STONE & WEBSTER ENGINEERING CORPORATION

245 SUMMER STREET, BOSTON, MASSACHUSETTS

ADDRESS ALL CORRESPONDENCE TO P.O. BOX 2325, BOSTON, MASS. 02107

W.U.TELEX: 94-0001
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Mr. G. A. Maneatis, Executive Vice President
Facilities Development
Pacific Gas and Electric Company
77 Beale Street
San Francisco, CA 94106

March 3, 1983

J.O. No. 14296.10
DCS-306Q

Mr. H. R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Mr. R. H. Engelken, Regional Administrator
Region V
U.S. Nuclear Regulatory Commission
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Docket No. 50-275
Diablo Canyon Unit 1
License No. DPR-76

SWEC INTERIM TECHNICAL REPORTS

Gentlemen:

Attached are Interim Technical Reports, Number 36, Revision 0, entitled "Final Report on Construction Quality Assurance Evaluation of Guy F. Atkinson Company" and Number 38, Revision 0, entitled "Construction Quality Assurance Evaluation of Wismer & Becker."

Very truly yours,

F. Sestak, Jr.
Project Manager, Diablo Canyon Nuclear Power Plant

Enclosure

cc: RRFray (45)
RFReedy
ETDenison
WECooper (10)
HSchierling (40)
HBBrown
DFFleischaker
JRReynolds
BNorton
ACGehr

PACIFIC GAS & ELECTRIC COMPANY

DIABLO CANYON NUCLEAR POWER PLANT

INDEPENDENT DESIGN VERIFICATION PROGRAM

FINAL REPORT

ON

CONSTRUCTION QUALITY ASSURANCE EVALUATION

OF

GUY F. ATKINSON COMPANY

PERFORMED BY

STONE & WEBSTER ENGINEERING CORPORATION

DOCKET NO. 50-275

LICENSE NO. DPR-76

PROJECT MANAGER Frank Sestak Jr. DATE 2-25-83

F. Sestak, Jr.

PROGRAM MANAGER'S PREFACE

DIABLO CANYON NUCLEAR POWER PLANT - UNIT 1

INDEPENDENT DESIGN VERIFICATION PROGRAM

INTERIM TECHNICAL REPORT

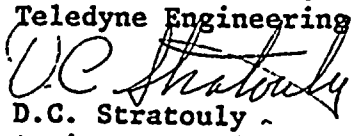
FINAL REPORT ON
CONSTRUCTION QUALITY ASSURANCE EVALUATION
OF
GUY F. ATKINSON CO.

This is the thirty-sixth of a series of Interim Technical Reports prepared by the DCNPP-IDVP for the purpose of providing a conclusion of the program.

This report provides the recommendations and conclusions of the IDVP with respect to the initial sample.

As IDVP Program Manager, Teledyne Engineering Services, (TES), has approved this ITR including the conclusions and recommendations. The methodology followed by TES in performing this review and evaluation is described by Appendix B to this report.

ITR Reviewed and Approved
IDVP Program Manager
Teledyne Engineering Services



D.C. Stratouly
Assistant Project Manager

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FINAL REPORT

1.0 INTRODUCTION

Stone & Webster Engineering Corporation (SWEC) was engaged by Teledyne Engineering Services (TES) to perform evaluations and verifications of the quality related activities of Wismer & Becker (W&B) who performed installation of NSSS piping, and G. F. Atkinson (GFA) who performed civil/structural work in the containment building at the Diablo Canyon Nuclear Power Plant (DCNPP) Unit #1.

SWEC has performed the evaluation and verification in accordance with the Independent Design Verification Program (IDVP), Program Plan, Rev 1, Adjunct Program for Evaluation of Construction Quality Assurance, dated October 1, 1982 issued by Teledyne Engineering Services (TES) as IDVP Program Manager.

This report concentrates on that portion of the civil/structural work performed by GFA and their major subcontractors on the Unit #1 containment only. GFA erected the on-site central mix batchplant, batched, mixed, delivered and placed the concrete. A separate report will be issued with respect to W-B.

Pacific Gas & Electric (PG&E) performed the inspections and tests associated with concrete and operated an on-site materials testing laboratory.

Major subcontractors to GFA and their primary functions included:

Pacific States Steel - supplying and erecting reinforcing steel

Pittsburgh Testing Laboratory - reinforcing steel testing and inspection

Pittsburgh Des Moines - liner erection

Bostrom-Bergen - supplying embedded metal

Subcontractors functioned under their own PG&E approved quality assurance programs; GFA performed periodic audits of their performance.

Concrete work for the containment structure was initiated in September of 1969, and was essentially completed in 1973.

The review was conducted at the site from September 28, 1982, through November 5, 1982, according to the objectives of the evaluation defined in Section 2.0, Paragraph 2.1 of the IDVP Plan. The subsequent evaluation was structured to assess whether the construction of the DCNPP was performed in accordance with quality requirements appropriate for the time of plant construction.

The Quality Assurance Program Evaluation was performed by a team of engineers and inspectors experienced in various aspects of nuclear power plant construction quality assurance and inspection and was led by a Senior Field Quality Control Representative.

The Quality Assurance Program Evaluation was performed by individuals certified as Auditors by SWEC in accordance with approved procedures and ANSI-N45.2.23. The construction verification was performed by individuals certified as Inspectors in the appropriate discipline by SWEC in accordance with approved procedures and ANSI-N45.2.6.

The review began with an evaluation to determine if the construction documentation provided evidence that the construction work correctly incorporated essential design features. To ascertain

this, random sampling of actual construction was performed to verify that the facilities were correctly constructed, and that other construction requirements, as applicable, were met.

2.0 CONSTRUCTION QUALITY ASSURANCE EVALUATION

An appropriate sample for evaluation was selected from the work of this contractor to provide evidence of his quality practices in each area of activity.

2.1 DEFINITIONS OF ITEMS REVIEWED

2.1.1 Evaluation of Construction Quality Assurance Program

Task A: Review contractor's quality programs to determine if adequate controls and practices were evident to assure the quality of construction and the incorporation of essential design features into the completed plant, and if controls were consistent with applicable regulatory requirements at the time the work was performed.

2.1.2 Verification of Physical Installation

Task B: To evaluate if physical installation of selected components of safety systems and structures conformed to the requirements of design drawings and specifications and that required inspections were performed.

2.2 DESCRIPTION OF REVIEW

2.2.1 Evaluation of Construction Quality Assurance Program

Checklist attributes were developed based on requirements of PG&E Specification 8831R "Construction of Buildings and Related Structures", and applicable

contractor and subcontractor Quality Assurance programs in effect at the time of construction. The checklist items were separated into different major work categories such as Reinforcing Steel, Concrete Work, Embedded Metal, Containment Liner, and Quality Assurance in the same manner as these categories appeared in Specification 8831R.

Documentation was randomly selected based upon PG&E documentation indexes and consisted of material certifications, test and inspection reports, drawings, material and procedure approvals, concrete placement cards, batch plant tapes, receiving reports, equipment calibration records, nonconformance reports (NCRs), corrective action reports, audit records and general correspondence.

2.2.2 Verification of Physical Installation

Checklist attributes were developed based on requirements of PG&E Specification 8831R, PG&E and contractor drawings, and applicable contractor and subcontractor QA programs. GFA "Concrete Lift Drawings", C-Series for containment, and I-Series for interior containment concrete, were very detailed and provided much of the criteria used in developing the physical verification checklist.

Visual inspection of the accessible completed work was then performed to verify that work was done in accordance with the approved design drawings and specifications. Items examined included concrete surfaces, construction joint locations, weld size and location, liner erection and embedment locations.

2.3 SUMMARY OF REVIEW RESULTS

2.3.1 Evaluation of Construction Quality Assurance Program

Based on the checklist, 1880 documents were reviewed against the appropriate attributes. Unless otherwise noted on the checklist, the documents were legible and sufficiently detailed to justify that the work was performed as required. PG&E was involved in the quality program as evidenced by their approval of contractor and subcontractor Quality Assurance programs, approvals of NCRs, audits of subcontractors and corrective action follow-up.

The review revealed the existence of deficiencies at the very start of concrete production when leveling mats were being placed and later with "fill" concrete for the "soldier beams" in the containment. It also identified two (2) isolated instances where small amounts of aluminium powder where used in grout within the containment.

2.3.2 Verification of Physical Installation

Based on the checklist attributes, 323 items were visually inspected. All GFA "C" and "I" Series concrete lift drawings used in the verification showed evidence of PG&E approval.

The review revealed two areas (i.e., the exterior of the containment and the inside surface of blockouts on interior walls), where the surface finish did not appear to meet specification requirements.

2.4 EOI Reports Issued

Four (4) EOI Files have been opened for the Construction Quality Assurance evaluation of the work performed by Guy F. Atkinson and this major subcontractors on the Containment Building at the DCNPP Unit #1. The status of these files is summarized in Appendix A.

EOI 9008 was issued because PG&E Specification 8831R details requirements on the exposed concrete surface that the Field Auditors considered were not met. This file was revised and analyzed with the additional information provided by PG&E. The Findings Review Committee has recommended and the IDVP has concluded that the file is resolved as an Error Class C (observation) in accordance with the program plan. No physical modifications are required. An IDVP Completion Report has been issued.

EOI 9015 was issued because PG&E Specification 8831R details requirements on the compressive strength of concrete, that the Field Auditors considered were not met on some specified early placements as given by the accompanying Field Reports. This file was revised and analyzed with the additional information provided by PG&E. The Findings Review Committee has recommended and the IDVP has concluded that the file is resolved as an Error Class C (observation) in accordance with the program plan. No physical modifications are required. An IDVP Completion Report has been issued.

EOI 9016 was issued because PG&E Specification 8831R prohibits the use of aluminum grout in the Containment Structure and the Field Auditors pointed to field records that show otherwise. This file was revised and analyzed with the additional information provided by PG&E. The Findings Review Committee has recommended and the IDVP has concluded that the file is resolved as an Error Class C (observation) in accordance with

the program plan. No physical modifications are required. An IDVP Completion Report has been issued.

EOI File 9021 was issued because PG&E Specification 8831R details requirements on the Reactor Containment Interior Walls that the Field Auditors considered were not met. The file was revised and analyzed with the additional information provided by PG&E. The Findings Review Committee has recommended and the IDVP has concluded that the file is resolved as an Error Class C (observation) in accordance with the program plan. No physical modifications are required. An IDVP Completion Report has been issued.

2.5 EVALUATION OF REVIEW RESULTS

2.5.1 Evaluation of Construction Quality Assurance Program

The documentation reviewed provides evidence that an effective quality control program existed and was enforced to assure work was performed in accordance with the PG&E specifications, GFA's Quality Assurance program, and the Quality Assurance programs of GFA's subcontractors. Records were logically filed, easily retrievable, and particularly detailed in their coverage. Deficiencies identified by the contractor during the program of work were documented on NCR's and corrective actions were effectively implemented. PG&E played an active role in the resolution of nonconformances and performed periodic audits of major subcontractors to assure program adherence.

2.5.2 Verification of Physical Installation

The physical verification indicated that GFA and their subcontractors performed work as specified and in accordance with their quality programs. Other than

the items identified in the Open Item Reports (EOIs) discussed in 2.4, all work observed was performed in accordance with the approved drawings and PG&E Specification 8831R.

2.6 CONCLUSION

It is the conclusion of the Review Team that in the areas reviewed (the containment), the civil/structural work performed in constructing the Diablo Canyon Nuclear Power Plant Unit #1 is satisfactory. The Review Team found that adequate controls and practices were in place to assure the quality of construction. Further, to the extent reviewed, the as-constructed physical installation conforms to the requirements of design drawings and specifications, and the required inspections were performed and appropriately documented.

APPENDIX A

DCNPP IDVP STATUS REPORT

	REV. 0		LATEST REV.			
FILE NO.	DATE	REV.	DATE	BY	STATUS	SUBJECT
9008	821102	0	821102	SWEC	OIR	Concrete Surfaces, Reactor Containment Exterior
9008	821102	1	830112	SWEC	PER/C	Concrete Surfaces, Reactor Containment Exterior
9008	821102	2	830117	TES	ER/C	Concrete Surfaces, Reactor Containment Exterior
9008	821102	3	830117	TES	CR	Concrete Surfaces, Reactor Containment Exterior
9015	821102	0	821102	SWEC	OIR	Spec Requirements - Concrete Placements
9015	821102	1	830112	SWEC	PER/C	Spec Requirements - Concrete Placements
9015	821102	2	830117	TES	ER/C	Spec Requirements - Concrete Placements
9015	821102	3	830117	TES	CR	Spec Requirements - Concrete Placements
9016	821102	0	821102	SWEC	OIR	Aluminium Used In Grout Containment
9016	821102	1	830112	SWEC	PER/C	Aluminium Used in Grout Containment
9016	821102	2	830117	TES	ER/C	Aluminium Used in Grout Containment
9016	821102	3	830117	TES	CR	Aluminium Used in Grout Containment
9021	821102	0	821102	SWEC	OIR	Concrete Surface Conditions Reactor Containment
9021	821102	1	830112	SWEC	PER/C	Concrete Surface Conditions Reactor Containment
9021	821102	2	830117	TES	ER/C	Concrete Surface Conditions Reactor Containment
9021	821102	3	830117	TES	CR	Concrete Surface Conditions Reactor Containment

APPENDIX B

Program Manager's Assessment

Independent review by TES of the tasks considered to evaluate the Construction Quality Assurance of the work performed by Guy F. Atkinson, Co. and his major subcontractors on the Containment Building at Diablo Canyon Nuclear Power Plant - Unit #1, was done in accordance with IDVP Program Plan, Revision 1, Adjunct Program for Evaluation of Construction Quality Assurance dated October 1, 1982.

The review involved a visit to the site to comment on the procedures and checklists drafted by SWEC's engineers and an analysis of the recommendations by the Findings Review Committee.

The files issued by SWEC were reviewed thoroughly and specific recommendations were made to the IDVP Program Manager delineating appropriate resolution.

As a result of the verification of the selected samples, and the assessment of the impact of SWEC's findings, TES, as Program Manager, is of the opinion that no additional verification is required.