

REFERENCE 6 - CONTINUED

CLOW CORPORATION ADDENDUM I
TO
PATEL TECHNICAL REPORT PEI-TR-83-29

COVERING

STATIC LOAD TEST AND SEISMIC QUALIFICATION
OF CLOW WAFER STOP VALVE ASSEMBLIES
24" HBB-BF-MO-57-115, -135, -147
18" HBB-BF-MO-57-112
INCLUDING
CLARIFYING OR CONCLUSIVE COMMENTS
TO THE MAIN SEISMIC QUALIFICATION REPORT
PEI-TR-83-29

BY

William J. Allen,
Design Engineer-Nuclear

Prepared for Bechtel Power Corporation
for
Philadelphia Electric Limerick Plant
In Accordance with Bechtel Specification 8031-P-144, Revision 1

Work Performed Under Clow Purchase Order No. 30-11654
Bechtel Purchase Order No. 8031-P-144-AC

Wyle Laboratories Job Number 46823

for

CLOW CORPORATION
ENGINEERED PRODUCTS DIVISION
WESTMONT, ILLINOIS

8309120501 830901
PDR ADOCK 05000352
A PDR

AUGUST 16, 1983

REPORT NO.: Clow Corp. Addendum I to Patel
Technical Report PEI-TR-83-29

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ORIGINAL ISSUE: August 16, 1983

REV. NO.	REV. DATE	REV. BY	CHECKED BY	Q.A. BY	DESCRIPTION OF CHANGES AND PAGES REVISED

CERTIFICATION OF CONFORMANCE

The subject valve assembly, manufactured by Clow Corporation and described in this report, has been subjected to static testing by Wyle laboratories to evaluate compliance with the governing specifications. Testing was performed in accordance with Wyle Test Procedure No. 541/0465/WB, Rev. A.

By my review of Bechtel Power Corporation Design Specification No. 8031-P-144, Revision 1, "Design Specification for Flanged Butterfly Valves for Nuclear Service for the Limerick Generating Station Units 1 and 2", I certify, to the best of my knowledge, that this Addendum satisfies the requirements of this Specification not covered by Patel Engineers Report No. PEI-TR-83-29, Rev. A.


Theodore E. Thygesen 8/17/83
Registered Professional Engineer of
Illinois
Registration No. 62-34780

ABSTRACT

A static load test for seismic qualification was performed on the subject valve assembly manufactured by Clow Corporation. The test was performed in accordance with Wyle Laboratories' Procedure 541/0465/WB, Revision A. Structural integrity of the assembly and operability of the functional components were verified during and after the static load test. The test was supervised by Patel Engineers, Huntsville, Alabama. The test confirms the integrity of the structure and compliance with applicable codes and specifications.

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1.0 INTRODUCTORY SUMMARY

This addendum presents the final results of the seismic qualification of Clow's Wafer Stop Valves for use in Philadelphia Electric Company's Limerick Nuclear Station.

Complete details of the entire qualification program are stated in the following reports:

- | | |
|-----------------------------|----------------------------|
| (1) Seismic Analysis Phase: | (2) Test Phase: |
| Patel Engineers Reports | Patel Engineers Report |
| PEI-TR-83-13 | PEI-TR-83-29, Rev. A; |
| PEI-TR-83-14 | which includes as Appendix |
| PEI-TR-83-15 | A, National Technical Ser- |
| PEI-TR-83-16 | vices Report No. |
| | 528-0951, Rev. C. |

Exceptionally tight scheduling requirements did not permit initiation and completion of the static load test of Clow's 24-inch motor operated wafer stop valve at National Technical Services Facilities in Saugus, California.

Table C-1 of Appendix 17 (Rev. 1) to Bechtel Design Specification 8031-P-144 (Rev. 1) permits qualification of an 18-inch motor operated wafer stop valve to be extended to the 24-inch motor operated stop valve. Under Patel Engineers supervision, an 18-inch motor operated wafer stop valve was tested at Wyle Laboratories facilities in Huntsville, Alabama.

The test procedure and results of the Static Load Test performed by Wyle Laboratories are included in this Addendum as Appendix A.

With regard to Patel Engineers' Report PEI-TR-83-29, Bechtel Power Corporation required a response to their list of comments and questions submitted by Telex (#160777 Dtd. 7-29-83). Bechtel's questions and Clow Corporation reply appear as Appendix B. Patel Engineers' reply to their portion of the Bechtel questions, appear as Appendix C.

2.0 SUMMARY OF RESULTS

Testing

Inspection of the valve assembly showed no visible damage. Operability of the functional components was verified during and after testing. Full documentation of the tests can be found in Wyle Test Report 46823-1 (Attached as Appendix A).

3.0 APPLICABLE SPECIFICATIONS

The following documents were used in the performance of the seismic qualification program:

Bechtel Power Corporation Design Specification No. 8031-P-144, Revision 1, "Design Specification for Flanged Butterfly Valves for Nuclear Service for the Limerick Generating Station Units 1 and 2"

Bechtel Power Corporation Specification No. 8031-P-358, "Specification for Dynamic Qualification of Safety Related Actuators for the Limerick Generating Station Units 1 and 2"

4.0 DESCRIPTION OF EQUIPMENT

18-inch motor operated wafer stop valve, Clow Serial No. 82-2053-04(N)-01, Philadelphia Electric Co., Serial No. 18" HBB-BF-MO-57-112, with a Limitorque SMB-1-60-H5BC operator.

5.0 STATIC LOAD TESTING OF EQUIPMENT

The valve described in Section 3.0 was subjected to static loads to demonstrate the capability of withstanding the simultaneous application of worst case forces anticipated in the course of service life.

The loads applied to the equipment to satisfy the static load qualification requirements were the following:

1. All normal loads, including weight of valve top works and differential pressure across the disc of 55 psid.
2. Horizontal and vertical inertial loads, equivalent to 4.5g seismic acceleration in each axis.

The equipment was rigidly attached to a Wyle-fabricated test fixture, described in Appendix A, for application of the specified loads.

All ancillary electromechanical devices necessary for equipment function were energized and monitored for change of state during the application of the inertial loads.

6.0 CONCLUSIONS

The valve as described in Section 4.0 and which was tested per Appendix A "demonstrated sufficient integrity to withstand, without comprise of structure, electrical function, or mechanical function, the prescribed load testing."

As a result of the successful qualification testing of the 18-inch valve, qualification is extended to the 24-inch valves, Philadelphia Electric Company, Serial No.'s 24" HBB-BF-MO-57-115, -135, and -147 by authority of Table C-1 of Appendix 17 (Rev. 1) to Bechtel Design Specification 8031-P-144 (Rev. 1).

APPENDIX A

WYLE TEST REPORT 46823-1

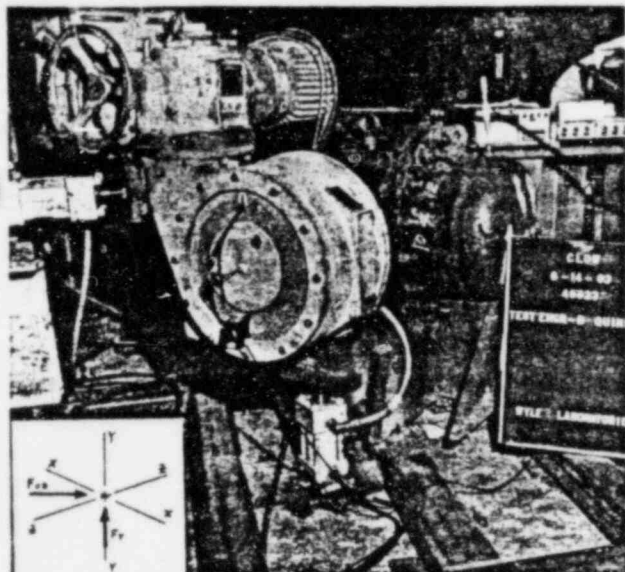
STATIC LOAD
TEST PROGRAM

ON AN

18-INCH BUTTERFLY VALVE ASSEMBLY
WITH LIMITORQUE OPERATOR
(CLOW JOB NO. 82-2053-04(N)-01)

FOR

CLOW CORPORATION
ENGINEERED PRODUCTS DIVISION
40 CHESTNUT AVENUE
WESTMONT, ILLINOIS 60559



SEISMIC SIMULATION Test Report

REPORT NO. 46823-1
WYLE JOB NO. 46823
CUSTOMER 30-11654
P. O. NO. _____
PAGE 1 OF 25 PAGE REPORT
DATE June 27, 1983
SPECIFICATION (S) See References
in Section 7.0

- 1.0 CUSTOMER Clow Corporation, Engineered Products Division
40 Chestnut Avenue, Westmont, Illinois 60559
ADDRESS _____
2.0 TEST SPECIMEN 18-inch Lugged Wafer Stop Valve with an SMB-1-H5BC Limitorque
Actuator
3.0 MANUFACTURER Clow Corporation
4.0 SUMMARY

An 18-inch Lugged Wafer Stop Valve Assembly with a Limitorque Actuator, hereinafter called the specimen, was subjected to Static Loads and Pressure Integrity Tests as required by the Clow Corporation, Engineered Products Division, Purchase Order Number 30-11654 and Wyle Laboratories' Seismic Test Procedure 541/0465/WB, dated May 25, 1983, Revision A. The test program was performed on June 14, 1983.

The test program consisted of static load testing and seat leakage testing prior to and after the load tests. The specimen was electrically powered and monitored for functional operation during the test program as required.

The specimen demonstrated sufficient integrity to withstand, without compromise of structure, electrical function, or mechanical function, the prescribed load testing.

STATE OF ALABAMA } Ala. Professional Eng.
COUNTY OF MADISON } Reg. No. 12761
Vincent F. Kearns III
being duly sworn,
deposes and says: The information contained in this report is the result of complete
and carefully conducted tests and is to the best of his knowledge true and correct in
all respects.
SUBSCRIBED and sworn to before me this 30 day of JUNE, 19 83
Notary Public in and for the State of Alabama at large.
My Commission expires June 15, 19 87

Wyle shall have no liability for damages of any kind to person or property, including special or consequential damages, resulting from Wyle's providing the services covered by this report.

PREPARED BY Bobby L. Quinn 6/27/83
APPROVED BY James H. Powell 6/27/83
WYLE Q. A. T. R. Stinson 6/30/83

WYLE
LABORATORIES SCIENTIFIC SERVICES & SYSTEMS GROUP

4.0 SUMMARY (Continued)

Table I contains descriptions of the test runs.

Figure 1 shows a representative section of the oscillograph records of the electrical monitoring channels.

Photograph 1 shows the load test setup.

Appendix I contains the Instrumentation Equipment Sheets.

Appendix II contains the Wyle Laboratories' Seismic Test Procedure 541/0465/WB, dated May 25, 1983, Revision A.

Appendix III contains the Wyle Laboratories' Certification of Compliance No. HSV/106, dated June 27, 1983.

5.0 STATIC LOAD TEST REQUIREMENTS

5.1 Specimen Mounting

The specimen shall be installed in a Wyle-fabricated test fixture as shown in Figure 1 of the Test Procedure (Appendix II). The test fixture shall be welded to a rigid reaction frame.

5.2 Static Load Excitation

An equivalent static load of 4.5 g* shall be applied in line with the center of gravity of the actuator in each of the three (3) orthogonal specimen axes. The center of gravity of the actuator and a smooth, flat surface for the application of the static load shall be provided by Clow Corporation. The seat leakage differential pressure for the valve shall be simultaneously applied to the test fixture while the static load is applied. The specimen shall then be cycled while in the deflected mode as described in Paragraph 5.5.

The magnitude of the load shall be determined by multiplying the hydraulic pressure by the effective piston area of the hydraulic cylinders. The loads shall be applied simultaneously with one, two or three hydraulic cylinders. It is assumed that the static load can be applied in either the positive or negative direction.

*Assuming an actuator weight of 1220 pounds,
the applied (or equivalent) static load shall
be 5490 pounds in each orthogonal direction.

5.3 Pre-test and Post-test Functional Operability

Prior to and following the application of the static loads, the specimen shall be stroked through four (4) complete operating cycles (two cycles with 368 VAC power and two cycles with 460 VAC power).

5.4 Seat Leakage Tests

Seat leakage tests shall be performed prior to and after the static load tests in accordance with the Clow Corporation "Seat Bubble Test Procedure EPS 30-49-832." The leakage test duration shall be four (4) minutes.

5.0 STATIC LOAD TEST REQUIREMENTS (Continued)

5.5 Operability Tests

With the static loads applied, the specimen shall be stroked through three (3) complete operating cycles: Open-to-closed with internal pressure; closed-to-open with differential seat leakage pressure.

The operating time in each direction of travel shall be recorded during each operating cycle.

5.6 Electrical Power

A variable source of electrical power (368 to 460 VAC, 3-phase, 60 Hz) shall be furnished for the operation of the specimen.

5.7 Electrical Monitoring

Five (5) electrical monitoring channels shall be recorded on oscillograph recorders to monitor the following:

- 1) A limit switch (which changes state in the opening direction).
- 2) A limit switch (which changes state in the closing direction).
- 3) Torque switch (which shuts off power at the end of the closing stroke).
- 4) Operating current.
- 5) Valve disc motion (rotary potentiometer attached to rotating disc on the actuator).

5.8 Pneumatics

Pneumatic pressure of 55 psig shall be provided to perform the leakage tests described in Paragraph 5.4 and the operability tests described in Paragraph 5.5.

6.0 STATIC LOAD TEST PROCEDURES AND RESULTS

6.1 SPECIMEN MOUNTING PROCEDURES

The specimen was installed in a Wyle-fabricated test fixture as shown in Figure 1 of Appendix II. The test fixture was welded to a rigid reaction frame as shown in Photograph 1.

6.2 Static Load Excitation Procedures

An equivalent static load of 4.5 g (5490 pounds-force) was applied in line with the center of gravity of the actuator in each of the three (3) orthogonal specimen axes. The seat leakage differential pressure for the valve was simultaneously applied to the test fixture while the static load was applied. The specimen was then cycled while in the deflected mode as described in Paragraph 6.5.

The magnitude of the force in the horizontal plane (X/Z axes as shown in Photograph 1) was 7764 lbf. The application of this force at a 45-degree angle (to either axis) resulted in an equivalent static load of 5490 lbf in both the X and Z axes. The magnitude of the force in the vertical axis (Y axis as shown in Figure 1) was 5490 lbf. The magnitudes of the two (2) loads were determined by multiplying the hydraulic pressures (620 psig to the horizontal, 440 psig to the vertical) by the effective piston areas of the 4-inch diameter hydraulic cylinders (12.6 square inches). The loads were applied in the directions shown in Photograph 1.

6.2.1 Static Load Excitation Results

It was demonstrated that the specimen possessed sufficient structural integrity to withstand the prescribed loads. Operational test results are presented in Table I.

6.3 Pre-test and Post-test Functional Operability Procedures

Prior to and following the application of the static loads, the specimen was stroked through four (4) complete operating cycles.

Two (2) operating cycles were performed at 460 VAC and two (2) were performed at 368 VAC.

6.3.1 Pre-test and Post-test Functional Operability Results

Stroking times recorded during cycling tests are presented in Table I.

6.0 STATIC LOAD TEST PROCEDURES AND RESULTS (Continued)

6.4 Seat Leakage Test Procedures

Seat leakage tests were performed prior to and after the static load tests in accordance with the Clow Corporation's "Seat Bubble Test Procedure EPS 30-49-832." The leakage test duration was four (4) minutes.

6.4.1 Seat Leakage Test Results

No leakage was detected during the seat leakage tests performed prior to and after the static load tests.

6.5 Operability Test Procedures

With the static loads applied and an operating voltage of 368 VAC, the specimen was stroked through three (3) complete operating cycles: Open-to-closed with an internal pressure of 55 psig; closed-to-open with a differential seat leakage pressure of 55 psig.

The operating time in each direction of travel was recorded during each operating cycle.

6.5.1 Operability Test Results

Stroking times recorded during operability tests are presented in Table I.

A representative section of the oscillograph records of the electrical monitoring channels is shown in Figure 1.

6.6 Electrical Powering Procedures

A variable source of electrical power (368 to 460 VAC, 3-phase, 60 Hz) was furnished for the operation of the specimen during the test program.

The electrical power was connected to the specimen such that a pushbutton motor starter (furnished by Wyle) would initiate valve travel in either the closed-to-open or open-to-closed directions. During the closed-to-open stroke, the electrical power was shut off by a preset limit switch. During the open-to-closed stroke, the electrical power was shut off by a preset torque switch.

6.0 STATIC LOAD TEST PROCEDURES AND RESULTS (Continued)

6.7 Electrical Monitoring Procedures

Five (5) electrical monitoring channels were recorded on oscillograph recorders to monitor the following:

- 1) A limit switch (which changed state in the opening direction).
- 2) A limit switch (which changed state in the closing direction).
- 3) Torque switch (which shut off power at the end of the closing stroke).
- 4) Operating current.
- 5) Valve disc motion (rotary potentiometer attached to rotating disc on the actuator).

6.7.1 Electrical Monitoring Results

The specimen stroking times are presented in Table I.

A representative section of the oscillograph records of the electrical monitoring channels is shown in Figure 1.

6.8 Pneumatics

Pneumatic pressure of 55 psig was provided to perform the leakage tests described in Paragraph 6.4 and the operability tests described in Paragraph 6.5.

7.0 REFERENCES

- 7.1 Clow Corporation, Engineered Products Division, Purchase Order Number 30-11654
- 7.2 Wyle Laboratories' Seismic Test Procedure 541/0465/WB, dated May 25, 1983, Revision A
- 7.3 IEEE Standard 344-1975 Specification entitled "Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations"
- 7.4 Wyle Laboratories' (Eastern Operations) "Quality Assurance Program" manual, dated February 1983
- 7.5 Clow Corporation's "Seat Bubble Test Procedure EPS 30-49-832," dated February 9, 1983
- 7.6 Bechtel Corporation Specifications: 8031-P-144, Revision 1, dated July 22, 1982, and 8031-G-11, Revision 15, dated May 7, 1979
- 7.7 Clow Corporation Drawing Number D-0702
- 7.8 Limitorque Corporation Drawing Number 02-442-0497-2

DESCRIPTION OF TEST RUNS

RUN NO.	TYPE TEST	OPERATING VOLTAGE	DIRECTION OF STROKE	STROKING TIMES (SECONDS)				REMARKS
				MOTOR OPERATION	DISC MOVEMENT TIME LAG	COAST AFTER SHUTOFF	ACTUAL DISC MOVEMENT	
1	Cycle	368 VAC	Closed-To-Open Open-To-Closed	4.8 5.1	0.3 0.5	0.8 ---	5.3 4.6	No pressure; No loads
2	Cycle	368 VAC	Closed-To-Open Open-To-Closed	4.8 5.2	0.3 0.5	0.8 ---	5.3 4.8	No pressure; No load
3	Cycle	460 VAC	Closed-To-Open Open-To-Closed	4.7 5.2	0.3 0.3	0.9 ---	5.3 4.9	No pressure; No loads
4	Cycle	460 VAC	Closed-To-Open Open-To-Closed	4.7 5.0	0.3 0.3	0.9 ---	5.3 4.7	No pressure; No load
5	Seat Leakage	N/A	Closed-To-Open Open-To-Closed	--- ---	--- ---	--- ---	--- ---	55 psig; No loads
6	Cycle	368 VAC	Closed-To-Open Open-To-Closed	4.8 5.1	0.3 0.5	0.8 ---	5.3 4.6	55 psig; 4.5g loads
7	Cycle	368 VAC	Closed-To-Open Open-To-Closed	4.8 5.2	0.3 0.5	0.8 ---	5.3 4.7	55 psig; 4.5g loads
8	Cycle	368 VAC	Closed-To-Open Open-To-Closed	4.8 5.3	0.3 0.5	0.8 ---	5.3 4.8	55 psig; 4.5g loads
9	Seat Leakage	N/A	Closed-To-Open Open-To-Closed	--- ---	--- ---	--- ---	--- ---	55 psig; No loads
10	Cycle	368 VAC	Closed-To-Open Open-To-Closed	4.8 5.3	0.3 0.5	0.9 ---	5.4 4.8	No pressure; No loads
11	Cycle	368 VAC	Closed-To-Open Open-To-Closed	4.8 5.3	0.3 0.5	0.8 ---	5.3 4.8	No pressure; No loads
12	Cycle	460 VAC	Closed-To-Open Open-To-Closed	4.7 5.2	0.2 0.3	0.8 ---	5.3 4.9	No pressure; No loads
13	Cycle	460 VAC	Closed-To-Open Open-To-Closed	4.7 5.2	0.2 0.4	0.8 ---	5.3 4.8	No pressure; No loads

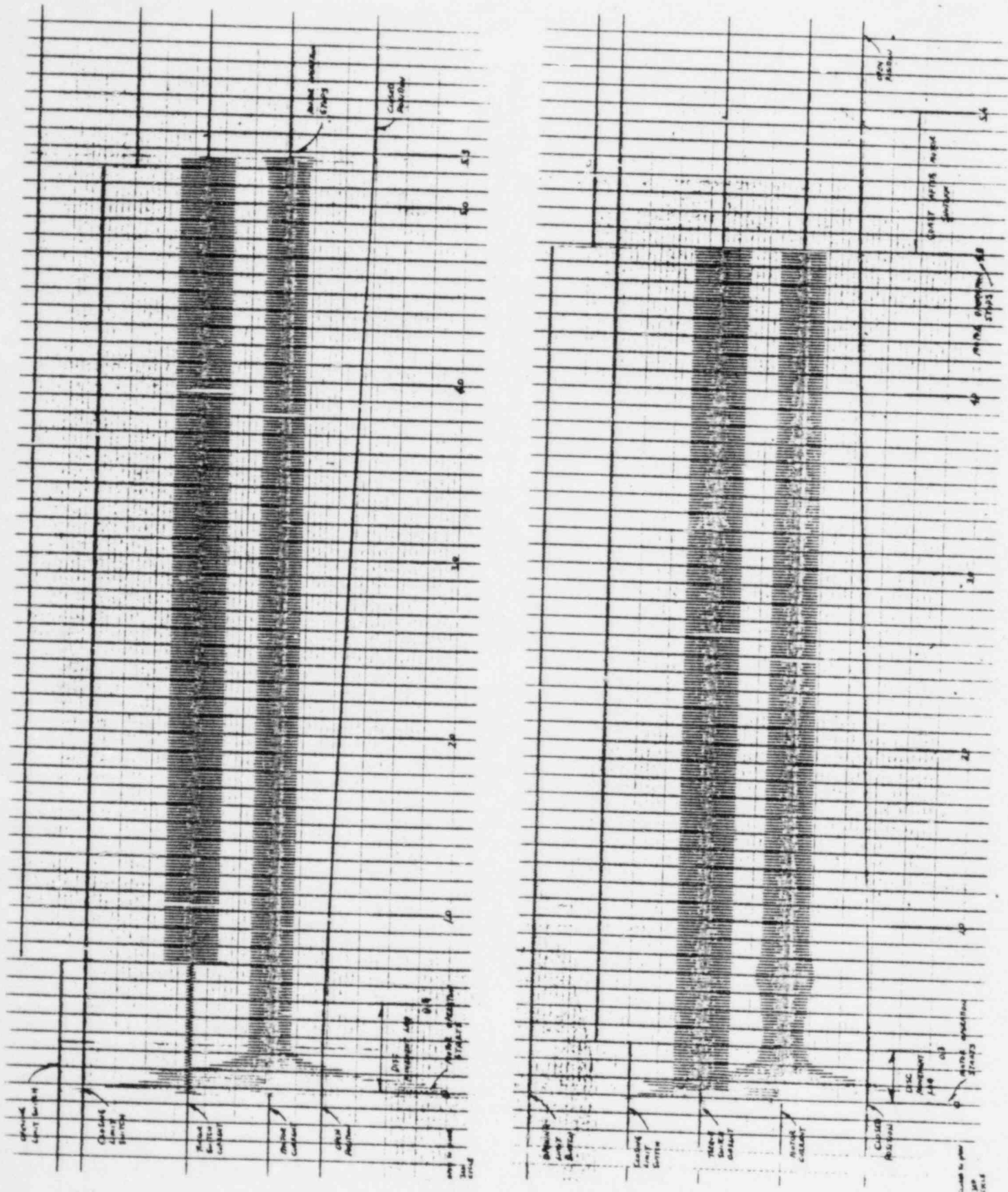
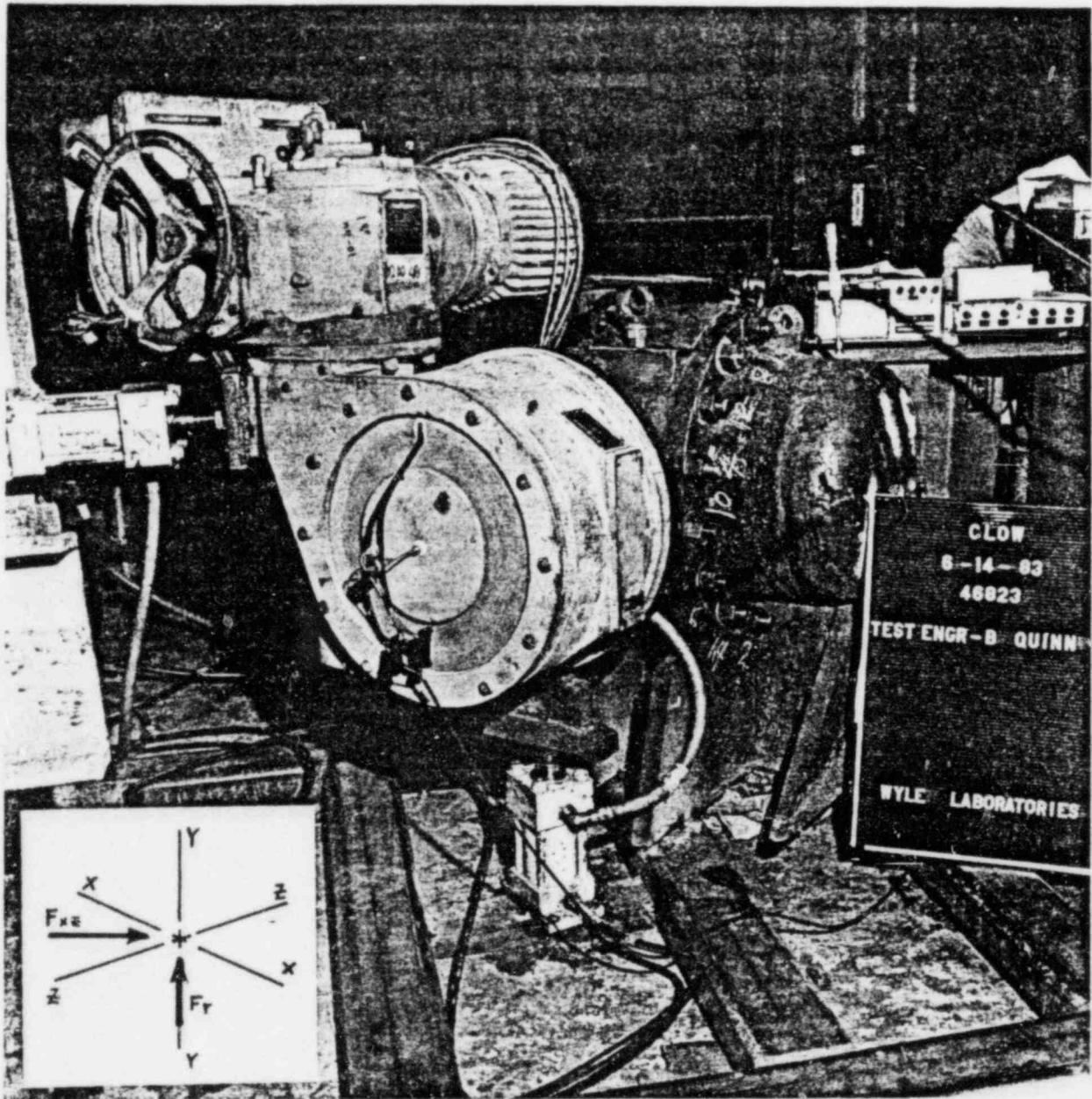


FIGURE 1. REPRESENTATIVE SECTION OF OSCILLOGRAPH RECORDS OF ELECTRICAL MONITORING CHANNELS



PHOTOGRAPH 1

TEST SETUP FOR STATIC LOAD TESTING

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APPENDIX I

INSTRUMENTATION EQUIPMENT SHEETS

Page 1 of 1

Test Area PIT #1 SEISMIC AREA

Type Test STATIC LOAD

Page No. 14
Report No. 46823-1

Checked & Received By Bobby L. Quinn 6/14/83

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APPENDIX II

STATIC LOAD TEST PROCEDURE

Page No. 18
Report No. 46823-1

WYLE SCIENTIFIC SERVICES & SYSTEMS GROUP
LABORATORIES P. O. Box 1008 • Huntsville, Alabama 35807
TWX(810) 726-2225 • TELEPHONE (205) 837-4411

TEST PROCEDURE NO. 541/0465/WB

DATE: May 25, 1983

Revision A

J/N 46823

STATIC LOAD TEST PROCEDURE FOR AN 18-INCH VALVE ASSEMBLY

FOR

CLOW CORPORATION
WESTMONT, ILLINOIS

APPROVED BY: _____
FOR: _____

APPROVED BY: _____
FOR: _____

APPROVED BY: _____
FOR: _____

APPROVED BY
PROJECT MANAGER: James H. Powell 5/24/83
APPROVED BY
QUALITY ENGINEER: U.B. Roberts 5/26/83
PREPARED BY
PROJECT ENGINEER: Robby L. Quinn 5/25/83

REVISIONS

FORM 1054-1 Rev. 4/74

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1.0 PURPOSE

The purpose of this test program is to seismically qualify an 18-inch Lugged Wafer Stop Valve Assembly (with a Limitorque Actuator) by statically loading the actuator and yoke of the valve with an equivalent static load of 4.5 g applied at the center of gravity of the actuator in each of the three (3) orthogonal specimen axes. The specimen temperature and humidity shall be ambient during the test program.

2.0 SPECIMEN DESCRIPTION AND MOUNTING

An 18-inch valve assembly (butterfly valve with an SMB-1-H5BC Limitorque actuator) as described on Clow Corporation Drawing Number D-0702, hereinafter referred to as the specimen, shall be attached to a Wyle-furnished test fixture as shown in Figure 1. The test fixture shall be welded to a rigid reaction frame.

3.0 STATIC LOAD

An equivalent static load of 4.5 g* shall be applied in line with the center of gravity of the actuator in each of the three (3) orthogonal specimen axes. The center of gravity of the actuator and a smooth, flat surface for the application of the static load shall be provided by Clow Corporation. The seat leakage differential pressure for the valve shall be simultaneously applied to the test fixture while the static load is applied. The specimen shall then be cycled while in the deflected mode as described in Paragraph 4.0.

The magnitude of the load shall be determined by multiplying the hydraulic pressure by the effective piston area of the hydraulic cylinders. The loads shall be applied simultaneously with one, two or three hydraulic cylinders. It is assumed that the static load can be applied in either the positive or negative direction.

*Assuming an actuator weight of 1220 pounds, the applied (or equivalent) static load shall be 5490 pounds in each orthogonal direction.

4.0 OPERABILITY TESTS

With the static loads applied, the specimen shall be stroked through three complete operating cycles: Open-to-closed with internal pressure; closed-to-open with differential seat leakage pressure.

The operating time in each direction of travel shall be recorded during each operating cycle.

5.0 SEAT LEAKAGE TESTS

Seat leakage tests shall be performed prior to and after the static load tests in accordance with Clow Corporation's "Pneumatic Seat Bubble Test" EPS 30-49-832. The leakage test duration shall be four (4) minutes.

6.0 PRE-TEST AND POST-TEST FUNCTIONAL OPERABILITY

Prior to and following the application of the static load, the specimen shall be stroked through four complete operating cycles.

7.0 ELECTRICAL POWER

Standard electrical power of 368 VAC, 3-phase, 60 Hz, shall be furnished for the operation of the specimen. The voltage shall be variable to 460 VAC for the pre-test and post-test baseline operability tests.

8.0 ELECTRICAL MONITORING

Five (5) electrical monitoring channels shall be provided to monitor the following:

- 1) A limit switch (which changes state in the opening direction).
- 2) A limit switch (which changes state in the closing direction).
- 3) Torque switch (which shuts off power at the end of the valve stroke).
- 4) Operating current.

8.0 ELECTRICAL MONITORING (Continued)

- 5) Valve disc motion (by attaching a rotary potentiometer to the rotating disc on the actuator).

The electrical monitoring channels shall be recorded on an oscillograph recorder.

9.0 PNEUMATIC PRESSURE

Pneumatic pressure of 55 psig shall be provided to perform the leakage tests described in Paragraph 5.0 and the cycling tests described in Paragraph 4.0.

10.0 IN-PROCESS INSPECTION

The records shall be checked for quality of performance after each test.

The specimen shall be examined for possible damage following each test.

All important loading effects shall be logged.

Photographs shall be taken of any noticeable physical damage that may occur.

11.0 REPORT

Five (5) copies of a certification-type test report for the valve shall be issued for approval subsequent to completion of testing. This report shall be signed by a Registered Professional Engineer and shall summarize the test results and conclusions, details and recommendations concerning deficiencies and repairs, and photographs of test setups, failures, test procedures, etc. The report shall also contain a list of test equipment used, calibrations, and Instrumentation Log Sheets.

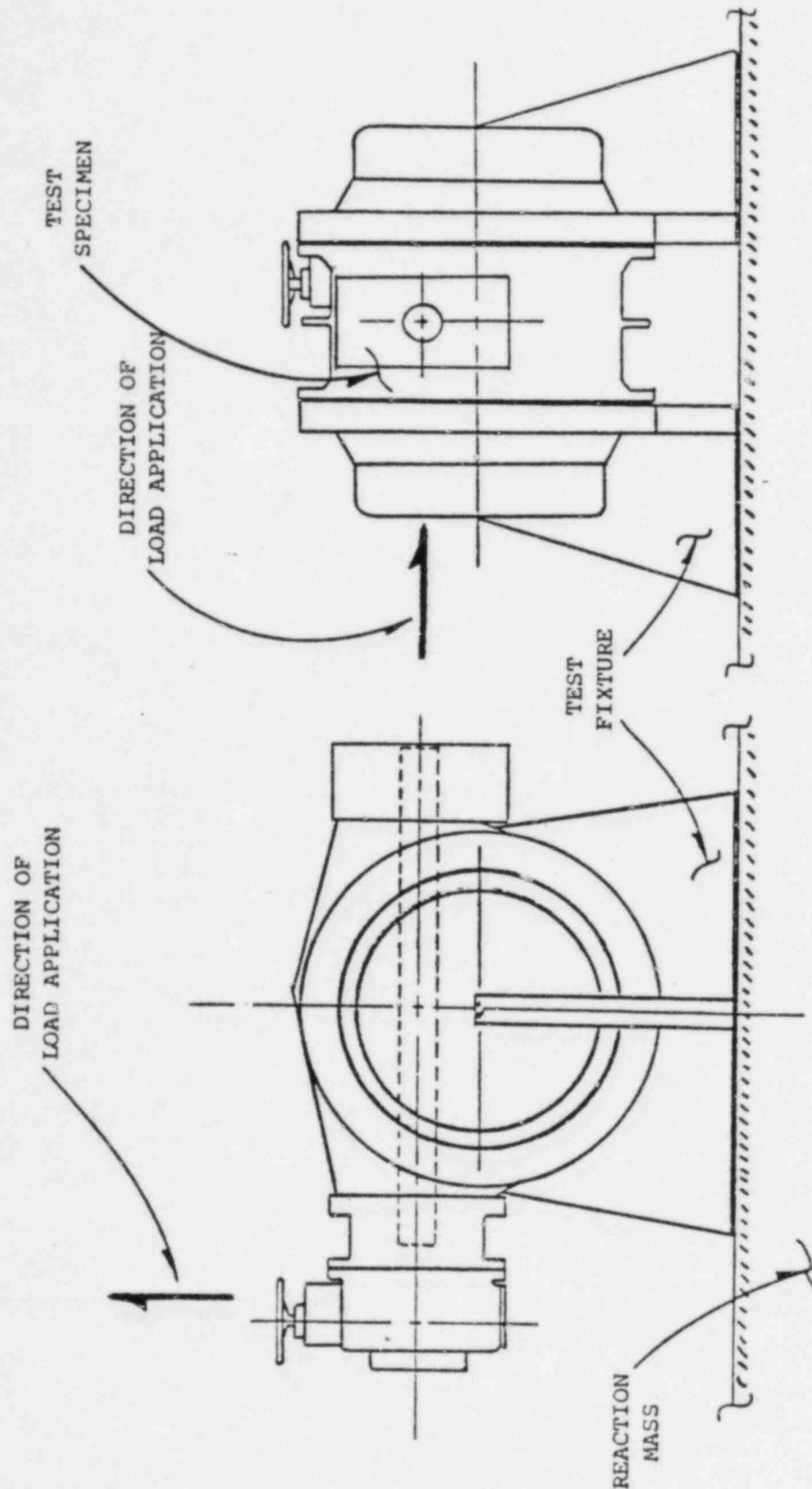


FIGURE 1.
SPECIMEN ORIENTATION AND
TEST FIXTURE ARRANGEMENT

APPENDIX III

WYLE LABORATORIES'
CERTIFICATION OF COMPLIANCE

WYLE
LABORATORIES SCIENTIFIC SERVICES & SYSTEMS GROUP

CERTIFICATE OF COMPLIANCE

NO.: Hsv/106
DATE: June 27, 1983
WYLE JOB NO.: 46823

Clow Corporation
40 Chestnut Avenue
Westmont, Illinois 60559

Gentlemen:

Wyle Laboratories certifies that an 18" Lugged Wafer Stop Valve with an SMB-1-H5BC Limitorque Actuator has been tested in compliance with Wyle Laboratories' Test Procedure 541/0465/WB, dated May 25, 1983, Revision A, and Clow Corporation's Purchase Order Number 30-11654 (Clow Job No. 82-2053-04(N)-01 for the Limerick Generating Station, Units 1 and 2). Additionally, these tests were performed in compliance with the guidelines of the following specifications:

- o Bechtel Corporation Specification 8031-P-144, Revision 1, dated July 22, 1982
- o Bechtel Corporation Specification 8031-G-11, Revision 15, dated May 7, 1979
- o Clow Corporation Drawing No. D-0/02
- o Limitorque Drawing No. 02-442-0497-2

The results of the testing conducted under the listed specifications have been completely and correctly conducted with accurate results, as documented in Wyle Laboratories' Test Report No. 46823-1 dated June 27, 1983.

STATE OF ALABAMA } ss.
COUNTY OF MADISON }

James H. Powell, Supervisor

being duly sworn,
deposes and says: The information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

SUBSCRIBED and sworn to before me this 30th day of June, 19 83

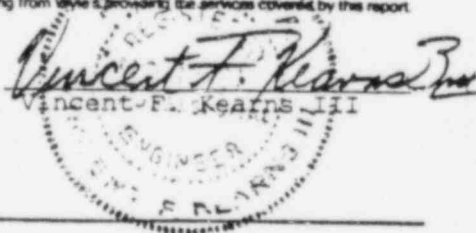
Virginia L. Dent

Notary Public in and for the State of Alabama-at large.

My Commission expires June 13, 19 87

Wyle shall have no liability for damages of any kind to person or property, including special or consequential damages, resulting from Wyle's providing the services covered by this report.

REGISTERED
PROFESSIONAL
ENGINEER



WYLE

LABORATORIES SCIENTIFIC SERVICES & SYSTEMS GROUP

APPENDIX B

BECHTEL QUESTIONS
(TELEX #160777 DATED 7-29-83)
WITH CLOW REPLY.

1
2 EDITOR TEN
* TEXT SIKED *

* IN

* ON LINE *

CLOW CORP WSMI

BECHTEL I SFO

SCA2 0063 22:39GMT
STWX 0041 22:41GMT 07/29/83

9106953538 CLOW CORP WSMI/
CMG80318X81640/941677

X4:
001/3613 7/29/83 1:25 P.M.
STWX-48
CLOW CORPORATION
40 CHESTNUT LANE
WESTMONT, ILL

CC VIA TELEX: PATEL ENGINEERING - SENT
3400 BLUESPRING ROAD, NW, SUITE B-3
P.O. BOX 3531
HUNTSVILLE, AL 35810
ATTENTION: ALAN DAVIDSON

ATTN: B. ALLEN
J. SROVATKA

SUBJECT: JOB NO. 8031 PHILADELPHIA ELECTRIC COMPANY
LIMERICK GENERATING STATION, UNITS 1 & 2
BECHTEL P.O. 8031-P-144-AC
SEISMIC QUALITY REPORT PEI-TK-63-29
N. P. NO. 8031-P-144-Y9-1

DOCUMENT CONTROL NBR: 160777

U R G E N T

GENTLEMEN:

CONFIRMING OUR TELECON OF 7/27/83, THE FOLLOWING COMMENTS TO THE
REFERENCED SEISMIC QUALIFICATION REPORT MUST BE RESOLVED EXPEDITIOUSLY
BY PATEL AND CLOW FOR RESUBMITTAL:

- COMMENTS:
- 1) TITLE PAGE - VALVES LISTED ON PAGE 2, SECTION 2.0
DID NOT INCLUDE TAG NO. AU-57-147. PLEASE
CLARIFY WHETHER THIS REPORT COVERS THIS VALVE OR
NOT, AND WHY.
 - 2) PAGE 1, PARA 1.2.2 - FIRST SENTENCE SHOULD BE
EXPANDED TO DESCRIBE WHEN INSPECTION WAS
PERFORMED. CERTAIN PARTS DID SUSTAIN DAMAGE.
 - 3) PAGE 2, SEC. 2 - THE 4" MOTOR OPERATED VALVE
ASSEMBLY AND THE 18" AIR OPERATED VALVE ASSEMBLY
HAVE NOT BEEN TESTED. PLEASE PROVIDE A STATEMENT
AS TO HOW THEY ARE QUALIFIED, (I.E., BY ENVELOPE
OF THE TESTED VALVES).
 - 4) PAGE 4, ITEM 4 - THE WORD "WATER" IS INCORRECT,
SHOULD READ "WAFER".

SEISMIC REPORT PEI-TK-63-29

- 5) PAGES 3, SEC. 4.3.1 - THE DATA ON THE CENTRIFUGAL
TEST IS NOT SUFFICIENT. SKETCH P-32 AND PHOTOS
P-42-44 DO NOT CLARIFY THAT THE TWO VALVES WERE
TESTED ON THE SAME CENTRIFUGAL. PLEASE VERIFY
THIS. ALSO, PLEASE PROVIDE THE SKETCH OF ROTATION

67 PAGE 9, ITEM 3.1.2 - PLEASE EXPLAIN THIS FROM TO NOTE THAT SEVERITY OF SSE TEST WAS THE BASIS FOR THIS ORIGINALLY 2.0, CONSIDERABLE MORE CYCLES AT HIGHER G LEVELS WERE INPUT INTO THE UNIT TO ACCOUNT FOR HAVING AT LOW OPERATING LEVELS.

71 PAGE 9, PARA 3.1.2.1A - PLEASE EXPLAIN USE OF UCLAS. DID BIGGER AIR SPACE RESULT IN PROPER OPERATION EVEN THOUGH THERE WAS INADEQUATE AIR SUPPLY?

107 PAGE 8, PARA 3.1.2.2A - PLEASE EXPLAIN THE WORK "LIVE" FREQUENCY?

117 PAGE 10, PARA 3.3.3.3 - SHOULD READ PARA 11.

127 PAGE 10 - ORTHOGONAL IS MISPELLED IN 4TH LINE AT TOP OF PAGE.

137 PAGE 10, PARA 3.3.3.2.1 - NO MARGINS WERE USED IN USE, SOME FALL BELOW REQUIRED 3.00 - PLOTS 2,3,6,7.

147 PAGE 13, UIC, C - JUSTIFY USE OF 316 FI - ROSE INSTEAD OF 4YD AS REQUIRED.

157 PAGE 13, ITEM 8 - LEAKAGE RATE SHOWN IS OUT OF THE SPECIFICATION REQUIREMENTS, PLEASE CURRENTLY

167 PAGE 14 & 15 - OPERABILITY TIMES DO NOT MEET SPECIFICATIONS REQUIREMENTS. BECHTEL NEEDS JUSTIFICATION FOR THIS. PLEASE NOTE THAT THE SPECIFICATION HAS BEEN REVISED TO ACCEPT THESE CLOSING TIMES.

SEISMIC REPORT PEI-IR-83-29

177 PAGE 25, PARA 3.3.4.2 - OPERATING TIMES ON 6" VALVE DOES NOT MEET DESIGN REQUIREMENTS, PLEASE CURRENTLY.

187 PAGE 28, 29, 30 - LOCATIONS OF ACCELEROMETERS ARE NOT CLEAR. PAGE 30 DOES NOT SHOW ACCELEROMETER NO. 3-24" VALVE OPERATOR AS FIXTURE (CONTROL) RESPONSE.

197 PAGE 30 - INDICATES THAT FOR 24" VALVE OPERATOR ACCELEROMETER NO.4 MEASURES ACCELEROMETER AT FIXTURE (E CONTROL). HOWEVER, TABLE III, PAGE 27 INDICATES THAT ACCELEROMETER NO.4 HAS RESPONSE AS HIGH AS 27.2 IN X-AXIS AT 3 HZ. PLEASE EXPLAIN THIS APPARENTLY LARGE AMPLIFICATION.

207 THE RESULTS OF THE SSE TESTS HAVE NOT BEEN INCLUDED IN THIS REPORT. PLEASE SUBMIT.

217 GRAPHS SHOWN IN APPENDIX C OF REPORT (USE KIM TEST FOR 24" VALVE OPERATOR) INDICATE G LEVEL BELOW 3.0.0 (THIS WAS CORRECTED IN APPENDIX E FOR 6" VALVE OPERATOR). PLEASE PROVIDE EXPLANATIONS.

227 PLEASE LABEL WHICH GRAPHS ARE FROM RETESTS.

237 DOES SIMPLY STATE A DEVIATION WITHOUT ANY RATIONALE OR JUSTIFICATION, PLEASE PROVIDE SOME THING.

247 SSE PLOTS ARE REQUIRED - AT A MINIMUM, ACCELERATION VS FREQUENCY OR A TABULATION OF THIS DATA SHOULD BE PROVIDED.

257 PHOTOS REPRODUCED AND INCLUDED IN REPORTS ARE ILLEGIBLE. PLEASE SUBMIT ACTUAL



Clow Corporation
Engineered Products Division

40 Chestnut Avenue
Westmont, IL 60559

312 789-8900

August 3, 1983

BECHTEL POWER CORPORATION
P.O. Box 3965
San Francisco, CA 94119

Attention: Mark Schletz

SUBJECT: Response to Bechtel Telex 160777 of 7/29/83
covering comments and questions on Report PEI-TR-83-29
Ref. 8031-P-144-99-1
Clow Job 82-2053(N)

Gentlemen,

From the 25 listed items, all but 5 have previously been responded to by our sub-contractor, Patel Engineers, Huntsville, Alabama. Five items require response from Clow. These items are numbered 14, 15, 16, 17 and 23 on the subject telex. The responses which follow will be incorporated as part of the report by a Clow produced Addenda.

Responses --

Item 14 -- Clow selects appropriate size actuators to provide for the required leakage based on calculation and previous experience. Due to variations in manufacture of the valve, actuator output torques are selected with a margin (50% or more) over what may actually be required to seal the valve. The subject unit did not produce the required torque as guaranteed by Bettis, yet it did provide sufficient torque to seal the valve (see Item 15 response). Bettis guarantees a torque of 5510 in-lbs. Previous information Bettis (Bettis Sheet ASK 891, not provided to Bechtel) had indicated an expected torque of 5950 in-lb. (495 ft-lb) and was the source of the assumed 495 ft-lb output torque. During testing at NTS, this low torque was questioned and presented to the Clow representative. The Clow representative based on his knowledge of typical torque margins determined the test should continue. A subsequent test at Clow using strain gage measurement showed the torque to actually be on the order of 350 ft-lb. The output torque actually obtained must be sufficient to perform the required sealing function and overcome any aerodynamic torques tending to resist valve closure under emergency conditions. Since all aerodynamic torques tend to close the valve (Ref. Clow Purge and Vent Valve Operability Qualification Analysis Report No. 6-06-83) this does not present a minimum torque criteria. Thus, sealing of the valve becomes the primary criteria for minimum torque. Clow tests, as witnessed by the Bechtel inspector, insures sufficient torque was available to meet required leakage values.



August 3, 1983

BECHTEL POWER CORPORATION
San Francisco, CA 94119

Attention: Mark Schletz

Item 15 -- When leakage was measured at NTS for valve (AO-57-121 (Clow 82-2053-03(N)-01) leakage was out of spec. Since inadequate facilities were available at NTS to correct the problem and Bechtel required the testing process to be expedited, Clow decided the test would be valid if it showed that leakage before and after the test did not differ significantly. The test results did validate this. Subsequent to the tests and prior to shipment, Clow made appropriate adjustments to the seal assembly to meet spec leakage requirements. Clow's position is that the required seismic tests will not alter the leakage rate significantly. Thus, if appropriate leakage rates are met prior to a seismic event, the valve will seal as required during and after such an event. Tests on the 6" motor operated valves further validate this.

Item 16 -- The operational times indicated in the report are out of spec. and beyond the previously requested deviation amount of 5.3 seconds. For the 6" M.O. valve the recorded post operational time is 5.5 seconds. Post operational tests at Clow's Westmont plant indicate 5.3 to 5.4 sec. for O-C, 5.2 to 5.3 for C-O operation at minimum voltage. The Clow representative present during tests at NTS advises that pre and post operational tests were timed with a hand-held stop watch by two different individuals. The time was based on viewing the indicator on the cover plate. Time tests at Clow were run with an electric stop watch activated by the start control signal and de-activated by dropout of the motor contactor (as controlled by the actuator torque switch). Clow feels that the .1 or less second difference between Clow measured time and the approved spec deviation time (5.3 sec) can be accepted by Bechtel. As a further basis for acceptance, Clow contends that the valve may in fact be closed (seal in complete contact with seat) before the torque switch causes the motor contactor to drop out. This may account for as much as .3 to .5 seconds depending on shaft windup (smaller valves have greater windup). For the air operated valve test the C-O cycle ran 5.2 seconds. Clow understands that this does not meet spec but we believe it is acceptable from the position that at 5.0 seconds, the valve will be open 95% of its full amount and more than approx 98% of the valves flow capacity will be available. Further, the valves main safety related function is to close.

Item 17 -- The data presented on pg. 25 for performance during static test indicates times well out of spec requirements. It appears NTS recorded results may not be correct as a correlation between Table I and Appendix B data is not apparent. Clow, through our sub-contractor, Patel, has requested that NTS review test records covering these times to see what actual results were. The known timing methods for pre and post operation are indicated in our response to Item 16 above.



August 3, 1983

BECHTEL POWER CORPORATION
San Francisco, CA 94119

Attention: Mark Schletz

For the test during static loading (on a centrifuge), the same timing method was not feasible, thus NTS apparently used motor current draw times as the measured criteria. First, Clow's evaluation of the motor current draw plots would not support a 6.8 sec operational time. Clow's measurement would suggest 6.3 to 6.4 sec for all cycles. Two problems exist with the test and the method of measurement. First, the valve must be closed (physical contact between seal and seat) before torque of any significant magnitude is sensed by the torque switch. This can give additional time for motor current draw of .3 to .5 seconds after the valve is physically closed (Section 16). Second, centrifuge static loading produces a unidirectional load not truly representative of a seismic load. A conversation with Limitorque qualification personnel (Joe Drab) suggests that such a unidirectional load may cause higher than normal bearing and motor end loadings, thus reducing the speed. The Wyle report No. 46823-1 shows that a time increase is not due to valve binding since static loading using a hydraulic cylinder showed no difference in time between load and no load conditions. From the above it seems reasonable to expect the valve assembly to cycle in a time period close to the pre and post test values, if subjected to a seismic or other dynamic load with some frequency content.

Item 23 -- The following responses give justification or rationale for all NOD's.

NOD No. D-1: Junction boxes were mounted by Bettis and the bolt sizing problem was not apparent until the box came loose during the test. Clow has inspected and corrected this problem on all units which were not shipped before this problem was detected. Clow will make arrangements to inspect and/or correct this problem on units which were shipped before this problem was known.

NOD No. D-2: For this notice of deviation no valve actuator problems were present. The failure resulted from the NTS setup providing an inadequate air supply to the actuator.

NOD No. D-3: Same response as to D-2.

NOD No. D-4: Explanation given in response to Item 14 above.

NOD No. D05: Copper line mounting by Bettis was inadequate for the required seismic test conditions. The test was continued after shortening the line length to increase response frequency. Knowledge gained from the test was used as basis for determining design corrections.



August 3, 1983

BECHTEL POWER CORPORATION
San Francisco, CA

Attention: Mark Schletz

NOD No. D-5: Justification and/or explanation is covered by response to Tele x Item 23 which was provided by Patel.

NOD No. D-7: This item was an unexpected occurrence and was an item of knowledge used to modify the actuator-valve system design. Again, units previously shipped will be corrected.

NOD No. 9: See response to Item 16 above.

NOD No. D-10: Gasket was not required for pressure retention or actuator function. Test was continued since gasket was non-essential to operation. Gasket was replaced later at Clow and should be replaced in field if a similar problem is noted after visual examination.

NOD No. D-11: Test was continued based on belief that tube was damaged in handling and that tube failure would allow unit to provide its safety related function of closing. Tube should be inspected in field for damage in handling.

NOD No. D-12: See response to Item 16 above.

If you have any further questions, please advise.

Sincerely,

John Sirovatka,
Manager-Contract Administrator

JS:hf

APPENDIX C

PATEL ENGINEERS, INC.
REPLY TO BECHTEL QUESTIONS



patel engineers
patel enterprises, inc.

3400 blue spring rd. nw • suite b-3 • p. o. box 3531 huntsville, alabama 35810
205-859-5000

July 29, 1983

Bechtel Power Corporation
P.O. Box 3965
San Francisco, CA 94119

Attention: Mr. Mark Schletz

Subject: PEI Response to Bechtel Comments from EQG No. 1275D

Reference: Patel Engineers Technical Report PEI-TR-83-29

Gentlemen:

The following is Patel response to the subject Bechtel comments:

- 4a) #57-147 is tag number for 24-inch motor operated valve and its dynamic qualification is not included in PEI-TR-83-29. Mention of #57-147 will be deleted from the title page of PEI-TR-83-29.
- 4b) The 4-inch motor operated and 18-inch air operated valve assemblies are qualified by similarity, due to the qualification "band" of 8031-P-144.
- 4c) The two valves were tested on different centerfuges. We will request that NTS provide you with the rotational speed of each centerfuge used. We will also request that they provide a sketch of monitoring details.
- ✓ 4d) Pages 28-30 of Appendix A of the subject report will be revised to include notes discussing location and tag number of control accelerometers.
- 4e) Patel will supply Bechtel with original photographs contained in the subject report. It is hoped that these photographs will clarify the location and mounting of the subject hardware.

Bechtel Power Corporation
Mr. Mark Schletz
July 29, 1983

Page 2

- 4f) Accelerometer number 4 is located on the spring can support which is part of the test fixture itself. It is felt that what appears to be a large Q factor is only the spring rattling inside the can, producing broad frequency "noise" picked up by accelerometer number 4. We will add a paragraph discussing this in the referenced report.
- 4g) We will request that NTS provide the SSE data required in either tabular or plot form for each valve tested.
- 4h) PEI will request NTS to respond to this matter. We will request that attention be given to the overtest levels of the SSE environments.
- 4i) There were no "re-tests" for OBE levels. The "re-tests" were performed on the 24-inch Bettis unit for the SSE condition.

If you have any questions or comments concerning this response, please feel free to call.

Sincerely,

N. Allen Davidson

N. Allen Davidson
Structural Dynamist
Nuclear Power Services

NAD/jb

cc: Mr. J. E. Krueger,
Clow/Frisch Corporation

Telecopy

REQUEST FOR TELECOPY BY FACH:
LINERICK GENERATING STATION:
UNITS 1 & 2, Job No. 8021

CONTROLLED DOCUMENT
COPY 2 2

TO: N. ALLEN DAVIDSON (Name)
DATTEL ENGINEERS (Company)
HUNTSVILLE ALABAMA (City & State)

VIA (205) 859-5000 (Receiving Facsimile)
Phone Number

FROM: FRANCIS LEUNG (415) 768-8265

LINERICK PROJECT - JOB 8021

RIGHTEL POWER CORP. S. F., CA

FACSIMILE PHONE NO. - 415-892-3543 (IM 9260)

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EQD No. 1275D

Sheet 1 of 3

EQUIPMENT QUALIFICATION GROUP
REVIEW DESCRIPTION SHEET

Description

DOCUMENT REVIEWED:

a) V.F. 8031-P.144-79-1 ———— BASIC QUALIFICATION OF GLOW
WAFER STOP VALVE ASSEMBLIES JOB
NUMBER 92-2053-01(N), -02(N), -03(N),
-05(N), -07(N), TECHNICAL
REPORT PEI-TR-83-29 BY
PATAL ENGINEERS, JULY 14, 1983

REFERENCE DOCUMENTS:

a) M/R 8031-P.144 REV. 2

b) SPECIFICATION 8031-P.144 REV 2

c) V.P. 8031-P.144-27-2 TECHNICAL REPORT PEI-TR-92-35-1 REV. 1

d) V.P. 8031-P.144-26-2 NUCLEAR TEST PROCEDURE 528-0951 08/1/84

REVIEW SUMMARY:

THIS DOCUMENT IS THE TEST REPORT FOR GLOW BUTTERFLY VALVES
WITH BETTS AIR-ACTUATOR OR LIMTORQUE MOTOR-OPERATOR. IT CONSISTS
OF (i) A DESCRIPTION AND SUMMARY OF THE TESTS BY PATAL
ENGINEERS AND (ii) THE TEST REPORT PERFORMED BY NATIONAL
TECHNICAL SYSTEMS. THE TESTS INCLUDE BASELINE FUNCTIONAL
TEST, RESONANCE SURVEY, CENTRIFUGAL PULL TEST AND DYNAMIC RIM
TEST FOR 6" AND 24" VALVES

FOR COMMENTS, SEE SHEET 2

EQUIPMENT QUALIFICATION GROUP
COMMENT SHEET

Item	Comments	Resolution
Init.	Date	
4	COMMENTS TO VENDOR:	
	a) TITLE PAGE - 24" VALVE # 57-147, IS MOTOR-OPERATED AND IS NOT LISTED IN P.2, SEC.2.D. PLEASE CLARIFY WHETHER THIS REPORT COVERS IT OR NOT AND WHY	
	b) P.2, SEC.2 - THE 4" MOTOR-OPERATED VALVE ASSEMBLY AND THE 18" AIR-OPERATED VALVE ASSEMBLY HAVE NOT BEEN TESTED. PLEASE PROVIDE A STATEMENT AS TO HOW THEY ARE QUALIFIED, I.E. BY ENVELOP OF THE TESTED VALVES, IF THEY ARE SO QUALIFIED	
	c) P.5, SEC.4.3) - THE DATA OF THE CENTRIFUGE TEST IS NOT SUFFICIENT. FROM THE SKETCH (P.52) AND PHOTOS (P.42 - 44), IT IS NOT CLEAR THAT THE TWO VALVES ARE TESTED ON THE SAME CENTRIFUGE. PLEASE VERIFY, AND ALSO PROVIDE THE SKETCH OF MOUNTING DETAILS, AND THE SPEED OF REVOLUTION, FOR THESE TESTS.	
	d) APPENDIX A, P.28 - P.30 - THE LOCATIONS OF ACCELEROMETER ARE NOT CLEAR. FOR 24" VALVE OPERATOR, ACCELEROMETER #5 (MENTIONED IN APPENDIX C OF REPORT) AS FIXTURE (CONTROL) RESPONSE IS NOT SHOWN IN P.30. FOR 6" VALVE ACTUATOR, ACCEL #6 (MENTIONED IN APPENDIX D OF REPORT AS FIXTURE RESPONSE) IS NOT DESCRIBED AS CONTROL ACCELEROMETER IN P.29 BUT ACCEL #5 IS. PLEASE CLARIFY	

EQUIPMENT QUALIFICATION GROUP
 COMMENT SHEET

Item	Comments	Resolution	
		Init.	Date
4	COMMENTS TO VENDOR (CONT'D)		
	2) THE MOUNTING DETAILS ARE NOT CLEAR FROM THE REPRODUCTION OF LAB PHOTOGRAPHS, FOR THE DYNAMIC TESTS. PLEASE CLARIFY THE LOCATION AND HARDWARE OF MOUNTING.		
	f) P. 30 OF REPORT INDICATES THAT FOR 24" VALVE OPERATOR, ACCEL. #4 MEASURES ACCELERATION AT FIXTURE, I.E. CONTROL. HOWEVER, TABLE III RESONANCE SURVEY RESULTS (P. 27 IN REPORT) INDICATES THAT THIS #4 ACCELEROMETER HAS RESPONSE AS HIGH AS 27.2 IN X-AXIS AT 31 Hz. PLEASE EXPLAIN THIS APPARENTLY LARGE AMPLIFICATION.		
	g) THE RESULTS OF THE SSE TESTS HAVE NOT BEEN INCLUDED IN THIS DOCUMENT. PLEASE PROVIDE.		
	h) MOST OF THE GRAPHS SHOWN IN APPENDIX C OF REPORT (OBSERVATION TEST FOR 24" VALVE OPERATOR) INDICATE g LEVEL BELOW 3.0g. (THIS HAS BEEN CORRECTED IN APPENDIX D FOR 6" VALVE OPERATOR). EVEN THOUGH THIS HAS NO APPARENT IMPACT ON QUALIFICATION, PLEASE PROVIDE EXPLANATIONS.		
	i) PLEASE LABEL WHICH GRAPHS ARE FROM RESULTS OF RETESTS.		



patel engineers
patel enterprises, inc.

3400 blue spring rd. nw • suite b-3 • p. o. box 3531 huntsville, alabama 35810
205-859-5000

August 1, 1983

Page 1 of 4

Bechtel Power Corporation
P.O. Box 3965
San Francisco, CA 94119

Attention: Mr. Mark Schletz

Subject: PEI response to Additional Bechtel Comments from Telex
Dated July 28, 1983, four pages.

Reference: PEI Technical Report PEI-TR-83-29, Job No. 8220

Gentlemen:

The following is a Patel response to the additional Bechtel comments:

Page 1; Para. 1.2.2:

First sentence will be modified to describe when inspections were made. Operator parts, that did sustain seismically induced damage, had design modifications made on site. The modified units successfully completed the qualification program with no visible damage.

Page 4; Item 4:

"Water" will be changed to "wafer"

Page 6; Para. 4.3.2.1:

"Operating Basis Event" will be changed to read "Operating Basis Earthquake". "Safe Shutdown Event" will be changed to "Safe Shutdown Earthquake". Mark I will read Mark II.

Page 8, Item 5,6,7:

"After OBE" will be deleted and clarification will be given to insure these items be treated during normal maintenance or shutdown periods.

Bechtel Power Corporation
Mr. Mark Schletz
August 1, 1983

Page 2

Comments to NTS Test Report (Appendix A of PEI-TR-83-29)

Page 8; Item 5.2:

This paragraph will be expanded to note that the severity of the SSE test was the basis for this mission. (i.e., considerably more cycles at higher G levels were input into the unit to account for vibrational aging at lower operating levels.

Page 6; Para. 5.1.2.1A:

The description of the problem with the air supply will be more adequately explained. This will include deletion of the word "Ullage" and addition of discussion centered around the small compressor used during the initial tests. This small unit could not meet the volumetric flow requirements of the large Bettis operator. The re-test functionals, using house air, proved this to be the case.

Page 6; Para. 5.1.2.2.A:

I believe "live frequency" is actually referring to the voltage being AC rather than DC. With the mentioning of 60Hz frequency, this is obviously a redundant comment. "Live frequency" will be deleted.

Page 10; Para. 5.3.3.3:

Mark I will be replaced by Mark II

Page 10; Top of Page:

Orthogonal will be spelled correctly.

PEI

Bechtel Power Corporation
Mr. Mark Schletz
August 1, 1983

Page 3

Page 10; Para. 5.3.3.2.1:

We will request NTS to explain why the 3.0g levels were not reached through the entire OBE tests. A discussion of overtest of the SSE levels will be used to help justify the inconsistency of the OBE tests.

Page 13; Item C:

Clow Corporation will address torque justification.

Page 15; Item B:

The test procedure shows no failure criteria for seat leakage. Clow will deal with Bechtel on this issue.

Page 14 and 15:

Clow Corporation will deal with justification for out of specification operating times. After PEI is notified of revised allowable operating times, a note will be added to the report discussion acceptance of these times.

Page 25; Para. 5.3.4.2:

Clow Corporation will address operating times of the 6-inch motor operated valve assembly.

General:

- 1) Original photographs will be sent to Bechtel. We were unable to make any better copies.
- 2) The function of the NOD is only to report the deviation. Any problem arising from the presentation of the NODs must be addressed by Clow Corporation.
- 3) Patel will request that NTS provide acceleration versus frequency data for the SSE tests. This may be in either tabular or plot form.

pe

Page 4 of 4

Bechtel Power Corporation
Mr. Mark Schletz
August 1, 1983

Page 4

If you have any questions or comments concerning this response please feel free to call.

Sincerely,

N. Allen Davidson

N. Allen Davidson
Structural Dynamist

NAD/jb

cc: Mr. J. E. Krueger,
Clow/Frisch Corporation

pep

Telecopy

REQUEST FOR TELECOPY by PDCC
LIMERICK GENERATING STATION
UNITS 1 & 2, Job No. 2031

TO: N. ALLEN DAVIDSON (Name)
PATEL ENGINEERS (Company)
HUNTSVILLE, ALABAMA (City & State)

VIA 205 859-5000 (Receiving Facsimile)
Phone Number

FROM: MARK SCHLETZ
LIMERICK PROJECT - JOB 2031
BECHTEL POWER CORP. S. F., CA
FACSIMILE PHONE NO. - 415-882-3543 (BM 9160)
INFORMATION PHONE NO. - 415-788-8224

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COMMENTS ON TECHNICAL REPORT PEI-TR-83-29

PAGE

- 1 PARA 1.2.2 FIRST SENTENCE SHOULD BE EXPANDED TO DESCRIBE WHEN INSPECTION WAS PERFORMED CERTAIN PARTS DID SUSTAIN DAMAGE.
- 4 ITEM (4) WATER SHOULD BE WAFER
- 6 4.3.2.1 & 2 OBE SHOULD BE OPERATING BASIS EARTHQUAKE, SSE .SAFE SHUTDOWN EARTHQUAKE, SHOULD BE MARK II NOT MARK I
- 8 ITEM 5(6) & 7) REMOVE "AFTER OBE", THESE ITEMS SHOULD BE TREATED DURING NORMAL MAINTENANCE OR SHUTDOWN PERIODS.

REPORT 528-0951, REV. A

- 8 ITEM 5.2 PLEASE EXPAND THIS PARA TO NOTE THAT SEVERITY OF SSE TEST WAS THE BASIS FOR THIS OMISSION EG. CONSIDERABLY MORE CYCLES AT HIGHER G LEVELS WERE INPUT INTO THE UNIT TO ACCOUNT FOR AGING AT LOW OPERATING LEVELS.

6 PARA 5.12.1 A

PLEASE EXPLAIN USE OF
ULLAGE. DID BIGGER AIR
SPACE RESULT IN PROPER
OPERATION EVEN THOUGH
THERE WAS INADEQUATE AIR
SUPPLY?

6 PARA 5.1.2.2 A

"LIVE" FREQ?

10 PARA 5.3.3.3

SHOULD BE MARK II

10 TOP

ALSO ORTHOGONAL IS MISPELLED
IN 4TH LINE AT TOP OF PAGE

10 S.3.3.2.1

NO MARGINS WERE USED IN
OBE, SOME FALL BELOW
REQD 3.0; PLOTS 2,3,8,9

13 ITEM C

JUSTIFY USE OF 318 FT-LBS
INSTEAD OF 495 AS REQD

15 ITEM B

LEAKAGE SHOWN IS OUT OF
SPEC?

14/15

OPERATING TIMES DO NOT
MEET SPEC REQUIREMENTS.
NEED JUSTIFICATION FOR
THIS. PLEASE NOTE SPEC
HAS BEEN REVISED TO
ACCEPT THESE TIMES.

25 S.3.4.2

OPERATING TIMES ON 6" TOO SLOW?

GENERAL

1) PHOTOS OR "MUCH" BETTER

- 2) NODS SIMPLY STATE A
DEVIATION WITHOUT ANY
RATIONALE OR JUSTIFICATION
PLEASE PROVIDE SOMETHING
- 3) SSE PLOTS ARE REQUIRED —
AT A MINIMUM, PEAK
ACCELERATION VS FREQUENCY
OR A TABULATION OF THIS
DATA SHOULD BE INCLUDED



patel engineers
patel enterprises, inc

3400 blue spring rd. nw • suite a-3 • p. o. box 3531 huntsville, alabama 35810
205-859-5000

August 4, 1983

Bechtel Power Corporation
P.O. Box 3965
San Francisco, CA 94119

CONTROLLED DOCUMENT
COPY 2 OF 2

Attention: Mr. Mark Schletz

Subject: NTS Response to Bechtel Comments

Reference: Patel Engineers Technical Report PEI-TR-83-29

Gentlemen:

NTS has responded to the subject comments in the following manner:

Page 6 Paragraph 5.1.2.1 A:

NTS shall delete the sentence: "The baseline test was repeated..."

NTS shall insert the sentence: "Careful investigation of the test setup revealed that the air compressor used to operate the 24-inch air operated actuator was unable to supply sufficient volumetric flow to meet the requirements of the 24-inch operator. The test setup was modified to meet the volumetric flow requirements of the 24-inch operator and operability was verified before and after the partial dynamics retest, reference page 12."

Page 6, Paragraph 5.1.2.2 A:

NTS shall delete "live frequency."

Page 8 Paragraph 5.2:

NTS shall include the sentence: "The fatigue cycles from vibration cycling are insignificant compared to the number of fatigue cycles and high acceleration levels induced during the SSE test exposure."

Page 10, Paragraph 5.3.3.3:

Mark II shall replace "Mark I."

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Page 10, top of page:

The spelling of "orthogonal" shall be corrected.

Page 10, Paragraph 5.3.3.2.1:

After the third sentence, NTS shall insert the sentence: "Due to the inherent characteristics of the test machine, NTS was unable to meet the OBE test levels at low frequencies. Additional SSE testing was conducted in excess of the OBE test levels, reference Figure 4.

Pages 28, 29, 30:

NTS shall include a note on each page to clarify control accelerometer location and number.

Page 27, Paragraph 5.3.2.3:

After the fourth sentence, NTS shall insert the following sentence: "A high acceleration amplification signal (27.2 g) was noted at 31 Hz in the X axis for the accelerometer located on the spring can (accelerometer #4). This amplification was determined to have resulted from rattling and impacting of the spring on the spring can. This amplification does not represent a global resonance of the test specimen."

General Comments:

1. General comment 1 may represent a cost impact as well as a scheduling problem. An acceleration versus frequency matrix may be out-of-scope of the original purchase order. NTS will advise Patel of the additional cost, if any.
2.
 - a) NTS shall include the centrifuge arm radius used for each unit statically tested.
 - b) NTS shall include centrifuge speed of revolution for each unit statically tested.

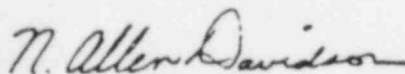
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c) In accordance with NTS telephone conversation with Patel on 8/3/83, the word "monitoring" in the Patel letter to NTS shall read "Mounting." Patel has informed NTS that the original photographs shall be mailed to Bechtel to clarify the mounting orientation of the test articles. No further action by NTS was required for this comments.

3. Valve operating times were generally determined by visual inspection of the rotating cam and utilization of a stop watch as described in Paragraph 5.2.1.2. As this method of obtaining accurate valve operating times was not appropriate during static testing, the operating times were recorded indirectly by monitoring current draw to the valve. The current versus time traces shown on Pages B-3 and B-4 of the report show valve operating times of 6.0 seconds for each close to open and open to close operation cycle during testing. The times on page 25 shall be corrected to correspond with the traces shown on Pages B-3 and B-4. The calibration of the recording device has been verified. The accuracy of the device is three percent. The pre and post operating times shown on Page 14 may appear to be inconsistent with those shown on the traces, reference Pages B-1 and B-5. Due to the operating characteristics of the valve, valve seating and cam movement may stop prior to cessation of current draw. This reason may explain why the pre and post operating times, recorded by visual inspection of the cam, were shorter than those times shown on the traces. NTS shall label those traces used to obtain data for Pages 25.

NTS has promised that Patel will receive Revision C of their report on Wednesday, August 10, 1983. If you have any additional questions or comments please feel free to call.

Sincerely,



N. Allen Davidson
Structural Dynamist

NAD/jb





patel engineers
patel enterprises, inc.

Page 1 of 2

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205-859-5000

August 1, 1983

Clow/Frisch Corporation
40 Chestnut Avenue
Westmont, IL 60559

Attention: Mr. J.E. Krueger

Subject: Bechtel Comments to PEI-TR-83-29 that need be addressed
by Clow Corporation

Reference: Patel Job No. 8220, Clow P.O. No. 30-10469,
Clow Job No. 82-2053-(N)-ALL

Gentlemen:

The following are Bechtel comments to the subject report that need to be addressed by Clow. All items fall under the NTS test report section of the subject report.

Page 13, Item C:

Justifies the use of 318 ft-lbs instead of 495 ft-lb as required.

Page 15, Item B:

Leakage shown is out of specification.

Page 14 and 15:

Operating times do not meet specification requirements. Need justification for this. Please note specification has been revised to accept these times.

Pages 25; 5.3.3.2:

Operating times too slow.

Please advise PEI of your resolution so that we may incorporate them into our report if necessary.

Clow/Frisch Corporation
Mr. J.E. Krueger
August 1, 1983

Page 2

General:

Bechtel mentioned that the NODs simply state the deviation without providing rationale or justification. PEI explained to Bechtel that during the tests, that is the sole function of the NODs. Any rationale or justification would need to be discussed with Clow Corporation. (This mainly refers to NODs issued for out of tolerance operating times and torques.)

If it is hoped that when Bechtel couples the resolution to these items with the additional Patel responses, that all issues concerning the seismic qualification will be resolved. If you have any questions or comments concerning this matter, please feel free to call.

Sincerely,

N. Allen Davidson

N. Allen Davidson
Structural Dynamist

NAD/jb

cc: Mr. Mark Schletz
Bechtel Power Corporation

PEI