ATTACHMENT 3

NRC DOCKET 50-366
OPERATING LICENSE NPF-5
EDWIN I. HATCH NUCLEAR PLANT UNIT 2
PROPOSAL FOR TECHNICAL SPECIFICATION CHANGES
PURGE VALVE OPERATION

The proposed change to the Technical Specification (Appendix A to Operating License) would be incorporated as follows:

Remove Page	Insert Page
3/4.6-2	3/4.6-2
-----	3/4.6-46
B 3/4 6-6	B 3/4 6-6

SURVEILLANCE REQUIREMENTS (Continued)

b. By verifying each containment airlock OPERABLE per Specification 3.6.1.3.

c. By verifying the suppression chamber OPERABLF per Specification 3.6.2.1.

PRIMARY CONTAINMENT PURGE SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.6.5 The drywell and suppression chamber 18 inch purge supply and exhaust isolation valves shall be OPERABLE with:

a. Each valve may be open for purge system operation for inerting, deinerting and pressure control.

b. A leakage rate such that the provisions of Specification 3.6.1.2 are met.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2 and 3.

ACTION:

a. With an 18 inch drywell and suppression chamber purge supply and/or exhaust isolation valve(s) inoperable or open for other than inerting, deinerting or pressure control, close the open 18 inch valve(s) or otherwise isolate the penetration(s) within 4 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

SURVEILLANCE REQUIREMENTS

4.6.6.5 The primary containment purge system shall be demonstrated OPERABLE:

a. At least once per 31 days, when not purging and venting, by verifying that each 18 inch drywell and suppression chamber valve is closed.

b. At least once per 18 months by replacing the valve seat of each 18 inch drywell and suppression chamber purge supply and exhaust isolation valve having a resilient material seat and verifying that the leakage rate is within its limit.

CONTAINMENT ATMOSPHERE CONTROL (Continued)

The OPERABILITY of the systems required for the detection and control of hydrogen gas ensures that these systems will be available to maintain the hydrogen concentration within containment below its flammable limit during post-LOCA cpnditions Either recombiner is capable of controlling the expected hydrogen generation associated with: (1) zirconium-water reactions, (2) radiolytic decomposition of water, and (3) corrosion of metals within containment. The hydrogen mixing system is provided to ensure adequate mixing of the containment atmosphere following a LOCA. This mixing action will prevent localized accumulations of hydrogen from exceeding the flammable limit

The requirement for the primary containment atmosphere oxygen concentration to be less than 4% by volume is being added for fire protection considerations. This is being done in lieu of the installation of sprinkler for the recirculation pumps inside the drywell.

3.6.6.5 PRIMARY CONTAINMENT PURGE SYSTEM

The primary containment purge system is designed to perform two basic functions: pressure control and inert/de-inert the primary containment. Under normal operations the purge system is used to maintain containment pressure less than two psig. Post LOCA, the purge system, through the 2 inch bypass lines, is also used to reduce containment pressure. The 18 inch lines are the primary means of reducing the oxygen concentration inside containment before long term power operations to less than 4% in accordance with Technical Specification 3.6.6.4. Conversely, it is also the path for restoring oxygen concentration to life sustaining levels before drywell entry. The system is hard-piped to the Standby Gas Treatment System; therefore, any entrained radioactivity will be reduced before being released to the environment through the main stack.

The use of the drywell and suppression chamber purge lines is not limited since the 18" valves will close during a LOCA or steam line break accident and therefore the site boundary dose guideline of 10 CFR Part 100 would not be exceeded in the event of an accident during purging operations. The design of the 18" purge supply and exhaust isolation valves meets the requirements of Branch Technical Position CSB 6-4, "Containment Purging During Normal Plant Operations."

Replacement of the 18" valve resilient seats on a cyclic basis will allow the opportunity for repair before gross leakage failure develops. The 0.60 L_a leakage limit shall not be exceeded when the leakage rates determined by the leakage integrity tests of these valves are added to the previously determined total for all valves and penetrations subject to Type B and C tests.

ATTACHMENT 4

NRC DOCKET 50-321
OPERATING LICENSE DPR-57
EDWIN I. HATCH NUCLEAR PLANT UNIT 1
PROPOSAL FOR TECHNICAL SPECIFICATION CHANGES
PURGE VALVE OPERATION

The proposed change to the Technical Specification (Appendix A to Operating License) would be incorporated as follows:

Remove Page	Insert Page
3.7-10a	3.7-10a
-------	3.7-10b
3.7-34	3.7-34
3.7-34a	3.7-34a
--------	3.7-34b

3.7.A.8 Primary Containment Purge System

a. When primary containment is required, all drywell and suppression chamber 18 inch purge supply and exhaust isolation valves shall be operable and in the fully closed position except when required for inerting, de-inerting, or pressure control.

b. Each drywell and suppression chamber 18 inch purge supply and exhaust isolation valve shall have a leakage rate as specified in 4.7.A.2.

If either of these requirements cannot be met, close the valve(s) or otherwise isolate the penetration(s) within 4 hours or be in at least Hot Shutdown within the next 12 hours and in Cold Shutdown within the next 24 hours.

4.7.A.8 Primary Containment Purge System

a. Each drywell and suppression chamber 18 inch purge supply and exhaust isolation valve shall be verified to be closed at least monthly.

b. Each refueling outage each drywell and suppression chamber 18 inch purge supply and exhaust isolation valve with a resilient material seat shall be demonstrated operable by having its valve seat replaced and verifying that the leakage rate is within its limit.

9. Shutdown Requirements

If Specification 3.7.A cannot be met, an orderly shutdown shall be initiated and the reactor shall be brought to Hot Shutdown within 12 hours and shall be in the Cold Shutdown condition within the following 24 hours.

B. Standby Gas Treatment System

1. Operability Requirements

A minimum of three (2 of 2 in Unit 1 and 1 of 2 in Unit 2) of the four independent standby gas treatment system trains shall be operable at all times when Unit 1 secondary containment integrity is required.

B. Standby Gas Treatment System

1. Surveillance When System Operable

At least once per operating cycle, not to exceed 18 months, the following conditions shall be demonstrated:

3.7.A.8 Primary Containment Purge System

The purge system is designed to perform two basic functions: pressure control and inert/de-inert the primary containment. Under normal operations the purge system is used to maintain containment pressure less than two psig. Post LOCA, the purge system, through the 2 inch bypass lines, is also used to reduce containment pressure. The 18 inch lines are the primary means of reducing the oxygen concentration inside containment before long term power operations to less than 4% in accordance with Technical Specification 3.7.A.5. Conversely, it is also the path for restoring oxygen concentration to life sustaining levels before drywell entry. The system is hard-piped to the Standby Gas Treatment System; therefore, any entrained radioactivity will be reduced before being released to the environment through the main stack.

The use of the drywell and suppression chamber purge lines is not limited since the 18" valves will close during a LOCA or steam line break accident and therefore the site boundary dose guideline of 10 CFR Part 100 would not be exceed in the event of an accident during purging operations. The design of the 18" purge supply and exhaust isolation valves meets the requirements of Branch Technical Position CBS 6-4, "Containment Purging During Normal Plant Operations."

Replacement of the 18" valve resilient seats on a cyclic basis will allow the opportunity for repair before gross leakage failure develops. The 0.60 L_a leakage limit shall not be exceeded when the leakage rates determined by the leakage integrity tests of these valves are added to the previously determined total for all valves and penetrations subject to Type B and C tests.

4.7.A.9 Shutdown Requirements

Bases for shutdown requirements are discussed above in conjunction with the individual requirements for primary containment integrity.

B. Standby Gas Treatment System

The standby gas treatment systems are designed to filter and exhaust the Unit 1 secondary containment atmosphere to the off-gas stack during secondary containment isolation conditions, with a minimum release of radioactive materials from these areas to the environs. The Unit 1 standby gas treatment system fans are designed to automatically start upon receipt of a high radiation signal from either the Unit 1 or Unit 2 refueling floor ventilation exhaust duct monitors or the Unit 1 reactor building ventilation exhaust duct monitors, or upon receipt of a signal from the Unit 1 primary containment isolation system. The Unit 2 standby gas treatment system fans are designed to automatically start, to assist the Unit 1 fans to exhaust the Unit 1 secondary containment atmosphere upon receipt of a high radiation signal from either the Unit 1 or Unit 2 refueling floor ventilation exhaust duct monitors or the Unit 1 reactor building ventilation exhaust duct monitors, or upon receipt of a signal from the Unit 1 primary containment isolation system. In addition, the systems may also be started manually, from the Main Control Room.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS

With one of the Unit 1 standby gas treatment systems inoperable, for any reason, Unit 1 reactor operation and fuel handling and/or handling of casks in the vicinity of the spent fuel pools is permissible for a period of seven (7) days provided that all active components in the remaining operable standby gas treatment systems in each unit (minimum of 1 in Unit 1 and 1 in Unit 2) shall be demonstrated to be operable within 4 hours, and daily thereafter.

a. Pressure drop across the combined HEPA filters and charcoal absorber banks is less than 6 inches of water at the system design flow rate (+10%, -0%).

b. Operability of inlet heater at rated power when tested in accordance with ANSI N510-1975.

c. Air distribution is uniform within 20% across the filter train when tested in accordance with N510-1975.

B. Standby Gas Treatment System

In the case of the Unit 1 standby gas treatment system, upon receipt of any of the isolation signals, both fans start, isolation dampers open and each fan draws air from the isolated Unit 1 secondary containment.

In the case of the Unit 2 standby gas treatment system, upon receipt of an isolation signal from the Unit 1 primary containment isolation system, reactor building ventilation exhaust duct monitors, or the Unit 1 or Unit 2 refueling floor ventilation exhaust duct monitors, both fans start, fan supply and discharge dampers open, and the fans draw air from the isolated Unit 1 secondary containment.

Once the SGTS systems have been initiated automatically, the operator may place any one of the Unit 1 and Unit 2 trains in the standby mode provided the remaining train in each unit is operable. Should a failure occur in the remaining operating trains, resulting in air flow reduction below a present value, the standby systems will restart automatically.

As a minimum for operation, one of the two Unit 1 standby gas treatment trains and one of the two Unit 2 standby gas treatment trains is required to achieve the design differential pressure, given the design building infiltration rate. Once this design differential pressure is achieved, any leakage past the secondary containment boundary shall be inleakage.

A detailed discussion of the standby gas treatment systems amy be found in Section 5.3.3.3 of the Unit 1 FSAR, and in Section 6.2.3 of the Unit 2 FSAR.

Any one of the four filter trains has sufficient adsorption capacity to provide for cleanup of the Unit 1 secondary containment atmosphere following containment isolation. Any one of the four available standby gas treatment trains may be considered an installed spare. Therefore, with one of the standby gas treatment trains in each unit inoperable, there is no immediate threat to the Unit 1 containment system performance, and reactor operation or fuel handling operations may continue while repairs are being made. Should either or both of the remaining standby gas treatment trains be found to be inoperble, the Unit 1 plant should be placed in a condition that does not require a standby gas treatment system.

High efficiency particulate air (HEPA) filters are installed before the charcoal adsorbers to prevent clogging of the iodine adsorbers. The charcoal adsorbers are installed to reduce the potential release of radioiodine to the environment. Bypass leakage for the charcoal adsorbers and particulate removal efficiency for HEPA filters are determined by halogenated hydrocarbon and DOP respectively. The laboratory carbon sample test results indicate a radioactive methyl iodide removal efficiency for expected accident conditions. Operation of the fans significantly different from the design flow will change the removal efficiency of the HEPA filters and charcoal adsorbers. If the performances are as specified, the calculated doses would be less than the guidelines stated in 10 CFR 100 for the accident analyzed.

4.7.C. Secondary Containment

The secondary containment is designed to minimize any ground level release of radioactive materials which might result from a serious accident. The refueling area of the reactor building incudes the Unit 1 and Unit 2 refueling floor volumes. Therefore, the reactor building provides secondary containment during unit 1 reactor operation when the drywell is sealed and in service; and provides primary containment when the Unit 1 and/or Unit 2 reactor is shutdown and its respective drywell is open, as during refueling.

ATTACHMENT 5

SYSTEM DESCRIPTION

18" PURGE/VENT LINE EXCESS FLOW ISOLATION DAMPERS

2T46/T48

June 15, 1983

1.0 Function

The function of the excess flow isolation dampers is to provide automatic isolation capabilities on high flow in the 18" purge/vent line to protect the Standby Gas Treatment System (SGTS) filter trains from overpressure in the event of a LOCA.

2.0 Design Basis

2.1 Safety Design Basis

A. The excess flow isolation dampers will prevent the SGTS filter trains from being subjected to more than 2 psig due to a flow/pressure increase in the event of a LOCA while purge and/or vent operations are in progress.

B. The excess flow isolation dampers will be safety grade and seismic Category I.

C. A 2" bypass line without an isolation valve will be installed around the isolation dampers to assure post LOCA venting capabilities.

D. The dampers will be self-actuating and self-contained.

E. The dampers shall be tested prior to installation for closure time and structural integrity with the LOCA pressure and flow.

F. Redundant isolation dampers are installed so that a single failure will not prevent compliance with safety design basis A.

2.2 Power Generation Design Basis

A. The excess flow isolation dampers shall remain open for normal plant operation.

B. By assuring protection of equipment, increased purge/vent times are feasible. This allows for more operational flexibility.

2.3 Codes and Standards

The applicable portions of the following codes and standards will be met:

AMCA 500-75	Test Methods for Louvers, Dampers and Shutters
ANSI N45.2 (1977)	Quality Assurance Requirements for Nuclear Power Plants
ANSI N509 (1980)	Nuclear Power Plant Air Cleaning Units and Components
AWS D1.1	Structural Welding Code
IEEE 344 (1975)	Recommended Practices for Seismic Qualifications of Class 1E Equipment for Nuclear Power Generating Stations

3.0 Description

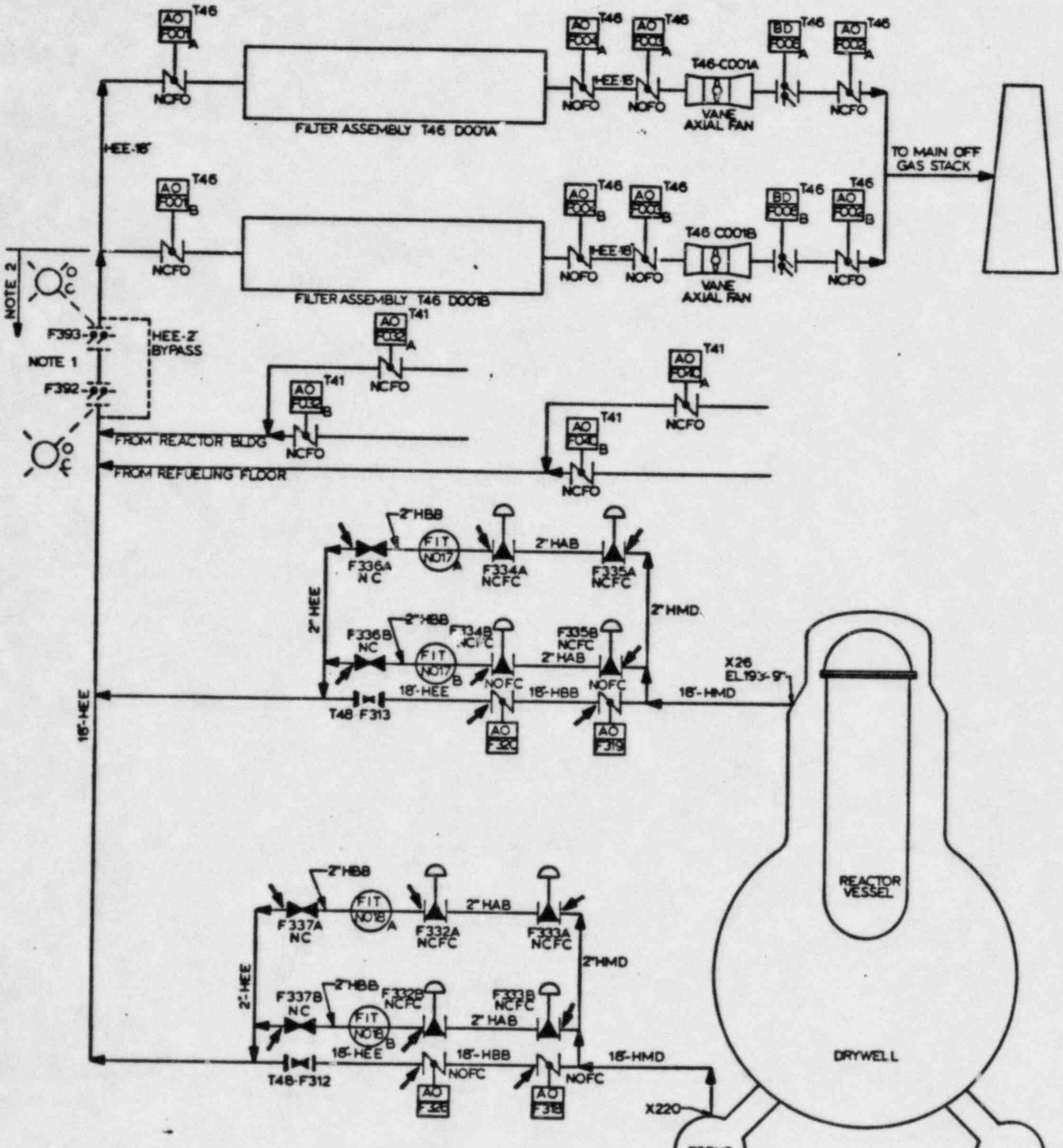
Two redundant safety grade, fast acting, excess flow isolation dampers with control room position indication will be installed in the common 18" vent/purge line from the drywell and torus before it ties into the SGTS filter trains. The location of the dampers within the system is shown in figure 1 for Unit 1 and in figure 2 for Unit 2. These dampers will close due to a flow/pressure spike resulting from a LOCA. Calculations have shown that while purge or venting operations are in process a LOCA could overpressurize the SGTS filter trains within 0.475 seconds. The dampers will be designed and tested to assure that they will close within this limit.

To assure that post LOCA venting capabilities are maintained, a 2 inch bypass line will be installed around the isolation dampers as shown on figures 1 and 2. Calculations have demonstrated that the SGTS filters will not be overpressurized with the 2" bypass line.

These dampers will not be containment isolation valves. Containment isolation capabilities are provided by the existing valves. For unit 1 from figure 1 these valves are T48-F318, F319, F210 and F326. For unit 2 from figure 2 these valves are 2T48-F318, F319, F320 and F326. These containment isolation valves will close within 5 seconds post LOCA.

4.0 Component Description

Excess Flow Isolation Dampers	2T46-F076,2T46-F077,T48-F392,T48-F393
Quantity	2 per unit
Size, % capacity	100% each
Type Actuator	Counter Weight
Leakage Class	III
Seismic Class	I
Max ΔP Closed	53 psig
Closing Time, (post LOCA)	0.4 seconds or less



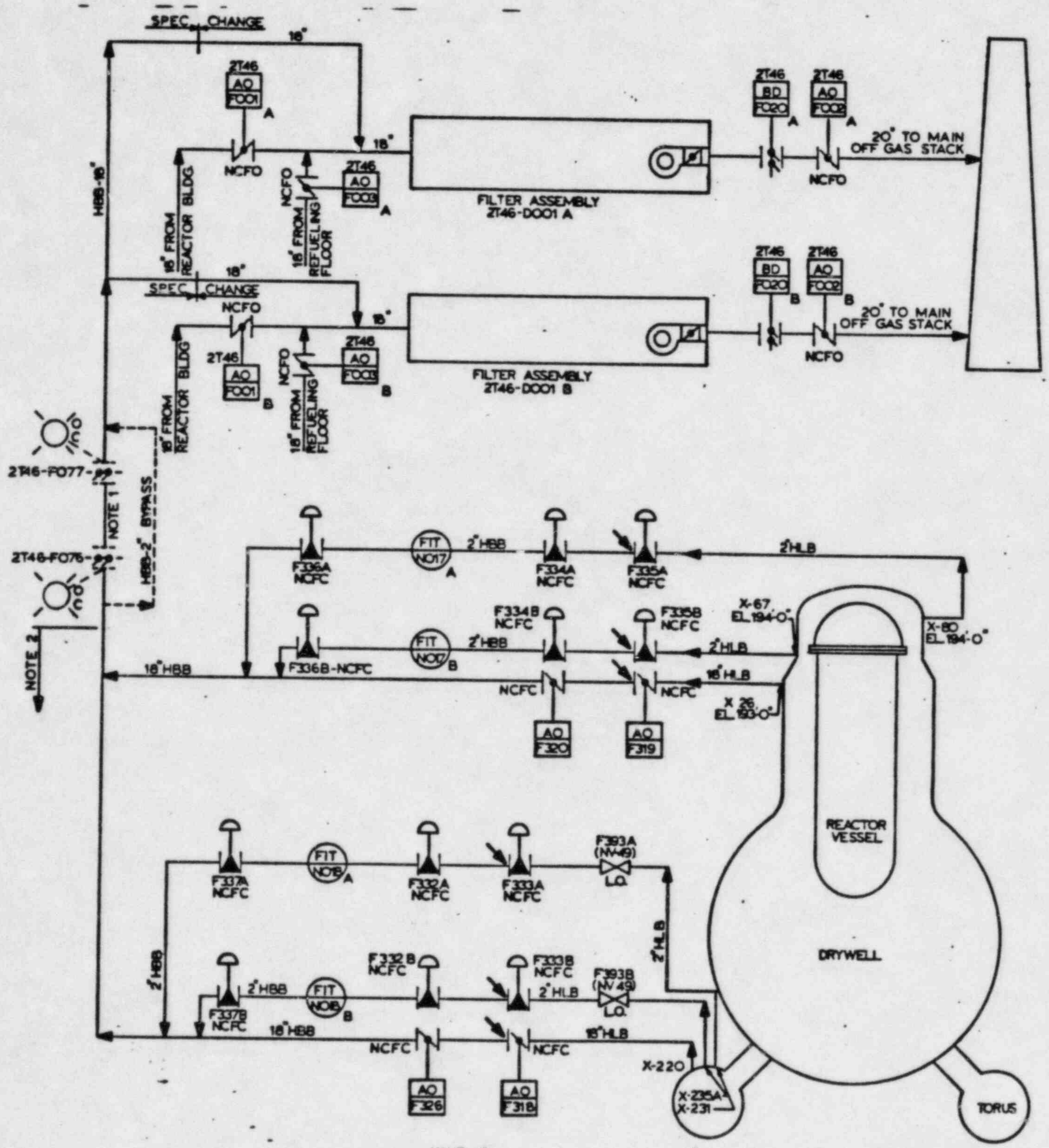
UNIT #1

NOTE 1 EXCESS FLOW ISOLATION DAMPERS

NOTE 2: T48 UNLESS OTHERWISE NOTED

---- NEW EQUIPMENT

FIGURE NO. 1



UNIT 2

NOTE 1 - EXCESS FLOW ISOLATION DAMPERS
NOTE 2 - 2T48 UNLESS OTHERWISE NOTED
---- NEW EQUIPMENT

FIGURE NO. 2

ATTACHMENT 6

SUMMARY OF PURGE VALVE LOCA AND SEISMIC LOAD TEST

June 15, 1983

Summary of Purge Valve LOCA and Seismic Load Test

The valves identified as containment isolation valves in the purge and vent system are 18-inch butterfly valves, Fisher Controls Model number 9220. The valves are equipped with Bettis Model 733C-SR60 (Unit 2 valves) or 733B-X-SR60 (Unit 1 valves) air open - spring to close operators. The capabilities of the two operators are identical.

The valve assembly tested was an 18 inch Fisher butterfly valve, model 9220 with a Bettis 733C-SR60 pneumatic actuator. The assembly was mounted in a bookend type fixture, with the valve shaft oriented in the horizontal plane. The mounting fixture was welded to the triaxial seismic simulator table at Wyle Laboratories, Huntsville, Alabama.

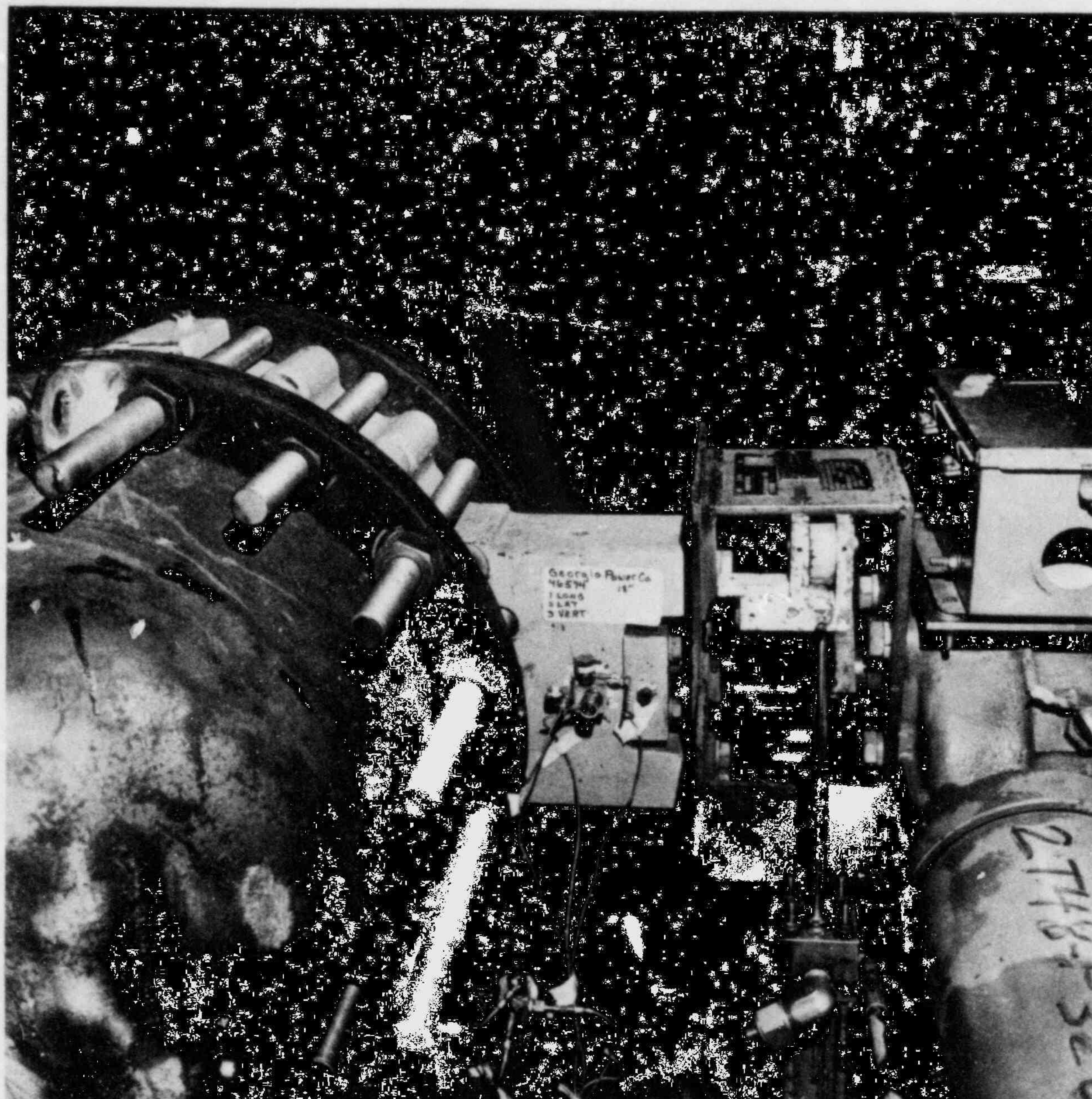
Six accelerometers were mounted on the valve assembly, three at the valve - actuator connecting bracket, refer to photograph 1, and three at the end of the actuator, refer to photograph 2.

To simulate the in-service fluid dynamic loads, which occur during a LOCA, a torsional load of 5164 in-lbs, which is equivalent to the required torque to close the valve at 62 psid, was applied by means of a hydraulic cylinder to the valve shaft, in an opposing direction to the closing rotary motion. The cylinder was attached to the valve shaft at the point as shown in the attached sketch. Since the actuator valve connection is a critical point on the assembly, and the shaft is the weakest part, this attachment point was considered as being the worst case condition. The torsional load was applied only during the SSE test.

The valve assembly was subjected to 30-second duration triaxial multifrequency random motion which was amplitude controlled in one-third octave band widths spaced one-third octave apart over the frequency range of 1-40 Hz. Three simultaneous random signals were used as the excitation in the vertical and two horizontal axes. The amplitude of each one-third octave bandwidth was adjusted in each of the axes until the Test Response Spectra (TRS) enveloped the Required Response Spectra (RRS) at ½ percent damping. Refer to the attached Operating Basis Earthquake (OBE) and Safe Shutdown Earthquake (SSE) TRS vs RRS curves.

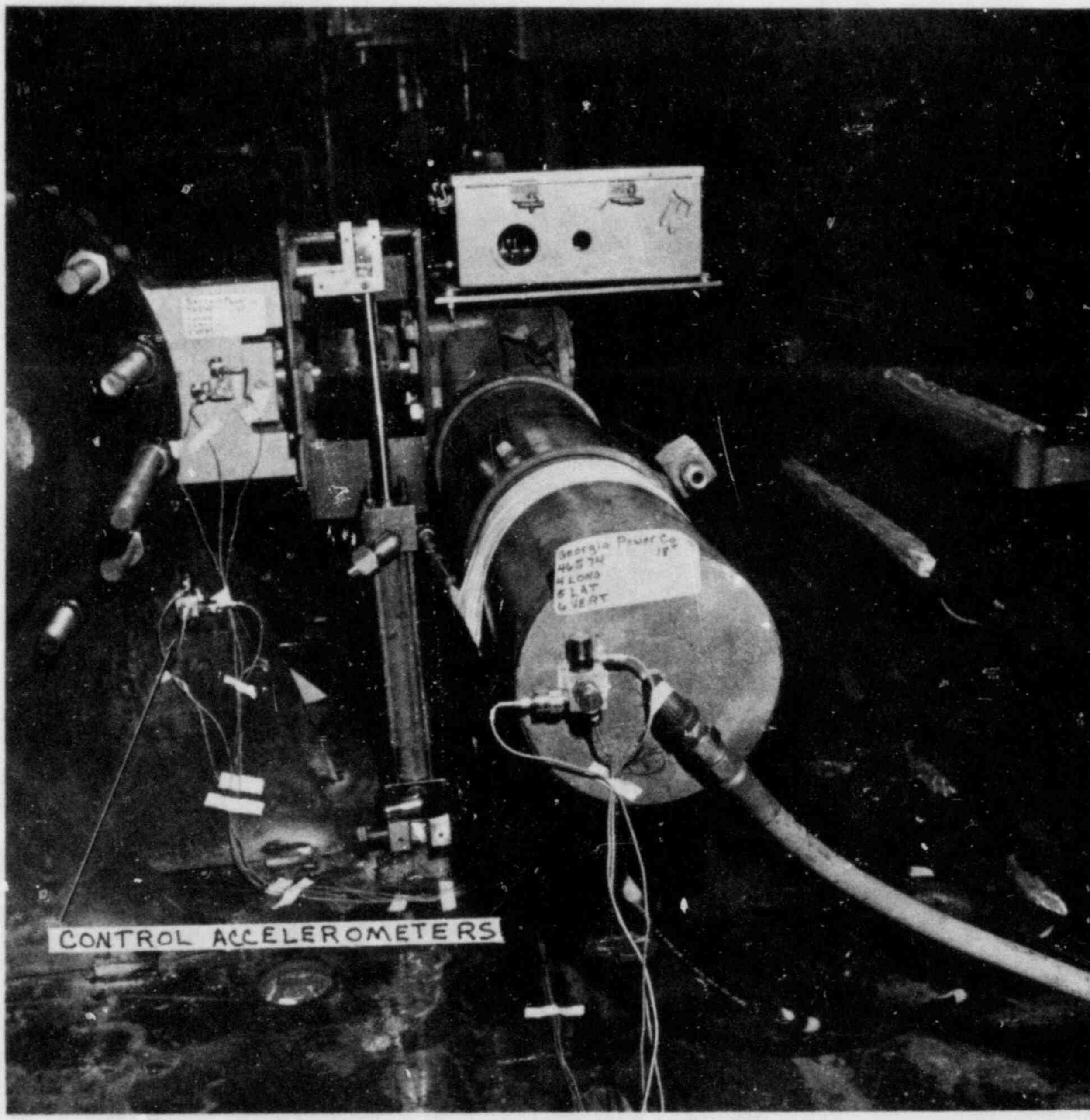
The functional operability of the valve assembly was verified by cycling the valve from close-to-open-to close during each OBE test and from open to closed twice with the simulated fluid dynamic load applied during the SSE test. Five (5) OBE tests were applied prior to the SSE test.

It was demonstrated that the valve assembly possessed sufficient integrity to withstand the combined fluid dynamic and SSE loads, without the compromise of structure and function. Under full load conditions, the valve went from open to closed in a maximum of 2 seconds. The plant Technical Specification requires that the valves close in a maximum of 5 seconds. Therefore, the test has demonstrated that the T48 containment isolation valves will function as required with the combined seismic and LOCA loading conditions.



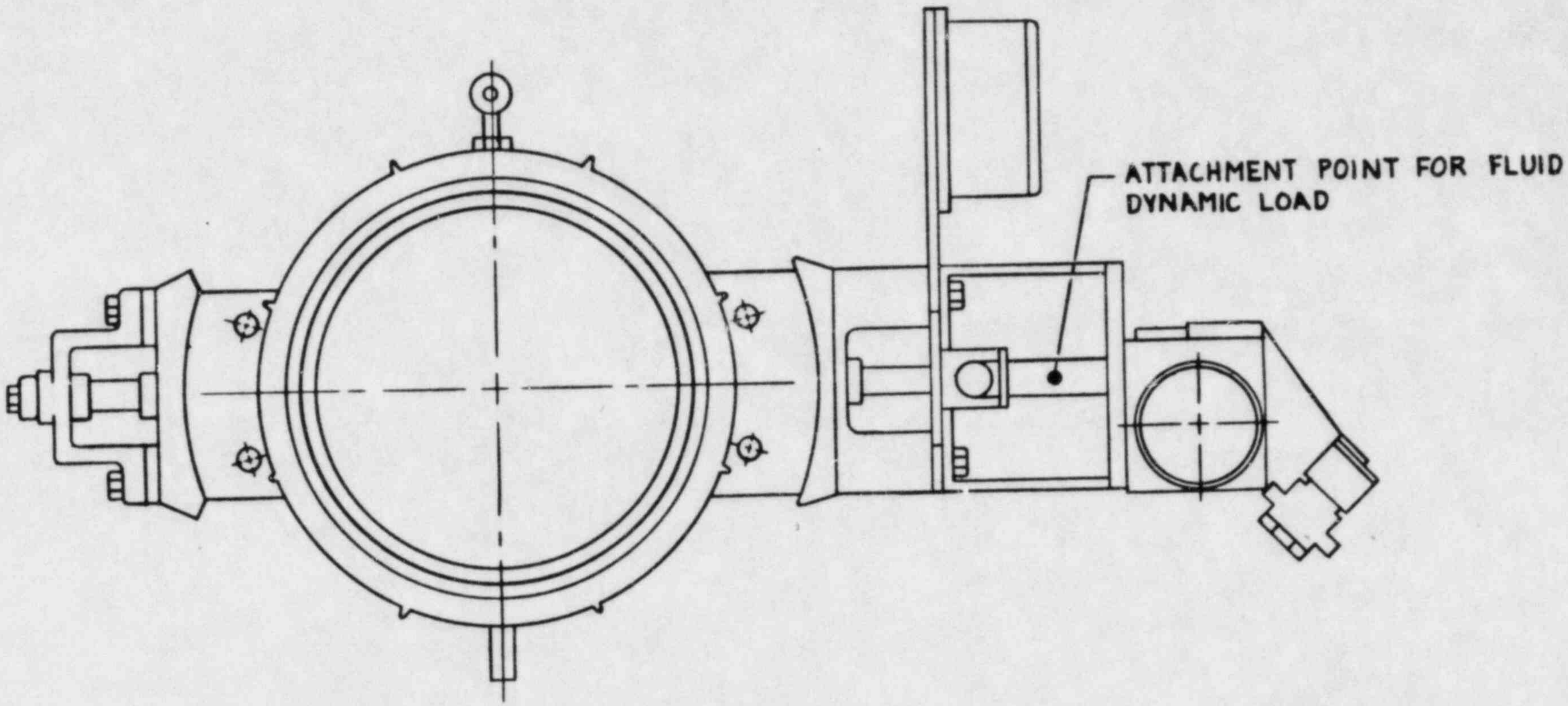
PHOTOGRAPH 1

ACCELEROMETER LOCATIONS
1 LONG, 2 LAT, AND 3 VERT



PHOTOGRAPH 2

ACCELEROMETER LOCATIONS
4 LONG, 5 LAT, AND 6 VERT
AND
CONTROL ACCELEROMETER LOCATIONS

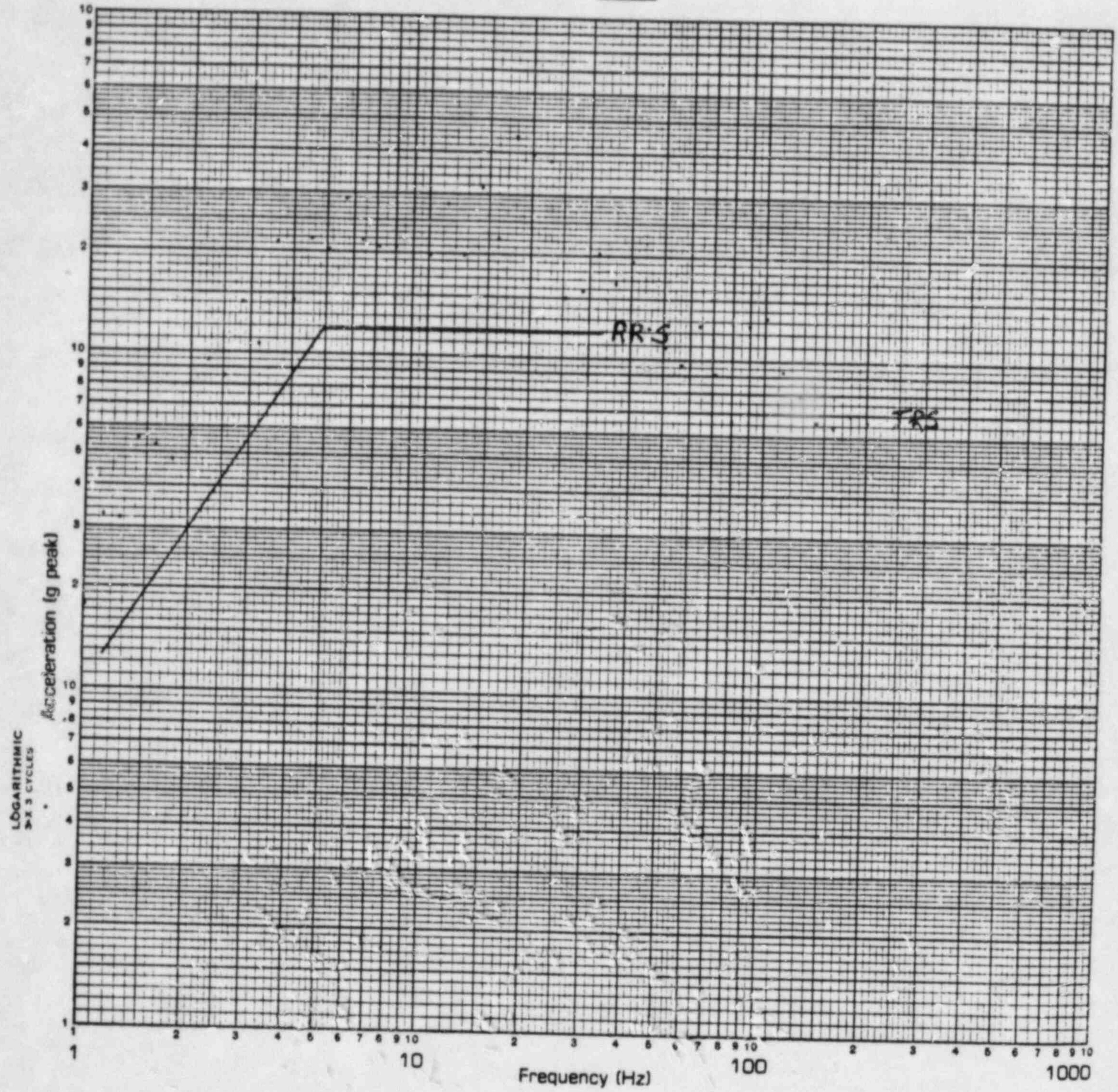


TORSIONAL LOAD ATTACHMENT POINT

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☒ 100 ☐ 1000☐

DAMPING .5%



AXIS TRIAXIAL

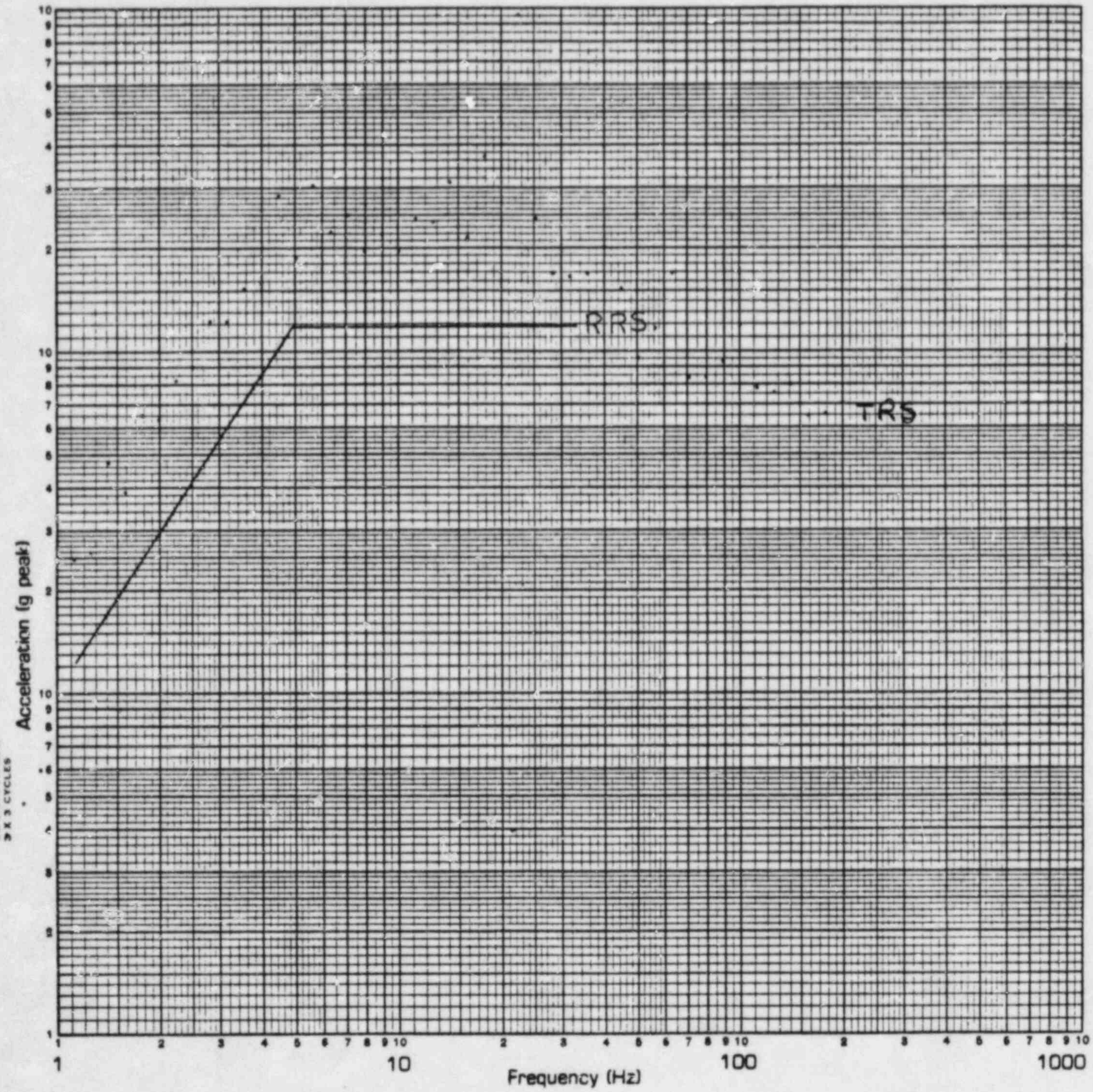
LOCATION NO. VCP -OBE

TEST RUN NO. 4

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10.☒ 100 ☐ 1000☐

DAMPING .5%



LOCATION NO. LAT HCA-OBE

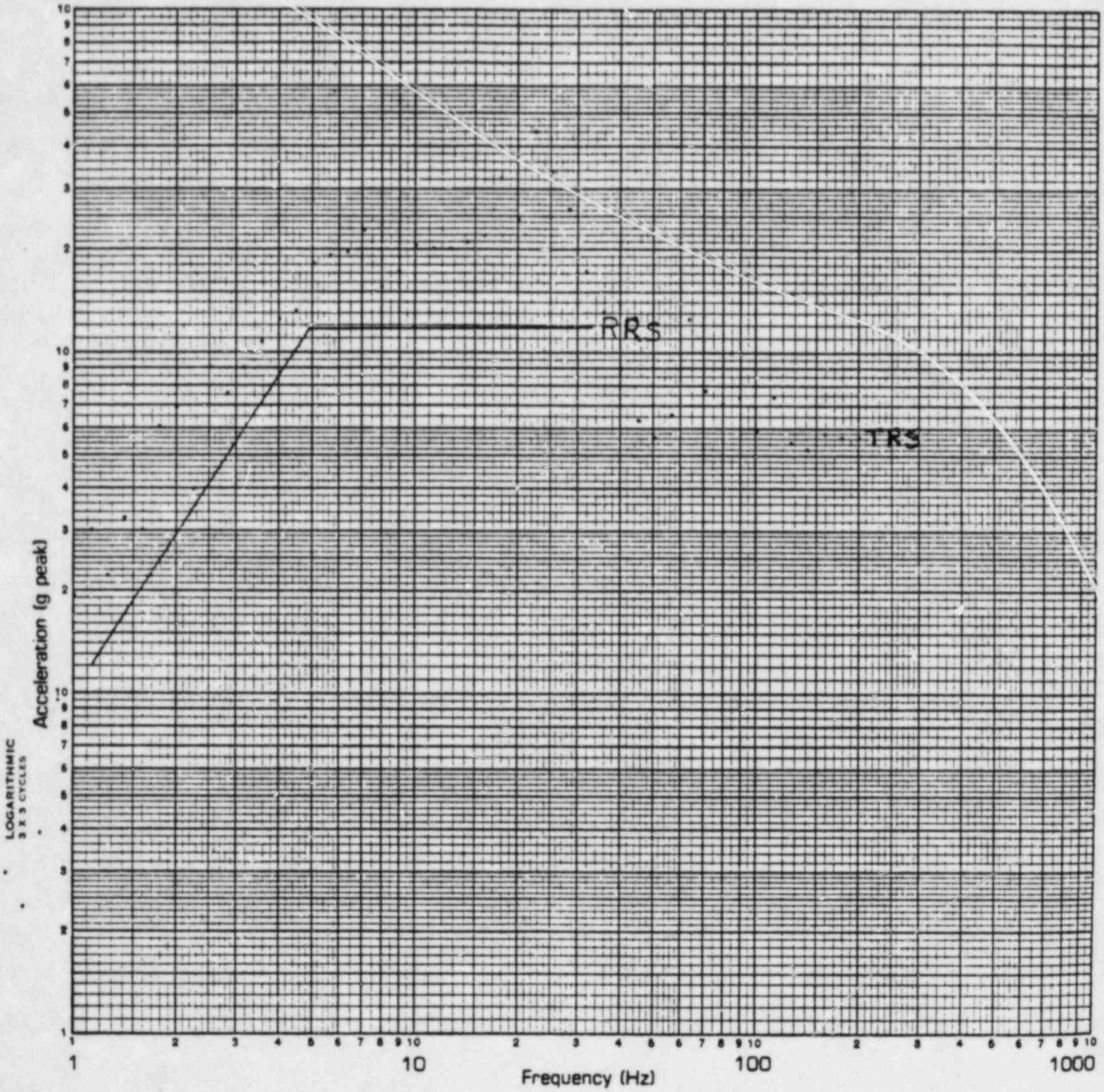
AXIS TRIAXIAL

TEST RUN NO. 4

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☑ 100 ☐ 1000 ☐

DAMPING .5%



LOCATION NO. LONG HCA-OBE

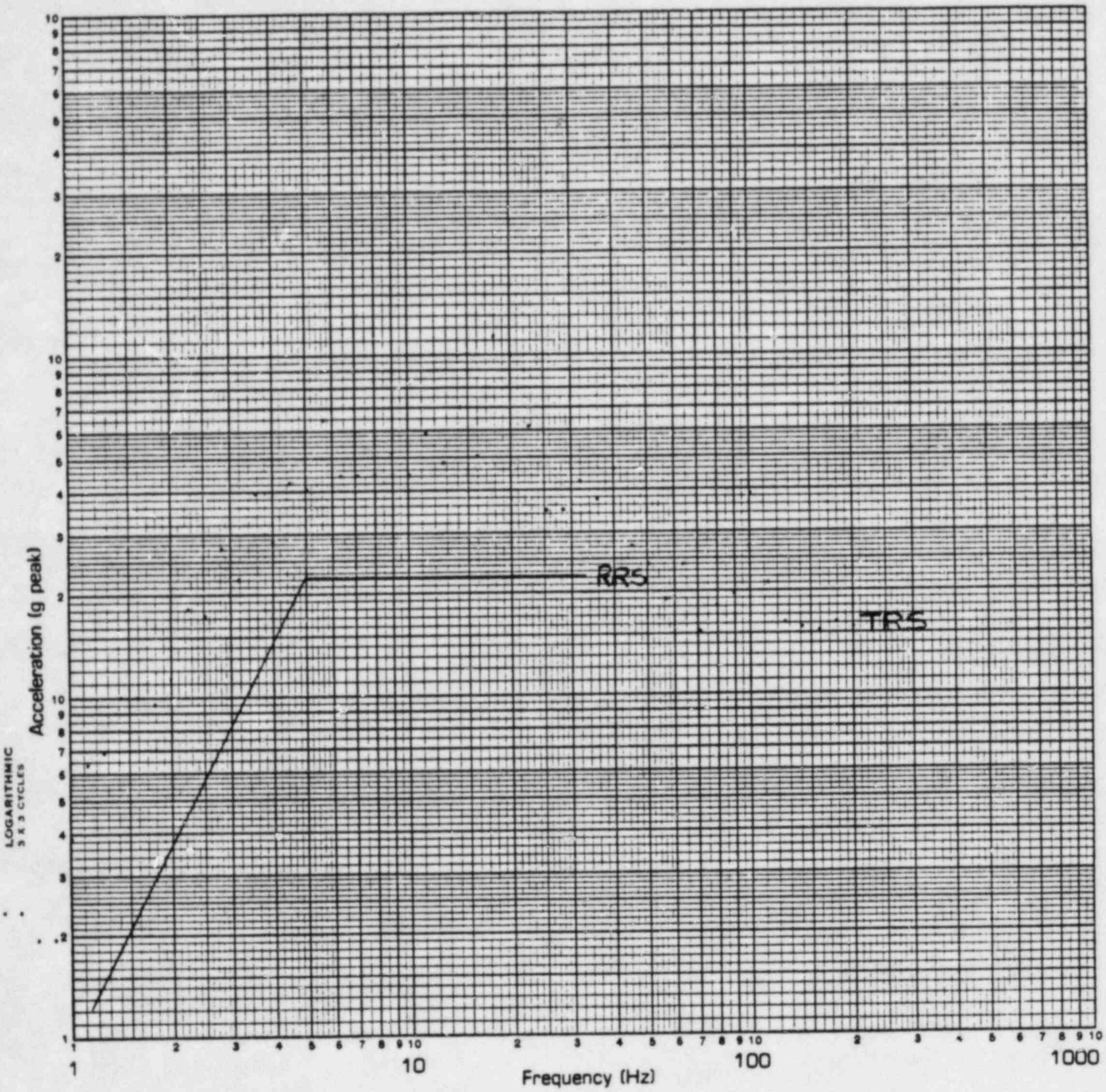
AXIS TRIAXIAL

TEST RUN NO. 4

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10. 100 ☒ 1000☐

DAMPING .5%



LOCATION NO. VCA - SSE

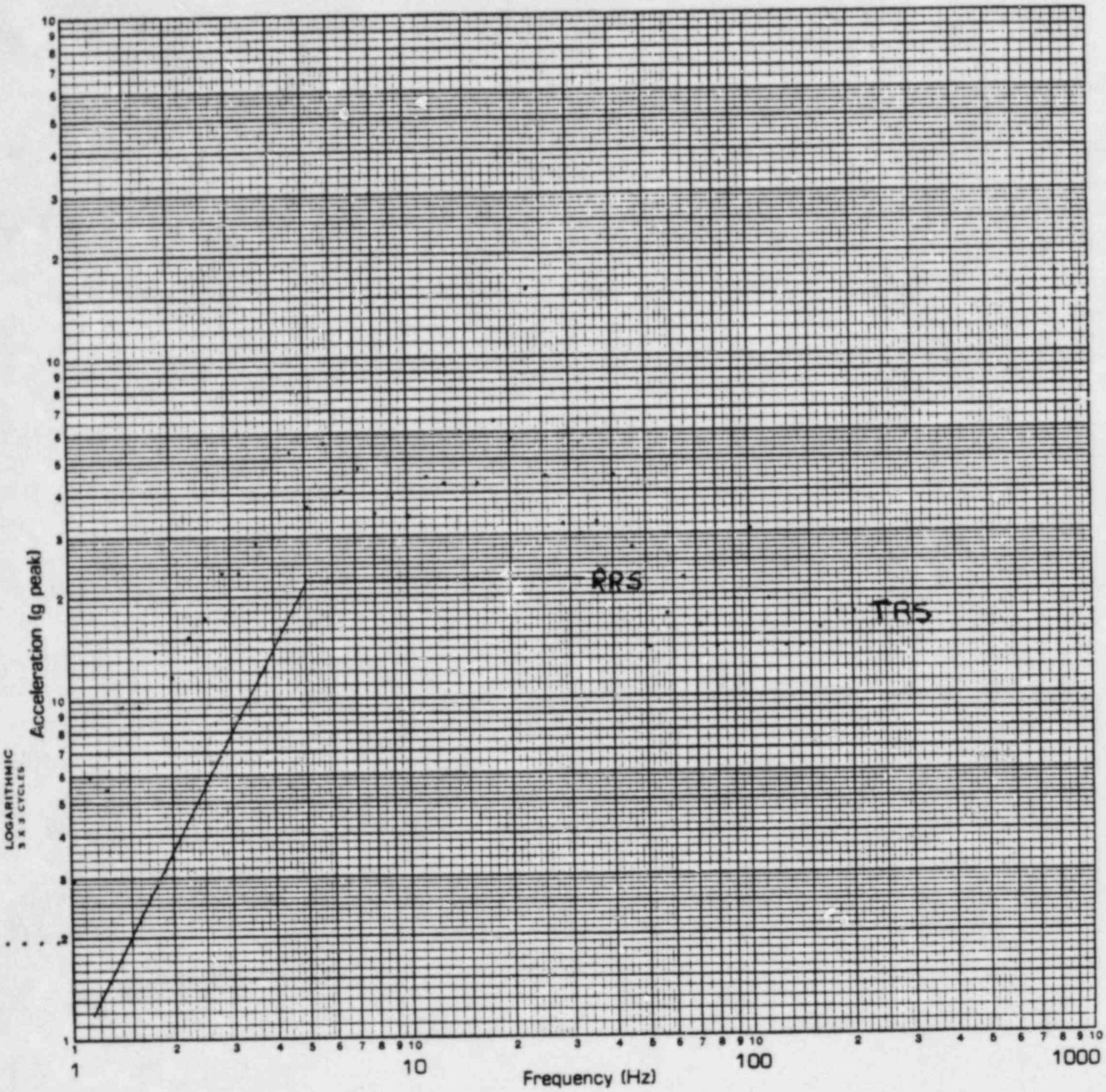
AXIS TRIAXIAL

TEST RUN NO. 9

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 100 ☒ 1000☐

DAMPING .5%



LOCATION NO. ~~LAT~~ HCA-5SE

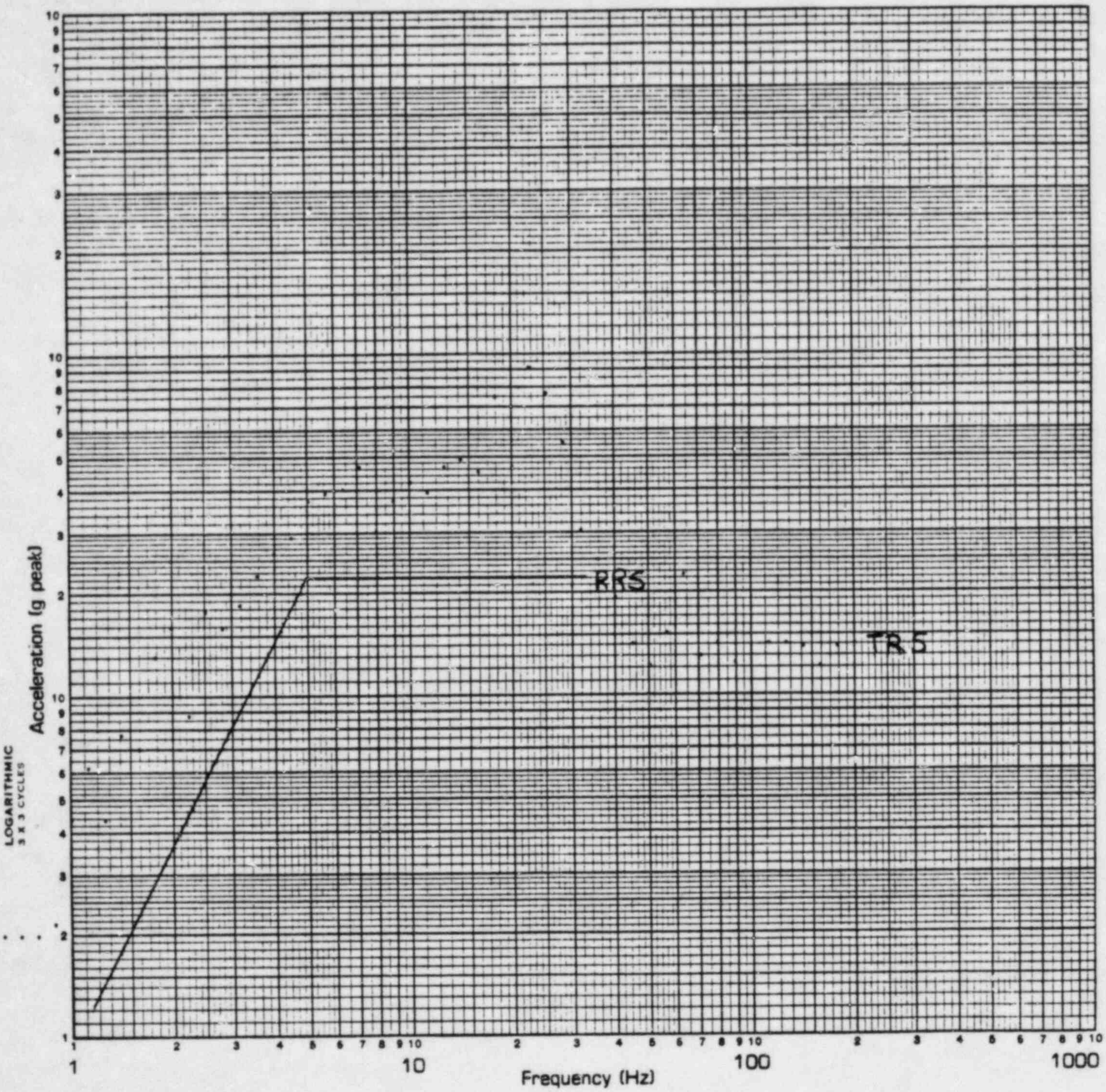
AXIS TRIAXIAL

TEST RUN NO. 9

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 100 ☒ 1000☐

DAMPING .5%



LOCATION NO. LONG HCA -SSE

AXIS TRIAXIAL

TEST RUN NO. 9

ATTACHMENT 7

PURGE AND VENT SYSTEM

OPERABILITY

Rev. 1
June 15, 1983

I. INTRODUCTION

The intent of this report is to provide full and complete information pertinent to the containment purge and vent system operability issues. It is our understanding that the information provided below will allow the staff to close all open items dealing with the E. I. Hatch Units 1 and 2 containment purge and vent system operability issues. One possible exception is the need to provide test results from a May, 1983, valve test conducted to demonstrate operability of the 18" containment isolation valves.

Each open issue raised in the July 7, 1982, letter from Mr. J. F. Stolz to Mr. J. T. Beckham, Jr. is addressed.

II. CONFORMANCE TO STANDARD REVIEW PLAN SECTION 6.2.4 REVISION 1 AND BRANCH TECHNICAL POSITION CSB6-4 REVISION 1.

(A) Adequate justification for unlimited use of the 18-inch purge/vent systems or an estimate of the expected annual usage of the 18-inch purge/vent system.

G.P.C. Response:

The operating history at Hatch Unit 1 and 2 has shown that the requirement that the 18" purge and vent valves can only be open for 1% of the operating time has imposed severe restrictions on the operation of the plant. There are clearly extensive benefits which can be realized both in the safety and operational aspects of plant operation if unlimited purge times are granted. The operations department personnel at Plant Hatch make drywell inspections soon after startup, prior to power escalation, to inspect for leaks and just prior to shutdown in order to assure that any leakage or other abnormalities are detected prior to depressurization. If the drywell is inerted the operations department personnel are not permitted to enter the drywell by corporate policy due to the fact that an inerted atmosphere will not sustain life. Therefore, drywell inspections can not be made. It is Georgia Power Company's position that this is not in the best interest of safety. For this reason Georgia Power Company will request that the Plant Technical Specifications be changed to allow increased purge times for the purposes of safety inspections of the drywell.

(B) Sufficient information concerning provisions made to ensure that isolation valve closure will not be prevented by debris which could potentially become entrained in the escaping air and steam.

G.P.C. Response:

Debris screens which conform to the guidance provided by the NRC are being installed during the current outage on the 18-inch purge and vent lines which communicate with the drywell on Unit 2.

Debris screens will not be installed on the Unit 1 piping since structural members inside the drywell make it very unlikely that debris could enter the piping. Pictures of the obstructions were provided to the NRC Staff on March 31, 1983. GPC has been verbally informed by the staff that no debris screens will be required on Unit 1.

(C) An analysis of airborne radioactivity releases as a result of a LOCA; i.e., the amount of air/steam which will be released to the environment prior to purge system isolation following a LOCA.

G.P.C. Response:

An acceptable dose consequence analysis has been performed per the NRC position presented in SRP Section 6.2.4 and Section B, Item B.5.a, of BTP CSB 6-4. A summary of the analysis is presented below as justification for increased use of the purge system during operational conditions 1,2, and 3.

To determine the most severe consequences of an accident occurring during purging of the drywell, two scenarios ar analyzed. These are loss of coolant accidents (LOCA) with both pre-existing and concurrent iodine spikes. Each scenario is summarized below. Resulting offsite doses are listed in Table 1.

Case A: LOCA with pre-existing iodine spike

Prior to the LOCA, the reactor coolant concentration is assumed to be the maximum limit allowed by the technical specifications for the 48 hours following a power transient. For Hatch Unit 1, the limit is 100.0 μCi/g dose equivalent I-131. For Unit 2, the limit is 4.0 μ Ci/g dose equivalent I-131. The specific accident analyzed is the instantaneous guillotine rupture of a reactor recirculation line. Mass blowdown data and primary containment pressure and temperature profiles are taken from Figures 6.2-23 through 6.2-26 of Hatch Unit 2 FSAR for an accident in either unit.

A flashing fraction of 40% is assumed for the reactor coolant which spills from the ruptured recirculation line. All of the activity in the flashed liquid remains airborne in the primary containment and is available for release through the open purge valves. The 18" purge and vent valves are assumed to close in five seconds. No credit is taken for the reduction in cross sectional area of the duct opening during isolation. Because the drywell purge system exhausts via the standby gas treatment system, the activity is filtered and released from the plant stack at a height of 120 meters.

Case B: LOCA with concurrent iodine spike

The pre-accident iodine concentration of the reactor coolant is assumed to be 10.0 μCi/g dose equivalent I-131 for Unit 1 and 0.2 μCi/g dose equivalent I-131 for Unit 2. These are the maximum limits allowed by the technical specifications during steady state full power operation. A LOCA in either unit is assumed to increase the release rate of iodine from the fuel by a factor of 500. The release of radioactivity to the environment is the same as that described in Case A.

The doses calculated for Cases A and B are only the increments received from a LOCA during purge system operation prior to closure of the purge isolation valves. The other release pathways of primary containment leakage and MSIV leakage contribute much larger dose increments, making the purge portion insignificant in comparison (See FSAR, Table 14.5-1 in HNP Unit 1 and Table 15.1-36 in HNP Unit 2 for radiological consequences due to LOCA).

(D) An analysis of the provisions to protect structures and safety related equipment located downstream of the purge isolation valves against a loss of function from the environment created by the escaping air and steam.

G.P.C. Response:

The subject of steam flood and jet impingement from a ruptured purge or vent line has been investigated. On both units the majority of the lines are fabricated from 150 lb. class pipe and thus do not present a rupture potential. On Unit 2 there is a pipe to duct interface which is located on the 130-foot elevation of the reactor building which could rupture if a LOCA were to occur while purge operations are in progress. A review of the existing HELB analysis has demonstrated that the environment created by a main steam line break in the pipe chase bounds that of a rupture in the ducting and is therefore acceptable. On Unit 1 there are two pipe to duct interfaces. One is located in the SGTS equipment room and the other is located in the torus room. The duct at these interfaces could rupture in the unlikely event of a LOCA while purge and/or vent operations are in progress. It has likewise been shown in both these areas that existing HELB analysis yields more severe environments than the SGTS duct rupture. In no case has it been determined that jet forces due to a ruptured duct present a danger to any essential equipment.

Acceptable over pressure protection of the standby gas treatment filter housings in the the unlikely event of a LOCA concurrent with vent operation has not been demonstrated with the existing design. For this reason, numerous design modifications have been evaluated. We plan on installing redundant safety grade fast acting, excess flow, isolation dampers which will automatically isolate the common 18" vent line from the drywell and torus before it ties into the SGTS filter train suction. Our calculations have determined that under the worst case conditions the dampers must have a closing time of less than 0.475 seconds in order to protect the SGTS filters from overpressure. To assure that post LOCA venting capabilities are maintained with the worst single failure a 2-inch bypass line will be installed around the isolation dampers. We propose that this plant modification be completed during the first outage of sufficient duration for installation on both units after NRC approval of the modification, the completion of the engineering design, and the receipt of materials on site.

With the completion of the design modification discussed above no safety equipment will be subjected to conditions in excess of their design condition.

III Valve Operability

The following information is provided to document the qualification of the purge and vent valves. This information was requested in the September 27, 1979, letter to all light water reactors from Mr. Darrell G. Eisenhut.

(A) Valve closure rate vs time - i.e., constant rate or other.

G.P.C. Response:

The valves are designed with a constant rate of closure. As noted below the data has demonstrated that under the maximum expected loading conditions the valves will close in approximately two seconds. The plant technical specifications require closure in less than 5 seconds.

(B) Flow direction through valves; ΔP across valve.

G.P.C. Response:

The valves have symmetric disc design therefore are bi-directional. The analysis was completed assuming a ΔP of 62 psi across the valves

(C) Single valve closure (inside containment or outside containment valve) or simultaneous closure. Establish worst case.

G.P.C. Response:

Both valves on each line are located outside the drywell and receive simultaneous isolation signals. Since both valves are located outside the drywell for each penetration, there is no worst case.

(D) Adequacy of accumulator (when used) sizing and initial charge for valve closure requirements.

G.P.C. Response:

The valves are spring loaded to close with no air assist; therefore, the size of the air accumulator has no bearing on the closure time of the valves.

(E) For valve operations using torque limiting devices - are the settings of the devices compatible with the torques required to operate the valve during the design basis condition.

G.P.C. Response:

The valve operators do not use torque limiting devices.

(F) Valve closure capabilities:

G.P.C. Response:

In addition the containment purge and vent valve must be capable of closing under a postulated accident condition which results in fluid dynamic related loads combined with seismic related loads.

(F.1) Description of Purge and Vent Valves

The valves identified as the containment isolation valves in the Purge and Vent System are listed on Table 2.

The valves are butterfly type Model 9200 (Series 9220) manufactured by Fisher Controls. These valves are equipped with Bettis Model 733C-SR-60(Unit 2 Valves) or 733B-X-SR60 (Unit 1 Valves) air open-spring to close operators. The capabilities of the two actuators are identical. Valves are limited to a 50° opening angle (90°= full open) by means of mechanical sleeve type stop.

(F.2) Demonstration of Operability

Operability is based on the following assumptions:

1. Redundant valves on each purge and vent line.
2. Peak design containment pressure (62 psig) is the ΔP across the valve at all disc angles from 50° to seating.
3. The valves are symmetrical.
4. Pressure losses in the pipeline are neglected.

The torque values are based on a series of laboratory tests performed at Fisher, using a selected group of models. Analytical technique are used to determine the dynamic torque for the actual valve size.

The approach taken to evaluate critical valve parts is to determine maximum allowable ΔP's across the valve vs disc angles. The maximum allowable ΔP is based on the valves weakest part. The maximum allowable ΔP for each disc angle, in 10° increments, is compared to the 62 psig operating condition, and the maximum disc-opening angle is selected.

A description of the Fisher Computer Program used to determine the maximum opening angle is as follows:

The program begins by calculating the loadings at a particular opening angle. The hydrostatic load on disc, and seating, bushing, packing and dynamic torques are included.

After loading is determined, the program calculate stresses in the shaft, key, pin and bushing for a specific ΔP and compares the calculated stresses to the material strength.

The program calculates stress and change in ΔP iteratively until the allowable strength matches the stress. This determines the maximum allowable pressure drop for that angle. Refer to the attached Tables 3 and 4 which establish the disc angle versus allowable ΔP.

The weak point of the valve assembly is the shaft. The maximum allowable ΔP based on the shaft stress is 75 psi, which establishes the limiting angle of 50° open. Using the 50° open angle and the actual 62 psi ΔP the program calculates the required actuator torque of 5164 in-lbs.

The valves are equipped with Bettis model 733C-SR-60 or 733B-X-SR-60 actuators. The actuator is a spring to close type with a torque output of approximately 8200 in-lbs at the end of stroke. In midstroke, the torque output will drop to approximately 79% of the end stroke values because of the scotch-yoke actuator linkage (approximately 6478 in-lbs). This torque value output is adequate to provide the required closing torque at 50° (5164 in-lbs). Since butterfly valves of this type have a flow-closed characteristic when starting at 50° opening, the only resistances to be overcome for closing are friction and seating torques, which are approximately 2500 in-lbs combined. This torque is well within the capabilities of the actuator. Therefore closure from the 50° open position can be assured under flowing conditions at 62 psig.

The 733B-X-SR60 or 733C-SR-60 basic actuator mechanism is capable of withstanding an external input of 51,000 in-lbs end of stroke position and 30,600 in-lbs mid stroke position. Therefore, a wide margin exists between actuator capabilities and the required performance.

To ensure operability of the valve assembly under to a combined fluid dynamic and seismic loading conditions, Wyle Laboratories was contracted to test a valve. The preliminary test results have been reviewed. The test program consisted of mounting a valve assembly on a triaxial shaker table at Wyle Laboratories, at Huntsville, Alabama. A resistance equal to 5164 in-lbs of torque was applied to the valve, and triaxial accelerations equal to plant SSE accelerations were input into the assembly. The valve was stroked twice while being subjected to the combined loads. The valve assembly operated smoothly during the test, and went from the open to close position in aproximately 2 seconds. A summary of the valve assembly test report will be transmitted for your information upon completion.

All drywell purge and vent inboard and outboard valve assemblies are being reoriented to an elbow-shaft inplane installation configuration (Unit 2 valves by completion of current outage, Unit 1 by completion of next scheduled refueling outage). In this configuration use of the 1.5 safety factor is acceptable. Based on the use of the 1.5 safety factor there is a requirement for the disc to start motion at an actual ΔP of 41 psi. Test results demonstrate full valve closure in about 2 seconds under full load. Based on the DBA analysis, it takes about 2.5 seconds (Unit 2) and 4 seconds (Unit 1) to reach this pressure. The isolation initiation signal is received at essentially time zero. The Plant Technical Specifications require full valve closure within 5 seconds. Therefore, the valves will be subjected to less than the design ΔP prior to motion.

The torus purge and vent inboard and outboard isolation valve assemblies (T48-F309, T48-F318, T48-F324, T48-F326, 2T48-F309, 2T48-F318, 2T48-F324, and 2T48-F326) are not being rotated into a shaft-elbow inplane configuration. Therefore, in the out of plane configuration a safety factor of 3 is used. With this safety factor the disc must start to move at a ΔP of 20 psi. Using figure 14.4-8 curve 2 from the Unit 1 FSAR and figure 6.2-25 curve 2 from the Unit 2 FSAR for the torus on both units, attached, it can be seen that a ΔP of 20 psi occurs at 6 second on Unit 1 and 7 seconds on Unit 2.

The plant Technical Specifications require valve closure within 5 seconds for both units. The valve will be fully closed prior to reaching a ΔP of 20 psi. Therefore, it is concluded that valve motion will be initiated far before it is required.

(F.3) Summary

The combination of analysis and test has established that the 18-inch containment purge and vent butterfly valves will go to a safe position and maintain that position when subjected to combined LOCA and seismic loadings. A copy of the December 28, 1979, letter to Mr. M. S. Desai of Bechtel from Mr. J. C. Dresser of Fisher Controls Company is attached for information and use in the evaluation.

IV Safety Actuation Signal Override

As indicated in the July 7, 1982, letter the review of this issue is being handled separately outside the framework of the purge and vent review.

V Containment Leakage Due to Seal Deterioration

Georgia Power Company has a comprehensive maintenance and surveillance program which assures operability and the leak tight integrity of the 18" purge valves. The valves are leak tested each refueling outage as part of the LLRT (Appendix J) program which assures their leak tight integrity. In order to further assure the seats are at their optimum effectiveness at all times, Georgia Power Company will commit to replace the seats on all the 18" purge and vent valves each refueling outage. Based on the above, we do not believe revised surveillance requirement such as has been suggested is needed at Plant Hatch.

VI Conclusion

It is believed that information provided above will allow the NRC Staff to successfully resolve all open issues dealing with the purge and vent system. The summary report dealing with the valve test program will be forwarded when complete and isolation damper procurement activities will commence pursuant to NRC approval of the proposed design modification.

TABLE 1

Offsite Thyroid Dose from LOCA During Purging of the Drywell (REM)

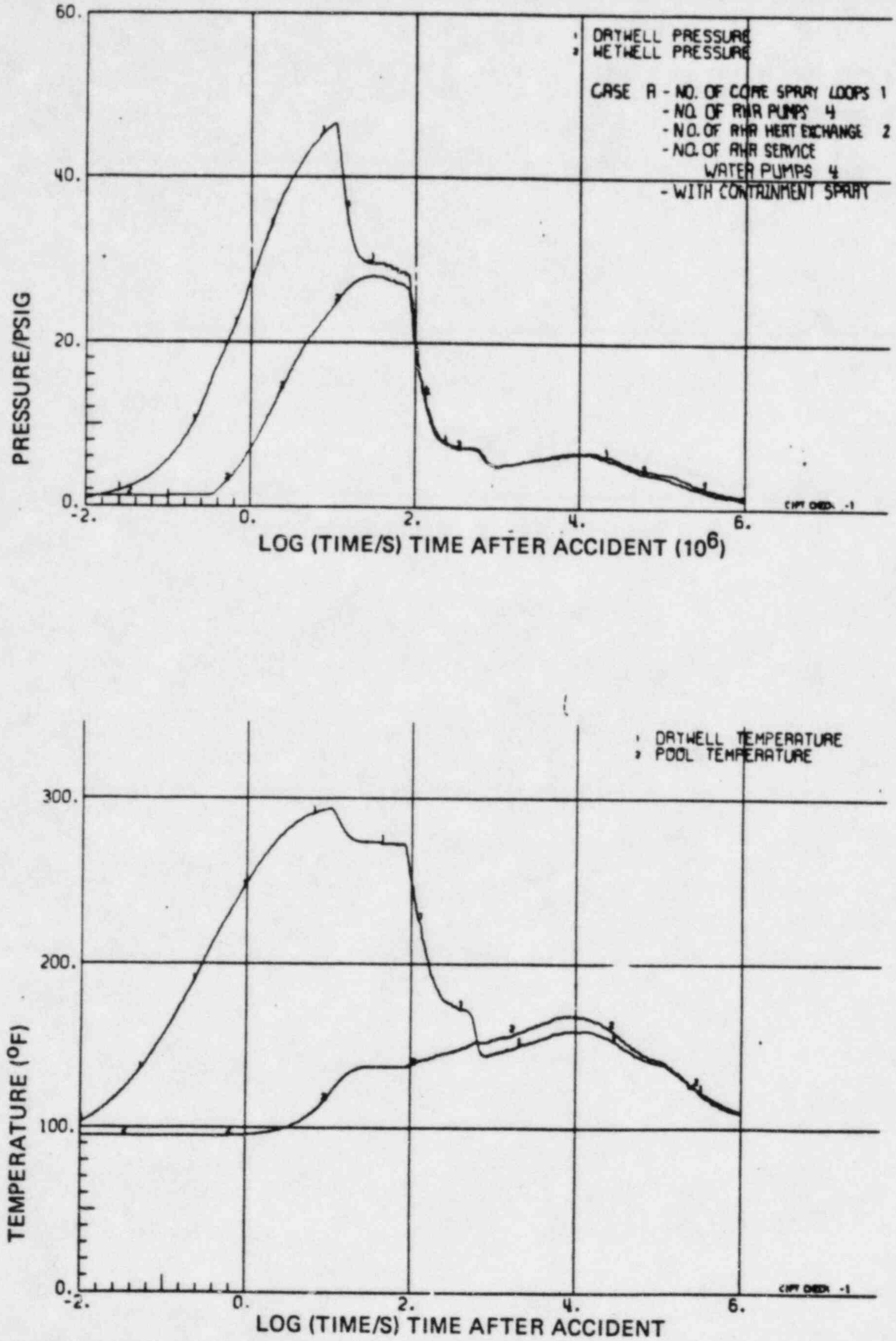
Case	Description of Release	Unit 1	Unit 2
A	Release through open purge valves with pre-existing I spike (5 seconds)	5.5E-3	2.2E-4
B	Release through open purge valves with concurrent I spike (5 seconds)	6.5E-4	1.3E-5

TABLE 2

PURGE AND VENT SYSTEM

CONTAINMENT ISOLATION VALVES

Valve Tag		Valve Size	Location
T48-F307	2T48-F307	18"	Drywell Purge Inboard Inlet Isolation
T48-F308	2T48-F308	18"	Drywell Purge Outboard Inlet Isolation
T48-F309	2T48-F309	18"	Torus Purge Inboard Inlet Isolation
T48-F318	2T48-F318	18"	Torus Purge/Vent Outboard Outlet Isolation
T48-F319	2T48-F319	18"	Drywell Purge/Vent Inboard Outlet Isolation
T48-F320	2T48-F320	18"	Drywell Purge/Vent Outboard Outlet Isolation
T48-F324	2T48-F324	18"	Torus Purge Outboard Inlet Isolation
T48-F326	2T48-F326	18"	Torus Purge/Vent Inboard Outlet Isolation



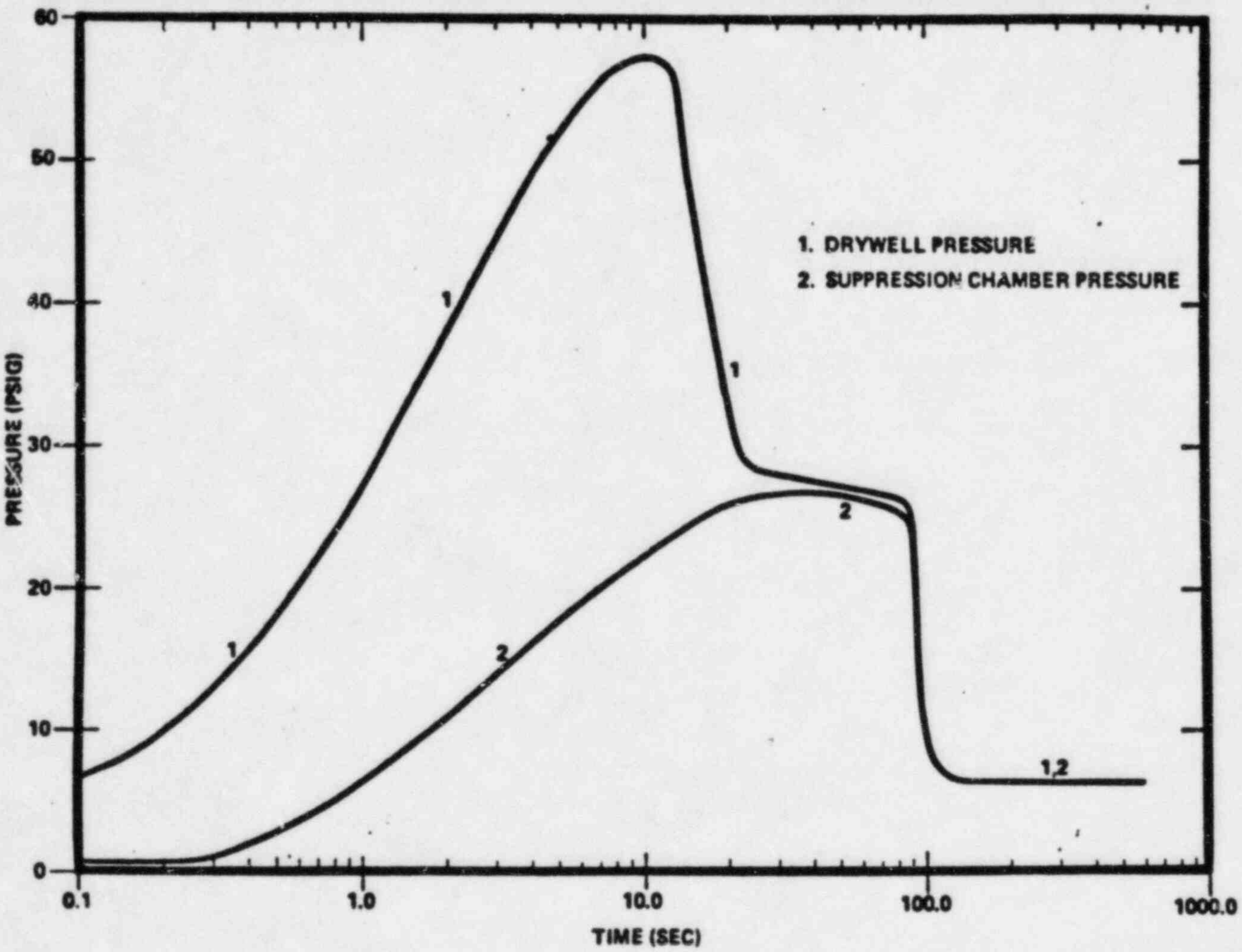
Georgia Power

EDWIN I. HATCH
NUCLEAR PLANT – UNIT 1

LOCA CONTAINMENT PRESSURE AND TEMPERATURE RESPONSE

FIGURE 14.4-8

3604-0



Georgia Power

EDWIN I. HATCH
NUCLEAR PLANT – UNIT 2

RECIRCULATION BREAK, CALCULATED CONTAINMENT PRESSURE RESPONSE

FIGURE 6.2-25

3604-0

TABLE 2

PURGE AND VENT SYSTEM

CONTAINMENT ISOLATION VALVES

Valve Tag		Valve Size	Location
T48-F307	2T48-F307	18"	Drywell Purge Inboard Inlet Isolation
T48-F308	2T48-F308	18"	Drywell Purge Outboard Inlet Isolation
T48-F309	2T48-F309	18"	Torus Purge Inboard Inlet Isolation
T48-F318	2T48-F318	18"	Torus Purge/Vent Outboard Outlet Isolation
T48-F319	2T48-F319	18"	Drywell Purge/Vent Inboard Outlet Isolation
T48-F320	2T48-F320	18"	Drywell Purge/Vent Outboard Outlet Isolation
T48-F324	2T48-F324	18"	Torus Purge Outboard Inlet Isolation
T48-F326	2T48-F326	18"	Torus Purge/Vent Inboard Outlet Isolation

HATCH

Table 3

DATE 12-14-79 BY A.L.G REF. NOS P87139-02 + P99769-03/10

VALVE TYPE 9200 SIZE 18" TEMP 340° SHAFT MATL 316 S/S BUSH. MATL BRONZE/GRAPHITE

DISC TO SHAFT CONNECTION PINNED DRIVE TO SHAFT CONNECTION KEYED

SHAFT STRENGTH FCTR %	51.000	51.000	51.000	51.000	51.000	51.000
BUSH. STRENGTH FCTR %	85.000	85.000	85.000	85.000	85.000	85.000
DISC TO SHAFT CONC FCTR	.500	.500	.500	.500	.500	.500
DRIVE TO SHAFT CONC FCTR	.750	.750	.750	.750	.750	.750
INPUT						
D	17.000	17.000	17.000	17.000	17.000	17.000
DP ALLOWABLE	103.800	89.300	[75.200]	47.600	33.000	32.500
Lo	.600	.600	.600	.600	.600	.600
Ts	.000	.000	.000	.000	.000	.000
Ti	.000	.000	.000	.000	.000	.000
m	.000	.000	.000	.000	.000	.000
DTF	14.300	58.300	136.000	315.000	720.000	882.000
P1	103.800	89.300	75.200	47.600	33.000	32.500
DPe fact	.260	.350	.250	.180	.110	.090
GENERATED VARIABLES						
St	26775.000	26775.000	26775.000	26775.000	26775.000	26775.000
Ss	13387.500	13387.500	13387.500	13387.500	13387.500	13387.500
Sb	8500.000	8500.000	8500.000	8500.000	8500.000	8500.000
OUTPUT						
ds TORK & BEND (St)	1.408	1.357	1.309	1.177	1.103	1.101
ds TORK & BEND (Ss)	1.426	1.391	1.365	1.269	1.227	1.226
ds TORK & SHEAR (Ss)	1.500	1.500	1.492	1.378	1.320	1.316
ds DISC CONNECT (Ss)	1.256	1.404	1.500	1.500	1.500	1.500
ds DRIVE CONNECT (Ss)	1.293	1.371	1.421	1.381	1.360	1.360
ds BUSH LOAD (Sb)	1.177	1.092	1.002	.797	.664	.658
ds SPECIFIED	1.500	1.500	1.500	1.500	1.500	1.500
TOT ACTUATOR TORK RQ	4777.282	5348.559	5802.608	5338.001	5085.964	5080.303
ACTUAL BUSH LOAD	5239.683	4507.744	3795.995	2402.784	1665.796	1640.556
	10°	20,30 & 40°	[50°]	60°	70°	80 & 90°

Table 4

DATE 12-14-79 BY A.L.G. REF. NOS

VALVE TYPE 9200 SIZE 18" TEMP 340° SHAFT MATL 316 SS BUSH. MATL BRONZE/GRAPHITE

DISC TO SHAFT CONNECTION PINNED DRIVE TO SHAFT CONNECTION KEYED

SHAFT STRENGTH FCTR %	51.000	51.000
BUSH. STRENGTH FCTR %	85.000	85.000
DISC TO SHAFT CONC FCTR	.500	.500
DRIVE TO SHAFT CONC FCTR	.750	.750
INPUT		
D	17.000	17.000
DP	65.000	[62.000]
Lo	.600	.600
Ts	2316.600	260.000
Ti	.000	.000
m	.000	.000
DTF	.000	136.000
P1		62.000
DPe fact		.250
GENERATED VARIABLES		
St	26775.000	26775.000
Ss	13387.500	13387.500
Sb	8500.000	8500.000
OUTPUT		
ds TORK & BEND (St)	1.237	1.235
ds TORK & BEND (Ss)	1.283	1.296
ds TORK & SHEAR (Ss)	1.375	1.402
ds DISC CONNECT (Ss)	1.375	1.446
ds DRIVE CONNECT (Ss)	1.308	1.359
ds BUSH LOAD (Sb)	.931	.910
ds SPECIFIED	1.500	1.500
TOT ACTUATOR TORK RQ	4715.063	[5164.043]
ACTUAL BUSH LOAD	3281.113	3129.677
	0°	50°

FISHER CONTROLS COMPANY

MARSHALLTOWN, IOWA 50158

AUTOMATIC CONTROL EQUIPMENT
SINCE 1880

Reply to: FISHER CONTROLS COMPANY, R. A. Engel Technical Center, P.O. Box 11, Marshalltown, Iowa 50158

BECHTEL POWER CORP.
JOB 6511

BECHTEL JOB 6511			
ROUTE		ACT	INT.
E. MGR.			
P.E.			
FJK			
NBW			
PQE			
MECH			
PLT. DES			
CS			
ELEC			
CIVIL			
ARCH			
HC'G			
PC			
STUP			
ADMIN			
FILE: A-19.3			

December 28, 1979

Bechtel Power Corporation
15740 Shady Grove Road
Gaithersburg, Maryland 20760

Attn: Mr. Manu S. Desai

Subject: E. I. Hatch Nuclear Plant, Units 1 & 2
Bechtel Job 6511-001/020
Purge Butterfly Valves
File: A-19.3/SS-2102-107/SS-6902-107
Fisher CCN: P87139 & P99769 (25-24142 & 25-30222)
18" Type 9220 BFV w/Bettis 733B-SR58 or SR60
Tag: T48 & 2T48-F307, 8, 9, 18, 19, 20, 24, 26

Reference:

a. Conference Agreements with Bechtel/Georgia Power representatives per 12-4-79 meeting in Marshalltown.

b. Letter: Fisher Controls (Dresser) to Bechtel Power Corp. (Desai) dated 12-17-79; Same subject.

c. Letter: Bechtel Power Corp. (Glasby) to Fisher Controls (Fleetwood) dated 12-10-79; Operational, Maintenance, and Surveillance History for Subject Valves.

d. NRC letter to "All Light Water Reactors" dated 9-27-79; Subject: Containment Purging and Venting During Normal Operation - Guidelines for Valve Operability.

Gentlemen:

1. Attached is the analysis printout data substantiating the limiting open angle of 50° which was provided per reference (b) above. A brief explanation of this analysis follows:

   a. The horizontal column labeled "DP" shows the allowable differential pressure across the valve, for various opening angles (listed at the bottom of the page) for the 1.5-inch shaft used. Note that only the opening angles up to and including 50° indicate an allowable differential pressure higher than 62 psid (accident condition ΔP). Therefore 50° is the maximum allowable opening angle.

   b. Refer to the second sheet of the printout for the "Total Actuator Torque Required" at 0° and 50° for maximum differential pressure conditions (65 psid shutoff, 62 psid flowing). (The actuator

torque listings on sheet 1 do not apply because these torque values are for the maximum allowable ΔP values at each angle.) The torque values given are for plate discs, so the flow direction has no effect on the torque requirements.

c. The analysis was done using material strength values for 340°F (service condition temperature).

2. These valves are provided with Bettis Type 733B-SR58 or SR60 actuators, which are to be operated with 60-100 psig air. Comparison of the performance characteristics of these actuators with the torque requirements reveals that these actuators are adequate to operate the valve under normal and accident conditions.

   a. The 733B-SR58 is a spring-close type actuator with a torque output of approximately 10,000 in-lb at the end of the stroke. In mid-stroke, the torque output will drop to approximately 79% of the end-stroke values because of the scotch-yoke actuator linkage (approximately 7900 in-lb at 25° open angle). This torque output is adequate to provide the required opening torque at 0° (4715 in-lb at 65 psid) and the hold-open torque at 50° (5164 in-lb at 62 psid).

   b. The 733B-SR60 is a similar spring-close type actuator with a torque output of approximately 8200 in-lb at the end of the stroke. In mid-stroke, the torque output will also drop to approximately 79% of the end of stroke values (6478 in-lb); thus this actuator is also adequate to meet the required opening torque at 0° and the hold-open torque at 50°.

   c. Since butterfly valves of this type have a flow-closed (flow aids closure) characteristic when starting at 50° opening, the only resistances to be overcome for closing are the friction and seating torques, which are fairly low (approximately 2500 in-lb combined). This torque is well within the capabilities of the return spring provided; therefore, closure from the 50° open position can be assured under flowing conditions (at 62 psid).

   d. A Bettis Chart is enclosed showing typical output torques for actuators of the type used (Heavy-duty Series). The curves shown reflect the mid-stroke loss of output due to the scotch-yoke mechanism. If higher pressure air is used (without changing the spring), the air stroke torque output will be increased, while the spring stroke output will remain unchanged.

   e. A marked diagram of a Bettis Type 733B-SR actuator is enclosed, showing the suggested location of the travel stop. The air breather and body plug should be removed from the spring barrel end, and the end of the spring barrel should be re-bored and re-threaded to take a travel stop (machined from bar stock).

The travel stop should be bored for an air breather also. The length of the travel stop may be determined by noting the position of the spring piston rod extension at the desired rotary shaft angle.

3. There will be substantial capacity reductions at the limited opening angles.

   a. If the valves are limited to a 30° maximum opening, the Cg will be approximately 20,700. This will permit a flow of 1500 SCFM of 150°F air at a minimum ΔP of 0.5 psid.

   b. If the valves are limited to a 50° maximum opening, the Cg will be approximately 57,000. This will permit a flow of 1500 SCFM of 150°F air at a minimum ΔP of 0.2 psid.

4. The capacity and torque values used in sizing are based on a series of laboratory tests done at Fisher, using a selected group of models. Capacity and Torque Curves obtained from a typical test are enclosed to illustrate the method and the general shape of the curves for Type 9200 butterfly valves. "Reverse flow" means flow into the hub side of the disc, and positive torque values are assigned if flow tends to close (the usual condition for partial opening). Note that the curves provided are for a 6" model, not for an 18" 9200 butterfly valve with a plate disc.

5. Consideration is given to the eight topics under "Operability - Guidelines for Demonstration of Operability of Purge and Vent Valves" listed in the NRC letter of 9-27-79, as follows:

   (1) Valve Closure Rate/Time: The as-installed closure time for all these valves was determined to be 3-5 seconds under no-flow conditions per the Bechtel letter of 12-10-79 (Ref. C). Because flow aids (or does not impede) closure, the closure time under flow conditions will be at least this fast (even at a ΔP of 62 psid). Only friction and seating loads must be overcome; these are relatively low, in the order of 2500 in-lb, which are well within the capabilities of the spring return torque from the actuator, disregarding the assistance from the flow-closed effect. The closure rate will not be perfectly linear because of the scotch-yoke mechanism, but the departure from linearity will not be drastic, and closure should be achieved in 3-5 seconds.

   (2) Flow Direction Through Valve: The preferred orientation for Type 9200 butterfly valves is to have the T-ring retaining ring on the outlet side of the valve. However, closure can be achieved regardless of flow direction. Since these valves are equipped with symmetrical plate discs, flow direction will have no significant effect on valve capacity or torque requirements. These 18" valves will pass 1500 SCFM of 150°F air each, at a minimum ΔP of 0.5

psid if pinned at 30° maximum opening; if pinned at 50° maximum opening, each valve would pass the above air flow at a ΔP of 0.2 psid.

(3) Single Valve Closure or Simultaneous Closure: In the Hatch Installation, it is understood that the subject valves are installed in pairs (in series) outside the drywell. Thus these valves are not exposed to ambient external pressure/temperature buildup in the event of a LOCA condition. The solenoids and Bettis actuator would be free to vent without backpressure buildup effects, and the spring-action would drive the solenoids and the butterfly valve actuators to the safety-mode position (valve disc closed). With the valves pinned at 50° maximum opening, either valve of the series pair would be able to shut off at the maximum ΔP of 62 psid, and this would be the worst condition (one valve closing against the maximum ΔP). If both close simultaneously, the total pressure drop would be shared.

(7) The Effect of the Piping System (turns, braches, etc.): Fisher considers that essentially uniform flow is achieved within 4-5 pipe diameters downstream from an obstruction. Therefore if no obstructions (turns, bends, valves) are present closer than about 72" on the upstream side, there will be little effect on the flow pattern at the valve (assuming 18" line sizes). On the downstream side, there should be ample clearance for the disc motion. If obstructions are closer than 4-5 pipe diameters on the upstream side, the effect on capacity and torque will be related to the disc shaft orientation with respect to the non-uniform flow pattern. (See following paragraph.)

(8) The Effect of Valve Disc and Shaft Orientation: The preferred orientation for the valve disc and shaft is such that any non-uniform flow in the pipe would be split by the valve shaft, and such that one-sided impingement on the "wings" of the disc are avoided. This is related, therefore, to the nature and orientation of any close obstructions or discontinuities upstream (within 4-5 pipe diameters or less). If there are no close obstructions, the orientation of the disc and shaft would be immaterial, since the flow would be essentially symmetrical, distributed evenly across the pipe cross section.

6. This communication completes our review of the subject valves at the E. I. Hatch Nuclear Plant. We trust that the questions discussed

during our December 4, 1979, meeting have been satisfactorily resolved. If additional evaluation and analyses are needed, appropriate commercial arrangements should be made.

Sincerely,

FISHER CONTROLS COMPANY

John C. Dresser

John C. Dresser
Nuclear Engineering Specialist

JCD:md

Enclosures:

1. Analysis Printout for P87139-02 & P99769-03/10, dated 12-14-79; 2 pages.

2. Diagram of Bettis Model 733B-SR Actuator Marked for Travel Stop, 1 page.

3. Typical Torque Output Chart for Bettis Spring Return Actuators Page 1.27, dated 7-9-74.

4. Flow vs. Travel Characteristic Curves Fisher Report 13, Problem 983, Figure 1.

5. Dynamic Torque Curve Fisher Report 13, Problem 983, Figure 2.

cc: Richard Hoober - Continental Div.
John Weekley - Continental Div.
Al Gentile - Continental Div.
Dick Baumann
Floyd Jury
Larry Fleetwood
Floyd Harthun

DATE 12-14-79 BY A.L.G REF. NOS P87139-02 + P99769-03/10

VALVE TYPE 9200 SIZE 18" TEMP 340° SHAFT MATL 316 S/S BUSH. MATL BRONZE/GRAPHITE

DISC TO SHAFT CONNECTION PINNED DRIVE TO SHAFT CONNECTION KEYED

SHAFT STRENGTH FCTR Z	51.000	51.000	51.000	51.000	51.000	51.000
BUSH STRENGTH FCTR Z	85.000	85.000	85.000	85.000	85.000	85.000
DISC TO SHAFT CONC FCTR	.500	.500	.500	.500	.500	.500
DRIVE TO SHAFT CONC FCTR	.750	.750	.750	.750	.750	.750
INPUT						
D	17.000	17.000	17.000	17.000	17.000	17.000
DP ALLOWABLE	103.800	89.300	[75.200]	47.600	33.000	32.500
Lo	.600	.600	.600	.600	.600	.600
Ts	.000	.000	.000	.000	.000	.000
Ti	.000	.000	.000	.000	.000	.000
s	.000	.000	.000	.000	.000	.000
DTP	34.300	58.300	136.000	315.000	320.000	882.000
P1	103.800	89.300	75.200	47.600	33.000	32.500
DPB TLCE	.260	.330	.230	.180	.110	.090
GENERATED VARIABLES						
St	26775.000	26775.000	26775.000	26775.000	26775.000	26775.000
Ss	13387.500	13387.500	13387.500	13387.500	13387.500	13387.500
Sb	8500.000	8500.000	8500.000	8500.000	8500.000	8500.000
OUTPUT						
ds TORK & BEND (St)	1.408	1.337	1.309	1.177	1.103	1.101
ds TORK & BEND (Ss)	1.426	1.391	1.365	1.269	1.227	1.226
ds TORK & SHEAR (Ss)	1.509	1.500	1.492	1.378	1.320	1.316
ds DISC CONNECT (Ss)	1.256	1.404	1.500	1.500	1.500	1.500
ds DRIVE CONNECT (Ss)	1.293	1.371	1.431	1.281	1.360	1.360
ds PUSH LOAD (Sb)	1.177	1.092	1.002	.797	.664	.658
ds SPECIFIED	1.500	1.500	1.500	1.500	1.500	1.500
TOT ACTUATOR TORK RQ	4777.282	5348.559	5802.608	5338.001	5085.964	5080.303
ACTUAL BUSH LOAD	5239.685	4507.744	3795.995	2402.784	1665.796	1640.556
	10°	20,30 & 40°	[50°]	60°	70°	80 & 90°

DATE 12-14-79 BY A.L.G. REF. NOS

VALVE TYPE 9200 SIZE 18" TEMP 340° SHAFT MATL 316 SS BUSH. MATL BRONZE/GRAPHITE

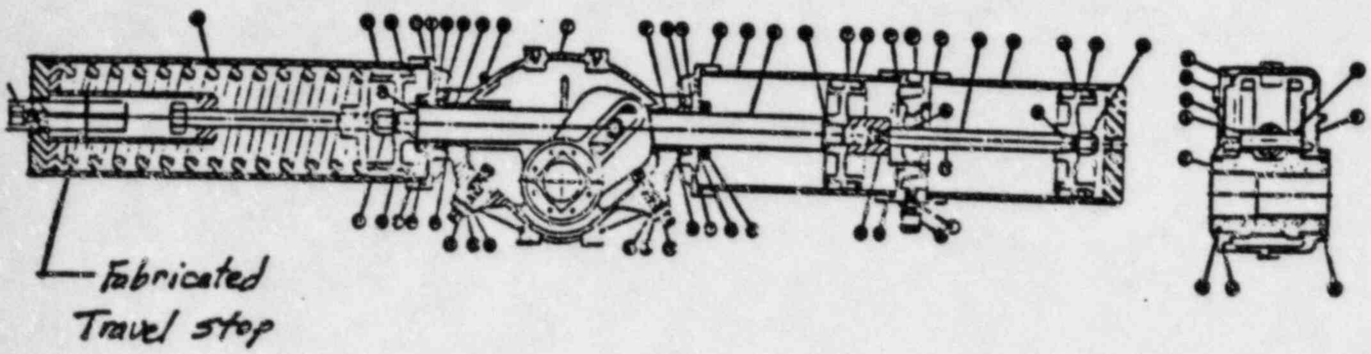
DISC TO SHAFT CONNECTION PINNED DRIVE TO SHAFT CONNECTION KEYED

SHAFT STRENGTH FCTR %	51.000	51.000
BUSH. STRENGTH FCTR %	85.000	85.000
DISC TO SHAFT CONC FCTR	.500	.500
DRIVE TO SHAFT CONC FCTR	.750	.750
INPUT		
D	17.000	17.000
DP	65.000	[62.000]
Lo	.600	.600
Ta	2316.600	260.000
Ti	.000	.000
m	.000	.000
DTP	.000	136.000
P1		62.000
DPe fact		.250
GENERATED VARIABLES		
St	26775.000	26775.000
Se	13387.500	13387.500
Sb	8500.000	8500.000
OUTPUT		
ds TORK & BEND (St)	1.237	1.235
ds TORK & BEND (Se)	1.283	1.296
ds TORK & SHEAR (Se)	1.375	1.402
ds DISC CONNECT (Se)	1.375	1.446
ds DRIVE CONNECT (Ss)	1.308	1.159
ds BUSH LOAD (Sb)	.931	.910
ds SPECIFIED	1.500	1.500
TOT ACTUATOR TORK RQ	4715.063	[3164.043]
ACTUAL BUSH LOAD	3281.113	3129.677
	0°	50°

BETTIS®

ALWAYS FURNISH SERIAL NUMBER OF ACTUATOR WHEN ORDERING PARTS

MODEL 733 B-SR

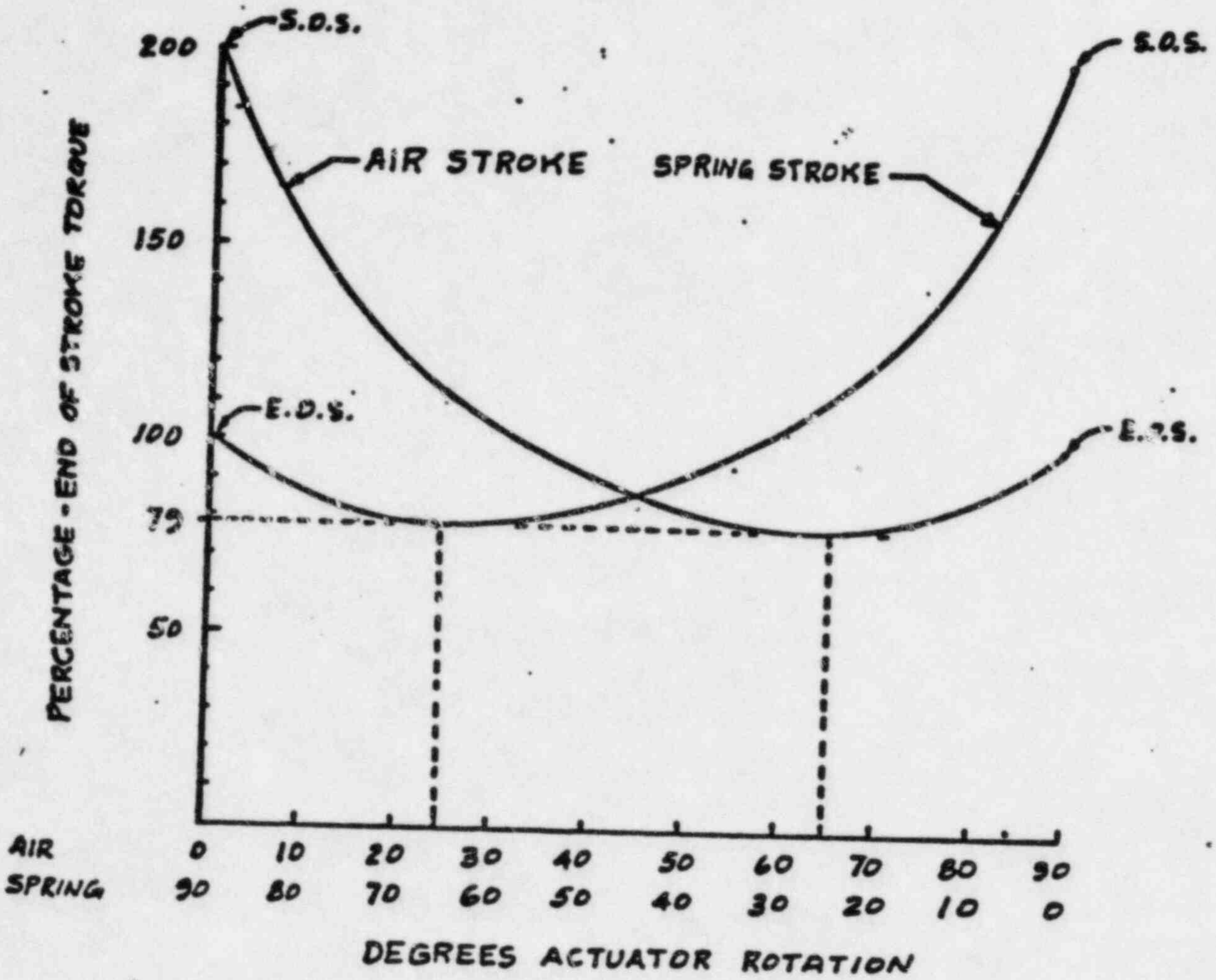


MODEL 733 B-SR

ITEM NO	PART NO	DESCRIPTION	MATERIAL	MATERIAL SPEC	QUAN	SPARE PARTS
1	211328	HOUSING	DUCTILE IRON	ASTM-A445-63T GRADE 60-45-15	1	
2	211329	YOKE	DUCTILE IRON	ASTM-A536-65T GRADE 65-45-12	1	
3	211330	HOUSING COVER	DUCTILE IRON	ASTM-A536-65T GRADE 65-45-12	1	
4	211331	YOKE PIN	STEEL	STRESSPROOF	1	
5	211415	YOKE PIN ROLLER	STEEL	STRESSPROOF	2	
6	211332	PISTON ROD	STEEL	STRESSPROOF	1	
7	203[illegible]0	PISTON	GRAY IRON	ASTM-A126-61T CLASS B	1	
8	202662	CYLINDER ADAPTER	DUCTILE IRON	ASTM-A536-65T GRADE 60-45-15	2	
9	211333	CYLINDER	STEEL	TUBING AISI 1010 & PLATE ASTM-A7	1	
10	209695	PISTON ROD GUIDE BUSHING	BRONZE	ASTM-B 143-52 GRADE [illegible]-10-2	2	
11	208384	PISTON RETAINER NUT	STEEL & NYLON	ASTM-A194-65 GRADE 2	1	
12	21[illegible]	STOP ADJUSTING SCREW	STEEL	45/53 Rc	2	
13	211335	ADJUSTING SCREW JAM NUT	STEEL	ASTM-A194-65 GRADE 1	2	
14	208387	PISTON SEAL	BUNA-N	DURO 70A	3	3
15	205244	YOKE SEAL	BUNA-N	DURO 70A	2	2
16	210826	PISTON ROD SEAL	BUNA-N	DURO 65A	2	2
17	208323	CYLINDER SEAL	BUNA-N	DURO 70A	4	4
18	211334	HOUSING COVER GASKET	COMPRESSED ASBESTOS	ASTM-D1170	1	1
19	204684	HOUSING COVER SCREW	STEEL	ASTM-A307-65 GRADE A	4	
20	209094	CYLINDER ADAPTER GASKET	COMPRESSED ASBESTOS	ASTM-D1170	2	2
21	2046[illegible]	CYLINDER ADAPTER SCREW	STEEL	35-42 Rc	8	
22	20[illegible]27	OIL FILL & DRAIN PLUG	STEEL	COMMERCIAL	1	
23	203727	CYLINDER ADAPTER PLUG	STEEL	COMMERCIAL	4	
24	200017	ADAPTER SCREW LOCKWASHER	STEEL	COMMERCIAL	8	
25	211337	ADJUSTING SCREW SEAL	NYLON	ZYTEL® 101	2	2
26	205216	PISTON HEAD SEAL	BUNA-N	DURO 70A	2	2
27	203254	SERIAL NUMBER TAG	ALUMINUM		1	
28	210921	PISTON ROD ANTI-EXTRUSION SEAL	POLYTHANE®	CUP DURO 90A, O-RING DURO 70A	2-SETS	2-SETS
29	209200	INNER CYLINDER	STEEL	AISI-1018	1	
30	211759	OUTER BODY	DUCTILE IRON	ASTM-A536-65T GRADE 60-45-10	1	
31	212221	OUTER PISTON ROD	STEEL	STRESSPROOF	1	
32	212936	PISTON ROD ADAPTER	STEEL	GRADE B1112	1	
33	202155	OUTER PISTON	GRAY IRON	ASTM-A126 CLASS-B	1	
34	209[illegible]	OUTER PISTON RETAINER NUT	STEEL & NYLON	ASTM-A194 GRADE 2	1	
35	[illegible]	[illegible] ROD SEAL	[illegible]	[illegible]	1	
36	[illegible]	[illegible] SEAL	[illegible]	[illegible]	1	
37	[illegible]	[illegible]	[illegible]	[illegible]	1	
38	[illegible]	[illegible] SEAL [illegible]	[illegible]	[illegible]	2	
39	[illegible]	[illegible]	[illegible] & BUNA-N	ASTM-[illegible] 65-45-55	2	2
40	209[illegible]	SPRING PISTON	GRAY IRON	ASTM-A126 CLASS-B	4	
41	2119[illegible]	OUTER BODY BREATHER BUSHING	STEEL	COMMERCIAL	1	
42		SPRING CYLINDER	STEEL	TUBING AISI-[illegible] & END CAP ASTM-A7	1	
43		SPRING ASSEMBLY	STEEL & DUCTILE IRON		1	

SEAL KIT P/N 820240

BY. B. REED DATE 7-9-74 SUBJECT TORQUE CURVE FOR SPRING RETURN TYPE ACTUATORS ~ I POSITION vs. % OF E.O.S. RATED TORQUE SHEET NO 1 OF 1
CHKD BY ____ DATE ____ JOB NO 3-1848-1 (521-SR-60)



VALUES SHOWN ARE THOSE FROM ONE ACTUATOR & SHOULD BE CONSIDERED APPROXIMATE ONLY.

E.O.S. = END OF STROKE.
S.O.S. = START OF STROKE.

DATE 7-1-76 WCS

FISHER CONTROLS COMPANY

PROBLEM 983
REPORT 13
FIGURE 1

FLOW VS TRAVEL CHARACTERISTIC

BODY SIZE 6" DESIGN/TYPE 9200 B/F BODY DWG. F41629-B

SEAL CONSTRUCTION ____ SEAL DWG. ____

MEASURED PROTECTOR RING DIA. ____ PROTECTOR RING DWG. ____

BALL/DISC TYPE 5 TO 1 ASPECT RATIO BALL/DISC DWG. 75-115DXX2002-A

VALVE FLOW DIRECTION: ☒ NORMAL ☒ REVERSE

⊙ WATER TEST

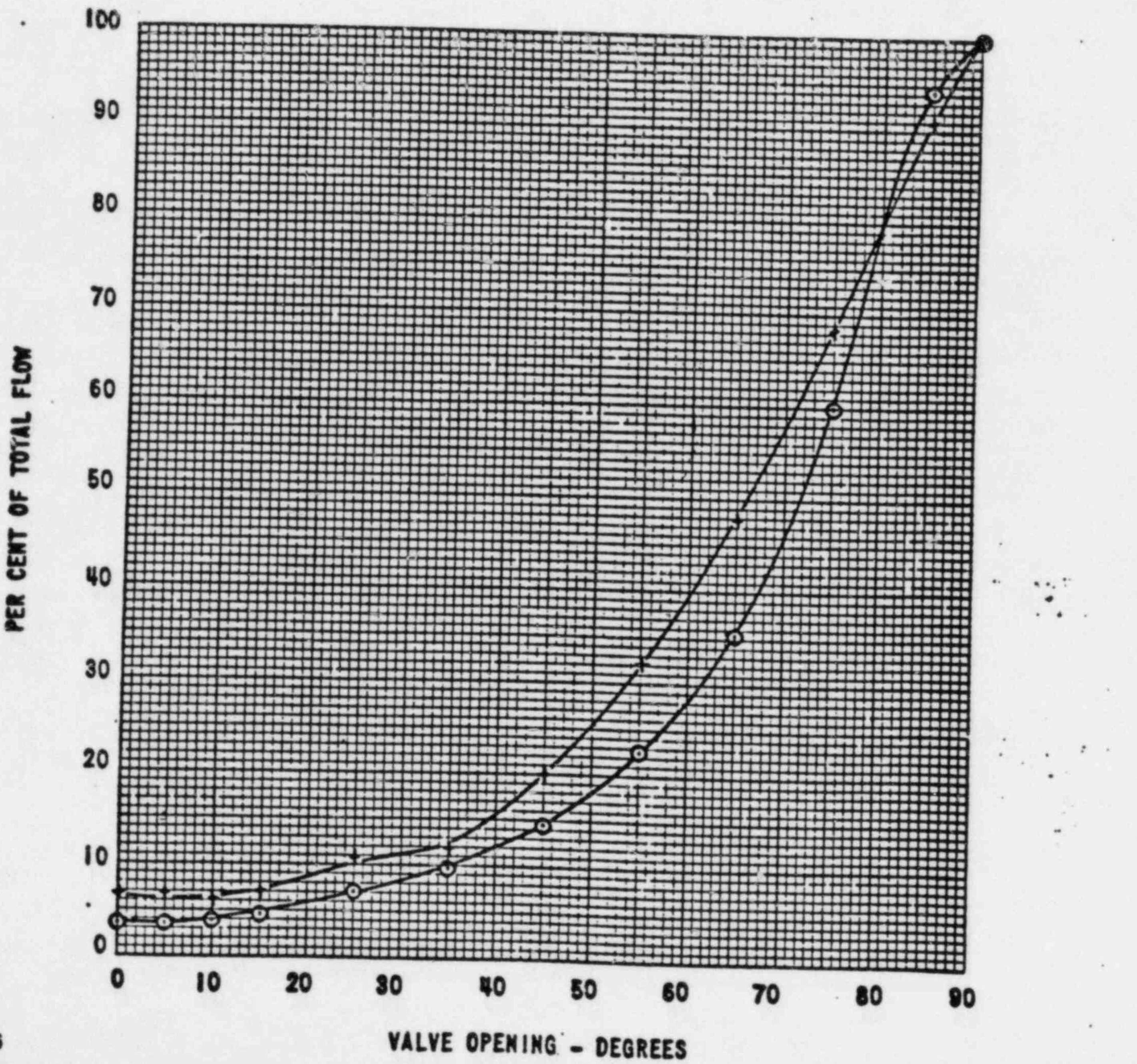
BODY INLET PRESSURE >100 PSIG BODY PRESSURE DROP 5 PSI

AVERAGE C_v = 1370

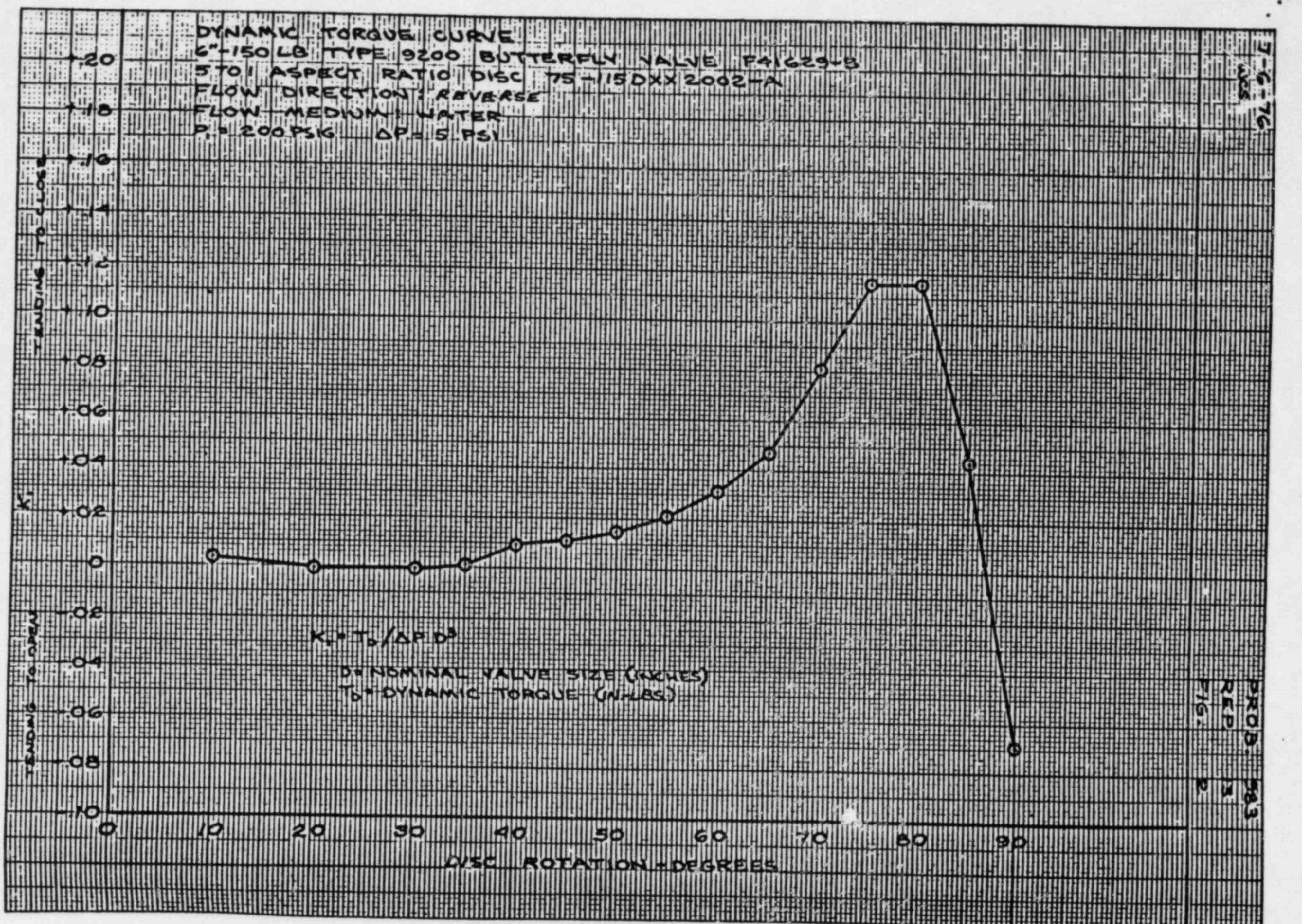
† AIR TEST

BODY INLET PRESSURE 64.3 PSIA BODY PRESSURE DROP CRITICAL

AVERAGE C_g = 25700



IES. FORM 06


DYNAMIC TORQUE CURVE
6"-150 LB TYPE 9200 BUTTERFLY VALVE F41629-B
5 TO 1 ASPECT RATIO DISC 75-115DXX 2002-A
FLOW DIRECTION: REVERSE
FLOW MEDIUM: WATER
P1 = 200 PSIG ΔP = 5 PSI
KT = TD/ΔP D3
D = NOMINAL VALVE SIZE (INCHES)
TD = DYNAMIC TORQUE (IN-LBS)
KT
TENDING TO CLOSE
TENDING TO OPEN
+.20
+.18
+.16
+.14
+.12
+.10
+.08
+.06
+.04
+.02
0
-.02
-.04
-.06
-.08
-.10
0
10
20
30
40
50
60
70
80
90
DISC ROTATION - DEGREES
7-6-76
WCS
PROB. 583
REP. 13
FIG. 2