuel Storage Project Quality Related Concrete Activities," Revision 0;
AR A0672928

Category: Concrete Mix & Delivery **Topic:** Conveying

Reference: ACI 349, Sect 5.9.1

Requirement: Concrete shall be conveyed from mixer to place of final deposit by methods that will prevent separation or loss of materials.

Finding: This requirement was achieved. Section 3.22.17.4 of Engineering Specification 10055-C-NPG required conveying equipment to be capable of providing a supply of concrete at the placement site without separation of ingredients and without interruptions. The licensee utilized a telebelt conveyor system for placement of the mudmat concrete on May 24, 2006, and two telebelt conveyor systems for the first ISFSI pad concrete placement on July 12, 2006. Elephant hoses were used during placement of the concrete to minimize potential separation of the aggregates as the concrete was placed to the lower elevations of the ISFSI pad.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2

Category: Concrete Mixing & Delivery **Topic:** Ready Mixed Concrete

Reference: ACI 349, Sect 5.8.2

Requirement: Ready-mixed concrete shall be mixed and delivered in accordance with the requirements of "Specification for Ready-Mixed Concrete" ASTM C 94 or "Specification for Concrete Made by Volumetric Batching and Continuous Mixing" ASTM C 685.

Finding: Section 3.21.1.3 of Engineering Specification 10055-C-NPG specified that measuring of materials, mixing and batching will be conducted in accordance with ASTM C 94. The concrete central mix batch plant was inspected and found to meet the requirements of ASTM C 94 as well as the requirements of the National Ready Mix Concrete Association (NRMCA). A registered engineer performed the NRMCA inspection and determined that the central mix batch plant and concrete trucks present were acceptable for use on May 18, 2006. The licensee obtained a back-up truck mixed plant and located it near the central mix batch plant. The back-up plant was also inspected and found to meet the requirements of ASTM C 94 and NRMCA on July 6, 2006.

The aggregate, cement and water measurement devices for both batch plants were checked and determined to be within the tolerances of ASTM C 94 prior to batching concrete for the mudmat. The tolerances for the weights of the various components were specified to be +/- 2% for aggregates, +/- 1% for cement/slag, and +/- 1% for the mixing water.

During a review of the cement batch weight tickets after the initial ISFSI pad concrete placement, the inspector noted that the cement scale did not consistently weigh the cement and slag within the required 1% tolerance that was specified in ASTM C 94. There were twenty-nine loads of concrete discovered that were used in the first ISFSI pad that were outside of the 1% tolerance specified for either the cement or the slag weights. The batch scales would automatically attempt to adjust for the underage/overage of one component by compensating with the other cementitious component. When the weight of the cement and slag were considered together there were four loads that were all outside of the specified +/- 1% tolerance. All four loads were over the specified weight for both components from 1.2% to 4.1%, which would tend to increase the concrete compressive strength. The seven day compressive strength results for the first ISFSI pad vary between 4,310 and 6,050 psi; with an average value of 5,050 psi from 40 compressive strength tests. The licensee performed an evaluation to

determine what affect the additional cementitious materials would have on the concrete temperature. The evaluation found that the additional heat generated from the concrete was within the adiabatic heat-up conditions that had been considered in the original concrete mix design, where fly ash had been specified instead of the slag. Slag was ultimately used in the ISFSI concrete mix.

The cement/slag scale outside of the specified +/- 1% tolerance is a deviation of ASTM C 94 standard requirements and was entered into the licensee's corrective action system as AR A0673162. The NRC will make a final decision on the acceptability of the concrete based on the concrete meeting the final compressive strength requirement of 5,000 psi at 90-days. The 90-day concrete compressive strength test results will be tracked by URI 72-026/0601-01.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2;
Certification of Ready Mixed Concrete Production Facilities Quality Control Manual, Ninth Revision Signed on May 18, 2006 and July 6, 2006;
AR A0673162

Category: Concrete Mixing & Delivery **Topic:** Addition of Job Site Water

Reference: ASTM C 94, Section 11.7

Requirement: When a truck mixer or agitator is approved for mixing or delivery of concrete, no water from the truck water system or elsewhere shall be added after the initial introduction of mixing water for the batch except when on arrival at the job site the slump of the concrete is less than specified. When adding water, the drum or blades shall be turned an additional 30 revolutions or more if necessary, at mixing speed, until the uniformity of the concrete is within these limits.

Finding: This requirement was met. Procedure TP TB-0612, Section 5.7.4.c. required a minimum of 30 revolutions at mixing speed be performed after the addition of water. If high range water reducing admixtures were added, the minimum number of mixing revolutions was specified to be 70. During the concrete placement for the first ISFSI pad, two loads of concrete had water added to the concrete in the trucks prior to the concrete placement (ticket numbers 69380 and 69433). The two loads of concrete were mixed for an additional 30 revolutions after the addition of the water. The amount of water added to the two trucks was 3 and 5 gallons, respectively. The licensee had inspected each of the trucks used for transport of the concrete and verified the accuracy of the truck's water meter/sight glass prior to use.

Documents Reviewed: Temporary Procedure TP TB-0612, Used Fuel Storage Project Quality Related Concrete Activities," Revision 0:
AR A0631067

Category: Concrete Mixing & Delivery **Topic:** Concrete Discharge Limits

Reference: ASTM C 94, Section 11.7

Requirement: Discharge of the concrete shall be completed within 1 1/2 hour or before the drum has revolved 300 revolutions, whichever comes first, after the introduction of mixing water to the cement and aggregates or the introduction of the cement to the aggregates. These limitations are permitted to be waived by the purchaser if the concrete is of such slump after the 1 1/2 hour time or 300-revolution limit has been reached that it can be placed, without the addition of water, to the batch.

Finding: This requirement was achieved. Section 3.22.17 of Engineering Specification 10055-C-NPG required that the discharge of the concrete be completed within 90 minutes or 300 revolutions of the drum after the introduction of water to the cement and aggregates. During the placement of the mudmat concrete on May 24, 2006 and the first ISFSI pad concrete on July 12, 2006, the inspector observed that the concrete did not exceed the maximum time or revolution requirements due to the short amount of time before the concrete was placed. This was primarily attributed to the short haul path between the concrete batch plant and the concrete placement locations.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2

Category: Concrete Mixing & Delivery **Topic:** Concrete Mixing Revolutions

Reference: ASTM C 94, Section 11.5

Requirement: Concrete that is completely mixed in a truck mixer will be mixed at 70 to 100 revolutions at the mixing speed designated by the manufacturer to produce the uniformity of concrete indicated in Annex A1. The mixing revolutions will begin after all ingredients including water, are in the drum. Additional revolutions by the mixer beyond the number found to produce uniformity of concrete shall be at a designated agitating speed.

Finding: This requirement was available but unnecessary during the initial concrete placement for the ISFSI pad. Engineering Specification 10055-C-NPG, Section 3.22.13.1 required that the mixing time for truck mixed concrete be between 70 to 100 revolutions at the manufacturer's recommended mixing speed after all the ingredients were added to the drum. The licensee had erected a truck-mixed concrete batch plant for emergency use should the central mix batch plant break down during concrete placement activities. The concrete trucks on site during the concrete placement activities for the first ISFSI pad had been inspected and approved for use to mix the concrete, should their use become necessary. There were no major problems experienced with the central batch plant during the first ISFSI pad concrete placement activities, therefore the truck-mixed batch plant was not utilized.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2;
AR A0631067

Category: Concrete Mixing & Delivery **Topic:** Measurement of Aggregate Materials

Reference: ASTM C 94, Section 8.2

Requirement: Aggregates shall be measured by mass including the mass of dry materials plus the total mass of moisture (both absorbed and surface) contained in the aggregate. The quantity of aggregate used in any batch of concrete as indicated by the scale shall be within +/- 2% of the required mass when the mass is measured in individual weigh batchers. In a cumulative aggregate weigh batcher, the cumulative weight after each successive weighing shall be within +/- 1% of the required cumulative amount up to that point when the scale is used in excess of 30% of its capacity. For cumulative weights less than 30% of the scale capacity, the tolerance shall be +/- 0.3% of scale capacity of +/- 3% of the required cumulative weight, whichever is less.

Finding: This requirement was met. The licensee utilized a central mix batch plant for the production of the mudmat, the CTF basemat and the first ISFSI pad. The aggregate scales are calibrated as part of the batch plant set-up. The calibration of the aggregate scale occurred on May 16, 2006 and was documented on Attachment 8.25 of Procedure TP TB-0612. As a back-up measure in case the central mix batch plant experienced difficulties, the licensee brought in a truck mixed batch plant. The aggregate scales for the truck mixed batch plant were calibrated on June 27, 2006 and were found to be within tolerance. The calibration for the truck mixed plant was also documented on Attachment 8.25 of Procedure TP TB-0612. The licensee obtained moisture samples of the concrete aggregates during the concrete placement activities.

Documents Reviewed: Attachment 8.25 of Procedure TP TB-0612, "Used Fuel Storage Project Quality Related Concrete Activities," Revision 0, Dated May 16, 2006;
Attachment 8.25 of Procedure TP TB-0612, "Used Fuel Storage Project Quality Related Concrete Activities," Revision 0, Dated June 27, 2006;

Category: Concrete Mixing & Delivery **Topic:** Measurement of Mixing Water

Reference: ASTM C 94, Section 8.3

Requirement: The added mixing water shall be measured by weight or volume to an accuracy of 1% of the required total mixing water.

Finding: This requirement was met. The licensee utilized a central mix batch plant for the production of the mudmat, the CTF basemat and the first ISFSI pad. The water meter is calibrated as part of the batch plant initial set-up. The calibration of the water meter occurred on May 16, 2006 and was documented on Attachment 8.24 of Procedure TP TB-0612. As a back-up measure in case the central mix batch plant experienced difficulties, the licensee brought in a truck mixed batch plant. The water meter for this truck mixed batch plant was calibrated on June 27, 2006 and found to be within tolerance. The calibration for the truck mixed plant was also documented on Attachment 8.24 of Procedure TP TB-0612.

Documents Reviewed: Attachment 8.24 of Procedure TP TB-0612, "Used Fuel Storage Project Quality Related Concrete Activities," Revision 0, Dated May 16, 2006;
Attachment 8.24 of Procedure TP TB-0612, "Used Fuel Storage Project Quality Related Concrete Activities," Revision 0, Dated June 27, 2006;

Category: Concrete Mixing & Delivery **Topic:** Slump Tolerances

Reference: ASTM C 94, Section 6.1.2

Requirement: Unless other slump tolerances are included in the project specifications, the following tolerances shall apply: When the slump specifications are NOT written as a "maximum" or "not to exceed" amount and the specified slump is 2 inches and less the slump tolerance is +/- 0.5 inches. If the slump is specified as more than 2 inches through 4 inches the slump tolerance is +/- 1 inch. If the slump is specified as more than 4 inches the slump tolerance is +/- 1.5 inches.

Finding: The licensee specified the concrete slump to be 4 inches +/- 2 inches in Report 420DC-06.33 for the concrete mudmat. The inspector witnessed licensee personnel measuring the concrete slump during the mudmat concrete placement activities on May 24, 2006. All the concrete slump measurements taken were within the slump requirements.

The licensee modified the concrete slump requirements prior to the first ISFSI concrete pad to improve concrete placement characteristics. The concrete slump was specified to be 4 - 8 inches in Report 420DC-06.45 for the ISFSI pad concrete that was placed on July 12, 2006. All the concrete slump measurements for concrete placed in the first ISFSI pad were within the specified tolerance, with the exception of one truck that had a measured slump of 3 1/2 inches. The lower end of the slump requirement is specified to allow for efficient concrete placement and consolidation. The concrete from this one truck load was able to be placed and consolidated without any difficulty and the concrete compressive strength would be expected to improve based on a lower slump. The concrete slump falling below the prescribed limit is a deviation of ASTM C 94 requirements and was entered in the licensee corrective action process as AR A0673209.

Documents Reviewed: Report 420DC-06.33, "Diablo Canyon Power Plant - ISFSI Project Main Slab "Q" Class Concrete Mix Design," Revision 5, Issued May 23, 2006;
Report 420DC-06.45, "Diablo Canyon Power Plant ISFSI Project 5000 PSI -1-1/2 MSA "Q" Class Concrete Mix Design # DC6649A.";
AR A0673209

Category: Concrete Placement **Topic:** Concrete Deposition

Reference: ACI 349, Sect 5.10.1

Requirement: Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing.

Finding: This requirement was achieved. Section 3.22.17 of Engineering Specification 10055-C-NPG required that the concrete be conveyed from the mixer to the place of final deposit by methods to prevent separation. During the placement of the concrete for the mudmat and the first ISFSI pad, the contractor used a telescoping conveyor system to deliver the concrete to the placement location. Elephant chutes were used at the end of the conveyor system to direct the concrete to the placement location.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2

Category: Concrete Placement **Topic:** Concrete Placement Rate

Reference: ACI 349, Sect 5.10.2

Requirement: Concreting shall be carried on at such a rate that concrete is at all times plastic and flows readily into spaces between reinforcement.

Finding: This requirement was achieved. During the mudmat and first ISFSI pad concrete placements, the licensee was observed to keep the concrete in a plastic condition. The short haul distance from the batch plant to the concrete placement location helped to keep the concrete in a plastic state.

Documents Reviewed:

Category: Concrete Placement **Topic:** Foreign Material in Concrete

Reference: ACI 349, Sect 5.10.3

Requirement: Concrete that has partially hardened or been contaminated by foreign materials shall not be deposited in the structure.

Finding: This requirement was met. Portions of the concrete placement activities for the mudmat and the ISFSI pad were observed by the inspector. There was no evidence of contamination from foreign materials in any of the concrete. Due to the short amount of time required to move the concrete truck from the batch plant to the concrete placement area, there was no evidence of partially hardened concrete being placed into the mudmat or ISFSI pad concrete placement locations.

Documents Reviewed:

Category: Concrete Placement Prep. **Topic:** Construction Joints

Reference: ACI 349, Sect 6.4.2

Requirement: Immediately before new concrete is placed, all construction joints shall be wetted and standing water removed.

Finding: This requirement was met. Section 5.6 of TP TB-0612 required that as part of the pre-placement checkout the surface of construction joints be wetted to prevent absorption of water. Immediately prior to the concrete placement activities for the first ISFSI pad, the surface of the concrete mudmat was moistened with water. The surface of the mudmat was observed not to have standing water located on the concrete surface.

Documents Reviewed: Temporary Procedure TP TB-0612, "Used Fuel Storage Project Quality Related Concrete Activities," Revision 0

Category: Concrete Placement Prep. **Topic:** Formwork

Reference: ACI 349, Sect 5.7.1 (c)

Requirement: Preparation before concrete placement shall include that forms shall be properly coated.

Finding: This requirement was met. Section 5.6.2 of TP TB-0612 required that the concrete forms be mortar tight and coated with a form release agent, if required. The concrete formwork that was used for the ISFSI pad concrete was supplied pre-coated by the manufacturer.

Documents Reviewed: Temporary Procedure TP TB-0612, Used Fuel Storage Project Quality Related Concrete Activities," Revision 0

Category: Concrete Placement Prep. **Topic:** Reinforcement Conditions

Reference: ACI 349, Sect 7.4.1

Requirement: At time concrete is placed, reinforcement shall be free from mud, oil, or other nonmetallic coatings that decrease bond.

Finding: This requirement was achieved. Engineering Specification 10055-C-NPG, Section 3.25.3 required that before the concrete was placed, the reinforcement to be embedded shall be free of mortar, oil, dirt, excessive mill scale and scabby rust and other coatings of any character that would destroy or reduce the bond. Prior to the placement of the concrete for the first ISFSI pad, the steel reinforcement was inspected to ensure that it was free from mud, oil, or other nonmetallic coatings that would decrease the bond and found to be acceptable.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2

Category: Concrete Placement Prep. **Topic:** Removal of Debris

Reference: ACI 349, Sect 5.7.1 (b)

Requirement: Preparation before concrete placement shall include that all debris and ice shall be removed from spaces to be occupied by concrete.

Finding: This requirement was met. Attachment 8.2 of TP TB-0612, required that the cleanliness of the forms and rebar be inspected prior to concrete placement. Due to the time of year that the concrete was placed there were no concerns with ice being present inside the concrete forms. The area where the concrete was to be placed was inspected to insure that all debris had been removed and found to be clean, prior to the concrete placement.

Documents Reviewed: Temporary Procedure TP TB-0612, Used Fuel Storage Project Quality Related Concrete Activities," Revision 0

Category: Concrete Placement Prep. **Topic:** Water Removal

Reference: ACI 349, Sect 5.7.1 (f)

Requirement: Preparation before concrete placement shall include that water shall be removed from place of deposit before concrete is placed.

Finding: This requirement was achieved. Section 5.6 of TP TB-0612 required that as part of the pre-placement checkout that any standing water be removed. During the concrete mudmat placement activities conducted on May 24, 2006 and the ISFSI concrete placement on July 12, 2006, the inspector observed that there was no standing water present prior to concrete placement.

Documents Reviewed: Temporary Procedure TP TB-0612, Used Fuel Storage Project Quality Related Concrete Activities," Revision 0

Category: Concrete Quality **Topic:** Cement Specification

Reference: ACI 349, Sect 3.2.1, 3.2.3

Requirement: Cement shall conform to ASTM C 150, "Specification for Portland Cement." Every shipment of cement shall be accompanied by a certified mill test report stating the results of tests representing the cement in the shipment and the ASTM specification limits for each item of required chemical, physical, and optional characteristics. No cement shall be used in any structural concrete prior to receipt of the 7 day mill test strengths.

Finding: This requirement was met. The cement manufacturer provided certification that the cement supplied met the requirements of ASTM C 150, Type II requirements along with chemical analysis. The licensee performed a 72.48 safety evaluation that determined a 7 day mill strength test was not necessary due to the manufacturing process used by the cement supplier. The cement manufacturers in the area process the cement in a continuous process instead of storing the material in lots or silos. Samples of the continuously processed cement are gathered and blended for a set tonnage of through-put material and tested. Additionally, the vendor process utilized X-ray fluorescence to test the cement as it is being processed.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2;
Form 69-10430, "Licensing Basis Impact Evaluation Screen,"
Reference Document DCP C-49727, Revision 2;
Hanson Cement Certification Dated May 22, 2006
Hanson Cement Certification for April from Silos 28/29
Hanson Bill of Lading Numbers 1249962, 1249983, 1247665 from Silos 28 & 29

Category: Concrete Quality **Topic:** Clean Water Requirements

Reference: ACI 349, Sect 3.4.1

Requirement: Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or reinforcement.

Finding: This requirement was met. The licensee used water from a reservoir that was maintained for plant use. Water tests performed for the licensee confirmed that the water was considered as potable and was chemically acceptable for use in the concrete.

Documents Reviewed: AR A0631067

Category: Concrete Quality **Topic:** Concrete Admixtures

Reference: ACI 349, Sect 3.6.5

Requirement: Water-reducing admixtures, retarding admixtures, accelerating admixtures shall conform to ASTM C 494, "Specification for Chemical Admixtures for Concrete."

Finding: This requirement was met. Section 3.23.10.3 of Engineering Specification 10055-C-NPG required that water reducing or retarding and plasticizing admixtures meet the requirements of ASTM C 494 or C 1017. The two liquid admixtures used in the mudmat concrete and the first ISFSI pad concrete were manufactured and supplied by Grace. The

first admixture was ADVA 170, a high range water reducer and WRDA 64, a water reducing admixture. The documentation provided with both admixtures showed compliance with ASTM C 494 requirements.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2

Category: Concrete Quality **Topic:** Concrete Aggregates

Reference: ACI 349, Sect 3.3.1

Requirement: Concrete aggregates shall confirm to "Specification for Concrete Aggregates" ASTM C 33 or utilized by exception when shown by special test or actual service to produce concrete of adequate strength and durability and approved by the building official.

Finding: The inspector reviewed the results of the aggregate tests performed for the fine and coarse aggregates, including the gradation tests, before the concrete mudmat was placed and found that they met the requirements of 1055-C-NPG and ASTM C 33.

During the concrete placement activities for the mudmat and the ISFSI pad, aggregate samples were obtained for testing. Several of the sieve analysis test results for the coarse aggregate material were slightly outside of specification limits. The licensee evaluated the potential affect of the sieve analysis results on the concrete and determined that the affect on the concrete compressive strength results would be negligible due to the small deviation involved. The 56-day compressive strength results for the mudmat were reported to be between 7,540 and 9,590 psi, which are well above the required minimum of 5,000 psi. The 7-day compressive strength results for the first ISFSI pad were reported to be between 4,310 and 6,050 psi.

The failure to meet the concrete coarse aggregate grading requirements is a deviation from the ASTM C 33 standard, which was entered into the licensee corrective action system as AR A0670157 and AR A0673180. The NRC will make a final decision on the acceptability of the coarse concrete aggregates based on the ISFSI concrete meeting the final compressive strength requirement of 5,000 psi at 90-days. The 90-day concrete compressive strength test results will be tracked by URI 72-026/0601-01.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2;
TP TB-0612 Attachment 8.16, Initial Testing Checklist, Dated May 2, 2006;
TP TB-0612 Attachment 8.7, Gradation Report ASTM C136 - Concrete Sand, Dated April 28, 2006;
TP TB-0612 Attachment 8.8, Gradation Report ASTM C136 - Concrete Aggregate 1 1/2", Dated May 2, 2006;
TP TB-0612 Attachment 8.9, Gradation Report ASTM C136 - Concrete Aggregate 3/4", Dated April 28, 2006;
TP TB-0612 Organic Impurities In Sand- ASTM C40, Dated April 18, 2006;
Potential Reactivity ASTM C 289-03, Dated May 13, 2006;
Abrasion of Coarse Aggregate ASTM C 131-03, Dated May 13, 2006;

Lightweight Particles ASTM C 123-04, Dated May 13, 2006;
Soundness of Aggregates, ASTM C 88-05, Dated May 13, 2006;
Friable Particles ASTM C 142-97, Dated May 13, 2006;
TP TB-0612 Attachment 8.14, Percentage of Aggregate Passing No.200 Screen - ASTM C117, Dated April 18, 2006;
AR A0670157;
AR A0673180

Category: Concrete Quality **Topic:** Concrete Strength Requirements

Reference: ACI 349, Sect 5.6.2.3

Requirement: Strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met: (a) Every arithmetic average of any three consecutive strength tests equals or exceeds f'c (required 28 day concrete compressive strength) and (b) no individual strength test (average of 2 cylinders) falls below f'c by more than 500 psi.

Finding: This requirement was partially met at the time of the report. ACI 349, Section 4.1.3 allows the concrete compressive strength to be specified at other than 28-days. To reduce the amount of heat generated during the cement hydration process in the 7.5 feet thick ISFSI pad, a portion of the cement was replaced by slag in the concrete mix designs. The licensee specified a 56-day compressive strength for the mudmat of 5,000 psi and a 90-day compressive strength for the ISFSI pad and CTF of 5,000 psi.

The results of the concrete compressive strength tests for the mudmat was reported as between 7,540 and 9,590 psi at 56-days, which met the requirement of ACI 349, Section 5.6.2.3. The only results available at the time of the inspection report issuance for the first ISFSI pad and the CTF basemat were the 7-day breaks. The 7-day compressive break test results varied from 4,310 to 6,050 psi for the first ISFSI pad and between 4,390 to 4,560 psi for the CTF basemat.

The certification for the ACI concrete strength testing technician that performed the concrete compressive strength tests for the mudmat, the first ISFSI pad and the CTF basemat was reviewed by the inspector and found to be satisfactory.

The actual compressive strength results for the CTF and the first ISFSI pad will be documented in the resident inspector's quarterly report and tracked by URI 72-026/0601-01.

Documents Reviewed: Report of Concrete Cylinder Tests, Report Numbers 1-29

Category: Concrete Quality **Topic:** Corrosion Protection

Reference: ACI 349, Sect 4.4.1

Requirement: For corrosion protection of reinforcement in concrete, maximum water soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the limits of Table 4.4.1, that specifies the maximum water soluble chloride ion in concrete by weight of cement of reinforced concrete exposed to chloride in service of

0.15 percent. The testing shall conform to ASTM C 1218.

Finding: This requirement was met. The licensee provided documentation that chloride tests from concrete samples had been performed per the requirements of ASTM C-1218. The reported amounts of chloride by weight for the concrete were all minimal. The largest single test reported the amount of chloride as 0.0024 percent, which was well below the specified limit of 0.15 percent.

Documents Reviewed: TES Log#: TM-B CL,
TES Log# TM-DC6649A-CL-1

Category: Concrete Quality **Topic:** Ground Slag

Reference: ACI 349, Sect 3.6.7

Requirement: Ground-granulated blast-furnace slag used as an admixture shall conform to ASTM C989, "Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars."

Finding: This requirement was achieved. Attachment 8.16 of TP TB-0613 specified that the slag was to meet the requirements of ASTM C 989. The inspectors reviewed selected slag certification reports supplied with the slag for use at the ISFSI and found that the slag documentation met the requirements of ASTM C 989.

Documents Reviewed: Temporary Procedure TP-TB-0613, "Used Fuel Project Quality Related Reinforcing Steel Activities," Revision 0;
Lehigh ALLCEM GGBFS (SLAG CEMENT) TEST REPORTS, Dated August 16, 2005
Lehigh Certificate of Compliance, Dated May 22, 2006

Category: Concrete Quality **Topic:** Infrared Spectrum Trace

Reference: ACI 349, Sect 3.6.10.2

Requirement: An infrared spectrum trace of the conformance test sample of air-entraining and water-reducing admixtures shall be furnished with the conformance test results.

Finding: This requirement was met. Section 3.23.10 of Engineering Specification 10055-C-NPG required that the contractor submit certified test reports with an infrared spectrum trace of admixtures for review prior to the initial shipment and acceptance of the admixtures. The inspector was furnished an email documenting the analysis of the two liquid admixtures used in the ISFSI concrete. The two liquid admixtures were manufactured and supplied by Grace. The first admixture was ADVA 170, a high range water reducer and WRDA 64, a water reducing admixture. Infrared spectra were supplied with both of the liquid admixtures.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2;
Email dated May 19, 2006 documenting the analysis of WRDA 64 and ADVA 170

Category: Concrete Quality **Topic:** Water/Cement Ratio

Reference: ACI 349, Sect 4.2.2, Table 4.2.2, 4.1.1

Requirement: Concrete that will be subject to the exposures given in Table 4.2.2 of ACI 349 shall conform to the corresponding maximum water-cementitious materials ratios and minimum strength requirements of that table. The water-cementitious materials ratio shall be calculated using the weight of cement plus the weight of fly ash or other pozzolans.

Finding: This requirement was achieved. Table 4.2.2 of ACI 349 provided the maximum water/cement of normal weight concrete that is intended to have low permeability when exposed to water of 0.50 with a minimum concrete compressive strength of 4,000 psi. The licensee used two different concrete mix designs, both of which met the requirements of Table 4.2.2. The concrete mix used for the mudmat had a maximum water/cement ratio of 0.40 and a specified minimum compressive strength of 5,000 psi at 56 days. The concrete mix used for the first ISFSI pad had a maximum water/cement ration of 0.47 and a specified minimum compressive strength of 5,000 psi at 90 days. The licensee used a mixture of 70% slag and 30% cement to reduce the amount of heat generated during the cement hydration for the ISFSI pads due to the pad's thickness of 7 1/2 feet.

Documents Reviewed: Report # 420DC-06.33, "Diablo Canyon Power Plant - ISFSI Project Main Slab "Q" Class Concrete Mix Designs," Dated May 1, 2006;
Report # 420DC-06.45, "Diablo Canyon Power Plant ISFSI Project 5000 PSI-1-1/2 MSA "Q" Class Concrete Mix Design # DC6649A," Dated June 27, 2006

Category: Concrete Reinforcement **Topic:** Mechanical Connections

Reference: ACI 349, Sect 12.14.3

Requirement: A minimum of six static tensile strength tests shall be conducted as part of the mechanical connection qualification. All the test samples shall develop in tension or compression, as required, at least 125% of specified yield strength of the bar.

Finding: This requirement was met. Section 5.2.2 of TP-TB-0613 specified that nine of the couplers for each bar size be provided to PG&E for testing. Six of the couplers were to be used for static testing and three of the couplers were to be used for cyclic tests. RPE C-09285 specified that the results of the tensile tests for the bar couplers must exceed 125% of the bar yield strength. The licensee supplied nine each of the couplers for bar sizes number 10 and 11 to be tested. All of the test results for the static tensile strength connections exceeded the 125% requirement. The lowest tensile test result was 86,500 psi for a number 10 connection. The results of the tensile strength of the cyclic tests for the number 10 and 11 connections were higher than the static test results. The lowest tensile test result was 88,900 psi for a number 10 connection.

Documents Reviewed: Temporary Procedure TP-TB-0613, "Used Fuel Project Quality Related Reinforcing Steel Activities," Revision 0;
Replacement Part Evaluation (RPE) C-09285, "ISFSI Design Class 1, Bar Couplers for Concrete Reinforcing Bars," Revision 0;
TES Log# 2006-R-07, Test Dated June 20 to 24, 2006

Category: Concrete Reinforcement **Topic:** Reinforcement Cover

Reference: ACI 349, Sect 7.7.1 (b)

Requirement: For Concrete permanently exposed to earth or weather, a minimum concrete cover of 2 inches shall be provided for number 6 through 18 reinforcement.

Finding: This requirement was met. Engineering Specification 10055-C-NPG, Section 3.25.5.5 required that reinforcement shall have a clear cover of 2 inches, except as otherwise shown on the drawings or specified. Prior to the concrete placement for the first ISFSI pad, the inspector randomly verified that the clear concrete cover consisted of at least 3 inches over the reinforcement on the ISFSI pad surface as well as between the reinforcement and the forms along the sides of the ISFSI pad.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2

Category: Concrete Reinforcement **Topic:** Reinforcement Tensile Tests

Reference: ACI 349, Sect 3.5.3.1.1, 3.5.3.2

Requirement: A minimum of one tensile test shall be required for each 50 tons of each bar size produced from each heat of steel. The specified yield strength fy for deformed reinforcing bars shall not exceed 60,000 psi.

Finding: This requirement was achieved. CITE# X-09331, Section 3 and Temporary Procedure TP-TB-0613, Section 5.1.1.3 required that 1 bar per every 50 tons of reinforcing steel from each heat lot number be tested. Section 5 of the CITE provided the critical characteristics for the reinforcing steel and provided the acceptance standard for the material bend tests. The licensee provided documentation of successful tensile test results that had been performed for the reinforcement bars.

Documents Reviewed: CITE# X-09331, "Commodity Items Technical Evaluation for ISFSI - A615 Gr 60 Deformed Steel Bar for Concrete Reinforcement," Approved April 13, 2006;
Temporary Procedure TP-TB-0613, "Used Fuel Project Quality Related Reinforcing Steel Activities," Revision 0;
TES Log Numbers: 2006-R-06, 2006-R-02, 2006-R-01, 2006-R-04, 2006-R-03, 2006-R-05

Category: Concrete Reinforcement **Topic:** Steel Reinforcement Requirements

Reference: ACI 349, Sect 3.5.1, 3.5.3.1

Requirement: Reinforcement shall be deformed reinforcement, except that plain reinforcement may be used for spirals or tendons. Deformed reinforcing bars shall confirm to ASTM A 615, "Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement."

Finding: This requirement was achieved. CITE X-09331, Section 1 required that the reinforcing steel meet the requirements of ASTM A 615 with surface lugs, protrusions or deformations. The reinforcement used in the first ISFSI pad was visually verified to meet the definition for deformed reinforcement prior to concrete placement.

Documents Reviewed: CITE# X-09331, "Commodity Items Technical Evaluation for ISFSI - A615 Gr 60 Deformed Steel Bar for Concrete Reinforcement," Approved April 13, 2006;

Category: Concrete Sampling **Topic:** Composite Sampling Requirement

Reference: ACI 349, Sect 5.6.2.1

Requirement: Samples for strength tests shall be taken in accordance with "Method of Sampling Freshly Mixed Concrete" (ASTM C 172).

Finding: This requirement was achieved. Section 5.11.1 of TP TB-0612 required that the concrete be tested and inspected in accordance with the requirements of ASTM C 94. Section 16.3 of ASTM C 94 required that samples of concrete be obtained in accordance with ASTM C 172. ASTM C 172 specified that a composite sample be obtained from the delivery truck, that the concrete tests be started within 5 minutes of obtaining the composite concrete sample and that the molding of the concrete strength samples be started within 15 minutes of obtaining the composite concrete sample. During the concrete placement activities for the concrete mudmat on May 24, 2006 and for the ISFSI pad on July 12, 2006, licensee personnel were observed obtaining the concrete samples and performing the specified tests required by ASTM C 172.

Documents Reviewed: Temporary Procedure TP TB-0612, Used Fuel Storage Project Quality Related Concrete Activities," Revision 1

Category: Concrete Sampling **Topic:** Composite Sampling Requirement 2

Reference: ASTM C 172, Section 5.2.3

Requirement: Sample the concrete by collecting two or more portions taken at regularly spaced intervals during discharge of the middle portion of the batch. Do not obtain samples until after all the water has been added to the mixer; also do not obtain samples from the very first or last portions of the batch discharge.

Finding: This requirement was met. Section 3.23.5 of Engineering Specification 10055-C-NPG required that the concrete be tested per ASTM C 172 at truck discharge or at the end of the pump line in case of pumped concrete. During the concrete placement for the concrete mudmat and the first ISFSI pad, the inspector witnessed the licensee obtaining concrete samples from selected concrete trucks during the discharge of the middle portion of the batch. The two samples were mixed together to form a composite sample as required by ASTM C 172, which was used for subsequent tests.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2

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Category: Concrete Sampling **Topic:** Making & Curing Test Specimens

Reference: ACI 349, Sect 5.6.2.2

Requirement: Cylinders for strength tests shall be molded and laboratory-cured in accordance with "Practice for Making and Curing Concrete Test Specimens in the Field" (ASTM C 31).

Finding: ASTM C 31 required that the field technicians making the concrete specimens be ACI field testing technicians, Grade 1 or equivalent; the concrete be sampled per the requirements of ASTM C 172; measurements of the concrete slump and temperature be

made; the concrete specimens be molded in three approximately equal layers; and that initial curing of the specimens be temperature controlled between 60 and 80 degrees F.

During the concrete placement of the mudmat on May 24, 2006 and the ISFSI pad on July 12, 2006 the inspector observed that the requirements of ASTM C 31, as listed above were met and were acceptable. Minor fluctuations of temperature, consisting of 3 to 4.5 degrees F below the specified minimum temperature requirement during the initial curing process were discovered by the licensee. The few degrees of temperature fluctuation was determined by the licensee to have a negligible impact on concrete strength which would be verified by the results of the concrete cylinder tests. The results of the concrete compressive strength tests for the mudmat at 56-days varied between 7,540 and 9,590 psi, which are all well above the specified limit of 5,000 psi. The 7-day compressive break test results varied from 4,310 to 6,050 psi for the first ISFSI pad.

The temperature fluctuation below 60 degrees F is a deviation from the ASTM C 31 standard requirement and was entered into the licensee corrective action system as AR A0669860 and AR A0673202. The NRC will make a final decision on the acceptability of the concrete based on the concrete meeting the final compressive strength requirement of 5,000 psi at 90-days. The 90-day concrete compressive strength test results will be tracked by URI 72-026/0601-01.

Documents Reviewed: Action Request (AR) A0669860, AR A0673202

Category: Concrete Sampling **Topic:** Required Number of Strength Samples

Reference: ACI 349, Sect 5.6.1.1

Requirement: Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day nor less than once for each 150 cubic yd of concrete, nor less than once for each 5000 square ft of surface area for slabs or walls.

Finding: This requirement was met. Engineering Specification 10055-C-NPG, Section 3.22.18 required that the slump, temperature, compressive strength and unit weight be measured at the first batch and every 100 cubic yards thereafter. During the concrete placement activities for the mudmat on May 24, 2006, and for the ISFSI pad on July 12, 2006 compressive strength samples were collected for every 100 cubic yards of concrete that was batched.

Documents Reviewed: Engineering Specification 10055-C-NPG, "Specification for the Construction of an Independent Spent Fuel Storage Installation (ISFSI) for Diablo Canyon Power Plant, Unit 1 & 2," Revision 2

Category: Hot Weather Requirements **Topic:** Protection During Hot Weather

Reference: ACI 349, Sect 5.13.1

Requirement: During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure.

Finding: This requirement was met. The licensee had defined the conditions for hot weather concrete as a wind speed greater than 10 mph, the concrete temperature higher than 85 degrees F and relative humidity less than 50%. During the concrete placement activities for the mudmat and the first ISFSI pad, the ambient weather conditions did not require implementation of controls to protect the concrete due to hot weather. To avoid potential problems with hot weather conditions during the first ISFSI pad concrete placement, the licensee started concrete placement activities at 0100 in the morning.

Documents Reviewed: Temporary Procedure TP TB-0612, Used Fuel Storage Project Quality Related Concrete Activities," Revision 0

Category: ISFSI Pad Stability **Topic:** Pad Excavation Preparation

Reference: FSAR, Section 2.6.4.4

Requirement: The ISFSI pads will be founded on dolomite, sandstone, friable dolomite, and friable sandstone. This bedrock will support the proposed facilities without deformation or instability.

Finding: This requirement was met. The inspector observed the condition of the bottom of the ISFSI pad surface during the final stage of excavation preparation that occurred prior to the placement of the ISFSI mudmat concrete. A small clay layer that had been located in the northern portion of ISFSI pad number one had been removed. The licensee required that Geosciences personnel inspect the bottom of the excavation to confirm the suitability of the foundation rock and the applicability of the assumptions and conclusions used in the related calculations. Geosciences personnel also confirmed that the roughness of the excavated rock surface met the requirements of PG&E calculation 52.27.100.174 for the assumed roughness condition at the interface between the rock and the mudmat. The Geosciences personnel also performed an evaluation of the suitability of the excavation for the CTF mudmat. Geological mapping of the ISFSI site area was conducted by Geoscience personnel. The prepared excavation surfaces were evaluated by the licensee and found to meet the design assumptions and FSAR requirements for the ISFSI pads and the CTF.

Documents Reviewed: Calculation Number 52.27.100.766, "Confirmation of Foundation Conditions at the DCPP ISFSI Site," Revision 0

Category: Overpack Anchorage **Topic:** Embedment Steel Assembly

Reference: FSAR, Section 4.2.1.1.4, Table 4.5-1

Requirement: The Overpack Anchorage Hardware, including the Embedment Steel Assembly that distributes the loads imposed on the surface of the ISFSI to the entire structure, is classified as Important to Safety.

Finding: This requirement was met. The licensee specified the embedment support structure as safety related along with a designation of purchase class 2. Specification 10062-C-NPG specified fabrication tolerances and testing requirements for the various components of the support structure. The licensee provided inspection acceptance reports documenting the satisfactory receipt acceptance of the support structure components, consisting of the ring, plates, couplers, 2 1/2" bars, washers and 2 1/2" heavy hex nuts.

Documents Reviewed: Specification 10062-C-NPG, "Specification for Furnishing the Embedment Support Structures for the ISFSI Storage Pads and Transporter Seismic Anchor," Revision 0; Inspection Accept Report No. 0175099 for Stock codes 957911, 957912, 957913, 957914, 957915, 957916, 957917

Category: Slope Stabilization **Topic:** Cut Slope Stabilization

Reference: FSAR, Section 4.2.1.1.9.1

Requirement: After excavation, cut-slope faces will be protected from weathering and minor unraveling by a wire-mesh shotcrete facing to stabilize the cut slope and prevent or minimize potential failures from occurring. To stabilize larger rock blocks, potentially prone to failure during seismic loading, rock anchors will be installed.

Finding: This requirement was met. Between the period of February 13 and April 21, 2006, the resident inspectors witnessed portions of the construction activities involving shotcrete application and use of rock anchors. During this timeframe, the inspectors observed sampling and the destructive testing of shotcrete and grout samples. The grout was used during the installation of the rock anchors, also called rock bolts. The rock bolt hole drilling, rock bolt installation and grouting activities were also observed. The inspectors witnessed tensioning of selected rock bolt anchors. No deficiencies were noted.

Documents Reviewed:

Category: Transport Route **Topic:** Compaction Requirements

Reference: FSAR, Section 2.6.4.3.3

Requirement: A portion of the transport route will be relocated near the Patton Cove area. The roadway will be compacted to 90 percent relative density, with the upper 2 1/2 feet compacted to 95 percent relative density.

Finding: This requirement was met. During the period of February 6-17, 2006, the resident inspectors witnessed 15 soil compaction tests that were performed on the roadway relocation. The results of all the compaction tests were satisfactory. The inspectors noted that a portion of the fill area had rocks that were larger in size than the 8-inch maximum allowed by the design. This was promptly corrected by the licensee by removal of the fill area in question and replacement with appropriate material. The licensee committed to constant oversight of the roadway construction to prevent recurrence.

Documents Reviewed: