MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

August 9, 1982

NUCLEAR PRODUCTION DEPARTMENT

U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Attention: Mr. Harold R. Denton, Director

Dear Mr. Denton:

SUBJECT: Grand Gulf Nuclear Station
Units 1 and 2
Docket Nos. 50-416 and 50-417
License No. NPF-13
File: 0260/L-334.0/L-860.0
Purge Valve Operability; License Condition 1.11 (43)
AECM-82/442

As requested in Supplement No. 2 to the Safety Evaluation Report (SER) for Grand Gulf Nuclear Station, NUREG-0831, Mississippi Power & Light (MP&L) is providing the attached analyses regarding drywell purge/ventilation isolation valve operability, during a design basis LOCA in the drywell. The subject valve operability analyses, performed by the valve supplier, Henry Pratt, is attached. This information addresses concerns identified as SER License Condition 1.11 (43) and refers to your review as presented in the above noted supplement Sections 6.2.4.1 and 22.2 (II.E.4.2). This information also pertains to plant restrictions as presented in Operating License Condition 2.C (19).

MP&L letter AECM-82/28, dated March 15, 1982, provided an initial discussion of the containment purge systems and additional clarification/justification on the use of these systems, as requested by the NRC (Supplement No. 1 to GGNS SER, subsection 6.2.4.1). A simplified composite of the systems involved was also included that report (Figure 1.1-1).

Followup information was provided in MP&L letter, AECM-82/133, dated April 6, 1982. This letter documented later discussion with your Equipment Qualification Branch on the operability requirements for drywell purge isolation valves. This letter provided MP&L's intent on the use of the drywell and containment purge systems and committed MP&L to conducting a valve operability analysis on the subject drywell isolation valves. The attachments represent fulfillment of that commitment.

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PM

AE2E1

MISSISSIPPI POWER & LIGHT COMPANY

MP&L has completed a review of the attached analyses and has concluded that the analyses provide adequate assurance that the 20" drywell purge/vent isolation valves can close within the required time.

The most severe design basis accident drywell peak pressure was used in the analysis. The resulting differential pressure was applied across the isolation valves during the valve closure form the maximum open position to the fully seated position. The worst case peak post-accident drywell pressure, as described above, results from a postulated design basis mair steam line break (Figure 6.2-10, provided on Attachment 1 of the analysis) while the plant is in power operation. For more information see FSAR subsection 6.2.1.1.3.3.2. In addition, a worst cast test configuration as described in the attached Pratt analysis bounds Grand Gulf's worst case configuration. This approach is conservative because it produces larger valve torque coefficients/loads that that which the subject GGNs valves would actually experience.

The analyses results confirm that the drywell purge/vent isolation valves will close under design basis accident conditions. Applying a peak differential pressure at closure time, the analysis showns that no disc or valve body deformation occurs, nor is the resulting actuator torque in excess of that used for the actuators design. The valve supplier had concluded that no additional rework, analysis, or testing of these valves is required to confirm operability.

The valve vendor has determined that the operability analysis also applies to the 20" containment purge isolation valves. This is based primarily on the fact that the subject containment and drywell valve designs are identical and that the test configuration bounds the Grand Gulf design. Based on this determination adequate assurance is provided that the subject isolation valves will function as required and justifies the purging of the drywell during operational modes 1 through 5.

Regarding the venting of drywell during operational mode 1, additional justification will be provided in a later submittal.

Please advise if further information is required.

Yours truly,

L. F. Dale
Manager of Nuclear Services

JTB/JGC/JDR:tlj
Attachments

cc: (See Page 3)

AE2E2

cc: Mr. N. L. Stampley (w/o)
Mr. R. B. McGehee (w/o)
Mr. T. B. Conner (w/o)
Mr. G. B. Taylor (w/o)

Mr. Richard C. DeYoung, Director (w/a)
Office of Inspection & Enforcement
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Atlanta, Georgia 30303

AE2E3

I. General Design Data

A. Valve

- System: Containment/Drywell Cooling
- Valve numbers and locations: M41F013 inside containment (outside drywell)
M41F015 inside drywell
M41F016 inside drywell
M41F017 inside containment (outside drywell)
- Figures, drawings, isometrics: FSAR Figures 9.4-11, 9.4-12, 9.4-13
Drawings M-1474, Rev. 25 (copy attached)
M-1478, Rev. 14 (copy attached)
Isometrics 1 and 2 (copies attached)
- Type: Butterfly
- Size: 20"
- Manufacturer: Henry Pratt Company
- Style Number: 1200 Series
- Standards and/or codes: Design incorporates ASME Section III, Class 2 (Class 1 design rules as appropriate).
- Pressure rating or class: ANSI 150#
- Disc type: Offset asymmetric
- Disc thickness to diameter ratio (A/D): 0.2418"
- Shaft diameter (nominal): 2.5"
- Valve opening limitation: N/A
- Reason for limiting opening: N/A
- Means used to limit opening: N/A

B. Operator

- Manufacturer: G. H. Bettis
- Model number: T312B-SR3
- Style number: None
- Type: Air-spring

- Standards and/or codes: Operator design is unique to Bettis and is based upon standard engineering principles.

- Accumulator used: No

C. Pilot Solenoid Valve

- Manufacturer: Automatic Switch Company

- Model number: NP831655E

- Type: 3-way

- Location: Solenoid is located adjacent to (attached to) the valve actuator.

II. Valve Stroke Time

A. Concern
What is the valve stroke time?

Response
Actual valve stroke times obained during preoperational testing are available for review at the GGNS plant site.

B. Concern
What is the valve stroke time required by Technical Specifications for inservice testing of these valves?

Response
Grand Gulf Technical Specifications specify a maximum closure time of 4 seconds.

C. Concern
If pressure-time profile is used in determining the differential pressure the valve is qualified to close against (rather than peak drywell pressure), show that the stroke time does not increase under load (as a result of combined valve torques or forces developed and/or containment backpressure). If stroke time does increase, the resulting closure and lag time should be used in the qualification.

Response
Peak drywell pressure was used in the Pratt analysis. This method is conservative and consistent with the NRC position as stated in the NRC Purge and Vent Valve Operability Review List:

> "Use of peak containment (drywell) pressure for the differential pressure is more conservative."

D. Concern
What is the maximum "delay time" from the start of a LOCA to the receipt of an isolation signal?

Response
The maximum "delay time" from the start of a LOCA to the receipt of an isolation signal is conservatively assumed to be one second. Reference Table I of Pratt Valve Report.

III. Determination of Differential Pressure Used to Qualify the Valve

A. Concern
What is the peak drywell pressure?

Response
The peak drywell pressure was 22.44 psig (Reference FSAR Figure 6.2-10 and Table 1 of the Pratt Valve Report).

B. Concern
Provide the pressure-time profile of the accident case postulated.

Response
Reference FSAR Figure 6.2-10.

C. Concern
Is the valve assembly (valve and operator) capable of withstanding a differential pressure equal to the peak drywell pressure at all disc opening angles from initial to full closed?

Response
A constant peak pressure was used in the Pratt analysis for various disc angles. The Pratt analysis demonstrates that the valve assembly is capable of withstanding a differential pressure equal to the peak drywell pressure at all disc opening angles from initial to full closed (Reference Table 1 of Pratt Valve Report).

D. Concern
If the peak drywell pressure was not used as the differential pressure for the qualification, show how the differential pressure across the valve was established at various disc angles during closure. In addition, provide the following:

1. Drywell pressure response (Pc) vs. disc angle (and associated stroke time).

2. Valve inlet pressure (P) vs. disc angle (and associated stroke time).

3. Pressure drop across valve (differential pressure), disc angle (and associated stroke time).

Response
Since peak drywell pressure was used in this analysis, this question is not applicable to GGNS.

IV. Determination of Valve Dynamic Torque Coefficients/Loads:

A. Butterfly Valves

Concern
1. Test Report
A test report should be submitted which establishes the basis for determining the torque coefficients of butterfly valves. The following areas should be addressed either in the report or in a supplement provided with the report.

a. Description of the test setup (include upstream and downstream piping and inlet and outlet nozzle configurations).

b. Description of test valve and justification that the valve is representative of the inservice valve.

c. Test procedure.

d. Installation configurations tested, i.e., flow directions, different shaft vs. elbow orientations, and disc closure direction.

e. Test results including a tabulation of torque coefficients determined at various angles of opening for the valves under review.

f. Piping flow resistance differences between the test configuration and the actual configuration for the inservice valve.

g. Provide an example of how dynamic torques are calculated for the inservice valve.

<u>Response</u>

1. a-f Although the Pratt test configuration is briefly described in the Pratt Valve Report, Pratt will provide a summary description of test parameters considered in their determination of worst case at a later date.

g. Reference pages 4 and 5 of the Pratt Valve Report.

<u>Concern</u>

2. Installation Factors for Inservice Valves

a. For each purge/vent valve installation provide a sketch or description showing the following:

1) Direction of flow.
2) Disc closure direction.
3) Curved side of valve disc upstream or downstream (asymmetric disc).
4) Orientation and distance of elbows, tees, bends, etc. within 20 pipe diameters upstream of the valve.
5) Shaft orientation.
6) Distance between in-series valves.

b. Describe the procedures (preferably test) used as a basis to show which installation produces the worst case loads on the valve.

c. Provide a tabulation of torque coefficients and corresponding inservice valve torques for the installation determined as the worst case for each valve size and type.

d. What effect will the failure of an upstream, in-series valve in the partially or full open position have on flow, differential pressure, and torque coefficients? Describe how these effects were correlated with installation factors to determine a worst case torque coefficient.

Response

2. a. 1), 4), 5), 6)
Reference drawings M1474, Rev. 25 and M1478, Rev. 14 (copies attached) and Isometrics 1&2 (copies attached).

2) Pratt has assumed worst case closure direction, i.e., leading edge of the valve disc toward the outer wall of the elbow (Reference Sections II.A.7 and II.A.8 of the Pratt Valve Report).

3) Pratt has assumed worst case flow direction, i.e., flow toward the hub side of the disc, which creates the highest torque (Reference Section II.A.2 of the Pratt Valve Report).

b. In a letter dated July 29, 1982 from Pratt to Bechtel, Pratt stated stated that:

> "...tests show that an elbow two diameters upstream of the valve has a significantly reduced effect on the valve torque versus an elbow immediately attached to the valve. Therefore, we believe that a partially open valve more than two pipe diameters upstream would have a lower torque effect than our worst case assumption that is an elbow immediately upstream of the valve."

Therefore, Pratt assumed a 90° elbow, out of plane with respect to the valve shaft, immediately upstream of the valve as the worst case installation. This is the worst case test identified at Pratt. It is believed to be a worse case than a partially opened upstream valve which tends to reduce the P across the downstream valve. No specific evaluation of a failed upstream valve was included in the analysis. As can be seen in the attached drawings, the Grand Gulf configuration is bounded."

c. Valve torque vs. disc angle has been shown at 5° increments. Torque coefficients are derived from analysis of experimental test data and correlated with analytically predicted behavior of airfoils in compressible media (Reference Table 1 of the Pratt Valve Report).

d. Reference IV.A.2.b. above.

B. Concern

Valve Types Other Than Butterflies

If tests are performed to establish dynamic loads on valves other than butterfly valves, the test reports should be submitted for review. As a minimum, these reports should include the following:

1. Description of test setup.

2. Description of test valve and justification that the valve is representative of the inservice valve.

3. Test procedure.

4. Test results.

5. Show how dynamic loads are calculated for the inservice valve.

6. For each globe type purge/vent valve installation, provide a sketch of the valve showing the direction of flow through the valve (during the accident mode).

Response
This question is not applicable for Grand Gulf.

V. Other Loads

A. Concern
Show how dynamic torques determined are combined with other torques, e.g., bearing torques, seating torques, etc. Show how these torques were determined. (For valves other than butterfly type show applicable load combinations).

Response
Reference Section III of the Pratt Valve Report.

B. Concern
Describe how the seismic loads were combined with the torque loads or dynamic loads.

Response
Reference pages 8 and 10 of the Pratt Valve Report and pages 28 - 30 of Attachment 2 to the Pratt Valve Report.

VI. Stresses

A. Concern
Provide a tabulation of the following for each valve type/size:

1. Critical valve parts analyzed.

2. Loads or load combinations used (torsional, bending, etc.).

3. Stresses calculated (include seismic loads in calculation) and corresponding disc angles (or calculated allowable differential pressures based on calculated stresses).

4. Stress allowables.

5. Codes/Standards used to determine allowables for each part (include percentage of yield/ultimate strength).

Response
Reference Attachment 2 to the Pratt Valve Report. The NRC Equipment Qualification Branch (EQB) has stated that for non-ASME valve parts, shear stress allowables shall be 0.4 yield strength, per AISC. Use of AISC stress allowable result in an overstressed condiition for the valve disc pins. The disc pin is fabricated from ASME SA-320, Grade B8M, and the analysis indicates a shear stress of 12,901 psi. Although the minimum specified yield strength of the material is 30,000 psi, the actual material yield strength (based on Certified Material Test Reports) is 54,500 psi. Using the AISC criterion for shear stress of 0.4 yield strength results in a shear stress of 21,800 psi. This value exceeds the pin's calculated shear stress, and therefore, the pin is not overstressed.

B. Concern
Describe how valve structural integrity is assured against drywell pressure accident loads when the valve is in the closed position. If determined by test, what margins are available to account for instrument error, environmental effects, etc.?

Response
The valves furnished for Grand Gulf are ANSI Class 150 design (285 psi cold working pressure). The peak differential pressure predicted is considerably below this rating, and all stress levels can be expected to be below normal ASME code allowables.

C. Concern
Are any of the valve or associated equipment parts overstressed when closing in a no-load situation.

Response
Based upon seismic analyses, the valve and associated equipment parts are not overstressed when closing in a no-load situation.

VII. Operators

A. Concern
Is there sufficient torque margin available for the operator to overcome the combined torques developed that tend to oppose valve closure as the valve strokes from its initial open position to the fully seated position? What is the minimum margin available and at what disc angle does this minimum exist?

Response
Flow tends to close a butterfly valve. The largest predominant torque value that opposes valve closure is the seating and bearing friction torque developed as the disc edge comes into contact with the seat. Since the valve assembly has previously been cycle tested by Pratt as well as in service, it has been proven that the operator is capable of overcoming the seating torque. Operator torque margins are, therefore, not analyzed.

B. Concern

Is the torque/load rating of the operator exceeded by the absolute valve of combined valve torques/loads developed? Where rating is dependent on disc opening angle, show that the combined torques do not exceed the rating at any disc opening angle.

Response

The torque/load rating of the operator is not exceeded by the absolute value of combined valve torques/loads for any disc opening angle (Reference Table 1 of the Pratt Valve Report).

VIII. Specific Valve Type Questions

The following questions apply to specific valve types only and need to be answered only where applicable. If not applicable, state so.

A. Concern

Torque Due to Containment Backpressure Effect (TCB)

For those air operated valves located inside containment, is the operator design of a type that can be affected by the containment pressure rise (backpressure effect), i.e., where the containment pressure acts to reduce the operator torque capability due to TCB. Discuss the operator design with respect to the air vent and bleeds. Show how TCB was calculated (if applicable).

Response

Reference Section II.A.4 of the Pratt Valve Report.

B. Concern

Where air operated valve assemblies use accumulators as the fail-safe feature, describe the accumulator air system configuration and its operation. Discuss active electrical components in the accumulator system and the basis used to determine their qualification for the environmental conditions experienced. Is this system seismically designed? How is the allowable leakage from the accumulators determined and monitored?

Response

Not applicable. Reference Section II.A.5 of the Pratt Valve Report.

C. Concern

For valve assemblies requiring a seal pressurization system (inflatable main seal), describe the air pressurization system configuration and operation including means used to determine that valve closure and seal pressurization have taken place. Discuss active electrical components in this system, and the basis used to determine their qualification for the environmental condition experienced. Is this system seismically designed?

Response

Not applicable for Pratt 1200 series valves.

D. Concern

Where electric motor operators are used to close the valve, has the minimum available voltage to the electric operator under both normal or emergency modes been determined and specified to the operator manufacturer to assure the adequacy of the operator to stroke the valve at accident conditions with these lower limit voltages available? Does this reduced voltage operation result in any significant change in stroke timing? Describe the emergency mode power source used.

Response

Not applicable.

E. Concern

Where electric motor and air operator units are equipped with handwheels, does their design provide for automatic re-engagement of the motor operator following the handwheel mode of operation? If not, what steps are taken to preclude the possibility of the valve being left in the handwheel mode following some maintenance test, etc. type operation?

Response

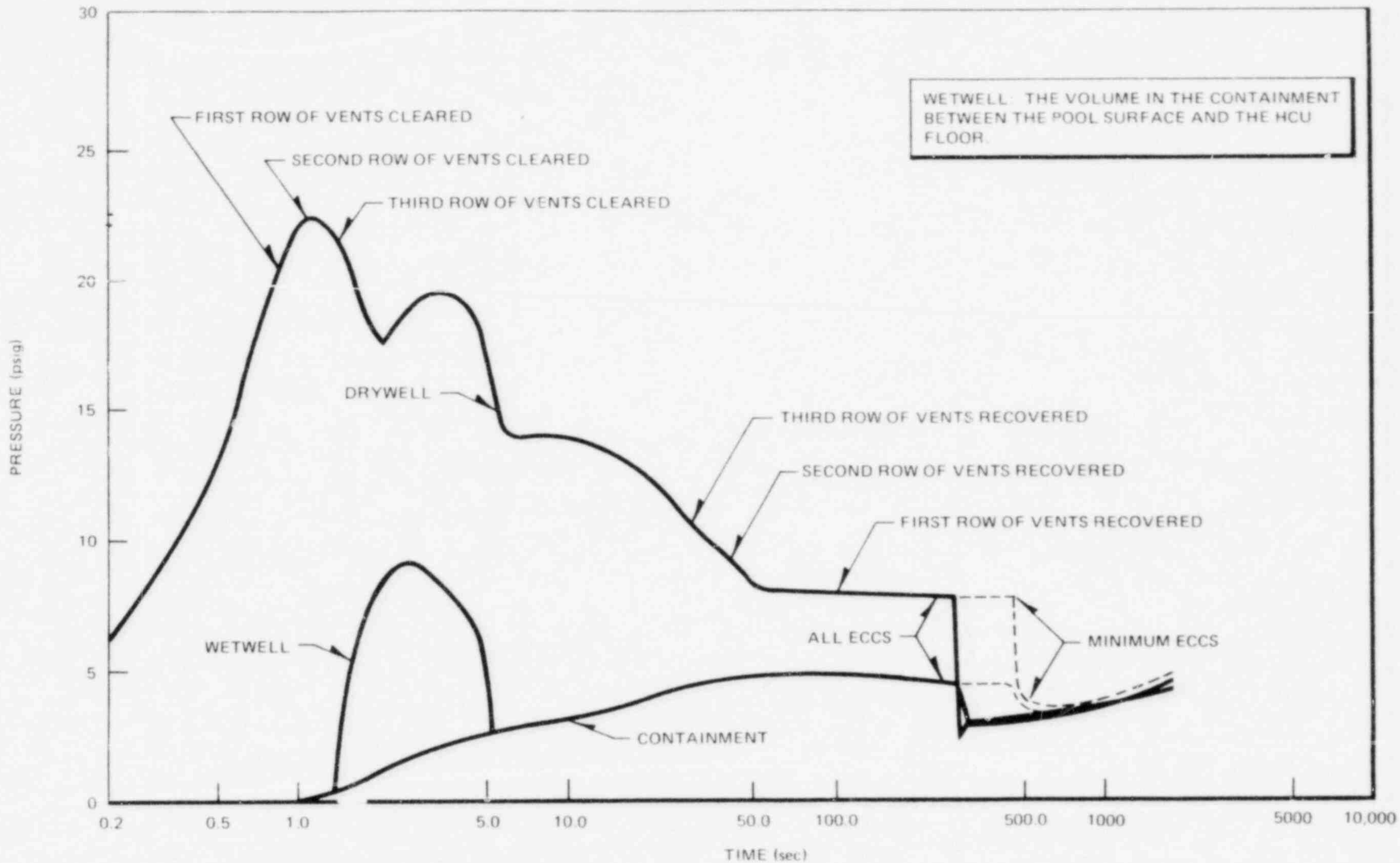
Not applicable.

F. Concern

For electric motor operated valves, have the torques developed during operation been found to be less than the torque limiting settings?

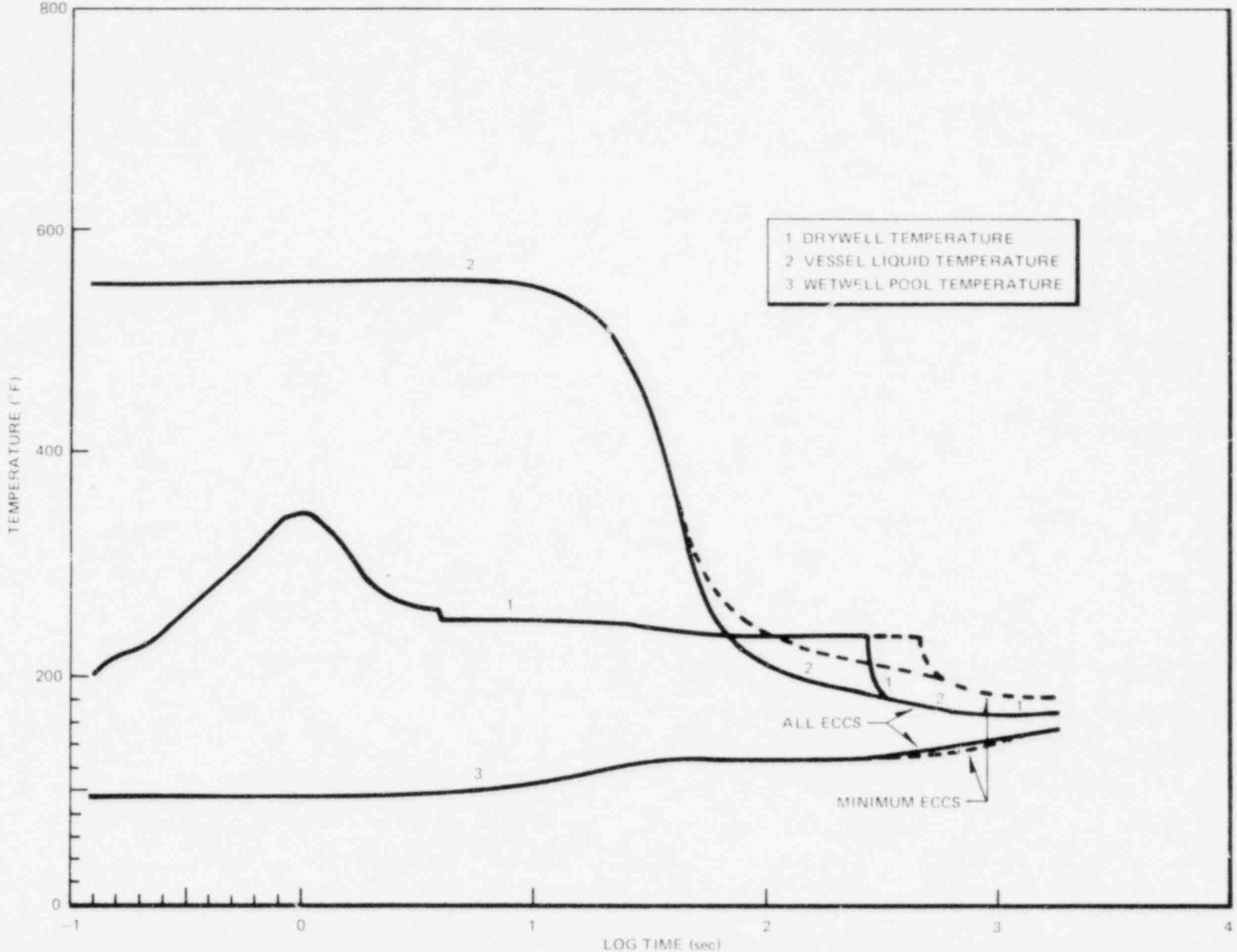
Response

Not applicable.

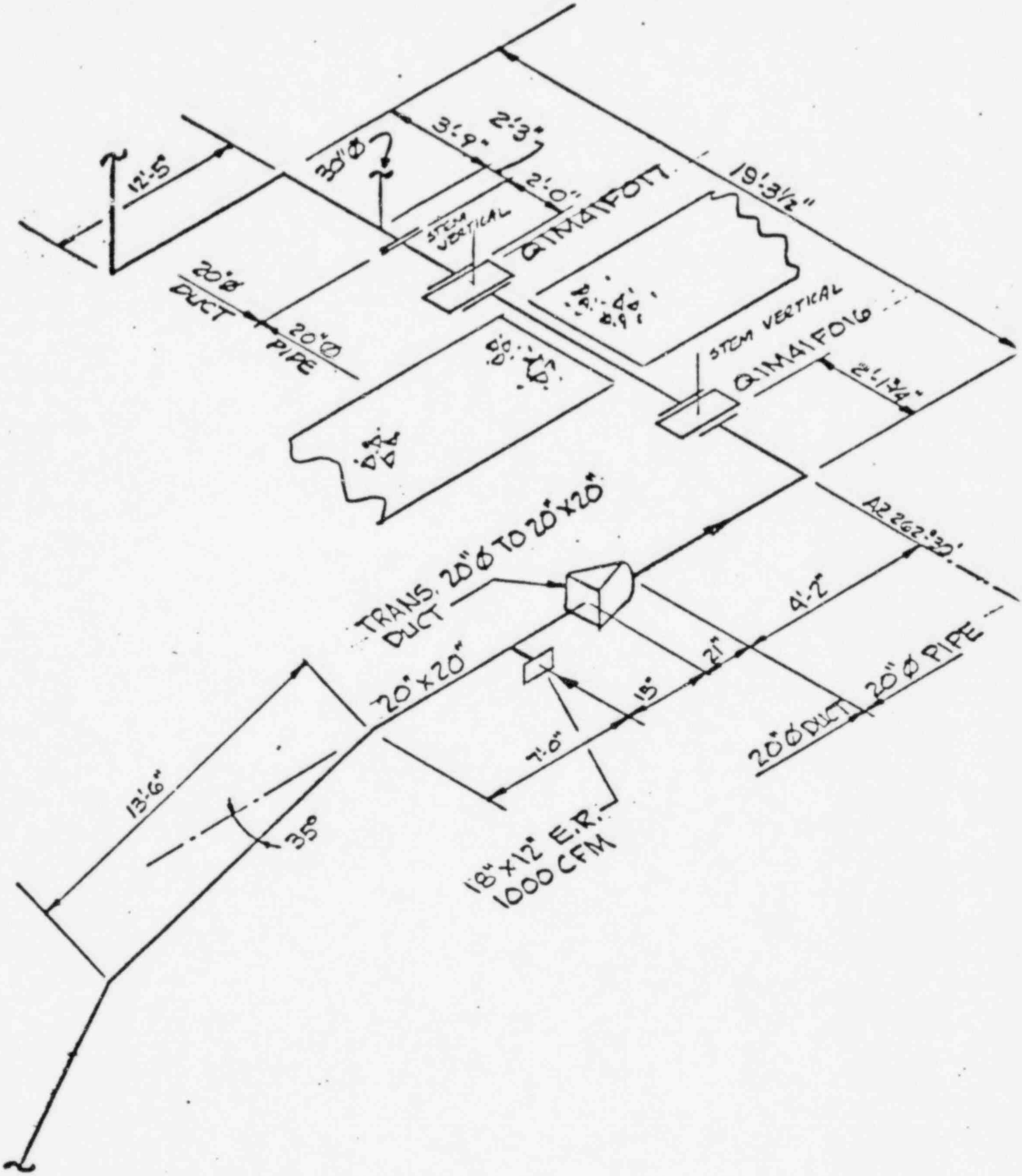


MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	PRESSURE RESPONSE TO A STEAM LINE BREAK FIGURE 6.2-10

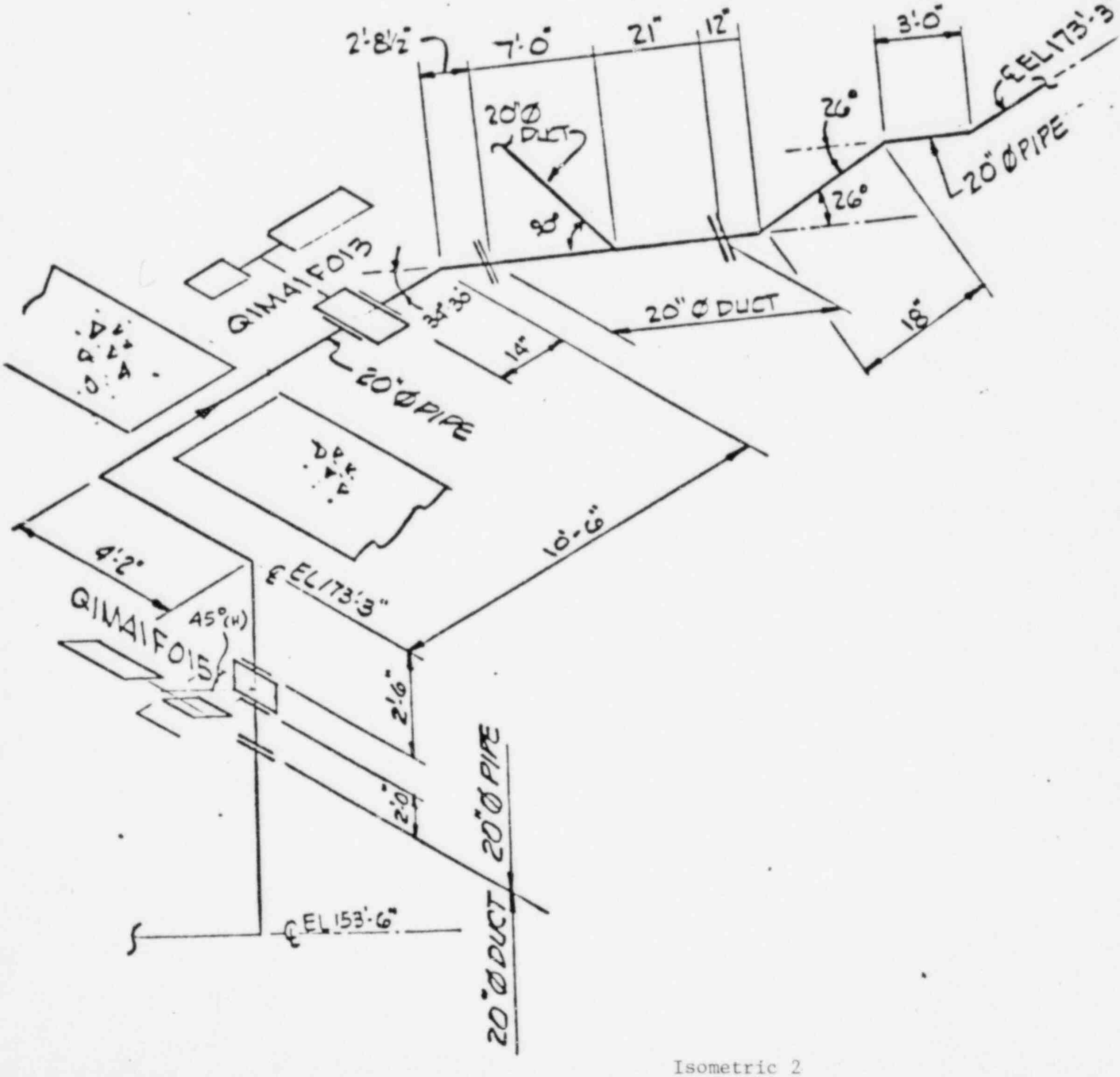
Amend. 48 6/81



MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	TEMPERATURE RESPONSE TO A STEAM LINE BREAK FIGURE 6.2-11


12'-5
30"Ø
3'-9"
2'-3"
2'-0"
19'-3½"
STEM VERTICAL
Q1M41F077
20"Ø DUCT
20"Ø PIPE
STEM VERTICAL
Q1M41F016
2'-1¾"
TRANS. 20"Ø TO 20"X20" DUCT
AZ 262°30'
4'-2"
21"
20"X20"
15"
7'-0"
20"Ø DUCT
20"Ø PIPE
13'-6"
35°
18"X12" E.R.
1000 CFM

Isometric 1


2'-8½"
7'-0"
21"
12"
3'-0"
℄ EL 173'-3"
20"Ø DUCT
26°
26°
20"Ø PIPE
80°
Q1M41F013
38°30'
20"Ø DUCT
14"
18"
20"Ø PIPE
10'-6"
4'-2"
℄ EL 173'-3"
Q1M41F015
45°(H)
2'-6"
2'-0"
20"Ø PIPE
℄ EL 153'-6"
20"Ø DUCT

Isometric 2

SEE

APERTURE

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AVAILIBILITY PDR CF HOLD

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