CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
NONCONFORMANCE REPORT

Project No. 06002.01.031 NCR No. 2004-11

PART 1: DESCRIPTION OF NONCONFORMANCE Contrary to QAP-014, sections 2.1 and 3.1, several calculations supporting the Diablo Canyon safety analysis review were (1) referenced in the report but not documented in a scientific notebook or (2) not referenced in the report or documented in a scientific notebook. QAP-014 requires all calculations to be documented in scientific notebooks.

Initiated by: D. Dunavant Date: June 11, 2004

Action Required by: B. Sagar Response Due Date: June 25, 2004

PART 2: PROPOSED DISPOSITION AND CORRECTIVE ACTION

Disposition: Rework:
(1) The calculations neither referenced in the report nor documented in the appropriate scientific notebook will be added in the scientific notebook associated with that project;
(2)The original technical reviewer will be directed to check the ~~three~~ two sets of calculations; and
(3) If necessary, the Diablo Canyon Safety Analysis report will be revised after the calculation check.

Basis of Disposition:
(1) The underlying foundation of QAP-014 is that sufficient detail of a calculation be available in records so that the calculation can be duplicated in the future. Providing sufficient documentation of a calculation in the report itself fulfils this requirement.
(2) Even though the calculation that was neither referenced in the report nor documented in a scientific notebook was judged to be simple enough that a technical person can easily reproduce the calculation, as a good practice, it should be documented somewhere, either in a scientific notebook or in the report itself. Since the report has already been issued, this deficiency will be corrected by adding the calculation in the associated scientific notebook.
(3) A check of QAP-002 revealed that the technical reviewer was instructed to check the software-based calculations (and that was done) but not the ~~three~~ two calculations in question. The original technical reviewer will be directed to check these ~~three~~ two calculations also.
(4) Depending upon the findings of (3) above, action will be taken to make any necessary modifications to the deliverable.

Action to Correct Nonconformance:
(1) Revise Section 3.1 of QAP-014 as follows: modify "Calculations shall be documented in appropriate Scientific Notebooks sufficiently so that the calculation can be duplicated." to "Calculations shall be documented in appropriate Scientific Notebooks or in the report itself, sufficiently so that the calculation can be duplicated."
(2) The calculation that was neither documented in the report nor in a scientific notebook will be added to the appropriate scientific notebook.
(3) The technical reviewer will check the calculations; and
(4) Any changes that need to be made to the deliverable will be identified and made.

Target date for completion: ~~07/26/04~~ Extended to ~~8/2/2004~~ 8/9/2004 RQS 1/23/04

Proposed by: B. Sagar Date: 06/15/04

PART 3: APPROVAL

Element Manager: Date: 6/15/2004

Director of QA: Date: 6/16/04 Extended to 8/9/2004 RQS 6/21/04

Comments/Instructions:

PART 4: CLOSE OUT

Comments:
1. QAP-014 was revised 1/22/04 as described.
2 & 3. - Scientific Notebook 671 was prepared to document and verify the calculations.
4. No changes to the report were necessary.

Verified by: R D Brunt **Date:** 8/5/04

Distribution:
Original-CENTER QA Records
ORIGINATOR
PRINCIPAL INVESTIGATOR J STAMATAKOS
ELEMENT MANAGER AS
TECHNICAL DIRECTOR
ADMINISTRATIVE DIRECTOR

SCIENTIFIC NOTE BOOK 671
Diablo Canyon ISFSI
Confirmatory Calculations

by

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August 4, 2004

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1.0 INITIAL ENTRIES

Scientific Note Book: 671

Issued to: Amitava Ghosh/John Stamatokos

Issue Date: July 3, 2004

Printing Period:

Project Title: Diablo Canyon Independent Spent Fuel Storage Installation (ISFSI)

Project Staff: Amitava Ghosh/John Stamatokos

By agreement with the CNWRA QA, this notebook is to be printed at approximate quarterly intervals. This computerized Scientific Notebook is intended to address the criteria of CNWRA QAP-001.

This notebook was established to address a nonconformance found during the June, 2004 Annual Quality Assurance Audit at the CNWRA. During the audit, one of the reviewers noted that "Calculations in support of the Diablo Canyon safety analysis review were either referenced in the report and not documented or documented in the report contrary to the requirements of QAP-014, 'Documentation of Scientific and Engineering Calculations,' 2.1, 3.1 which require that calculations be documented in a scientific notebook. Reference NCR 2004-11. Specifically, the NCR noted two confirmatory calculations in the Diablo Canyon Safety Evaluation Report that were not documented in a scientific notebook. The first was a confirmatory calculation for a potential tornado missile impact. The second was an event probability relating to earthquake hazards.

[John Stamatakos, Amitava Ghosh, August 3, 2004]

1.1 Objective

The objective of this study is to document the confirmatory calculations conducted by the staff on different tornado missiles considered by Pacific Gas and Electric Company (PG&E, 2002). PG&E (2002) did not conduct an estimation of the potential transporter instability after impact by an utility pole (a hypothetical tornado missile) although Holtec International (2001) studied the effects of transporter stability while transporting a loaded transfer cask to the storage area at the proposed facility. This analysis included a large missile represented by a 1,800 kg [4,000 lb] car traveling at a speed of 56 m/s [126 mph]. The impact analysis result indicates that a loaded transporter would displace laterally by a distance of only 1.65 cm [0.65 in]. However, the transporter remains stable and does not tipover as a result of this impact. The staff analysis is to determine whether the results of this analysis also bounds the effects of an utility pole impact.

[Amitava Ghosh, July 3, 2004]

August 3

2.0 CONFIRMATORY CALCULATIONS OF TORNADO MISSILES

PG&E (2002) used both an automobile, weighing 1,800 kg [4,000 lb] and traveling at a speed of

56 m/s [126 mph], and an utility pole, weighing 510 kg [1,124 lb] and flying at a speed of 16 m/s [35 mph], as two possible tornado missiles for the proposed ISFSI. The calculation given below is conducted to show that the kinetic energy imparted by the automobile is significantly larger than that of the utility pole.

Kinetic energy of an automobile (KE_{auto}) is

$$KE_{auto} = 0.5 \times \text{mass} \times \text{velocity}^2 = 0.5 \times \frac{4000}{32.2} \times 184.8^2 = 2{,}121{,}183 \text{ ft} - \text{lb}$$

Kinetic energy on utility pole (KE_{up}) is

$$KE_{up} = 0.5 \times \frac{1124}{32.2} \times 51.3^2 = 45{,}932 \text{ ft} - \text{lb}$$

Therefore, energy imparted by the automobile is significantly larger than that of the utility pole. Therefore, any impact of an utility pole would be bounded by the automobile impact in assessing transporter stability.

3.0 REFERENCES

Holtec International. *Design Basis Wind and Tornado Evaluation for DCPP.* HI–2012497, Rev 1. Marlton, NJ: Holtec International. 2001.

Pacific Gas and Electric Company. *Diablo Canyon Independent Spent Fuel Storage Installation: Safety Analysis Report.* Revision 1. Avila Beach, CA: Pacific Gas and Electric Company. 2002.

4.0 Confirmatory Calculation for probability of earthquake-induced damage to the casks while in transit from the power plant to the Cask Transfer Facility.

Maximum probability of the ILP earthquake at Diablo Canyon is 1×10^{-4}.
Annual exposure probability of cask in transit is 1.4×10^{-3}.

Both these values were provided in the Pacific Gas & Electric Safety Analysis Report for the ISFSI.

Thus the upper bound probability for the casks experiencing the ILP earthquake during transit is equal to:

1×10^{-4} times $1.4 \times 10^{-3} = 1.4 \times 10^{-7}$.

08/04/04

08/04/2004