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SUBJECT: Forwards response to NRC 831229 ltr re TDI emergency diesel generators. Includes procurement & performance specs & insp results.

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TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

August 17, 1984

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of the Application of) Docket Nos. 50-438
Tennessee Valley Authority) 50-439

Please refer to your letter to H. G. Parris dated December 29, 1983 which contained a series of questions that the staff developed regarding Emergency Diesel Generators manufactured by Transamerica Delaval, Inc. Please note that question 5 of this series does not apply to TVA. Enclosed is a response to the majority of the questions. TVA expects to respond to the remaining questions upon their resolution

If you have any questions concerning this matter, please get in touch with K. Mali at FTS 858-2680.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R. H. Shell

R. H. Shell
Nuclear Engineer

Sworn to and subscribed before me
this 17th day of August 1984

Paulette N. White
Notary Public
My Commission Expires 9-5-84

Enclosure

cc: U.S. Nuclear Regulatory Commission (Enclosure)
Region II
Attn: Mr. James P. O'Reilly Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

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ENCLOSURE

TVA RESPONSES TO QUESTIONS ON DELAVAL DIESEL GENERATORS

Question 1

Provide copy of the procurement specifications to which the standby diesel generators (DG) were ordered.

Response 1

Attachment A consists of a copy of the procurement specification for the standby DGs. The procurement specification consists of TVA Specification 2411 for the purchase of four standby DGs together with the 31 postaward contract changes which have been written to date (May 21, 1984).

Question 2

Provide the performance specification and inspections performed upon receiving the DGs to show that the procurement specifications were met.

Response 2

The performance specification is the same as the procurement specification. The original procurement specification is provided as attachment A to the response to question 1.

Receiving inspection reports for each inspection performed upon receiving DGs are provided in attachment B.

Question 3

Identify the materials used in the design of the DGs at your plant (specifically limiting components such as crankshafts, camshafts, piston rocker arms, bearing materials, cylinder blocks, cylinder heads, pumps, turbochargers, etc.). Discuss how you assured yourself that design materials used in the manufacture of your DGs were as stated and in accordance with materials described in the TDI proposal, purchase specifications, and conformance to industry standards.

Response 3

- A. Identification of the materials used in the design of the DGs is to be provided by the TDI Owners Group. Response to this portion of the question will be submitted by August 1, 1985.
- B. TVA's Quality Engineering Branch (QEB) provided assurance that proper design materials were used by performing surveillance inspection at the TDI plant and at the subcontractors of major components. The subcontractors visited by QEB inspectors included:

Crosby Valve and Gage Company - Valves
Delta Switchboard Company - Generator control panels

Kahn and Company - Air dryers
PX Engineering Company, Incorporated - Fuel oil day tanks
Electric Products (Portec) - Generators
Riley-Beaird, Incorporated - Exhaust silencers
Thermxchanger, Incorporated - Lube oil coolers
Thermxchanger, Incorporated - Jacket water coolers
Thermxchanger, Incorporated - Starting air receivers

The review of applicable certificates of compliance and material certification was a normal part of QEB surveillance at the subcontractor's plants.

Approximately 70 percent of the materials for the DGs came from TDI general stock and was not assigned to a particular engine until individual parts were installed on an engine. In this case, the material certifications were generally verified just before shipment.

Question 4

Does TDI have a program where parts/components, etc., are modified (such as design margins are reduced) in order to improve operability and DG reliability? Does this apply to any DG parts at your plant? Provide a list of product improvements made by TDI on your model DG and identify and justify which of these were not incorporated on your diesels.

Response 4

TDI has a program for parts or component modifications above and beyond changes required to correct 10 CFR 21 deficiencies. With respect to design margin, we wish to refer to the design review activity currently in process with TDI Owners Group. Copies of the design reports are being transmitted to the NRC as they are developed.

The product improvement program consists of service information memorandums (SIM) identifying product improvement information. Modifications based on experiences gained in the field or the manufacturing plant are passed on to owners of DGs as suggested or recommended modifications.

In addition, a list of product improvements which have not yet been incorporated by TVA has been received (attachment C). TVA is reviewing these improvements in conjunction with information received from the TDI DG Owners Group. Upon final review of modifications associated with the Owners Group review, TVA will determine which of these product improvements will be incorporated.

Question 6

Identify each of your DGs by model number and rating (continuous duty and short time overload) as purchased and discuss all tests (including torsional and other design proof tests) performed on the DGs that were observed (also those not observed) by you at the manufacturer's facilities.

Response 6

The model number and ratings are provided in Table 1, along with other engine specifications. Table 2 lists the qualification tests performed on one DG by TDI.

TABLE 1
DIESEL ENGINE SPECIFICATION

Model	DSRV-16-4
Engine Serial Number	75080-2843 75081-2844 75082-2845 75083-2846
Service	Stationary generator for nuclear service
Fuel Mode	Diesel
Configuration	45° "V" Type
Number of Cylinders	16
Bore (in)	17
Stroke (in)	21
Cycle Mode	4 Stroke
Total Displacement (cu in)	76,266
Crankshaft Rotation	CW (viewed from flywheel)
Firing Order	1L-5R-4L-2R-7L-6R-3L-1R 8L-4R-5L-7R-2L-3R-6L-8R
Continuous Rating (kW)	7000
Overload Rating (kW)	7700
Quantity	4
Crankshaft Diameter (in)	13
Crank Pin Diameter (in)	12

TABLE 2
 QUALIFICATION TESTING

<u>Test</u>	<u>Performed</u>	<u>Witnessed²</u>
Functional	X	-
Operational	X	-
Margin	X	-
Rated Load	X	-
300 Start ¹	X	-
Load Sequence	X	-
Load Rejection	X	-
Torsiograph	X	-
10 Start Test	X	-

¹This test was performed for the Grand Gulf DG units and was accepted and approved for TVA's use by similarity.

²All test results were reviewed by TVA and accepted.

Question 7

In addition to qualification tests that were performed in accordance with Regulatory Guides 1.9 and 1.108, and IEEE Standard 387, describe all other onsite tests performed on your DGs.

Response 7

The following tests are performed on the Bellefonte DGs as part of the preoperational test program, in accordance with Regulatory Guide 1.68.

<u>Test No. and Title</u>	<u>Test Objective</u>
PT-EG-01C Class 1E Standby AC Auxiliary Power System (DG Loading Logic)	To demonstrate the proper startup operation of the DG loading logic for the following cases: <ol style="list-style-type: none">1. For a complete loss of AC voltage.2. For a complete loss of AC voltage followed by an accident with worst case diesel loading.3. For a degraded voltage condition. This test also demonstrates that the standby source for one load group is never automatically interconnected under accident conditions with the standby power source of a redundant counterpart.4. To verify that provisions are made for paralleling the DG with the normal power supply for periodic testing.5. To verify that all generator protective devices except differential protection shall be blocked upon receiving an automatic or emergency start signal while in the test mode.6. To verify that the test will be aborted, all protective devices except differential protection will be blocked, and the diesel will be separated from normal power upon receipt of an ESFAS signal.
PT-EG-01D Class 1E Standby AC Distribution System (DG Qualification Test)	Twenty-three consecutive start and load tests will be performed on each DG unit as follows: <ol style="list-style-type: none">1. The DG set is to be automatically started and accelerated to specified frequency and voltage within the required time interval.

2. Immediately following (1) the diesel unit shall accept a single step load equal to approximately 50 percent of the rated generator continuous rating (3500 kW).

PT-EG-01E
Class 1E Standby
AC Auxiliary Power
System (Load
Capability Test)

To test the full load design capacity of each DG unit for an interval of time, not less than 24 hours, of which 22 hours is at the continuous rating of the unit and 2 hours at the short time rating of the unit.

PT-RG-01
Diesel Generator
Starting Air System

The objectives of this test are:

To verify that (1) the inline, dryer, and receiver pressure relief valves operate at specified pressure, (2) that the local and main control room "low starting air" annunciators operate properly, (3) that the receiver pressure switches operate properly to maintain the receiver pressure as specified, (4) that the starting air module output temperatures are within manufacturer's specifications and compatible with the input requirements of the dryers, (5) that the dryer output check valves operate properly to protect the dryer beds, (6) that the moisture content of the dryer output is within specifications, (7) that the starting air module compressors will automatically start when the air receiver pressure drops below specified limits, (8) that with all compressors off, the stored air receiver will provide five attempted starts of the diesel engines in succession using only stored receiver air, (9) the autostop circuits prevent continuous engine cranking longer than 10 seconds, (10) that after five successive starts of the DG engines, the starting air modules will repressurize the air receivers to specified limits, and (11) that with all compressors off, the stored air receivers have the capacity to crank the diesel engine continuously for a specified time and RPM.

PT-RT-01
Diesel Generator Control
and Field Flashing

The test objectives and method are:

1. Verify proper response to manual controls by operating emergency start-stop, test start-stop speed increase-decrease, and voltage raise-lower controls from the DG unit.

2. Verify that all protective interlocks are operable when the DG unit is running in the test mode. Demonstrate that if an emergency start signal is received, the control unit will deactivate the appropriate protective interlocks.
3. Verify the operation of the "maintenance mode" selection controls by operating the local enable controls and show that no remote commands, either manual or automatic, will cause the DG unit to start or stop. Verify that the local controls are operable. Demonstrate that the operation of the main control room enables controls returns the unit to remote operation.
4. Verify the proper operation of the Field Flashing System from observing the field flashing relay and the rise time of the DG output.
5. Verify the proper operation of the annunciator system by simulating the various annunciator signals at the interface with the DG control.

TVA also performs preoperational tests on the (1) fuel oil transfer, (2) environmental control, and (3) fire protection systems to further ensure DG reliability and operability.

Question 8

In addition to any deficiency reports already provided to the NRC, summarize and describe problems encountered and resolved during installation and preliminary operation of the DGs. During this period, were any unusual or abnormal operations observed such as excessive vibration, noise, etc., and how were these conditions corrected? Provide a detailed summary of the complete operating histories of your DGs.

Response 8

Problems have been encountered during installation and preliminary operation of our DGs, but none of these problems were extraordinary. A short history of DG activities follows:

A number of Nonconformance Reports (NCRs) have arisen in connection with the DG. Those generated by TDI were corrected before the initial runs, except for the one concerning start air check valves; it was corrected as soon as parts arrived on site. The following site-generated NCRs were written during preparation for the initial run:

NCR 1992 - While flushing the fuel oil systems on the diesels, the motor-driven fuel oil pump on engine 2844 became very noisy. Disassembly revealed an idler rotor inside the pump had chipped, and the chip had jammed in the close tolerances between the idler and drive rotors. Both idler rotors and the drive rotor were replaced and this NCR was closed.

NCR 2075 - An engine-driven lube oil pump was found to be leaking during the flush of the lube oil system. Upon examination, a crack was found in the pump casing near and parallel to the discharge flange. This could have been a flaw in the casting, but site personnel believe that it was caused by improper torquing of the discharge flange. The pump was returned to TDI where the pump casing was replaced, and it is now on site. This NCR will be closed when the pump is reinstalled.

NCR 2095 - During the lube oil flush, the lube oil pressure was not reaching the level expected. Site personnel discovered that four parts were missing in a pressure regulating valve; this resulted in it being fully open to the lube oil sump. These parts have been obtained, the lube oil pressure problem no longer exists, and the NCR is closed.

NCR 2097 - During a review of ASME B&PV Code Section III documentation requirements on the DG fuel oil system, the reviewers concluded that the fuel oil day tanks procured by TDI and supplied with the generator package were insufficiently documented. TVA has reviewed the documentation and determined that the documentation was sufficient. This NCR is closed.

NCR 2254 - Similar to NCR 2097, this involved documentation for the starting air system air receiver tanks. Again TVA review has determined that the documentation was sufficient, and this NCR has been closed.

The preceding NCRs document all problems encountered during preparation of the initial run, which occurred in November 1982. In the 15 monthly runs since then, amounting to about 60 hours of running time per diesel, the following problems have arisen, in chronological order:

Three jacket water keepwarm heaters, which maintain near operating temperature in the jacket water system, have burned out on the DGs. In each instance, it was due to draining of the jacket water system without shutting off the heater. To prevent recurrence, jacket water system drains have been protected from inadvertent opening, some drain pipes have been capped, and the jacket water system level has been carefully monitored and restored often. For a short time, an alarm indicated low jacket water header pressure on one DG. After the system was carefully studied, with pressure readings taken in nine places in the system, it was decided that no blockage was evident and that all parts were being cooled adequately. In response, TDI's service representative, with the concurrence of TDI Engineering, initiated a change in the location of the pressure tap feeding the jacket water pressure gauge and the pressure switch for the alarm on both diesels. This problem has not recurred.

Operations personnel suggested that the DGs governors were oversensitive and somewhat unstable. Consequently, site personnel returned the governors to their manufacturer, Woodward Governor Company, for general refurbishing and incorporation of the latest design improvements. They have been reinstalled now, and operations personnel consider their performance to be acceptable.

Aside from the above mentioned problems, the diesels have performed very well. No unusual noises or vibrations have appeared, and they have started and run reliably.

Question 9

Tabulate, compare, and discuss differences in present actual DG loading to estimate loads included in the procurement specifications. Identify the magnitude of the increased load (if any) on the DGs and describe how the increased loading affects the DG capability with regard to reserve margin.

Response 9

The present anticipated loadings for the diesel generators are as follows:

Load Step	FORCED SHUTDOWN		LOCA	
	Train A (kW)	Train B (kW)	Train A (kW)	Train B (kW)
1: Time = 0+s	936	862	973	903
2: Time = 4 s	1781	2020	1722	1902
3: Time = 10 s	1955	1956	2364	2365
4: Time = 16 s	1669	1669	1669	1669
I. Total Sequenced Load	6334	6500	6676	6784
II. Manual Loading by Operator Action	254	290	351	330
III. Total Load (Sequenced & Manual)	6588	6790	7027	7114
IV. Total Load Estimated in Procurement Specification	7241	7241	7241	7241
V. Diesel Generator Rating: Continuous	7000	7000	7000	7000
VI. Continuous Margin	+412	+210	-27	-114
VII. Diesel Generator Rating: 2 Hours	7700	7700	7700	7700
2 Hour Margin	1112	910	673	586

It can be seen that both the forced shutdown and LOCA loads are less than the estimated loads in the procurement specification, therefore, margins have not been reduced. The loading sequence has changed since the procurement but the vendor has verified its present adequacy.

Question 10

If DG loading has increased from that specified in the procurement specifications, has it been necessary to upgrade the standby DGs to meet the new load requirements? If DG upgrading has been performed, provide a detailed description of the upgrading accomplished on your DGs? What is the revised manufacturer's rating for each upgraded unit for normal continuous duty and short time overload conditions? Is the DG built-in design margin (after upgrading) still within the recommendations of IEEE Standard 387? What is the reserve load carrying capability (margin) of your upgraded DGs?

Response 10

It has not been necessary to upgrade the Bellefonte Nuclear Plant DGs to meet new load requirements.

Question 11

In light of the problems that have been identified to date with TDI diesels, discuss your plans to perform an internal visual inspection of each standby DG with regard to potential crankshaft and/or web cracks as identified at the Shoreham Station and provide a detailed discussion of your plans to perform any non-destructive testing (NDT) such as dye penetrant testing, etc., as deemed appropriate to assure absence of cracks at these locations or at any other locations where cracks may have been observed. Discuss schedules for such testing.

Response 11

Response to this question will be provided by August 1, 1985.

Question 12

Justify that the standby DGs at your plant are sufficiently reliable that there will be reasonable assurance that the facility can operate without undue risk to the health and safety of the public.

Your justification should include, but not be limited to the following:

- (1) Quality assurance program conducted by you during procurement, manufacturing, and receipt of your DGs.
- (2) Your assessment of the TDI manufacturing process, inspection, and quality assurance program conducted during manufacture of your DGs.
- (3) Your assessment of TDI responsiveness to problems that have occurred with your engines during installation and preliminary operation including assessment of TDI performance.

- (4) Comparison of your DGs with all other TDI emergency DG models now in use or to be used in other nuclear generating stations (and other non-nuclear facilities) to show that the conditions and/or failure modes present at Shoreham will not occur at your plant and at other nuclear plants; provide any supporting information that may be obtained from non-nuclear installations.
- (5) Independent review or verification of any TDI design calculations for critical components of your DGs, and/or other means used to assure that your DGs are designed to DEMA standards and applicable industry codes and standards.
- (6) Your overall assessment of the DGs at your plant with regard to TDI system design operating experience to date, and system dependability, availability and reliability to warrant operation of your plant.

Response 12

- (1) TVA contract No. 76K61-86161 for the Bellefonte Nuclear Plant emergency diesel generators was issued on October 1, 1975. TVA contract No. 77K61-820006 for the Hartsville and Phipps Bend Nuclear Plant generators was issued on May 20, 1977. Quality assurance review and acceptance of TDI quality assurance program for use on this contract was conducted on April 8, 1977. The Bellefonte contract was issued before the existence of a separate quality assurance program review group, but the same program that was accepted for Hartsville/Phipps Bend was in use for Bellefonte.

An audit (78V-23) of TDI's quality assurance program for both contracts was conducted July 18-20, 1978, with four deviations being identified. These deviations concerned: (1) overdue audits of vendors listed on the qualified suppliers list, (2) discrepancies between welder qualification dates and performance dates and out-of-date welder qualification, (3) nonstamping and nondating of inspection operations, and (4) no procedure for, nor implementation of, the collection, storage, and maintenance of quality assurance records.

A full program audit (79V-38) plus follow-up to verify implementation of corrective action to the four deviations identified during audit 78V-23 was conducted September 11-14, 1979, with eight deviations being identified. These eight deviations concern:

- (1) Failure to document instructions for preparing and completing the final inspection checklist and release form.
- (2) Document control problems with the review before release and/or distribution of quality-related documents to the shop.
- (3) Updating of the approved suppliers list and the inclusion of service-type contractors on the list.

- (4) Failure to sign hydrostatic test reports and lack of chemical analysis review of crankshaft assemblies by quality control.
- (5) Use of weld procedures on TVA work which had not yet been submitted to TVA for approval.
- (6) Failure to correctly complete route sheets, inspection checklists, corrective action on inspection reports, and final inspection sheets. The requirement was for stamping and dating the acceptance of items.
- (7) A breakdown of the overall calibration system.
- (8) Failure to document review of audits by appropriate management and failure to process corrective action notices properly.

In addition, the audit team was unable to close Deviation Report Nos. 1 and 4 from the previous audit 78V-23. Also, Deviation Report No. 3 was cancelled and incorporated into new Deviation Report No. 6 (increased scope). Deviation Report No. 2 was closed.

Deviation Report Nos. 6 and 7 were considered significant conditions affecting quality and were evaluated by TVA for reportability to the NRC. However, these deviations were determined to be nonreportable.

TDI responded to the 10 total deviation reports on October 3, 1979. The response was acceptable pending verification by reaudit.

Audit 80V-37 was conducted August 25-28, 1980, with two new deviations being identified. They concern: (1) a generic problem in the area of documenting the review of data from various tests and (2) that a breakdown in the vendor audit program had taken place.

Deviation Report Nos. 1 and 4 from audit 78V-23 and Deviation Report Nos. 1, 4, 5, and 8 from audit 79V-38 were closed during this audit. However, the audit team was unable to close Deviation Report Nos. 2, 3, 6, and 7 from audit 79V-38. TDI responded with proposed corrective actions for the deviation reports remaining open. The proposed actions were accepted pending verification of implementation.

Audit 81V-47 was conducted December 1-3, 1981, with one new deviation being identified. This concerned the failure to follow up and verify corrective action to corrective action requests prepared by quality assurance. This included the open TVA audit deviations.

Because of this, while improvement had been noted, none of the six open deviation reports from audits 79V-38 and 80V-37 could be closed.

The new deviation from audit 81V-47 was considered a significant condition adverse to quality and was reported to the NRC in January 1982 with a final report to the NRC in March 1982.

Proposed corrective action was received from TDI on January 20, 1982, and was considered acceptable pending verification.

Audit 82V-43 which was to evaluate proposed corrective action on open deviations was conducted June 8 and 9, 1982, with all seven deviations being closed. At this point in the time, all diesel generators except one had been fabricated and shipped.

Audit QDBVA-84-18 was conducted November 15-17, 1983, with emphasis on the panel manufacturing shop (manufacture of control panels was still underway), and six deviations were identified. These deviations concerned:

- (1) A configuration problem involving revision on drawings but failure to incorporate changes on earlier panels (already shipped) or to identify the shipped panels as needing modification.
- (2) A lack of documented instructions and procedures describing the method of operation for the panel shop.
- (3) Panel shop test data was not being recorded nor was a list of instruments used for testing being prepared.
- (4) Traceability to the National Bureau of Standards for panel shop test instruments was not being documented. Also, electronic instruments found out of calibration during routine calibration were not evaluated to assess impact on previously completed tests using these instruments.
- (5) The method of documenting discrepancies discovered during assembly/test of panels was inconsistent.
- (6) Changes to the initially qualified panel (seismic/category I) had not been evaluated for impact on the qualification test results.

Deviations 1, 3, and 6 were evaluated and subsequently reported to the NRC in December 1983.

TDI responded to the six audit deviation reports on January 12, 1984. The proposed corrective action to Deviation Report Nos. 2 and 6 was acceptable; the other responses were rejected. Following a telecon to discuss additional proposed corrective action on March 8, 1984, it was decided to schedule a verification visit for April 23, 1984, to evaluate proposed corrective action rather than to evaluate their written response and then schedule another visit.

This verification plus an additional TDI written response requested during the audit resulted in these six deviation reports being closed. The final report on these items to NRC Region II is due on August 24, 1984.

As can be determined by a review of the above-mentioned discrepancies identified during these audits of TDI, the quality assurance program was implemented in a manner that only partially ensures proper operation of the DGs in question. However, the surveillance performed by TVA quality assurance auditors and quality engineering inspection personnel adds confidence to the question of proper operation.

- (2) TDI's manufacturing process and quality control inspection of the engine itself was excellent. However, TDI's concern for excellence did not extend to off-engine auxiliary items. Some of the problems which required resolution were:

- (1) Jacket water coolers were rejected for unacceptable workmanship.
- (2) Pipe spools were rejected with questionable welds.
- (3) Jacket water coolers were code stamped before test completion.
- (4) Lube oil cooler hydrostatic test was rejected until approved test procedure was followed.
- (5) Items were rejected which were not ready for inspection.
- (6) Items were rejected for lack of complete shipping lists.

The TDI inspection and quality assurance programs were only marginally acceptable during the life of both DG contracts. It is our opinion that the main cause was the continuous turnover of quality assurance personnel at TDI which led to a weakening of the department's ability to obtain positive corrective action in a timely manner. Also, in too many cases quality assurance acquiesced to the test engineering personnel's belief that if required testing were successful then limited or no quality assurance participation during manufacturing would be necessary. Further, manpower was usually insufficient to adequately implement all facets of the quality assurance program. This resulted in quality problems like those mentioned above to be more numerous than normally encountered. However, to the best of our knowledge, all were resolved satisfactorily.

- (3) Throughout the installation period of DGs, a TDI representative participated in the supervision of installation activities and coordinated the resolution of installation related problems. TDI provided engineering support services, as required, to support the installation activities. Our assessment of TDI's responsiveness to problems encountered during installation of the DGs is that TDI was cooperative in providing accurate resolutions to installation problems. Documentation changes initiated by TDI site representatives have not always been handled in a timely manner.
- (4) Response will be provided by August 1, 1985.
 - (5) Response will be provided by August 1, 1985.
 - (6) Response will be provided by August 1, 1985.

Question 13

Provide a tabulation of the number of times (including each date of occurrence) voltage was lost at the emergency bus(es) requiring operation of the DG(s) including a brief description of each incident. In the above tabulation, also identify the loss of emergency bus voltage due to loss of offsite power.

Response 13

TVA is presently making monthly maintenance runs on the DGs. No emergency buses are in service at this time.

Question 14

Shoreham has identified connecting rod bearing materials are not in accordance with design specifications on their engines. This condition may also exist on all other TDI diesels. Provide assurance that correct bearing design and materials have been used in your engines. Should you find that improper bearings have been used in your diesels, state how and when you propose to correct this problem.

Response 14

Response will be provided December 1, 1984.

Question 15

Most of the piston skirts in the Shoreham diesels were cracked. Because of a common cylinder design for all TDI diesels, it is presumed that this condition potentially exists on all other TDI diesels. Discuss your plans, including internal inspection or other means to determine the potential or actual existence of such cracking. In your response, indicate whether the design and materials are identical to those in the Shoreham units; if not, identify differences. Identify any corrective actions you have taken to date or plan to take.

The staff understands that TDI has a piston design modification to correct the above problem. Are you aware of this and has TDI transmitted this service information to you?

Response 15

Response will be provided by December 1, 1984.

Question 16

What maintenance and/or operating practices have you developed to assure optimum reliability of your diesel generators at your plant?

Response 16

The maintenance operating instructions for our diesels at Bellefonte have not yet been finalized. They are being developed using Delaval's recommendations for maintenance and operation of engines of our type and application.

Question 17

What surveillance practices in addition to those required by plant technical specifications have you instituted to assure optimum reliability of your diesel generators at your plant?

Response 17

The surveillance requirements for our diesels at Bellefonte have not yet been finalized. Surveillance practices in addition to those required by the plant technical specifications will be based on TVA's experience with the diesel generators at our other plants and the experience of other Delaval users.

TENNESSEE VALLEY AUTHORITY

SPECIFICATION 2411

DIESEL ENGINE-DRIVEN EMERGENCY GENERATOR POWER PACKAGES

FOR

BELLEFONTNE NUCLEAR PLANT UNITS 1 AND 2

GENERAL PROVISIONS

1. Requirement

a. Work covered by this specification comprises furnishing and delivering four independent, self-contained, water-cooled, automatic-starting, diesel engine-driven, stationary electric generator power packages to be used to supply emergency power for four independent emergency buses in the event of loss of preferred station power.

b. The term "power package" is defined as being one engine-generator set mounted on one base complete with all auxiliaries necessary to make it a self-sufficient power source capable of delivering 7000-kw, 6900-volt, 3-phase, 60-Hz AC power for a continuous period of 8000 hours per year to TVA's connections.

c. The diesel engine-driven generator power packages shall be complete as specified herein and also in accordance with the specifications and drawings submitted by Contractor.

d. Each unit shall be designed to minimize the danger of accidents to operating and maintenance personnel. Manufacturer shall, prior to shipment, verify that all electrical connections are tight and that circuits are isolated, that onset piping connections are well made, and that standard safety equipment is included and functions according to design.

e. TVA will install all the apparatus to be furnished hereunder, furnish all electric wiring and electric conduit required to connect accessory equipment to building alternating-current distribution panels, and motor control centers and/or switchgear.

2. Service Conditions

a. Each power package shall be capable of an output of 7000 kw, 8750 kva at 0.8 power factor continuously for a period of 8000 hours per year. Each power package shall be capable of a 10 percent overload for a period of 2 hours out of any 24-hour period. Each power package shall be sized to start, accept load, and drive continuously for at least 8000 hours the loads listed in 2.c. The momentary voltage on starting any individual

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ALTERNATE COST ADJUSTMENT PROVISION

As an option to TVA, De Laval offers the following alternate to the COST ADJUSTMENT provision of TVA's Special Conditions:

For a total price addition to Item #1, Schedule of Prices, of \$ 160,000. De Laval agrees to maintain firm price on a portion of the price bid for Item #1 assignable to the first pair of engine-generators for Unit #1 through the specified delivery of April 1, 1977. That segment of the bid price which is firm as described is \$ 2,577,702. The remaining segment of the price bid for Item #1 assignable to the first pair of engine-generators which continues to be subject to adjustment in accordance with the COST ADJUSTMENT provision of the Special Conditions is \$ 1,010,000.

Further, and included in this option, De Laval agrees to maintain firm price through November 1976 on a portion of the price bid for Item #1 assignable to the second pair of engine-generators for Unit #2 for shipment in December 1977. That segment of the bid price which is firm as described is \$ 2,577,702. Cost adjustment on this segment begins in December 1976 in accordance with the procedures described in the COST ADJUSTMENT provision. The remaining segment of the price bid for Item #1 assignable to the second pair of engine-generators which continues to be subject to adjustment in accordance with the COST ADJUSTMENT provision of the Special Conditions is \$ 1,010,000.

The balance of the bid price for Item #1, or \$ 190,056, is the segment assigned to transportation charges, as reported on Page 6, and is not subject to the COST ADJUSTMENT provision.

load except the energization of the 6900/480-volt transformers shall not drop below 5175 volts at the package output terminals and shall return to within 90 percent of rated voltage within 1 second. Generator overvoltage shall not exceed 110 percent.

b. Capacity at each power package as specified shall be a minimum, and contractor shall furnish a standard unit of the capacity specified, or have a capacity greater than but most nearly conforming to capacity specified.

c. The sequence of application and magnitude of the loads to be applied to each generator power package are as follows:

<u>Component</u>	<u>Rated Load</u>	<u>Time of Application after Diesel Start Signal</u>	<u>Remarks</u>
480-Volt transformers	Two at 1500 kva each*	Less than 10 seconds	1000-kva total initial load
Makeup/high-pressure injection pump	900 hp	10 seconds	6600 volts
Essential raw cooling water pumps	Two at 1000 hp each	10 seconds	6600 volts
Component cooling pump.	800 hp	16 seconds	6600 volts
Auxiliary feedwater pump	650 hp	16 seconds	6600 volts
Reactor building spray pump	500 hp	16 seconds	6600 volts
Decay heat removal pump	700 hp	22 seconds	6600 volts
Vital plant control power	Two at 150 kva each	22 seconds	480 volts
Miscellaneous 480-volt loads	Approximately 2000 hp total	After 60 seconds	Individually applied loads

Low-reactance generators specifically designed for nuclear plant service shall be specially designed for starting large induction motor.

*Note: Voltage drop may exceed 30 percent for a duration of not more than 1 cycle during inrush to these transformers.

Characteristics of the above motors are not yet known. The bidders shall assume the inrush current to be 6.5 times normal full-load running current at 0.9 efficiency, 0.85 power factor, and rated horsepower.

3. The Engineer

a. Work under these specifications shall be subject to approval of the Manager of Engineering Design and Construction of TVA, hereinafter referred to as "the Engineer," acting directly or through properly authorized agents, who shall determine the amount, quality, acceptability, and fitness of the several kinds of work and materials which are to be furnished hereunder and who shall decide all questions which may arise as to measurement of quantities and fulfillment of technical requirements of the specifications.

4. Drawings and Data to be Furnished by Contractor

a. Within the time promised by Contractor in his bid, Contractor shall furnish assembly and detail drawings, instructions, and cuts of the work in such number and detail as necessary for installation, operation, and maintenance of the equipment, and for demonstrating that it complies with requirements of the specifications.

b. Such drawings and data shall include but shall not be limited to the following:

- (1) Foundation drawings of all parts set into or coming in contact with concrete, showing method of supporting and method of anchoring into concrete, including vertical and seismic anchor bolt and foundation loads.
- (2) Detailed drawings of all parts connecting to or related to equipment supplied by other manufacturers or to equipment furnished by TVA.
- (3) Control and wiring diagrams.
- (4) Plans, elevations, sections, and details of the units.
- (5) Details of all parts of equipment which may require adjustment or are subject to wear. Also drawings showing methods of lubricating parts.
- (6) Complete parts list including bearing replacement data.
- (7) Complete installation and operating instructions.
- (8) Records of tests.

Each print shall be identified by Contractor, prior to submission, with TVA contract number in addition to his standard identification.

c. Contractor shall permit the Engineer to examine such of Contractor's shop drawings as may be necessary to enable him to determine the efficiency of Contractor's design. Contractor shall provide the Engineer with copies of such of his design data as may be required by the Engineer for the purpose.

d. One print and one reproducible of each drawing, and four prints or one print and one reproducible of each data sheet shall be submitted to the Engineer for approval and in such sequence that he will have all information necessary for checking.

e. Reproducibles shall be of such readable quality that will microfilm to 35 mm and produce a clearly readable print when blown back to 50 percent of the size of original drawing. Reproducibles received that do not meet with this quality requirement will be returned for resubmittal and time required for such resubmission will not entitle Contractor to any extension of time for delivery.

f. All reproducibles must be submitted rolled (not folded) on inside of 1-1/2-inch minimum inside diameter regular mailing tubes, or on outside of 1-inch minimum outside diameter dowels, except for small sizes capable of being mailed unfolded in a suitable envelope with cardboard backing on both sides.

g. The Engineer will, within approximately 30 days after receipt of prints of drawings for approval, forward one copy to Contractor marked "Approved," "Approved with Correction as Noted," or "Returned for Correction."

h. Contractor shall make necessary corrections and revisions on drawings marked "Approved with Correction as Noted" and on drawings marked "Returned for Correction," and he shall within 20 days submit prints for approval in the same routine as before. Time required for such revision of drawings and resubmission of prints shall not entitle Contractor to any extension of time, but the Engineer will examine and return such prints within 30 days after receipt. After approval of drawings or data, Contractor shall furnish thirteen complete sets of prints of all approved data sheets not submitted as reproducibles and sixteen copies of maintenance and operating instructions.

i. After print of any drawing has been returned "Approved," Contractor may release to his shop for production all the parts covered by the approval. Any work done or material ordered by Contractor prior to receipt of drawings "Approved" or "Approved with Correction as Noted" by the Engineer shall be at Contractor's risk.

j. Drawings shall be identified by serial numbers and descriptive titles indicating their application to contract and shall be signed by a responsible representative of Contractor.

k. Approval by the Engineer shall not relieve Contractor of the responsibility for correctness of drawings furnished by Contractor nor for their compliance with the specification unless so stated at time of approval.

l. If at any time before completion of the work, changes are made necessitating revision of approved drawings, Contractor shall make such revisions and proceed in same routine as for original approval.

5. Materials and Workmanship

a. Materials used in the work shall be new and shall be of kind, composition, and physical properties best adapted to their several purposes in accordance with best engineering practice.

b. Materials shall conform to the latest standards of IEEE, NEMA, ANSI, ASTM, and ASME, or equal, wherever applicable. The standards and specifications shall be the issue in effect on date of invitation to bid.

c. Materials shall at all times be kept clean and protected from weather and shall be free from excessive scale and rust. Workmanship shall be first class and shall be done by workmen skilled in their various trades.

d. Incidental fittings, fixtures, accessories, and supplies shall be of approved manufacture and of standard first-grade quality.

e. Each part or component having the same part number shall be completely interchangeable, without rework, with like parts or components.

6. Quality Assurance Program Requirements

a. The Contractor shall establish and maintain a written description of his Quality Assurance Program in accordance with the requirements and guidelines of ANSI N45.2 and Appendix B to LOCFR Part 50 and shall apply all requirements as appropriate to the equipment being furnished. The Contractor's Quality Assurance Manual shall be submitted to the Engineer for approval. The Quality Assurance Program shall be made available at the plant to the Engineer or his representatives throughout the life of the contract. For any off-skid piping components, Contractor's Quality Assurance Program shall also be in accordance with requirements of the ASME Boiler and Pressure Vessel Code, Section III.

b. The Contractor shall identify and pass on to his suppliers all applicable Quality Assurance Program requirements. Appropriate holdpoints, subject to approval of the Engineer, shall be established prior to fabrication.

c. For handling nonconforming materials or parts, refer to appendix B of this specification.

7. Work to be Done and Materials to be Furnished by TVA and Others

- a. Concrete foundations.
- b. Erection.
- c. Electric wiring beyond the terminals of electrical equipment furnished hereunder.
- d. Field painting.

8. Shop Assembly and Tests

a. Contractor shall assemble and test each complete unit including engine and generator together with subsystems and selected modifications. Test program shall cover the following items:

- (1) Verify that all components are correctly installed and interconnected.
- (2) Verify that each subsystem is complete and functions according to design criteria.
- (3) Individually test each protective device and verify the accuracy of instrumentation set points.
- (4) Operate the unit at least three times, from 0 to 110 percent of the continuous rated load starting at no load and increasing in increments of 33-1/3 percent. Check at each load point for stable operation, fuel consumption, engine performance, and generator performance. The duration of each test shall be long enough to stabilize engine and generator temperatures plus 1/2 hour.
- (5) Perform full load transient tests at each of the continuous and 110 percent overload ratings, at least three times each, verifying that voltage and frequency transient characteristics are within the requirements of this specification.
- (6) Start, load, and operate each engine-generator set at the continuous rating continuously for a period of 72 hours. Record engine and generator readings on log sheets every 1/2 hour.

b. Contractor shall furnish TVA nine certified copies of results of the tests called for above.

9. Field Tests

a. As soon as practicable after completion of the work under this specification TVA will make, at its own expense, such tests as it deems desirable to demonstrate compliance of the equipment with requirements of these specifications and specifications and guarantees of Contractor. Contractor will be permitted to have a representative present at all such tests.

10. Qualification Testing

a. After tests outlined in section 8. and before shipment, each power package shall be set up ready to operate and tested for reliability of starting and accepting load. Each test shall have as its starting point cold ambient conditions (standby conditions). The starting signal shall be activated in a manner similar to an automatic start signal. The package shall demonstrate its ability to function by engine starting and obtaining rated speed within 10 seconds and accepting a load of at least 50 percent of the 2 hours out of 24-hour rating of the unit, attain stable operation (stable operation is defined as ± 1 percent nominal speed and ± 5 percent nominal voltage) within 30 seconds of starting signal, and run for 2 hours. This test shall be repeated 75 consecutive times without failure.

b. A margin test shall be conducted on each power package to demonstrate margin in excess of design requirements. This test shall be conducted as above except for the loading which shall be furnished before testing. A preliminary outline of such a test is as follows:

- (1) Loading the unit to 6500-kw static load and allow transients to stabilize.
- (2) Then sudden application of a 1300-hp motor and attain stable operation.

This test shall be performed two times without failure.

c. Contractor shall furnish the Engineer three copies of logs or graphs of these tests indicating speed, or frequency, generator voltage, engine and generator temperatures, and load versus time.

11. Painting

a. Each unit shall be painted in accordance with Contractor's standard practice.

12. Tools

a. Contractor shall furnish one set of all special tools required for maintenance of units.

13. Marking

a. All parts or units of assembly shall be marked or tagged with piece marks. Marks shall be in accordance with approved erection drawings, shall be clearly legible, and so placed as to be readily visible when the part is being erected in the field.

b. Connecting parts assembled in the shop shall, before dismantling for shipment, be matchmarked to facilitate erection in the field. All parts or assembly of parts or accessories shall also be so marked as to identify them with this contract.

14. Preparation for Shipment

- a. Contractor shall prepare all materials and articles for shipment in such manner as to facilitate handling, to protect them from damage in transit, and to prevent degradation while in storage before installation. Air receiver tanks shall be cleaned, purged by inert gas, and sealed to prevent rusting. Boxes and cratss shall be marked and have a packing list enclosed showing the parts contained therein.
- b. All finished surfaces shall be coated or otherwise protected with an approved rust preventive. All screwed connections shall be plugged or capped.
- c. The engines shall be drained free of water and prepared for storage for a period of at least 2 years.
- d. The Contractor shall furnish instructions for maintaining the stored units including a written program of inspection procedures.
- e. The Contractor shall furnish a written program of inspection procedures to be performed prior to unloading at the site for the purpose of discovering shipping damage. Copies of this program shall be furnished to the Engineer prior to shipping and copies shall be attached to each shipment.

DETAILED REQUIREMENTS

15. General

- a. Each diesel engine-driven generator set shall be a product of a manufacturer regularly engaged in production of equipment of the nature called for by these specifications. Each unit shall be capable of continuous operation at the design loads specified for the periods specified without injurious heating, and shall operate without objectionable noise or vibration.
- b. The diesel engine complete with accessories such as heat exchangers, lubricating oil cooler, oil pump, oil sump, fuel day tank, fuel and lubricating oil filters, turbochargers, fuel pumps, water pumps, and the generator shall be mounted on a common fabricated steel base plate of sufficient strength and rigidity to support the units and maintain alignment of shaft, complete with anchor bolts that drop below concrete to allow skidding of the equipment in position. Anchor bolts must be in compliance with the attached TVA drawing 88-C-4DB0092574X1-1. Intake air filters,

silencers, exhaust silencers, and starting air compressors shall be furnished with proper supports or bases suitable for bolting to foundations. Controls for engines and generators shall be mounted in appropriate cabinets or cubicles and prewired to suitable terminal blocks for connecting TVA cables as required.

c. All rotating exposed components shall have suitable guard covers designed to prevent accidental contact. Guards shall be of substantial construction, securely fastened in place, but removable for maintenance purposes.

d. Each power package shall be capable of accelerating to rated speed within 10 seconds, accepting rated load, and attaining stable operation within 30 seconds after receipt of an automatic start signal.

e. Each generator shall be rated 6900 volts, 3 phase, 60 Hz and shall be complete with excitation system.

f. Temperature of the standby diesel-driven generator rooms could vary between 0 F in winter and 110 F in summer. Combustion air will be piped from outside the generator rooms and should not exceed 100 F. The units will not normally be subjected to radioactivity.

g. Engine-generator sets will be installed at elevation 629.0 feet above sea level. Design of engines shall take into consideration such sudden drops in barometric pressure as would be experienced during a tornado; and engines shall be required to continue running should they experience drops of 3 psi in 3 seconds, remain at low pressure for a duration of 3 seconds, and recover to normal atmospheric pressure in another 3 seconds.

h. Units shall be capable of running at 110 percent rated speed without injury.

16. Engines

a. Engine shall be a full diesel, 2- or 4-stroke cycle, of current design and manufacture.

b. Engine shall be designed for satisfactory operation on commercial grade No. 2 fuel oil.

c. Full pressure lubrication shall be provided for all surfaces requiring lubrication.

d. Suitable valves or other devices shall be provided for protection against crankcase explosions, providing adequate means to minimize the hazard to personnel and equipment.

e. Lubricating oil filters shall be of the duplex-cartridge type with manual operation for 10-micron service. Oil pump shall be driven from main engine shaft.

f. Fuel oil filters shall be of the duplex-cartridge type with manual operation for 80-micron service.

g. Intake air filter shall be oil bath or dry type for remote mounting. An in-line air silencer shall also be furnished.

h. Cylinders shall be cast individually or cast "en bloc." If cast "en bloc," removable cylinder liners shall be provided.

i. Engine shall be equipped with a residential-type exhaust silencer for outdoor service. Mounting brackets, flexible tubing, flanges, and supports shall be furnished for complete installation. Piping will be furnished by TVA. Adapters for engine exhaust connections shall be included.

j. Rated speed shall not be over 1200 rpm or be less than 450 rpm.

k. BMEP shall not exceed 270 psi at rated load if engine is turbo-charged with aftercooling.

l. Piston speed shall not exceed 1650 fpm.

m. Crankshaft shall be balanced and drilled for pressure lubrication.

n. Speed governor shall be isochronous through load range and shall be hydraulic and/or electric type. Governor shall have provision for remote electrical switching to speed-droop mode, with field adjustable-adjustable, speed-droop characteristic. Speed governor reversible motor shall be for 125-volt DC service and arranged for remote speed adjustment.

o. Governor control shall maintain the output frequency within the following limits:

- (1) Frequency drift. With any constant load between no load and rated load, the change in regulated frequency shall be within $\pm 1/4$ percent from rated.
- (2) Steady state. Frequency control shall be within $\pm 1/4$ percent from rated when load is varied from no load to rated load and all transients have decayed.
- (3) Transient frequency deviation shall not exceed 3 percent upon adding or dropping 100 percent of rated load; the frequency shall return to $\pm 1/4$ percent of rated within 4 seconds with no more than one overshoot and one undershoot.

(4) Frequency variations during steady-state conditions shall show a random nature (as opposed to cyclic variations).

p. Engines shall conform to the recommendations of the "Standard Practices for Low and Medium Speed Stationary Diesel and Gas Engines" of the DEMA unless modified by this specification.

q. Cooling water system for engine cooling and the lubricating oil shall be heated during shutdown with electric immersion heaters controlled by thermostats to ensure rapid starting. Heaters shall be rated 480 volts, 3 phase, with 120-volt, single-phase control. Heater starters will be furnished by TVA.

r. A thermocouple shall be installed at each cylinder exhaust port. Control panel shall have a temperature indicator and selector switch to provide measurements of exhaust temperature.

s. Engines shall have catwalks, if necessary, to provide access for maintenance.

t. Contractor shall maintain within the continental area of the United States a stock of replacement functioning parts and equipment suitable for overnight shipment, with the exception of the crankshaft.

17. Fuel System

a. Each unit shall have its own fuel system complete with fuel oil filters, fuel feed pumps, fuel transfer pumps, valves, etc. System fuel feed pumps shall consist of one engine gear driven and one 125 volt DC motor driven.

b. A day tank having a capacity for 4 hours, or maximum allowable storage permitted by NFPA, at full load shall be provided for each unit.

c. Fuel feed pumps shall take suction from the day tank. Piping between day tanks and engines shall be provided by Contractor.

d. Each day tank shall be equipped with two level switches connected in parallel to start and stop two electric-motor-driven, skid-mounted fuel transfer pumps to be furnished under this contract. Level switches shall have three independent contacts for use on 125-volt DC circuit or 120-volt AC circuit.

e. Storage tanks and piping to transfer pumps will be supplied by others.

f. Any necessary solenoid valves shall be provided, shall have continuous duty coils for 125-volt DC service, and shall be equal to ASCO bulletin HB8300C58 (Red Hat type).

g. On-skid piping, fittings, and valves shall conform to the requirements of the Underwriters Laboratories, Incorporated, and ANSI Standard B31.1, "Power Piping."

h. Off-skid piping and system components shall conform to the requirements of ASME Section III, Class 3. Boundary of code jurisdiction shall be the first welded, screwed, or flanged piping connection on the skid.

18. Diesel-Engine Starting System

a. Each engine shall be equipped with two independent and redundant pneumatic starting systems, complete with all valves, piping, and controls.

b. Two receivers shall be furnished for each engine. Each receiver shall be of sufficient size to start the engine five times without recharging. One receiver will serve as a standby for the other. Each receiver shall be equipped with shutoff valves, pressure gauges, drain valves, safety valves, and low-pressure alarm contacts for use on 125-volt DC circuit. All valves shall be forged carbon steel.

c. Two motor-driven air compressors shall be supplied for each power package. Each compressor shall be sized to recharge one receiver in 30 minutes. Motors shall be 460 volts, 3 phase, 60 Hz. Motor starters will be furnished by TVA.

d. Solenoid valves shall have continuous duty coils for 125-volt DC service and shall be equal to ASCO bulletin HB8300C58 (Red Hat type).

e. Piping between major components will be supplied by TVA.

f. On-skid piping, fittings, and valves shall conform to the requirements of ANSI Standard B31.1, "Power Piping."

g. Off-skid piping and system components, excluding compressors, shall conform to the requirements of ASME Section III, Class 3. Boundary of code jurisdiction shall be the first welded, screwed, or flanged piping connection on the skid.

19. Engine Cooling Water System

a. A closed circuit cooling water system shall be furnished for each engine to provide cooling water for all necessary engine and engine auxiliary coolers.

b. System shall include pumps, heat exchangers, and all accessories.

c. Piping from the service water system to the heat exchanger will be furnished by TVA. Service water requirements shall not exceed 1500 gpm at 95 F.

d. Engine cooling water shall be circulated by a direct main engine shaft-driven pump. Pump shaft shall be of stainless steel.

e. An expansion tank equipped with a float valve shall be furnished to provide a means for supplying makeup water.

f. Tubes in the heat exchangers shall be 304L stainless steel, or approved equal. Tubes shall be 5/8-inch diameter. Heat exchangers shall be the straight tube design with end covers removable. Design pressure for tubes and waterbox shall be not less than 200 psig. Heat exchangers shall be designed for a service water temperature of 95 F. Piping shall be arranged for service water through tubes, engine cooling water through shell.

g. On-skid piping, fittings, and valves shall conform to the requirements of the Underwriters Laboratories, Incorporated, and ANSI Standard B31.1, "Power Piping." Skid-mounted heat exchangers shall conform to ASME Section VIII.

h. Off-skid piping and system components shall conform to the requirements of ASME Section III, Class 3. Boundary of code jurisdiction shall be the first welded, screwed, or flanged piping connection on the skid.

20. Generators

a. The generator shall be 6900 volts, 3 phase, 60 Hz, with not higher than 0.8 power factor. The generator rating shall be sufficient to accept and deliver the output of the prime mover to which it is connected under all conditions of loading without exceeding the following maximum temperature levels:

<u>Temperature Levels</u>	<u>Method of Measurement</u>
Stator - 120 C	RTD
Field - 125 C	Resistance
Collector - 125 C	Thermometer

The generator shall be designed to operate over the same ambient temperature range as the prime mover. Stator and rotor insulation shall be class B. The generator shall be capable of being operated at 110 percent of its 8000-hour rating for a period of 2 hours out of any 24 hours of operation without injurious heating.

b. The 3-phase winding shall be provided for wye connections with a minimum of three main and three neutral terminals brought out. Main terminals shall have suitable provision for connecting the generator to the generator breaker by means of cables furnished by others. Neutral terminals shall be brought out separately at the generator and carried to the grounding equipment specified elsewhere.

c. Short circuit requirements, telephone interference factors, overspeed requirements, and temperature rise of parts other than those listed above shall meet the requirements of ANSI C50.

d. Insulation shall be provided so that all paths of circulatory shaft currents will be broken in two places.

e. Resistance-type temperature detectors (10 ohms at 25 C) shall be provided as follows:

(1) Six in stator winding located in accordance with ANSI C50.

(2) Two in each bearing.

f. Generator enclosure shall be of drip-proof construction with rodent screens over any air inlet or discharge openings. Generator shall preferably be cooled by air circulated within the generator enclosure by means of fans mounted on the generator shaft. Suitable washable filters shall be provided for filtering outside air. Ambient air temperature will range from 0 to 110 F. Suitable thermostatically controlled space heaters, for operation at 480 volts, 3 phase, 60 Hz, shall be provided as required for cold weather protection and operation. Heater contactors will be furnished by TVA.

21. Exciters

a. Each generator shall be complete with a static-type excitation system. The static-type excitation system shall be complete with its power supply transformer, connections, air circuit breaker, bus, exciter cubicle, voltage regulator, rectifiers, fuses, and all devices necessary to automatically control the generator during the loading cycle as defined elsewhere in this specification. The minimum kilowatt rating shall be in accordance with NEMA Publication MG 1-22.

22. Generator Control Panels

a. Each power package shall be furnished with a self-supporting, metal-enclosed, floor-mounted control panel complete with floor and sills including, but not limited to, voltage regulator, excitation cubicle, and generator neutral cubicle.

23. Voltage Regulator

a. Static excitation shall include an automatic voltage regulator of the latest approved high-speed, continuous-acting dynamic type suitable for use with the equipment for which it is intended. Regulator shall be responsive to average 3-phase voltage. It shall be furnished complete with all necessary relays, contactors, and auxiliary devices.

b. Regulator shall function without hunting and shall be capable of preventing abnormal changes in the voltage of the generator. It shall control the voltage so as to increase the safe operating power limit, tend to improve the stability of the generator, and minimize the effects of disturbances caused by load changes.

c. The voltage-adjusting rheostat shall be 125-volt DC motor-operated type, mounted inside the excitation cubicle. Relays, contactors, and other auxiliaries shall also be mounted in the excitation cubicle.

d. Voltage regulator shall include reactive-drop compensation, minimum-excitation reactive limit, maximum excitation limiter with fixed time delay, cross current compensation which may be remotely switched out for independent operation at preset voltage, and accelerating-torque boost circuit for improving stability during starting of motors.

24. Excitation Cubicles

a. Cubicles shall include but not be limited to the following equipment supplied by Contractor:

- (1) Manually operated air circuit breaker or fuses in the incoming AC power leads from excitation supply transformers to provide a means of deenergizing the excitation equipment for maintenance or for extended shutdown periods.
- (2) Protection relays, fuses, etc., as needed.
- (3) Electrically operated, field discharge device for main field circuit.
- (4) Indicating lights for indicating and locating rectifier failure.
- (5) At least two alarm contacts to initiate annunciation of emergency and nonemergency troubles in the excitation equipment.

- (6) Excitation transformer and potential transformers.
- (7) Field flashing system including control and protective equipment.
- (8) Main and control connections and wiring. Terminal blocks for connections of TVA's cables shall be provided and located where accessible and convenient to TVA's conduits.

b. Provision shall be made for connection of TVA's remote instrumentation including generator field amperes, voltage, and temperature. Where circuits will not exceed 375 volts, these instrument connections may be made using 100-mv shunts and fused voltage taps. If circuits exceed 375 volts, instrument circuits shall be isolated by direct-current transducers (direct current and potential transformers) of sufficient burden capacity to maintain 1/2 percent accuracy while operating with these three instruments through 2000 feet of No. 10 AWG copper cable.

25. Generator Neutral Cubicle

a. A neutral cubicle for each generator consisting of a dry distribution-type grounding transformer and resistor with necessary terminals and connections shall be furnished. Transformer kva rating, resistor ohms, and current rating shall require approval by TVA.

26. Generator Neutral Current Transformers

a. Two 1200:5-ampere current transformers with metering accuracy shall be furnished in the neutral lead of each phase. Accuracy classification shall be 0.3 at burdens 80.1, 80.5, and 81.0. Current transformers to be mounted by the Contractor.

27. Controls

a. General

- (1) Contractor shall furnish all controls necessary to permit operation and testing of the diesel generators locally within the diesel building exclusive of application of loads. Contractor furnished controls shall permit local, remote manual, and remote automatic control of the diesel generators. Control equipment shall have the capability of being automatically transferred from manual to automatic control and ready to accept load within 10 seconds after receiving an automatic signal. Control equipment shall be designed to permit operating the diesel generators asynchronous and paralleled with the TVA system. Contractor's

control equipment shall have the necessary terminal switch contacts, relays, etc., to allow paralleling the remote control readout and annunciation equipment with that furnished by Contractor. TVA remote equipment is shown on TVA drawing 2DW0720RT-1R0. Location of this equipment may vary from that shown but shall not affect the diesel generator package.

b. Starting controls

- (1) Engine starting equipment shall be designed to accept a remote starting signal in the form of an interruption of a 125-volt DC control circuit.
- (2) Engine control equipment shall be designed to start and stop the engine from a signal from a local control station or from the main control room.
- (3) A local switch at each unit shall be provided which will cut out remote starting while the unit is being serviced. A contact of this switch shall be provided to operate the annunciator when switch is not in the automatic start position. Each engine shall run until manually shut down.
- (4) Overcranking lockout with manual reset and two alarm contacts shall be furnished.
- (5) Indicating lights and contacts for 125-volt DC service shall be furnished to show:
 - (a) Ready for automatic start but not running.
 - (b) Cranking.
 - (c) Running.
- (6) Each engine control scheme shall be designed for automatic reset for the next automatic start after the engine has been stopped.

28. Protective Relaying Panel

a. Each generator set shall be supplied with a freestanding, floor-mounted, protective, relaying panel. Equipment mounted on this panel shall include, but not be limited to the protective devices, meters, and meter switches shown on TVA drawing 2DW0720-RT-1 as part of the diesel generator set.

29. Engine Control Panel and Equipment

a. The engine control panel shall be a freestanding-vertical type enclosed with access doors at rear of the panel. All pneumatic or process connections shall terminate in bulkhead fittings at the sides or top of panel. Electrical terminations for field wiring shall be at the inside rear of panel. The electrical relay panel will be physically located adjacent to the engine control panel.

b. Panel shall include but not be limited to the following equipment:

- (1) Annunciator panel (24 points).
 - (a) Test switch.
 - (b) Reset switch.
 - (c) Alarm silence switch.
 - (d) Power on indicating lamp.
- (2) Engine start switch.
- (3) Engine stop switch.
- (4) Mode selector switch (AUTO - MAINTENANCE).
- (5) Governor speed/load control switch (RAISE - NOR - LOWER).
- (6) Generator voltage control switch (RAISE - NOR - LOWER).
- (7) Air compressor No. 1 control switch (MANUAL - OFF - AUTO).
- (8) Air compressor No. 2 control switch (MANUAL - OFF - AUTO).
- (9) Fuel pump control switch (RUN - AUTO).
- (10) Fuel transfer switch (MANUAL - OFF - AUTO).
- (11) Cooling water valve No. 1 control switch (OPEN - CLOSE).
- (12) Cooling water valve No. 2 control switch (OPEN - CLOSE).

30. Seismic Criteria

a. All equipment shall be designed to withstand and remain operable during and after a safe shutdown earthquake. The equipment shall be seismically qualified as indicated in the attached design criteria B-DC-20-22.

b. The diesel generator installation is considered to be an active component.

c. For purposes of seismic qualification, the equipment is to be located in the diesel-generator building at elevation 629.0 feet above sea level. Minimum design response spectra for horizontal and vertical motion at top of rock for the safe shutdown earthquake (SSE) are provided. The Bellefonte diesel-generator building is a bedrock supported structure; and pending verification by the final results of the building seismic structural analysis, these spectra are applicable to equipment located on the base slab. Therefore, these spectra are to be considered guidelines for equipment so located, and other elevations will require modifications of these spectra as a function of building structural characteristics as yet undefined. These spectra shall be used in conjunction with the attached Design Criteria B-DC-20-22, Design Criteria for Seismic Qualification of Category I Fluid System Components and Electrical or Mechanical Equipment, in computing the resulting seismic forces to the equipment and its anchors.

d. The excitation in each of the three major orthogonal directions is considered to act simultaneously, and their affect should be combined by the RSS method. These forces may act in any direction; the worst condition shall be used in design.

e. Stresses in supports and anchor bolts due to seismic loads shall be combined with stresses due to other live and dead loads and operating loads. Allowable stress for this combination of loads shall be based on 1.6 times the applicable AISC allowable stress.

f. Allowable shear on anchor bolts set in concrete shall be in accordance with Table 25-G of the Uniform Building Code (International Conference of Building Officials).

g. All equipment shall be so anchored or fastened that it would not be displaced if friction did not exist.

h. Contractor shall furnish calculations or test data to show compliance with the above as dictated by the documentation requirement of attached Design Criteria B-DC-20-22.

1. Pipe connections

- (1) Piping tank nozzles or penetrations shall be designed for the following loads as a minimum:
 - (a) The nozzle or penetration loads as defined in figure 1.
 - (b) The attached pipe will be schedule 40 of like size, unless otherwise specified.
 - (c) The material yield stress is assumed to be 30,000 psi.
- (2) Contractor shall provide support loads which reflect these nozzle/penetration loads.

- (3) Figure 1 (attached) illustrates the minimum nozzle/penetration design loads and the maximum allowable pipe imposed loads and presents the equations for calculating them. Note that the bending moment is not calculated as a resultant, but as a vector component which can be used as the allowable moment existing concurrently in two bending axes.

MINIMUM NOZZLE/PENETRATION DESIGN LOADS
MAXIMUM PIPE IMPOSED LOADS

Minimum Nozzle Loads	Maximum Pipe Imposed Loads
The Axial or Lateral Forces P_x, y, z shall be .01 times the force at yield in the pipe.	$P_{x,y,z}^* = 0.01 \sigma_y A$
The Bending Moment $M_{by,z}$ shall be 0.0707 times the moment at yield in the pipe.	$M_{by,z} = 0.0707 \sigma_y Z$ ($M_r = 0.1 \sigma_y Z$)
The Torsional Moment (M_{t_x}) shall be that required to produce a shear stress in the pipe wall of 0.1 times the yield stress of the pipe material.	$M_{t_x} = 0.1 \frac{\sigma_y J}{R_o} = .2 \sigma_y Z$

Definitions

$P_{x,y,z}$ = Minimum design force on nozzle*/penetration.

= Maximum allowable pipe imposed load.

$M_{by,z}$ = Minimum design bending moment on nozzle*/penetration.

= Maximum allowable pipe imposed bending moment.

(Note $M_{by} = M_{bz}$ are assumed to occur simultaneously.)

M_{t_x} = Minimum design torsional moment on nozzle/penetration.

= Maximum allowable pipe imposed torsional moment.

A = Metal cross sectional area of pipe.

A_o = Cross sectional area of pipe.

J = Polar moment of inertia of pipe cross section = $\frac{\pi}{32} (d_o^4 - d_i^4)$

P = Internal design pressure.

R_o = Outer pipe radius.

Z = Pipe section modulus = I/c

σ_y = Yield stress in pipe at operating temperature.

M_r = Resultant bending moment produced by M_{by} and M_{bz} .

*The load given for P_x shall be in addition to the internally induced pressure load PA_o , when evaluating the minimum design axial nozzle load.

APPENDIX B

REPAIRS AND NONCONFORMING MATERIALS

1. When it is found that material, a part, or equipment is not in accordance with either the drawing or specification, the contractor may either scrap or repair the nonconforming item provided no other contract provision is violated. If the contractor elects to repair, the method of repair must be approved, by TVA, prior to commencement of the repair.
2. It shall be the responsibility of the contractor and his suppliers, if any, to report all nonconforming materials on a NONCONFORMANCE REPORT.* For subcontracts with manufacturers or suppliers in which the responsibility has not been stated, it shall be the responsibility of the contractor to report nonconforming items.
3. The originator of the NONCONFORMANCE REPORT is responsible for completing all applicable sections of the form. The contractor is required to attach to the NONCONFORMANCE REPORT all descriptive information as may be necessary to clearly describe the nonconformance. The proposed disposition and/or corrective action of the NONCONFORMANCE REPORT shall include supporting facts such as calculations, test results, or results of other investigations showing why the condition is technically acceptable. The NONCONFORMANCE REPORT shall be signed by a responsible representative of the contractor prior to submittal.
4. All NONCONFORMANCE REPORTS are to be initially transmitted by the contractor to the Chief Materials Engineer, TVA Inspection and Testing Branch.
5. The contractor is responsible for assuring that all nonconforming material, parts or equipment are properly marked or tagged, segregated from conforming items (if applicable), and that adequate records are maintained to assure that further fabrication, manufacturing, or processing is not performed pending final disposition.
6. The contractor is responsible for correction and reinspection of all nonconformances in accordance with TVA direction.
7. All of the above provisions apply equally to any subcontracted item provided by any supplier of the contractor; and it shall be the responsibility of the contractor to require and assure full compliance from his suppliers to the above provisions.

*TVA Form No. 1C548

TENNESSEE VALLEY AUTHORITY
INSPECTION AND TESTING BRANCH
KNOXVILLE, TENNESSEE 37902

TVA PROJECT _____
CONTRACT NO. _____
PROJECT NO. _____
REPORT NO. _____

Component _____ Part _____
Drawing _____ Rev _____ Specification _____ Rev _____
Inspection Date _____ Date TVA Inspector Notified _____ How Notified _____
Contractor _____ Date Contractor Notified _____ (When Initiated by TVA Inspector)
Safety Class _____ Design Code _____
Nonconformance Verified by _____
(Name and Title) _____ (Company) _____

NONCONFORMANCE DESCRIPTION: (Describe method of inspection used to determine non conformance).

Attachments included

PROPOSED DISPOSITION AND/OR CORRECTIVE ACTION: (Contractor to submit proposed repair procedures, when applicable, for approval).

(include specific details) Attachments included

CONTRACTOR'S REQUEST: _____ Use As Is _____ Accept After Corrected

CONTRACTOR'S COMMENT:

Authorization Signature _____
(Name) _____ (Title) _____ (Date) _____

TVA DISPOSITION: _____ Approved _____ Rejected

TVA COMMENT:

TVA, Design Engineer	_____	_____
TVA, Chief Technical Engineer	Name _____	Date _____
TVA, Chief Materials Engineer	Name _____	Date _____
	Name _____	Date _____

cc: Chief, Technical Engineer
Chief Materials Engineer

Design Project Manager
Construction Project Manager (3)

Purchasing Agent
TVA Inspector

Contractor

No. 61- 86181

TENNESSEE VALLEY AUTHORITY

DIVISION OF ENGINEERING DESIGN

BELLEFONTE NUCLEAR PLANT

DESIGN CRITERIA
FOR
SEISMIC QUALIFICATION OF CATEGORY I
FLUID SYSTEM COMPONENTS AND ELECTRICAL
OR MECHANICAL EQUIPMENT

B-DC-20-22

1.0 SCOPE

These criteria provide direction and design information for establishing data which verify that safety related mechanical and electrical equipment can meet performance requirements during and following a safe shutdown earthquake. These criteria may be used by equipment manufacturers to establish and substantiate performance claims and verify equipment performance as part of an overall qualification effort. If there is a conflict between these criteria and the equipment purchase or design specification, or applicable codes or standards, those conflicts must be brought to the attention of TVA for appropriate resolution.

The seismic qualification procedures presented herein are, in general, consistent with the procedures established by IEEE Guide for Seismic Qualification of Class IE Electrical Equipment for Nuclear Power Generating Station, Standard 344-1971 (draft version Revision 3, February 15, 1974).

2.0 DEFINITIONS

The definitions in this section establish the meanings of words in the context of their use in these criteria.

a. Active Component

A component such as a piece of mechanical equipment, component of the electrical supply system, or instrumentation and control equipment which performs or causes the performance of a mechanical motion during the course of accomplishing a system safety function.

b. Assembly

Any integrated system complete with all appendages such as motors, fans, racks, piping systems, panels, or consoles which is supported as a unit from a surface having a defined seismic motion. When all the devices of a system are mounted on a support structure, the unit becomes an assembly.

Note: These criteria, written primarily for assemblies, recognize the necessity to qualify many items of equipment as independent devices.

c. Safe Shutdown Earthquake (SSE)

That earthquake which produces the maximum vibratory ground motion for which structures, systems, and components important to safety are designed to remain functional.

These structures, systems, and components are those necessary to assure:

- (1) the integrity of the reactor coolant pressure boundary,
- (2) the capability to shut down the reactor and maintain it in a safe shutdown condition, or
- (3) the capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the guideline exposure of 10CFR Part 100.

d. Device

Any motor, fan, valve, switch, relay, sensor, etc., to be seismically qualified which is not supported directly from a surface having a defined seismic motion.

e. Floor Acceleration

The acceleration of a particular building floor (or equipment mounting) resulting from a given earthquake motion applied to the building. The maximum floor acceleration can be obtained from the floor response spectrum as the response acceleration at high frequency (33 Hz).

f. Ground Acceleration

The acceleration of the ground resulting from a given earthquake motion. The maximum ground acceleration can be obtained from the ground response spectrum as the response acceleration at high frequency.

g. Natural Frequency

The frequency or frequencies at which an elastic system vibrates under the action of forces inherent in the system itself, and in the absence of external impressed forces. Natural frequencies of a system are defined by its own physical characteristics such as geometrical configuration, mass distribution, and stiffness.

h. Nonactive Component

Those components, such as pumps, valves, heat exchangers, vessels, filters, etc., that are not required to perform a mechanical motion during the course of accomplishing a system safety function.

i. Operating Basis Earthquake (OBE)

That earthquake which produces the maximum vibratory ground motion for which those features of the nuclear power generating station necessary for continued operation without undue risk to the health and safety of the public are designed to remain functional. This requirement will be assured by designing for shutdown of the reactor and maintaining it in a safe shutdown condition following an OBE. In general, the OBE reflects a ground motion equal to one-half that of the SSE.

j. Response Spectrum

A plot of the maximum response of a series of single-degree-of-freedom systems of different natural frequencies to an excitation time history. The damping value is expressed as a percent of critical damping. These systems are considered to be rigidly mounted on the surface of interest (i.e., on the ground for the ground response spectrum or on the floor of a building for that particular floor response spectrum) when that surface is subjected to a given earthquake motion.

k. Rigid

Equipment is considered rigid if it, at all points, follows the motion of its foundation, without amplification or attenuation. If all natural frequencies of the equipment are greater than 33 Hz, it may be considered rigid.

l. Seismic Category I

Those structures, systems, and components important to safety in nuclear power plants which are designed to remain functional under the effects of the SSE, including ASME Code Classes 1, 2, and 3. Although not included in the definition of Category I, those

portions of structures, systems, and components whose continued function is not required but whose failure could reduce the functioning of any safety related plant feature to an unacceptable safety level must be seismically qualified as required to ensure that an SSE would not cause such failure.

m. Sine Beats

A continuous sinusoid of 1 frequency, amplitude modulated by a sinusoid of a lower frequency. As used in this document, the amplitudes of the sinusoids represent acceleration and the modulated frequency represents the frequency of the applied seismic stimulus.

Note: Beats are usually considered to be the result of the summation of two sinusoids of slightly different frequencies with the frequency within the beats as the average of the two, and the beat frequency as the difference between the two. However, as used here, the sine beats may be an amplitude modulated sinusoid with pauses between the beats. (See Figure 2.0-1.)

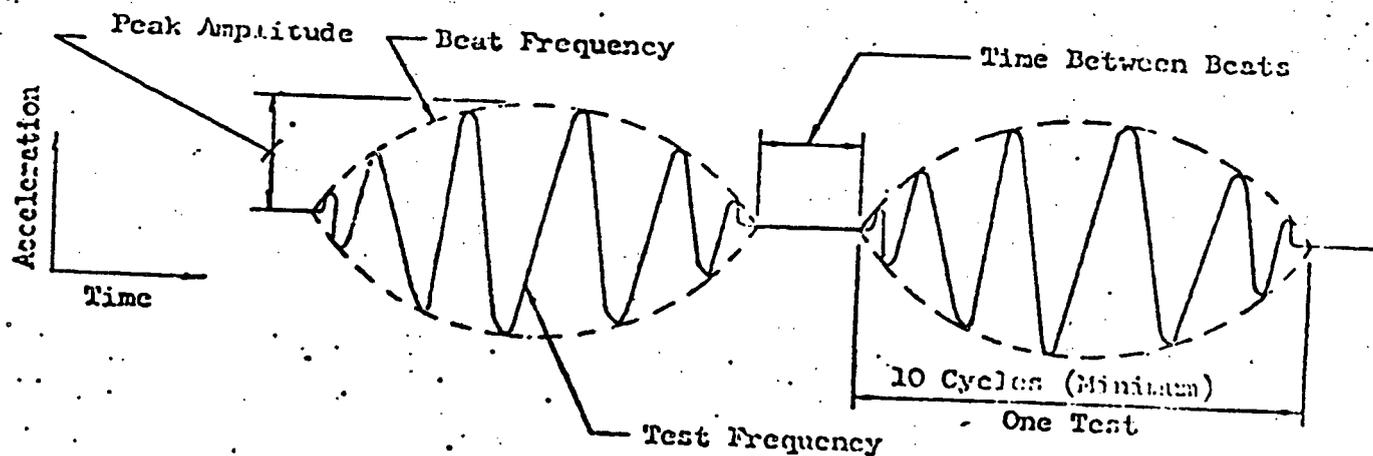


Figure 2.0-1. Sine Beat

3.0 SEISMIC QUALIFICATION PROCEDURE

Seismic qualification can be accomplished in various ways, two of which are presented herein as being the most common presently used, although other methods, if acceptable to TVA, may also be used. The two methods are:

- a. Predict the equipment performance by mathematical analysis.
- b. Test the equipment under simulated seismic conditions.

Each of the above, a combination of these, or other methods acceptable to TVA can be used to verify the ability of the equipment to meet the seismic qualification requirements. The choice will be based on the practicality of the method for the type, size, shape, and complexity of the equipment and the reliability of the conclusions. The documentation will clearly justify the choice.

For Category I pumps and valves, note additional seismic requirements as specified in paragraph 4.1.1.3 and 4.1.2.3.

3.1 ANALYSIS

The analysis method is not recommended for complex equipment which cannot be modeled to correctly predict its response. If this qualification approach is chosen, the analysis is expected to be extensive and to consider all items of a component or assembly.

3.1.1 Mathematical Model

Develop a mathematical model of the equipment, typically a multidegree-of-freedom, lumped-mass system with mass-free interconnections.

Other models acceptable to TVA may be used.

3.1.2 Dynamic Characteristics

Determine the natural frequencies and mode shapes (1)¹ of the equipment as it will be mounted in service.

3.1.3 Rigid Equipment

If all the natural frequencies of the equipment are greater than 33 Hz, the equipment may be considered rigid and analyzed statically as such. In this static analysis, the seismic forces on each

¹Numbers in parentheses refer to similarly numbered references in the bibliography.

component of the equipment are obtained by concentrating the mass at the center of gravity and multiplying the mass by the appropriate maximum floor acceleration. The seismic stress will be added to the equipment operating stresses and a determination then made of the adequacy of the strength of the equipment.

If the equipment has no definite orientation, the excitation along each of three mutually perpendicular axes shall be aligned with respect to the equipment so as to produce maximum loading. The excitation in each of the three axes is considered to act simultaneously and their effect should be combined by the square root of the sum of the squares method.

3.1.4 Dynamic Analysis

If the equipment cannot be analyzed by the criterion of 3.1.3, then a dynamic analysis must be performed if the analytical approach is used. The equipment shall be modeled as discussed in 3.1.1 in sufficient detail, i.e., number of mass points, to ensure adequate representation. The mathematical model can be analyzed using modal analysis techniques (2) or direct integration of the equations of motion. The structural damping given in Table 3.1-1 should be used in the analysis unless justification for other values can be provided in the form of documented test data. A stress analysis is then performed using the inertia forces or equivalent static loads obtained from the dynamic analysis for each mode.

For a modal analysis based on a response spectrum requirement, the modal response accelerations can be taken directly from the spectrum. The maximum spectral values within a ± 10 percent band of the calculated frequencies of the equipment will be used for computation of modal dynamic response inertial loading. The total seismic stress is normally obtained by combining the modal stresses by the square root of the sum of the squares (RSS). The seismic stresses of closely spaced modes (period within 10 percent of the adjacent mode)

are to be combined by absolute summation. The resulting total is treated as that of a pseudomode and is then to be combined with the remaining modal stresses in a RSS manner. The seismic stresses will be added to the equipment operating stresses and compared with allowable stress levels.

The excitation in each of the three major orthogonal directions is considered to act simultaneously and their effect should be combined by the RSS method.

TABLE 3.1-1

DAMPING VALUES(2)

(Percent of Critical Damping)

<u>Structure or Component</u>	<u>Operating Basis Earthquake¹</u>	<u>Safe Shutdown Earthquake</u>
Equipment and large diameter piping systems ² , pipe diameter greater than 12"	2	3
Small diameter piping systems, diameter equal to or less than 12"	1	2
Welded steel structures	2	4
Bolted steel structures	4	7
Prestressed concrete structures	2	5
Reinforced concrete structures	4	7

¹In the dynamic analysis of active components, these values should also be used for SSE.

²Includes both material and structural damping. If the piping system consists of only one or two spans with little structural damping, use values for small diameter piping.

3.1.5 Static Coefficient Analysis

An alternate method of analysis which allows a simpler technique in return for added conservatism is acceptable. No determination of natural frequencies is made but, rather, the response of the equipment is assumed to be the peak of the appropriate response spectrum at a conservative and justifiable value of damping. This response is then multiplied by a static coefficient of 1.5 which has been established from experience to take into account the effects of both multifrequency excitation and multimode response.

In a static coefficient analysis, the seismic forces on each component of the equipment are obtained by concentrating its mass at its center of gravity and multiplying it by the acceleration obtained above. The stress analysis may then be performed in a normal manner.

3.1.6 Equipment Configuration

If the equipment has no definite orientation, the worst possible orientation will be considered. Further, equipment will be considered to be in its operational configuration--charged with oil in crankcases, refrigerant in coils, water in heat exchangers, etc. The investigation will ensure that the point of maximum stress has been considered.

3.1.7 Analysis Results

The analysis will include evaluation of the effects of the calculated stresses on mechanical strength, alignment (if critical to proper operation), electrical performance (microphonics, contact bounce, etc.), and noninterruption of function. Maximum displacements will be computed and interference effects determined.

3.2 TESTING

Seismic tests will be performed by subjecting equipment to vibratory motion which conservatively simulates that to be seen at the equipment mounting during an earthquake. The details of the test procedures given below constitute the more common ones presently in use, but do not

preclude others if acceptable to TVA. The test program may be based upon selectively testing a representative number of mechanical components according to type, load level, size, etc., on a prototype basis.

3.2.1 Test Methods

The equipment will be tested in such a manner as to demonstrate its ability to perform its intended function, and sufficient monitoring equipment will be used to evaluate performance before, during, and following the test. The equipment being tested will be mounted on the vibration generator in a manner that simulates the intended service mounting. When qualification test requirements are specified in the form of a response spectrum, it is required that the response spectrum of the test input motion be shown to envelope the required spectrum and that the peak input acceleration level is equal to or greater than the zero period acceleration value of the required spectrum. In the event there is no appropriate response spectra, as is the case for equipment not mounted directly to a building floor (devices), the seismic loading shall be that which results from input accelerations of 3 g horizontal and 3 g vertical.

3.2.1.1 Multiaxis vs single axis

The qualification tests should be performed with test input motion applied in all three principal axes simultaneously. However, alternative procedures are allowed.

Single-axis tests are allowed if the equipment being tested can be shown to respond independently in each of the three orthogonal axes. This is the case if the coupling is zero or very low. For example, if a device is normally mounted on a panel that amplifies motion in one direction, single-axis testing of the device may be adequate; or, if a device is restrained to motion in one direction, the same may be used. Single-axis testing may also be used for multiaxis coupled equipment if the input acceleration level is increased to account for the coupling.

If the above considerations do not apply, multiaxis testing should be used. The minimum is biaxial testing with simultaneous inputs in a horizontal and the vertical axes. Independent random inputs are preferred but if in-phase inputs are used (such as with single frequency tests) four tests should be run. First, with the inputs in phase; next, with one input 180 degrees out of phase; next, with the equipment rotated 90 degrees horizontally and the inputs in phase; and, finally with the same equipment orientation but with one input 180 degrees out of phase.

3.2.1.2 Multifrequency vs single frequency

Seismic excitation generally has a broad frequency content. Multifrequency vibration input motion should therefore be used for seismic qualification. However, single frequency input, such as sine beats, may be applicable provided one of the following conditions is met:

- a. When the seismic ground motion has been filtered due to one predominant structural mode, the resulting floor motion may consist of one predominant frequency. This is characterized by a sharp, narrow-band response spectra.
- b. When it can be demonstrated that the anticipated response of the equipment is adequately represented by one mode.
- c. The input has sufficient intensity and duration to excite all modes to the required magnitude, such that the testing response spectra will envelope the corresponding response spectra of the individual modes.

3.2.1.3 Exploratory test

An exploratory vibration test will be run prior to the full level qualification test. This exploratory test will be in the form of a single axis continuous sweep frequency search using a sinusoidal steady-state input at the lowest possible amplitude at which test facilities are capable of determining resonance. The search will be performed in each principal axis and will include a minimum

of two continuous sweeps from 1 to 35 to 1 Hz at a frequency sweep rate of no greater than 1 octave per minute (1-35-1 Hz). All resonant frequencies of the equipment shall be recorded for testing per 3.2.1.5. Structural coupling data may also be obtained to provide justification for deviation from the multiaxis input requirement.

3.2.1.4 Rigid equipment

If no resonances are located within the range of frequencies specified by paragraph 3.2.1.3, then single frequency testing is acceptable and will be performed at every other 1/3 octave frequency interval, i.e., 5, 8, 13, 20, and 33 Hz. If known, the tests will also include resonant frequencies of the support structure as indicated by peaks in the applicable response spectra. In any case, single frequency tests will be made at a minimum of five frequencies. The equipment will be tested a minimum of two times at each frequency.

3.2.1.5 Flexible equipment - Test input descriptions

For the more general situation, where the equipment is found to have resonant frequencies within the range specified by paragraph 3.2.1.3, the equipment will be subjected to full qualification test levels a minimum of two times. The qualification test methods must be established per paragraphs 3.2.1, 3.2.1.1, and 3.2.1.2. The types of test input motions are described below.

a. Multifrequency Tests

When the seismic ground motion has not been strongly filtered, the floor motion retains the broad-band characteristics. In this case, multifrequency testing is applicable for qualification. Specific input excitation to the shake table includes time history, random, and pseudorandom or complex wave shapes. Since so many variations of this type of test can be used for input, the vendor or his testing contractor is required to contact TVA for approval of his shake table input.

b. Single Frequency Tests

(1) Sine beat test

A test at any frequency will consist of the application of sine beats of maximum acceleration corresponding to that which the device is to be qualified. The sine beats consist of a sinusoid at the frequency of interest and of amplitude as shown in Figure 2.0-1. The maximum amplitude corresponds to the maximum acceleration at which the device is to be qualified. The duration of the beat will be a minimum of 10 cycles unless it can be shown that a lower number of cycles is sufficient to exceed or duplicate the response of the equipment at the appropriate location. The time of the pause between beats will be long enough to allow the equipment to come to rest. A minimum of five beats is required.

(2) Continuous test

A test at the frequency of interest will consist of the application of a continuous sinusoidal motion corresponding to the acceleration at which the device is to be qualified for an appropriate length of time. A time duration will be selected which is conservatively consistent with the uses for which the device is being qualified. A time duration of 20 to 30 seconds is commonly used.

For single frequency testing, the test frequencies shall be spaced no further than 1/3 octave apart throughout the frequency range from 1 to 35 Hz. Any building frequencies indicated by peaks in the response spectrum, and any equipment resonances noted during exploratory tests within 1 to 35 Hz must also be included as test frequencies.

c. Other Tests

If there are other vibration tests which conservatively simulate the expected seismic service other than those described above and equally acceptable to TVA, they may be used instead of the above tests.

The proposed test methods and procedures must be submitted to TVA for approval and/or comment with sufficient lead time to incorporate changes, if required, without impacting test schedules.

3.2.2 Devices

A practical problem arises in attempting to describe tests for devices (relays, motore, sensors, etc.) as well as for complex assemblies such as control panals. It is reasonable to assume that a device, as an integral part of an assembly, can be subjected to seismic tests while in an operating condition and its performance monitored during the test; however, in the case of complex panels, such a test is not always practical. In such a situation, the following alternate approach is recommended.

The individual devices are teated separately in an operating condition and the test levels recorded as the qualification levels of the devices (see paragraphs 3.2.1 and 6.1). The panel, with similar devices installed but inoperative, is vibration tested to determine if the panal response accelerations as measured by accelerometers installed at the device attachment locations are less than the levels at which the devices were qualified. Note that the purpose of installing the nonoperating devices is to assure that the panel has the structural characteristics it will have when in use. If the acceleration levels at the device locations ara found to be less than the levels to which the device has been qualified, then the total assembly may be considered qualified. Otherwise, either

the panel must be redesigned to reduce the acceleration level at the device locations and retested, or the devices must be requalified to the higher levels.

3.2.3 Assemblies and Support Structures

3.2.3.1 Equipment test mounting

An assembly or support structure (equipment) to be tested will be mounted on the vibration generator in a manner that simulates the intended service mounting. If the equipment is too large to be so mounted, other means which simulate the service mounting will be used. Possible alternatives involve the use of a "clip table" or "soft mounting" the equipment using flexible supports with resonance outside the frequency band of the test and rigidly connect the base of the equipment to the vibration generator. (See Figure 3.2-1.) The vibratory motion will be applied to the equipment as described in paragraph 3.2.1.

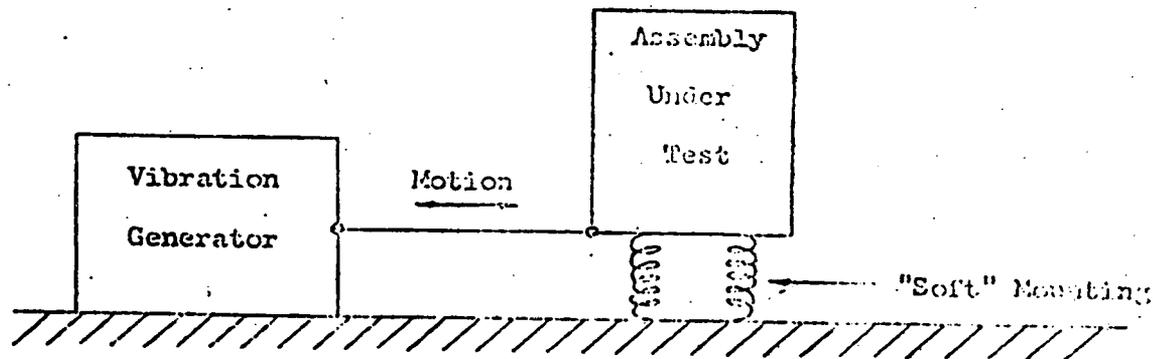


Figure 3.2-1. Alternate Test Arrangement for Large Equipment

3.2.3.2 Equipment configuration

Support structures such as air-conditioning units, consoles, racks, and panels containing devices tested as in paragraph 3.2.2 may be vibration tested without the devices being in operation if

they are performance tested following the vibration test. However, the components will be in their operational configuration, that is charged with oil in crankcases, refrigerant in coils, water in heat exchangers. The goal is to qualify the support structure and to determine that at the expected frequencies and accelerations of the specified earthquakes, the support structure does not amplify the forces beyond that level at which the devices have already been proved to operate (paragraph 3.2.2). Such functional monitoring as is practical will be done during the test.

3.2.3.3 Test procedure

The vibration tests of the assembly or support structure should be performed as in paragraph 3.2.1 to assure the structural integrity of the support structure and to determine the dynamic characteristics of the assembly to the specified earthquake. If these response accelerations are equal to or less than the acceleration levels to which the devices in the support structure have already been successfully functionally tested, no additional work is needed. If not, either the support structure design must be changed to reduce the amplified accelerations and the assembly retested, or the devices must be requalified to the higher levels.

4.0 FUNCTIONAL REQUIREMENTS, LOAD COMBINATIONS, AND ALLOWABLE STRESS LEVELS

4.1 GENERAL

The program for the qualification of Seismic Category I components shall conservatively demonstrate that no loss of function shall result either before, during, and/or after the occurrence of the combination of events for which functionality must be assured. No loss of function implies pressure boundary integrity, that the component will not be caused to operate improperly, that components required to respond actively will respond properly, etc., as appropriate to the specific equipment. In general, operability assurance must be established during and after the seismic event for active components. Pressure retaining integrity and the absence of improper actions must be demonstrated for nonactive components. Proper functioning of all equipment must be

assured prior to any seismic testing. A recommended program to assure functionality of specific components is provided herein. Alternate means for specific components may be utilized provided the program is approved by TVA.

4.1.1 Functional Assurance Procedures for Pumps

This program specifically addresses procedures for qualifying the mechanical portions of Category I pumps such as the body which forms a fluid pressure boundary including the suction and discharge nozzles and the shaft and seal retainers; the impeller assembly including the blading, shaft, and bearings for active pumps; and integral supports. Electric-drive motors for active pumps and instrumentation, including electrical devices which must function to cause the pump to accomplish its intended function, are discussed separately in paragraph 3.2.2.

Functionality of pumps and mechanical components defined above is demonstrated when the following conditions are satisfied:

4.1.1.1 Hydrostatic test

The fluid pressure boundary shall be hydrostatically tested in the manufacturer's shop in accordance with applicable section of ASME Boiler and Pressure Vessel Code, 1974 edition.

4.1.1.2 Leakage test

The fluid pressure boundary shall be examined for leaks at all joints, connections, and regions of high stress such as around openings or thickness transition sections while the pump is undergoing a hydrostatic test or during performance testing. Leakage rates permitted in the design specification that are exceeded shall be eliminated and the component retested to establish an observed leakage rate. The actual observed leakage rates, if less than permitted, shall be documented and made a part of the acceptance documentation package for the component.

4.1.1.3 Seismic qualification

The functionality of a pump during and after a seismic event shall be demonstrated by analysis, test, or a combination of both. The seismic loading effects shall be that which is obtained from the equipment response acceleration as determined from applicable response spectra. In the event there is no appropriate response spectra, as is the case for equipment not mounted directly to a building floor, the seismic loading shall be that which results from input accelerations of 3 g horizontal and 3 g vertical. For pipe supported pumps it must also be demonstrated that the pump is rigid, that is, its lowest natural frequency is greater than 33 Hz. The procedures for verifying the ability of the equipment to maintain its structural integrity and operability during a seismic event are presented in section 3.

4.1.1.3.1 Fluid Pressure Boundary

For fluid pressure boundary components, including their nozzles, the allowable stress levels for the various plant loading combinations are defined in the ASME Boiler and Pressure Vessel Code, Section III, Subsection NB-3400, 1974 edition for Class 1 pumps; and are presented in Table 4.1-1 for Class 2 and 3 pumps. The seismic loads shall be combined with the normal operating loads and the stresses calculated. Demonstrating that the allowable stress level is not exceeded in the pressure boundary is partial satisfaction of the functionality requirements.

4.1.1.3.2 Impeller, Shaft, and Bearings

The impeller, shaft, and bearings for active pumps must be analyzed to determine their adequacy while operating with the seismic loading effects applied in addition to the applicable operating loads including nozzle loads. Functional requirements are partially demonstrated by a suitable analysis which conservatively shows that:

- a. the stresses in the shaft do not exceed the minimum yield strength of the material used for its construction,
- b. the deflections of the shaft and/or impeller blades will not cause the impeller assembly to seize, and
- c. the bearing temperature shall not attain limits which may allow stresses in the bearing or bearing support to exceed minimum yield strength levels or jeopardize lubrication.

4.1.1.3.3 Pump Supports

The combined stresses of the support structures should be within the limits of ASME Section III, Subsection NF, Component Support Structures, 1974 edition, or other comparable stress limits.

An analysis or test must be accomplished which conservatively demonstrates the structural integrity and/or functionality of the equipment supports.

4.1.1.4 Performance testing

The vendor shall demonstrate that the pump is capable of meeting all hydraulic requirements while operating with flow at the total developed head, minimum and maximum head, net positive suction head (NPSH), and other parameters as specified in the equipment specification.

4.1.1.5 Documentation summary

All of the above requirements must be satisfied to demonstrate that functionality can be assured for pumps. The vendor shall present the documentation in a format that clearly shows that each consideration has been properly evaluated and tests have been validated by a designated representative for TVA. The analysis shall be included as a part of the certified stress report for the assembly.

4.1.2 Functional Assurance Procedures for Valves

This program specifically addresses procedures for qualifying mechanical portions of the valve assembly including the valve fluid-pressure boundary, the valve bonnet or yoke, the valve stem, and the mechanical portion of valve operators. Procedures for qualifying electrical and instrumentation components which are depended upon to cause the valve to accomplish its intended function are described in paragraph 3.2.2.

4.1.2.1 Hydrostatic test

The valve pressure boundary shall be hydrostatically tested in the manufacturer's shop in accordance with the applicable section of ASME Boiler and Pressure Vessel Code, 1974 edition.

4.1.2.2 Leakage test

Valve seat leakage tests shall be in accordance with the requirements specified in the design specification. Satisfying the minimum leakage rate constitutes partial fulfillment of the valve functionality requirements. The results of all required leakage tests shall be properly documented and included as a part of the functionality acceptance documentation package.

4.1.2.3 Seismic qualification

The functionality of a valve during and after a seismic event may be demonstrated by an analysis or by a combination of analysis and test. Valves shall be designed using either stress analyses or the pressure-temperature rating requirements based upon design conditions. An analysis of the extended structure shall be performed for static equivalent seismic loads applied at the center of gravity of the extended structure.

The maximum stress limits allowed in these analyses shall confirm structural integrity and shall be the limits developed and accepted by the ASME for the particular ASME Class of valve analysed. Where stress levels are not specifically defined for the various loading conditions, acceptable stress limits for ASME Class 2 and 3 valves has been defined in Table 4.1-1. These limits shall be applicable to both active and nonactive valves. Class 1 valves shall be designed/analyzed per the rules of the ASME Boiler and Pressure Vessel Code, Section III, Subsection NB-3500, 1974 edition.

Seismic qualification can be accomplished in the following way (assuming a valve whose lowest natural frequency exceeds 33 Hz):

- a. Determine the seismic loading effects of the operator and yoke assembly using the appropriate acceleration values as determined from applicable response spectra. In the event there is no appropriate response spectre, as is the case for equipment not mounted directly to a building floor, the seismic loading shall be that which results from input accelerations of 3 g horizontal and 3 g vertical. It must be demonstrated that the valve is rigid, that is, its lowest natural frequency is greater than 33 Hz. The procedures for verifying the ability of the equipment to maintain its structural integrity and operability during a seismic event are presented in section 3.
- b. Increase the calculated load in step a. by 10 percent.
- c. With the valve mounted in a manner that conservatively represents the typical plant installation, apply the load determined in step b. at the center of gravity of the operator in the direction of the weakest axis of the yoke. The design pressure of the valve shall be simultaneously applied to the valve during the static deflection tests.
- d. When specified in the design specification, representative active valves may be required to demonstrate that they can perform their required operation (fully open to fully closed, etc.) within the specified operating time limits while experiencing loads associated with the applicable seismic event. With the applied load as defined above held constant, the valve shall then be operated. The valve must then successfully perform its active function within the specified operating time limits.

4.1.2.4 Relief valves

The above requirements also pertain to relief valves. In addition, if a relief valve is tested to demonstrate operability, a static load equivalent to the seismic load determined as in 4.1.2.3.a. shall be applied to the top of the bonnet and the pressure shall be increased until the valve mechanism actuates. Successful actuation within the design requirements of the valve shall be demonstrated.

4.1.2.5 Documentation summary

All of the above applicable requirements must be satisfied to demonstrate that functionality can be assured for valves.

The vendor shall present the documentation in a suitable format for checking which clearly shows that each consideration has been properly evaluated and tests have been validated by a designated representative of TVA. The analysis shall be included as a part of the certified stress report for the assembly.

4.2 **NONACTIVE COMPONENTS - OTHER THAN FLUID SYSTEM COMPONENTS - ALLOWABLE STRESS LEVELS**

Seismic stresses in these nonactive components will be interpreted as primary stresses. Seismic stresses resulting from the earthquake when combined with other primary stresses will not exceed applicable code allowable stresses. The increase permitted by codes for earthquake loading conditions will apply. Where applicable codes do not specifically cover earthquake loads or temporary overload conditions, stresses will be maintained within 120 percent of code allowable stresses.

4.3 **EQUIPMENT SUPPORTS - ACTIVE AND NONACTIVE**

The combined stresses of the support structures should be within the limits of ASME Section III, Subsection NF, Component Support Structures, 1974 edition, or other comparable stress limits.

An analysis or test must be accomplished which conservatively demonstrates the structural integrity and/or functionality of the equipment supports.

TABLE 4.1-1

LOADING COMBINATIONS AND ALLOWABLE STRESS LEVELS

FOR ASME CLASS 2 AND 3 VALVES AND PUMPS

(Fluid Pressure Boundary)

Plant Loading Conditions	Loading Cases	Allowable Stress Limits	
		Active Pumps	Active Valves and NonActive Valves and Pumps
Normal	P+D+L+M - Primary	$P_m \leq 1.0 S_h$ $(P_m \text{ or } P_1) + P_b \leq 1.5 S_h$	$P_m \leq 1.0 S_h$ $(P_m \text{ or } P_1) + P_b \leq 1.5 S_h$
	T+S _d - Secondary	$P_e \leq S_a$	$P_e \leq S_a$
Upset	P+D+L+M+E ₁ +H+F _t - Primary	$P_m \leq 1.0 S_h$ $(P_m \text{ or } P_1) + P_b \leq 1.5 S_h$	$P_m \leq 1.1 S_h$ $(P_m \text{ or } P_1) + P_b \leq 1.65 S_h$
	T+S _d +E _d - Secondary	$P_e \leq S_a$	$P_e \leq S_a$
Emergency	P+D+L+M+E ₁₁ +H+F _t - Primary	$P_m \leq 1.1 S_h$ $(P_m \text{ or } P_1) + P_b \leq 1.65 S_h$	$P_m \leq 1.5 S_h$ $(P_m \text{ or } P_1) + P_b \leq 1.80 S_h$
Faulted	P+D+L+M+E ₁₁ +H+F _t +F _j - Primary	$P_m \leq 1.2 S_h$ $(P_m \text{ or } P_1) + P_b \leq 1.8 S_h$	$P_m \leq 2.0 S_h$ $(P_m \text{ or } P_1) + P_b \leq 2.4 S_h$
		Secondary stress not considered	

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22

Notes for Table 4.1-1:

- D Doad weight
- E_d Seismic anchor displacement load due to 1/2 of the displacement range of OBE
- E_i Inertia load resulting from OBE
- E_{ii} Inertia load resulting from a SSE
- F_j Jet impingement or pipe impact loads where applicable
- F_t Valve thrust loading effects
- H Dynamic head or water hammer loading effects where applicable
- L Live weight of fluid handled
- M Superimposed mechanical loads, including nozzle loads
- P Internal (design) pressure
- P_b Primary bending stress. This stress is produced by pressure and mechanical loads including inertia earthquake effects but excluding effects of discontinuities and concentrations.
- P_e Secondary expansion stresses which result from the constraint of free end displacement and the effects of anchor point motions resulting from earthquakes. Considered are effects of discontinuities but not local stress concentrations.
- P_l Primary local membrane stress, the average stress across any solid section under consideration. Considers effects of discontinuities but not concentrations. Produced by pressure and mechanical loads, including inertia earthquake effects.
- P_m Primary general membrane stress, the average primary stress across the solid section under consideration. Excludes effects of discontinuities and concentrations. Produced by pressure and mechanical loads.
- S_a Allowable stress range for expansion stresses per ASME, Section III, 1974 edition, $S_a = f (1.25 S_c + 0.25 S_h + (S_h - P - D - L - M))$
- S_c Material allowable stress at room temperature from ASME, Section III, 1974 edition.

- S_d Thermal support displacement stresses
- S_h Material allowable stress at maximum temperature from ASME, Section III, 1974 edition.
- SSE Safe shutdown earthquake
- T Thermal stresses

5.0 DOCUMENTATION

The documentation for each equipment type will demonstrate that the equipment meets the specified seismic design requirements in both performance and structural integrity. The seismic qualification testing or analysis is expected to be extensive and to encompass all items of a component or assembly. The aim is to prevent a device such as a limit switch on a valve operator from causing the malfunction of the operator and valve. With this idea in mind, the documentation of the qualification effort is also expected to be extensive and the guidelines for such a presentation are given below.

The documentation must include clearly defined failure criteria, functional as well as structural. Any deviation from nominal, whether or not it constitutes a failure of the particular item of equipment under consideration, must be included in the documentation for evaluation by TVA.

5.1 ANALYTICAL DATA

If proof of performance is obtained by analytical means it will be presented in a step-by-step form which is readily auditable by persons skilled in such analysis. A suggested format for such a presentation is given below.

5.1.1 Scope

This section will identify the equipment, state the purpose or reasons why the calculations were made, include a brief description of the overall problem, and give the scope of the specific problems covered by these calculations.

5.1.2 Summary of Results or Conclusions

This section will include a brief summary of the results obtained from the calculations. A concise statement of the conclusions reached as they relate to the stated purpose will also be included in this section.

5.1.3 Load Criteria and Assumptions

This section will include the loads considered in the calculations and any assumptions made in converting the load criteria to actual loads used for calculations.

5.1.4 Stress, Deformation, and Stability Criteria and Assumptions

This section will present the stress, deformation, and stability limits used in the calculation and include a reference to the criteria or code used in developing these limits. Any assumptions made in converting these criteria to actual stress, deformation, and/or stability limits will also be presented.

5.1.5 Method of Analysis

In this section will be stated the methods of calculations used which include the analytical equations and their development from basic principles or authoritative reference. Included also will be any assumptions made as to boundary or initial conditions and any limitations on the applicability of the calculations performed. If a computer program is being used, the documentation which establishes its validity will be specifically referenced. The Atomic Energy Commission has issued guidelines for the acceptability of computer programs used in the analysis of mechanical components and equipment. These guidelines are given below.

5.1.5.1 Computer program description

A list of computer programs that will be used in dynamic and static analyses to determine mechanical loads and deformations of Seismic Category I structures, components and equipment and the analysis to determine stresses should be provided including a brief description of each program and the extent of its application.

5.1.5.2 Computer program reliability

The design control measures as required by Appendix B, 10CFR Part 50, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," that will be employed to demonstrate the applicability and validity of the above computer programs should be described by any of the following criteria or procedures (or other equivalent procedures).

- a. The computer program is a recognized program in the public domain, and has had sufficient history of use to justify its applicability and validity without further demonstration. The dated program version that will be used, the software or operating system, and the computer hardware configuration must be specified to be accepted by virtue of its history of use.
- b. The computer program solutions to a series of test problems, with accepted results, have been demonstrated to be substantially identical to those obtained by a similar, independently

written program in the public domain. The test problems should be demonstrated to be similar to or within the range of applicability for the problems analyzed by the computer program to justify acceptance of the program.

- c. The program solutions to a series of test problems are substantially identical to those obtained by hand calculations or from accepted experimental test or analytical results published in technical literature. The test problems should be demonstrated to be similar to the problems analyzed to justify acceptance of the program.

Provide a summary comparison of the results obtained from each computer program with either the results derived from a similar program in the public domain on a previously approved computer program or results from the test problems. Include typical static and/or dynamic response loading, stress, etc., comparisons preferably in graphical form.

5.1.6 Calculations

In this section will be presented the actual design calculations and any figures, sketches, or mathematical models. When actual calculations are being performed on a computer, the mathematical model used will be sketched showing all nodes and members identified the same as in the computer input. When possible, loads, resultant forces, moments, stresses, and deformations will also be presented on the model.

5.2 TEST DATA

If the functional operability of Seismic Category I fluid system components and electrical or mechanical equipment is confirmed by test the following information will be required.

5.2.1 Test Procedure - Required Prior to Test

The detailed test procedure shall be approved by TVA before the test is performed. This test procedure shall define:

- a. The required environmental conditions.

- b. The required function to be demonstrated by the test, i.e., opening or closing of contacts, operation of an amplifier or other analog device, or the ability of the equipment to maintain a specified "state" during the test.
- c. The required data to be acquired during the test.
- d. The test procedure to be used to demonstrate the function or condition to be performed during the test.
- e. The test data sheet and log sheet forms to be used for recording of data. (The proper monitoring and recording of data on the test equipment during the test shall be part of the test data.)
- f. The extent of test report required to substantiate the purpose of the test.

5.2.2 Test Report

An approved test report is required before Seismic Category I equipment can be received at the plant site. The test report shall contain:

- a. The title page which shall include the name of the report, the contractor's name, the test facility name, the name of the company performing the test, the TVA plant name, the name of the equipment being qualified, the TVA contract number, and the test contract number;
- b. the certification page signed by the test engineer of the company performing the test, the responsible contractor engineer, the contracts report writer, and a responsible officer of the contractor's company (the test report shall also be certified by a registered professional engineer);
- c. a definition of each piece of test equipment and its capability including the manufacturer, equipment name, and serial number;
- d. and a certification of the calibration and workability of each piece of the test equipment;
- e. the test procedure;
- f. any deviation from the test procedure;
- g. the test results and conclusions;
- h. the reduced test data;

1. the "raw" test data shall be completely titled, dated, and signed by the data recorder, the contractor representative, and the test inspector. The data shall contain sufficient information so that a third party can audit the "raw" test data.

The above requirements shall not limit the extent of the test report.

5.3 TVA DESIGN DATA

The equipment manufacturer will provide data regarding the support locations, reactions, dimensions, etc., required for proper operations and support of the equipment such that appropriate interface requirements can be established between his equipment and TVA structure.

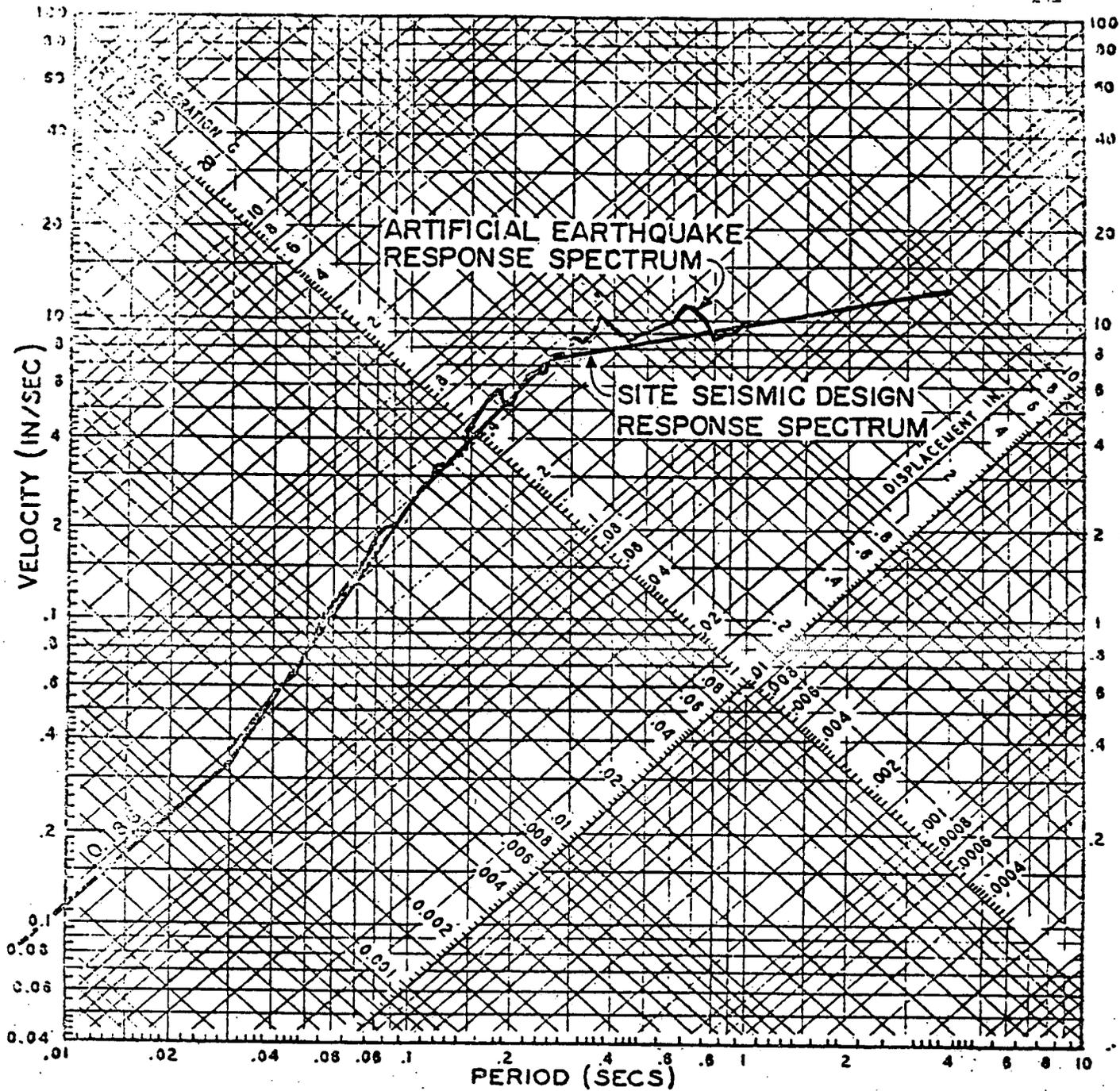
6.0 SEISMIC DESIGN DATA

Seismic design data are normally provided in the form of response acceleration spectrum curves. If only the OBE response spectra are provided, the design values for the SSE will be taken as twice the OBE response values. Seismic data for the ground or the building floor to which the equipment is attached will be used. Data for the floor above equipment supported by building walls, columns, etc., will be used. In the case of equipment which has a number of supports for which different seismic motion is specified, the most severe floor response spectrum will be applied identically to all the supports. The structural damping which should be used in analysis is given in Table 3.1-1.

6.1 DEVICES

When qualified separate from the enclosure or support structure, devices will be qualified to the postulated acceleration at the intended support location in the integrated assembly. In the absence of such information, the device will be qualified for no less than the following:

Acceleration input	Horizontal 3.0 g Vertical 3.0 g
Frequency range	1 to 35 Hz



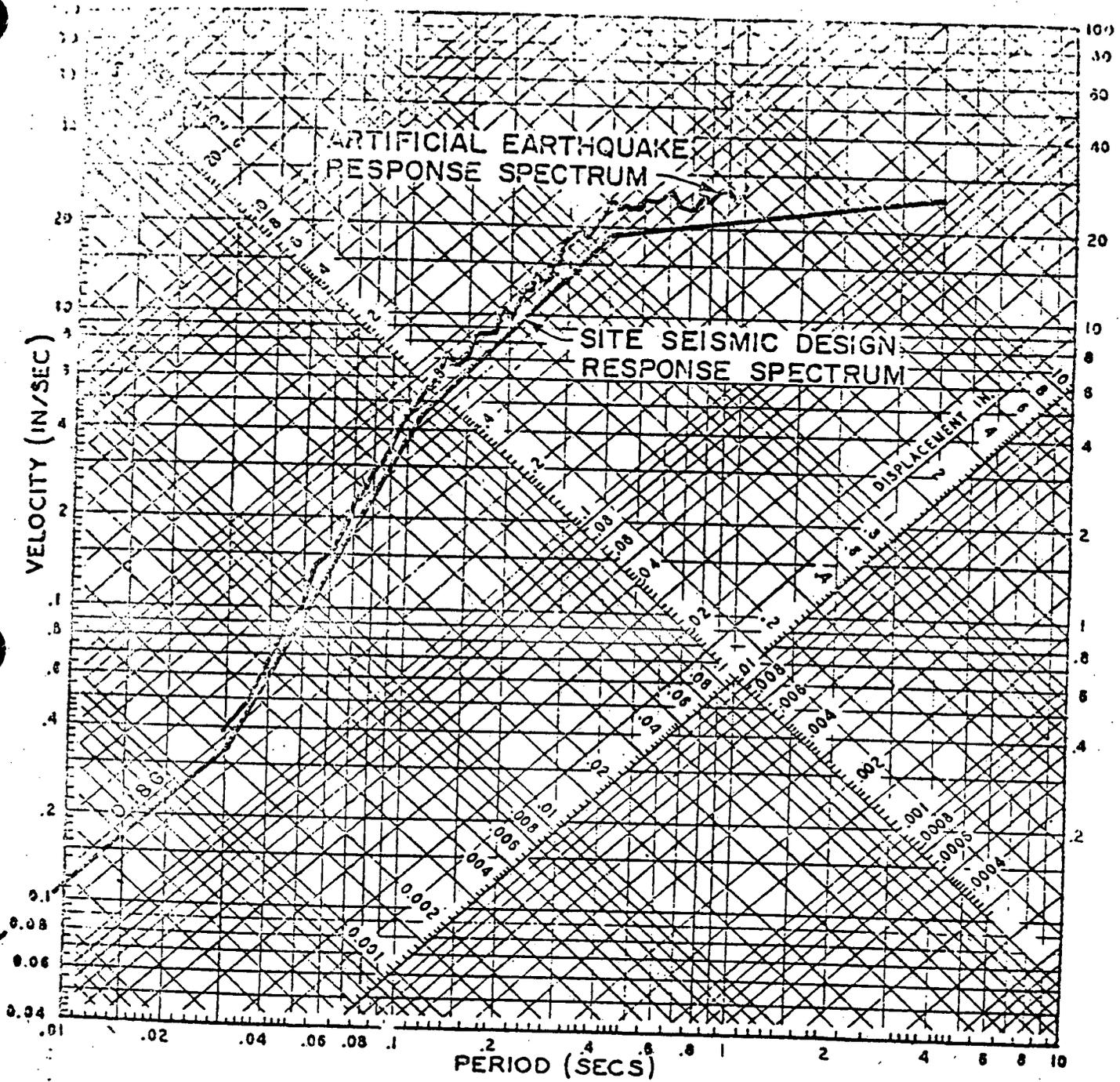
SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
VERTICAL MOTION
ROCK-SUPPORTED STRUCTURES
7% DAMPING

6.2 ASSEMBLIES

Assemblies will be qualified to the applicable floor response spectrum. The peak input acceleration level for assembly qualification tests will be equal to or greater than the earthquake rigid response for the appropriate support (zero period acceleration of the applicable response spectrum).

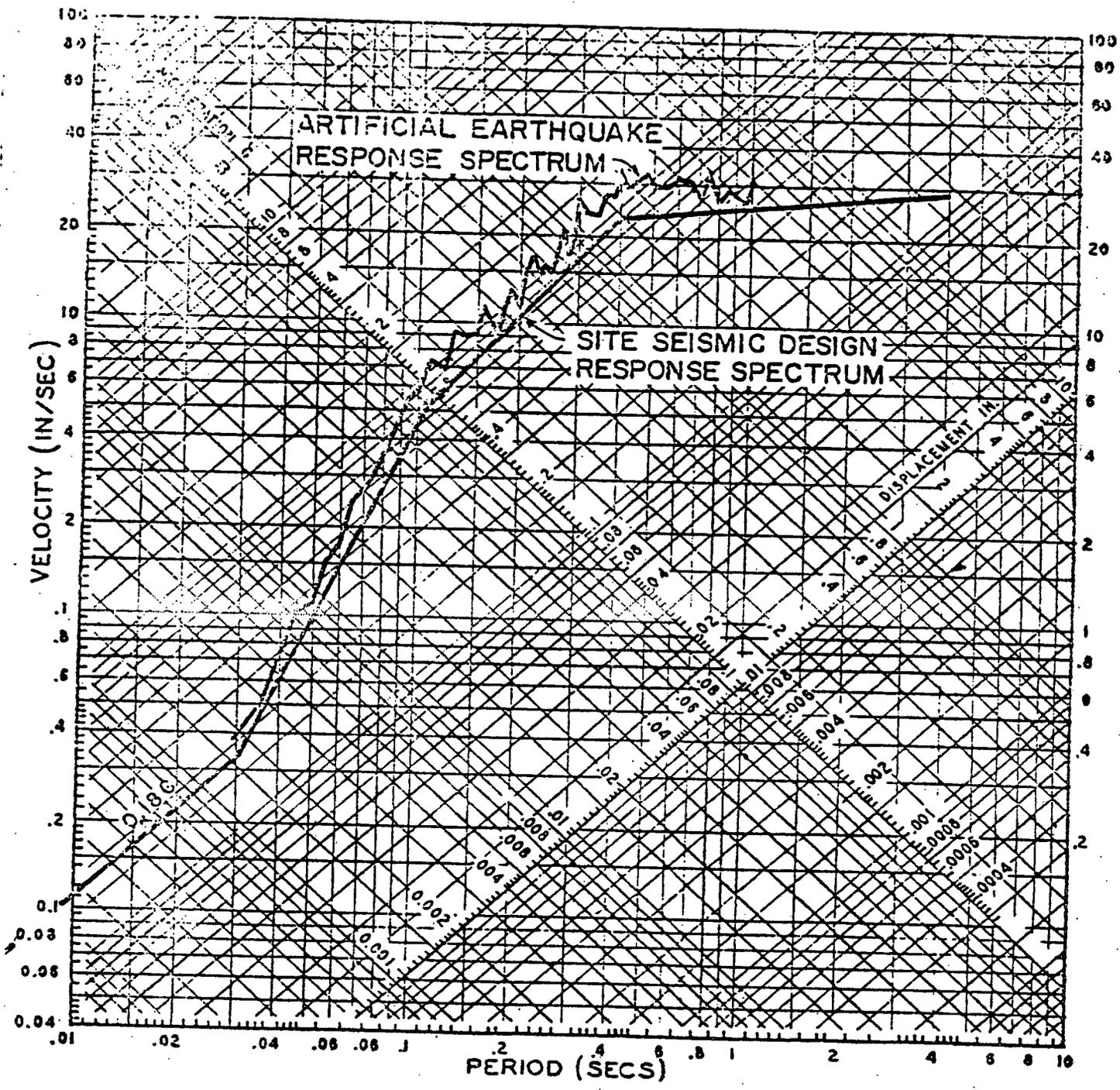
7.0 BIBLIOGRAPHY

1. Biggs, J. M., Introduction to Structural Dynamics, McGraw-Hill, 1964.
2. Regulatory Guide 1.61, Damping Values for Seismic Design of Nuclear Power Plants, U.S. Atomic Energy Commission, Directorate of Regulatory Standards, October 1973.

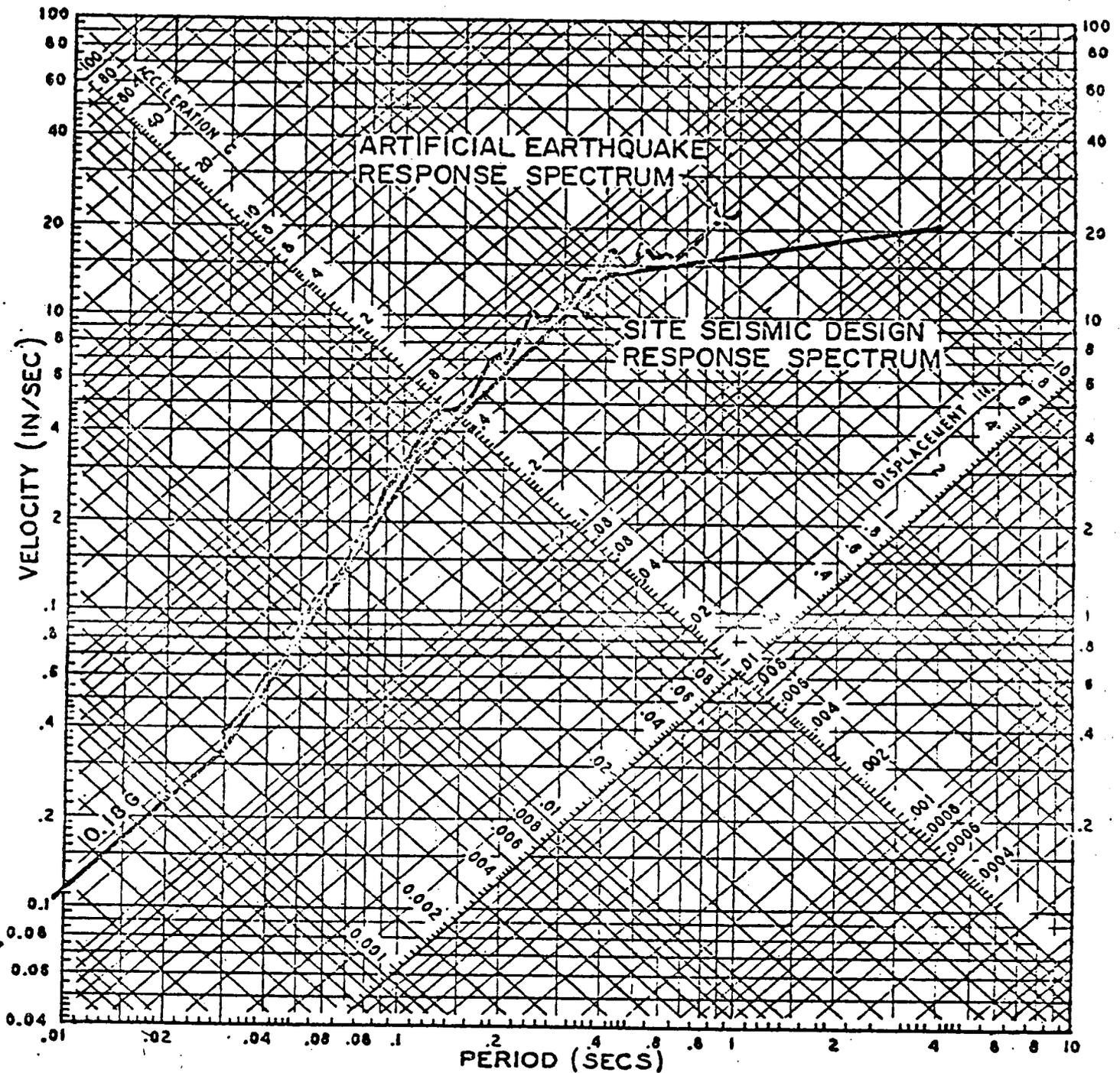


SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
HORIZONTAL MOTION - A (N-S)
ROCK-SUPPORTED STRUCTURES
2% DAMPING

FIGURE 3

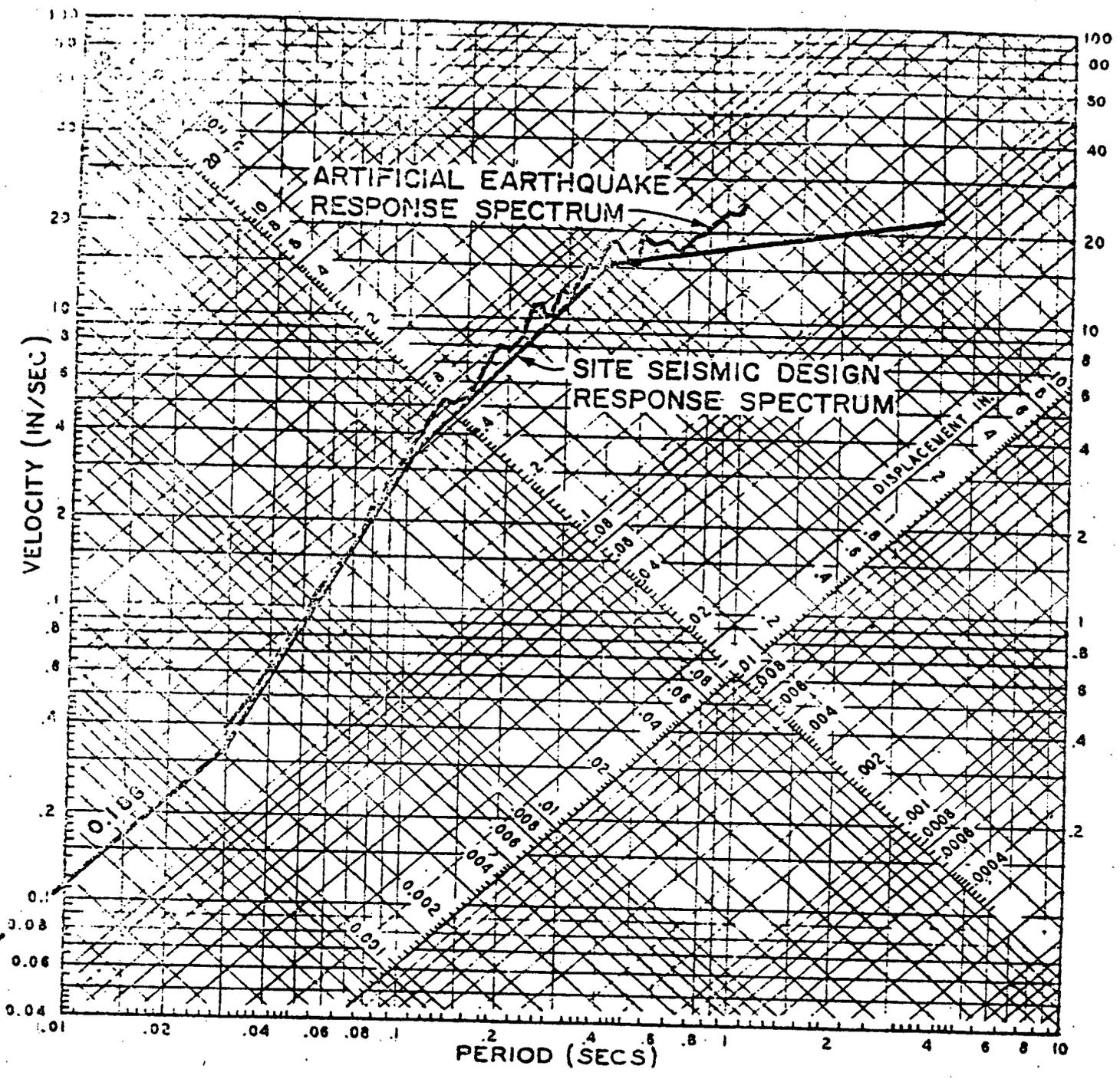


SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
HORIZONTAL MOTION - A (N-S)
ROCK-SUPPORTED STRUCTURES
1% DAMPING



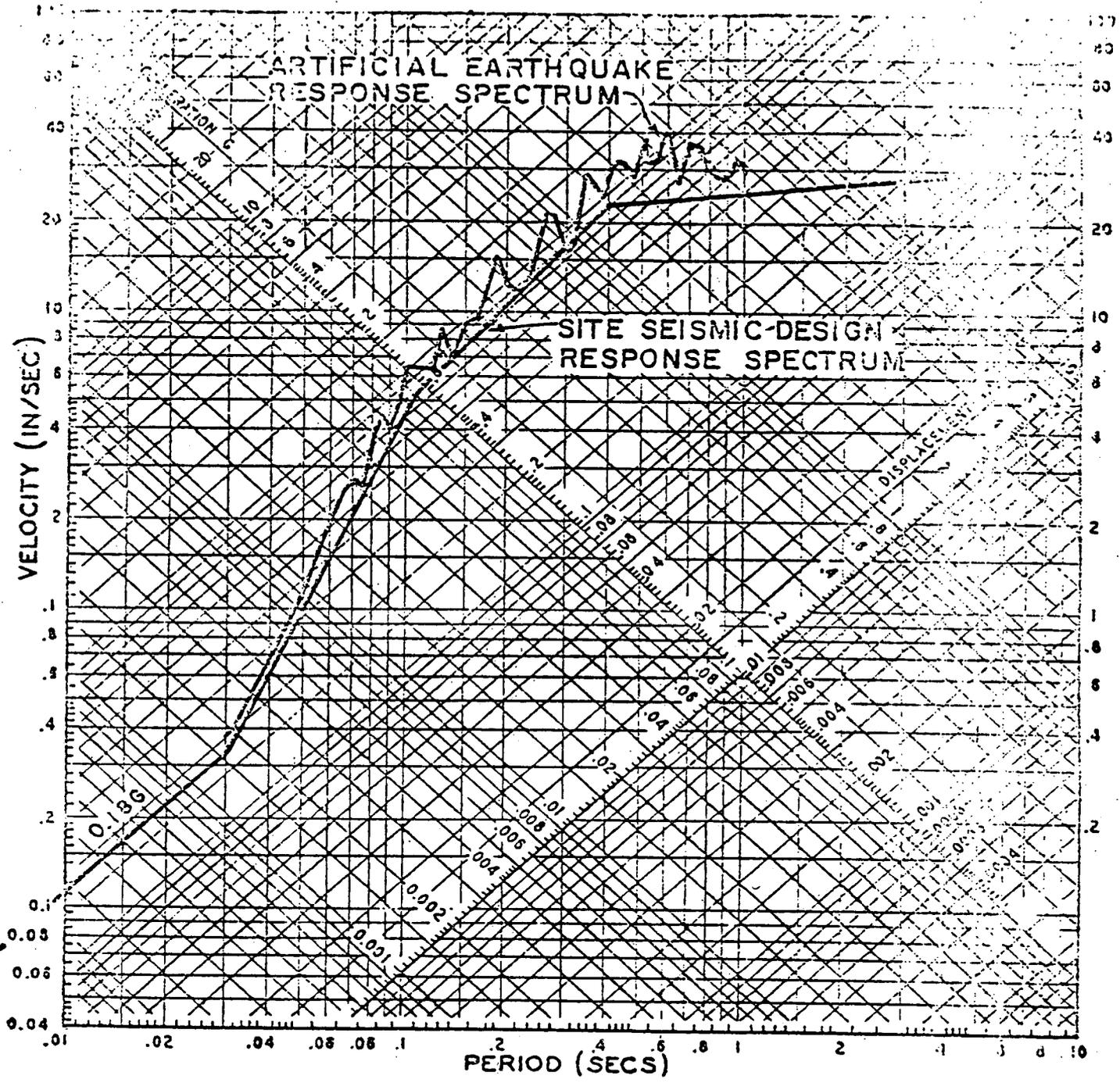
SAFE SHUTDOWN EARTHQUAKE
 DESIGN RESPONSE SPECTRA
 HORIZONTAL MOTION - A (N-S)
 ROCK-SUPPORTED STRUCTURES
 5% DAMPING

FIGURE 5

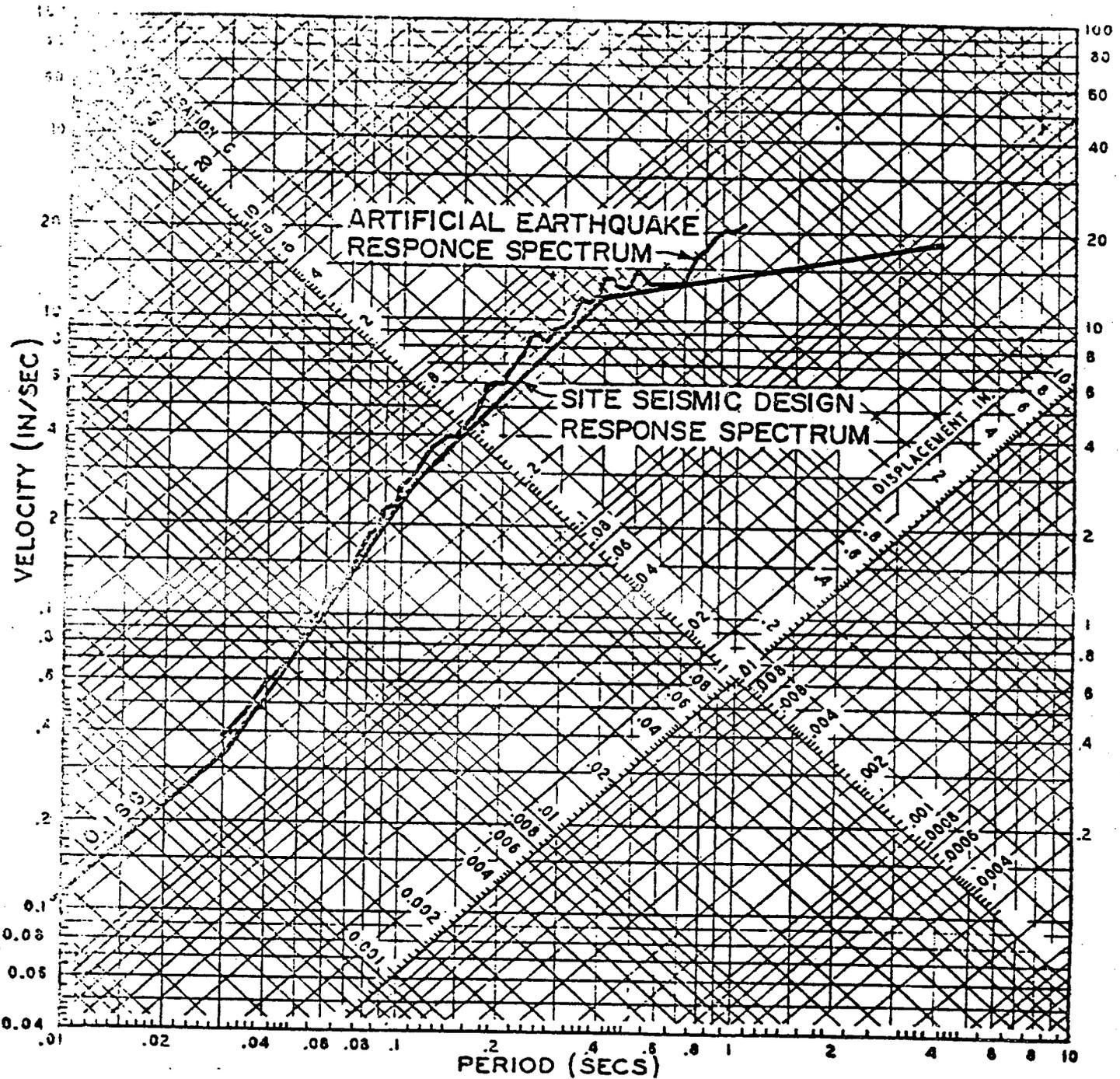


SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
HORIZONTAL MOTION - A (N-S)
ROCK-SUPPORTED STRUCTURES
4% DAMPING

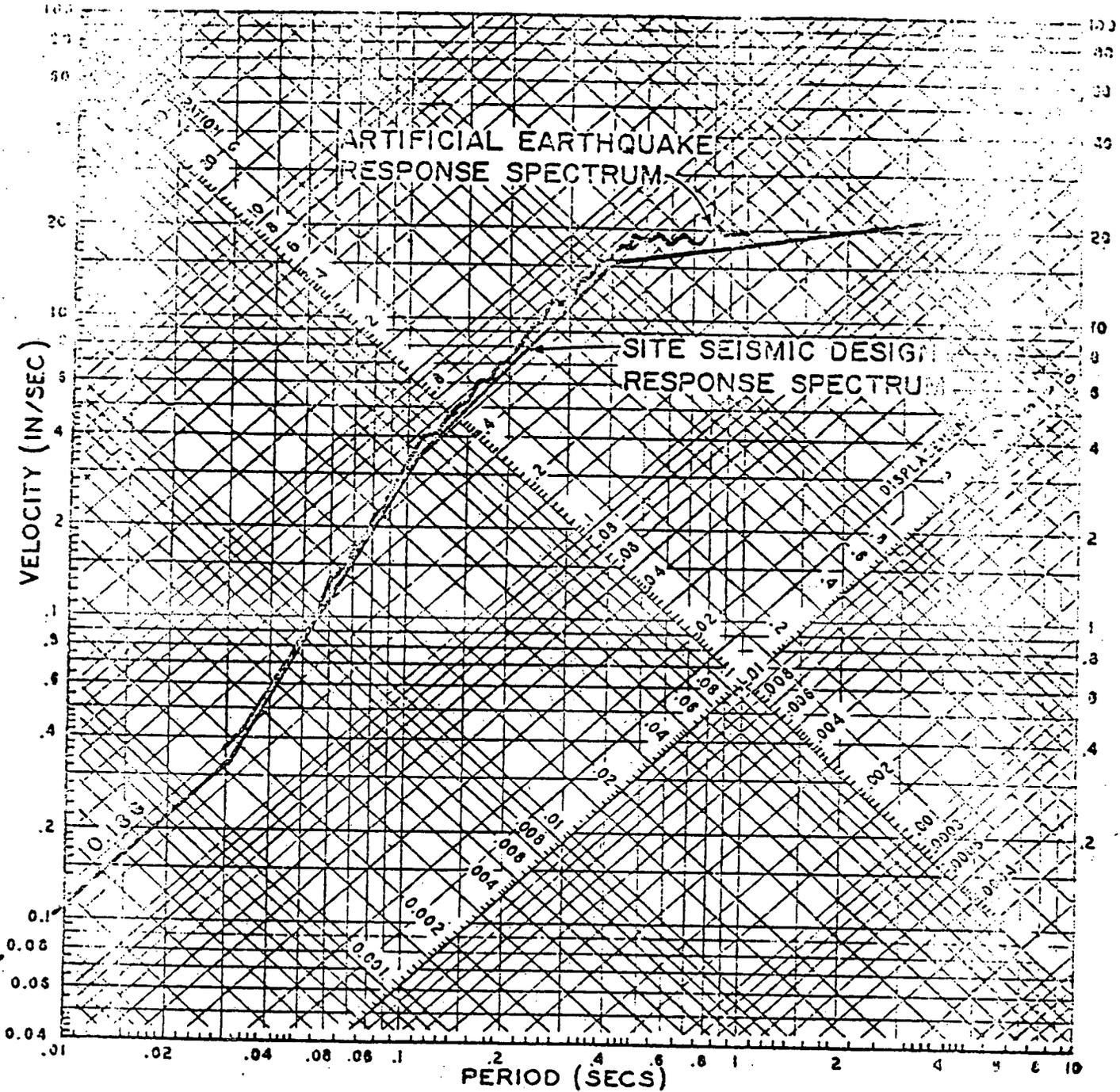
FIGURE 4



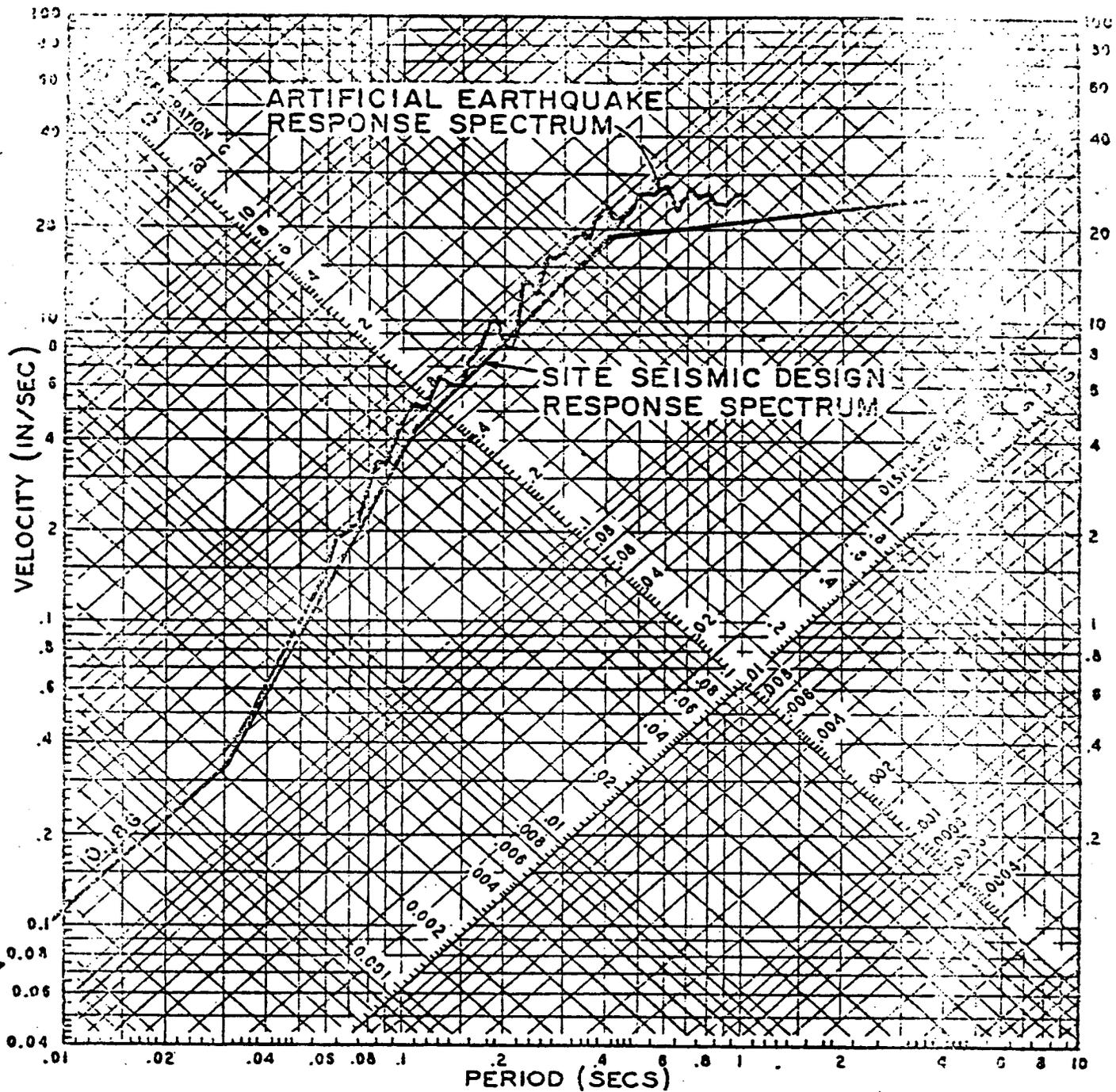
SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
HORIZONTAL MOTION - B (E-W)
ROCK-SUPPORTED STRUCTURES
1% DAMPING



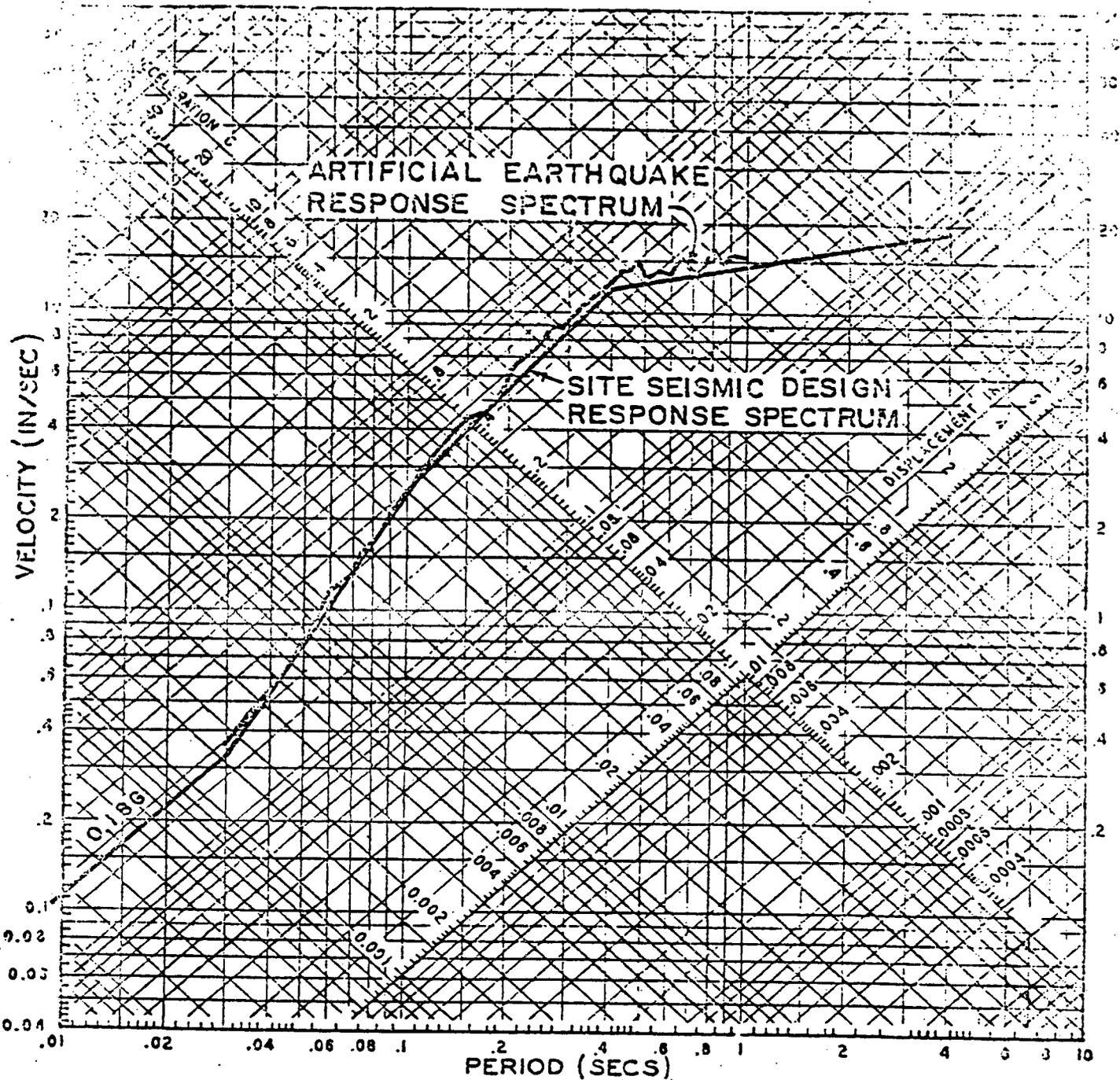
SAFE SHUTDOWN EARTHQUAKE
 DESIGN RESPONSE SPECTRA
 HORIZONTAL MOTION - A (N-S)
 ROCK-SUPPORTED STRUCTURES
 7% DAMPING



SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
HORIZONTAL MOTION-B (E-W)
ROCK-SUPPORTED STRUCTURES
4% DAMPING

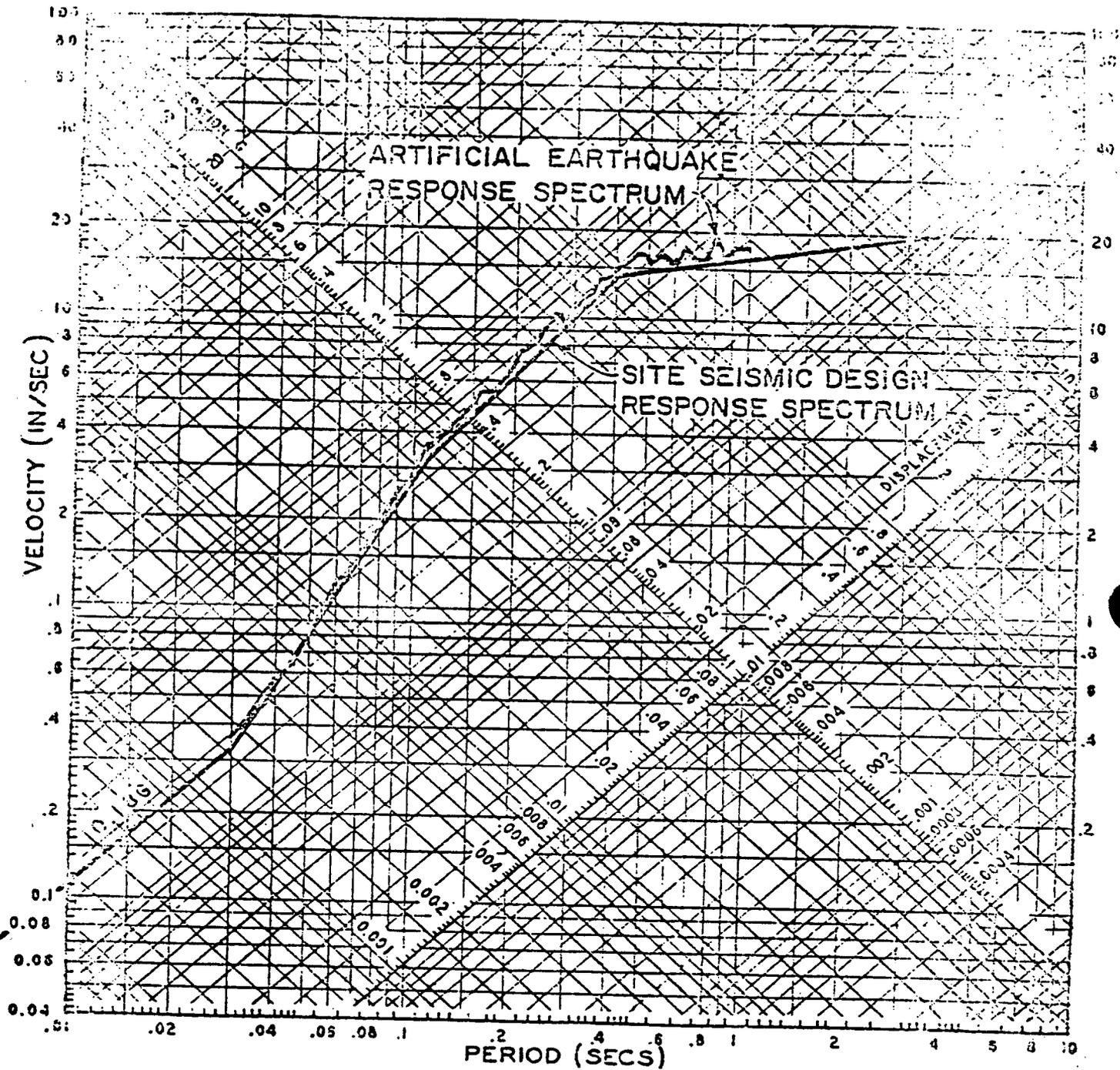


SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
HORIZONTAL MOTION-B (E-W)
ROCK-SUPPORTED STRUCTURES
2% DAMPING



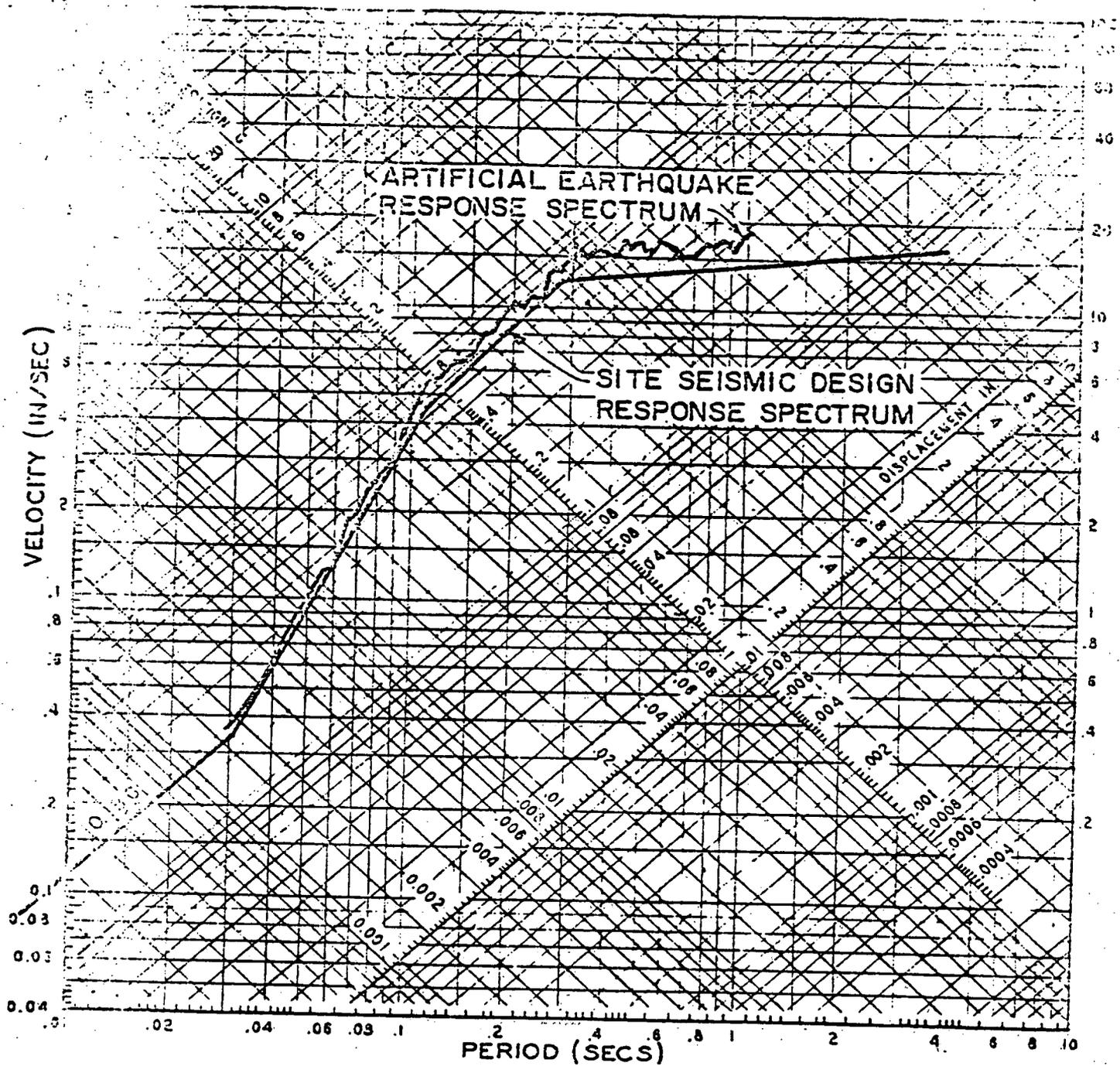
SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
HORIZONTAL MOTION-B (E-W)
ROCK-SUPPORTED STRUCTURES
7% DAMPING

FIGURE 11



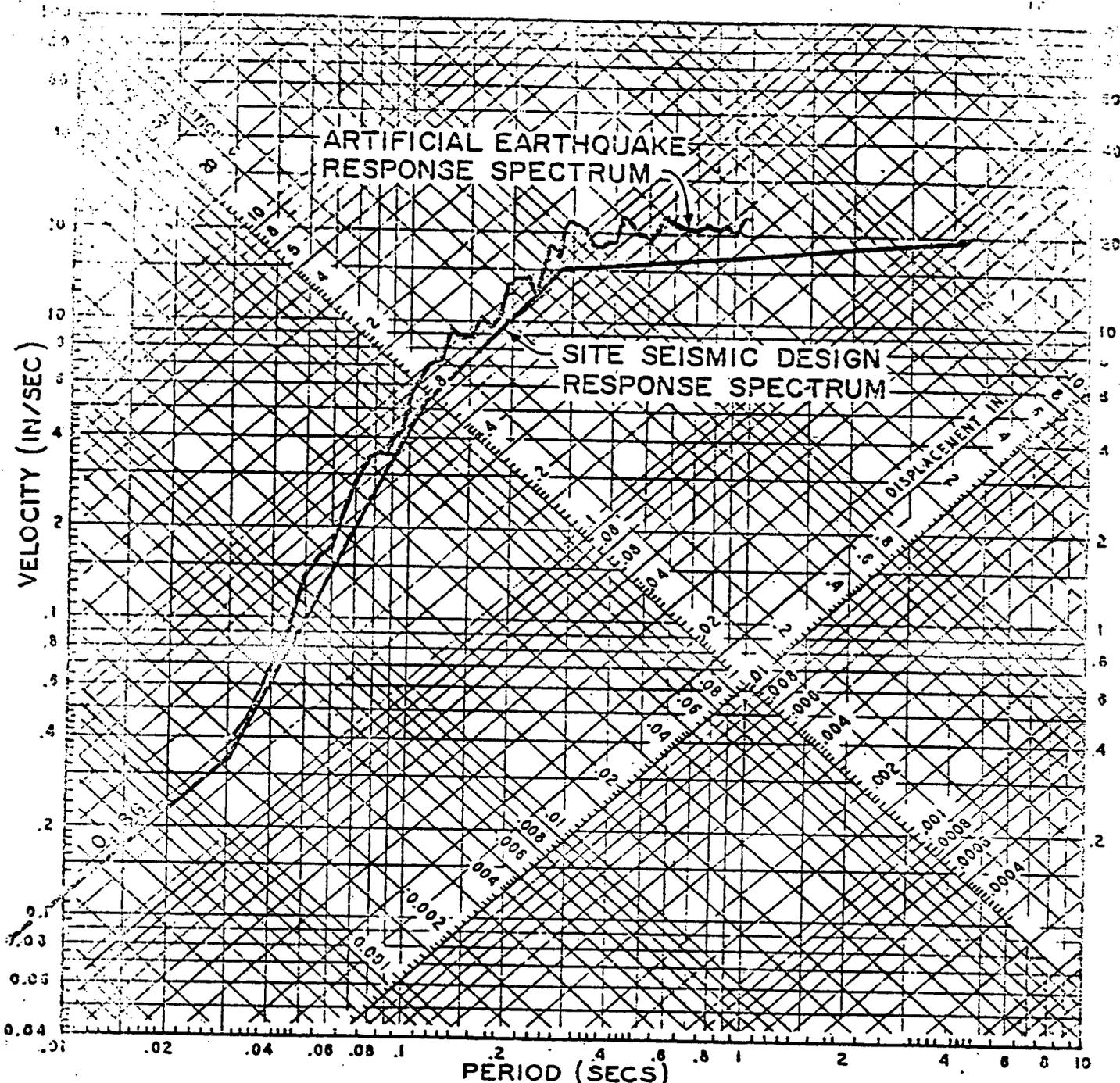
SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
HORIZONTAL MOTION-B (E-W)
ROCK-SUPPORTED STRUCTURES
5% DAMPING

FIGURE 10



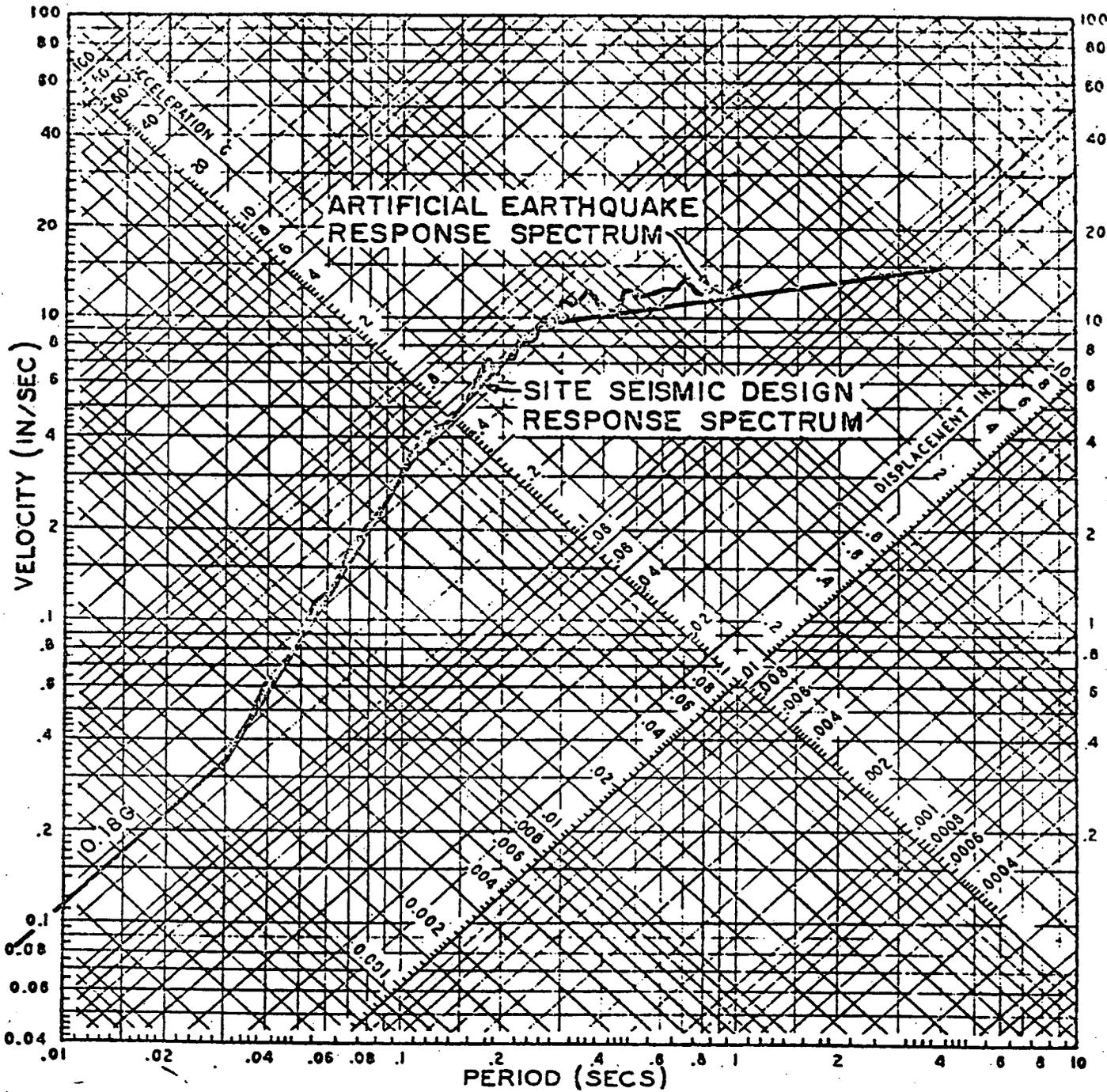
SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
VERTICAL MOTION
ROCK-SUPPORTED STRUCTURES
2% DAMPING

FIGURE 13

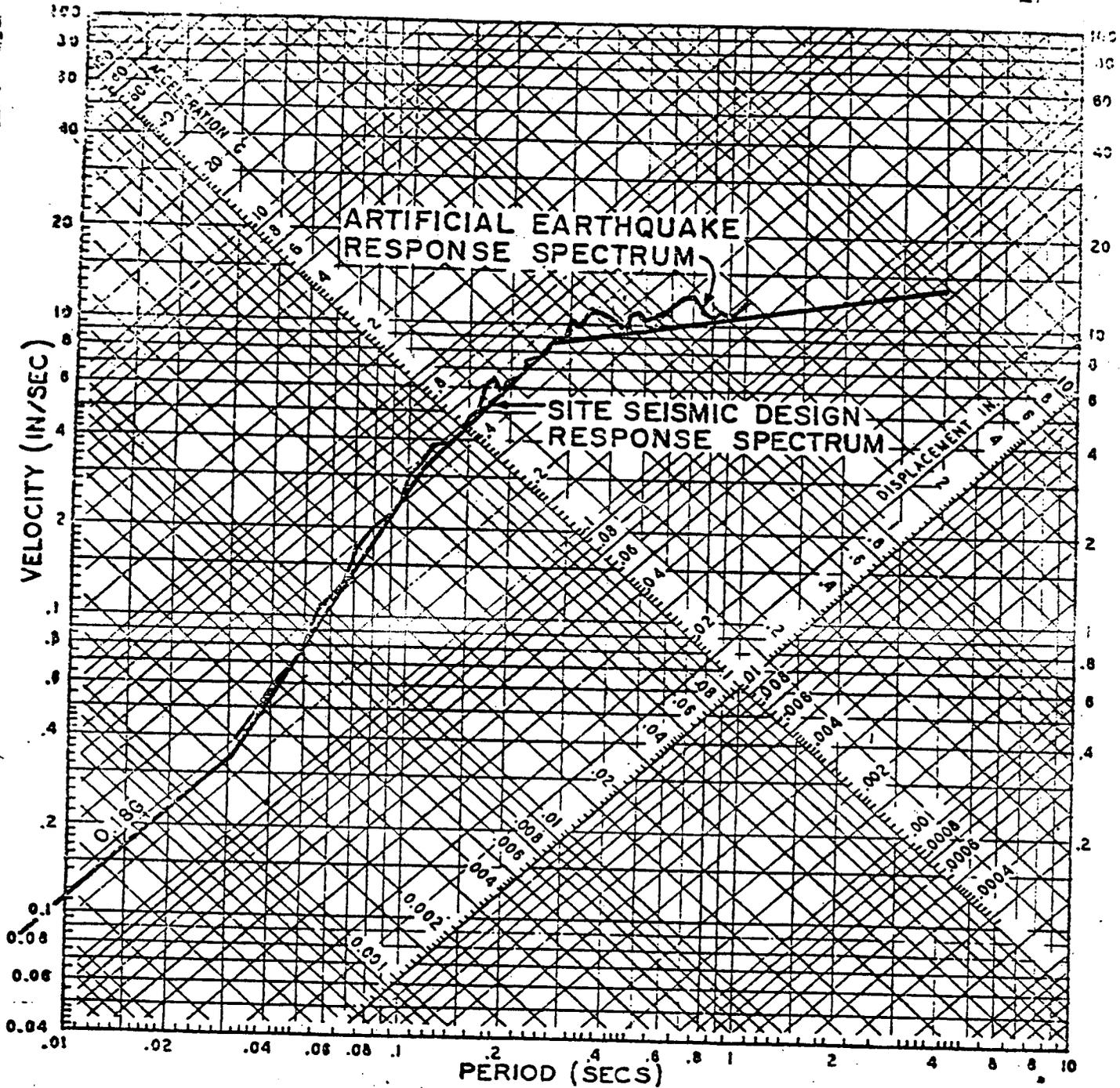


SAFE SHUTDOWN EARTHQUAKE
 DESIGN RESPONSE SPECTRA
 VERTICAL MOTION
 ROCK-SUPPORTED STRUCTURES
 1% DAMPING

FIGURE 12



SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
VERTICAL MOTION
ROCK-SUPPORTED STRUCTURES
4% DAMPING



SAFE SHUTDOWN EARTHQUAKE
DESIGN RESPONSE SPECTRA
VERTICAL MOTION
ROCK-SUPPORTED STRUCTURES
5% DAMPING

FIGURE 15

CHANGE OF CONTRACT

Address all communication except invoices to:
 TENNESSEE VALLEY AUTHORITY
 DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Telex 55-8417 Telephone 615-755-3011

ANSWERBACK TVAPURTRFCTA

Teletypewriter 615-755-3214

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence

VENDOR CODE	STATE OR COUNTY CODE 04	ITEM REFERENCE NO. 76K61-86181	CONTROL NO. 13
BUYING CODE L I A	COMMODITY CODE 6115E	CHANGE AMOUNT \$ Plus 4,390.00	
VENDOR REFERENCE NO.		CHANGE DATE 1/6/81	PERFORMANCE DATE *SEE BELOW
ACCOUNT NO. N4 39		810116A035	
PROJECT Bellefonte Nuclear Plant Units 1 and 2			

TO
 Transamerica Delaval Inc.
 Engine and Compressor Division
 3379 Peachtree Road, N.E.
 Atlanta, Georgia 30326

EMERGENCY DIESEL ENGINE-
 DRIVEN GENERATORS

Add

Load profile for revised loading sequence transmitted to Delaval
 by C. A. Chandley's letter dated September 17, 1980, and revised
 by C. A. Chandley's telex dated October 24, 1980.

Lump Sum \$4,390.00

In accordance with W. V. Dilworth's letter to J. Marcel Anderson
 dated October 27, 1980.

*For this change only, performance will be by February 3, 1981.

(Refer to C. A. Chandley's memo to J. M. Anderson dated December 10, 1980.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total \$6,881,733.12

Correct Total \$6,886,123.12

WRDahnke 6
 JAJohnson
 Specs 9
 TB

MEDS, E4637 C.R.

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

By *J. Marcel Anderson*
 (61) J. Marcel Anderson, Purchasing Agent
 /plb

TVA 394 (DP-7-80)

Contractor
 Auditor

Contract File
 Purchasing A File

Accounting Office
 Consignee

Requisitioner (2)
 Plant Accounting

1593

TENNESSEE VALLEY AUTHORITY
 DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401
 Telephone 615-755-3011
 Telex 55-8417

CHANGE OF CONTRACT

Issue or Country Code	VT	No.	1
Vendor Code		Change Date	December 20, 1979
Buying Code	L A	Change Amount \$	plus \$622.00
Commodity Code	6115	Performance Rate	per policy
Account Number	26 130		

Project Bellefonte Nuclear Plant
 Units 1 and 2
 Vendor Reference No. _____

To
 Belval Turbine, Inc.
 3379 Peachtree Road, N.E.
 Atlanta, GA 30326

**EMERGENCY DIESEL ENGINE DRIVEN
 GENERATORS**

This confirms J. Harold Anderson's order of November 6, 1979 for the following addition of Hex Screws and Caps in accordance with the attached packing list:

ADD

16	1-3/4 x 5 x 5 round bolts		
16	flat washers		
16	lock washers	Lump Sum	\$622.00

800104E0405 (2)

*Delivery for this change only by December 24, 1979.

In accordance with A. T. Olsen's telex dated November 28, 1979, to J. H. Anderson,

FILMED FROM BEST
 AVAILABLE COPY

(Refer to C. A. Chandley's December 12, 1979, memo to J. M. Anderson.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total	\$6,881,111.12	Dabase 6
Correct Total	\$6,881,733.12	IB
		Sherrod
		Specs 9

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

By _____
 Purchasing Agent
 (61) J. Harold Anderson/dg

MEDS, E4B37 C-K

TVA 294 (DP-3-77)

CONTRACT NUMBER must be shown on all invoices, packages, shipping papers and correspondence.

- | | | | | |
|---------------|----------------------|----------------------|------------------|---------------------|
| 1. Contractor | 3. Contract File | 5. Accounting Office | 7. Requisitioner | 9. Plant Accounting |
| 2. Auditor | 4. Accounting A File | 6. Comptroller | 8. Requisitioner | 10. & 11. EGRS |

12

EP

SHIPPER'S NO. 17510551/55L-200-800-950

TVA-BELLEVILLE NUCLEAR PLANT
HOLLYWOOD, ALABAMA (NEAR SCOTTSBORO)

FILMED FROM BEST AVAILABLE COPY

W/F: CONTRACT NO. 76K61-86181
BELLEVILLE NUCLEAR PLANT
ATTN: CHIEF STORE KEEPER

DELAVAL TURBINE, INC.
ENGINE & COMPRESSOR DIV.
P.O. BOX 2161
OAKLAND, CA 94621

- 1 SKID GEN. STATOR PKG. NO.1
 - 1 " " ROTOR W/(1) EX:
 - 1 HDWE. ATTACHED PKG. NO.2
 - 1 CRT. GEN. BRG. & PED. LTD. ON SOLE PLATE PKG. NO.3
 - 1 SKID GEN. SOLE PLATE PKG. NO.4
- PACKAGED WITH DESICCANT (HUMI-SORB)

TOTAL WEIGHT 97,154 LB.

P.O. NO. 59089
REQ. OR REF. NO.

TY OR DER	PKG. NO.	DESCRIPTION	QTY. SHIPPED	BALANCE ON ORDER	FOR EXPORT USE W/A		
					LENGTH	WIDTH	HEIGHT
							GR. WT. 44,000 LB.
	1	SYN. GEN. STATOR TYPE L-11074 A-48191-3L XVA 8750, EN 7000, 69007/1PH/60HZ 450 RPM, .8 PF, WITH OUTLET BOX D-69515-2 AND FARR FILTERS LTD. SER. NO. 1751C553-200	1	1			GR. WT. 48,219 LBS
4	2	ROTATING ELEMENT FOR ABOVE A-48190-30 W/FAN BLADES & SLIP RING ASSY. LTD.	1	1			LTD. ON PED. C-6358
4	3	12" DODGE PLAIN SLEEVOIL BRG. & PILLW BLOCK ASSY. W/TWO DRILLINGS FOR BRG. R.T.D'S ON SAME SIDE, SIDE 1 PER B-69328 TYPEV & VI OIL GAGE PER GAUGE TYPE V SIDE 2	1	1			D-63525B-2 W/INSUL. HOLDERS & BRUSHES LTD. ON BRG.
B	4	SOLE PLATES S-67639-29	4	4			
16	2	" " STATOR SHELS A-37012-17	4	4			
16		HEX CAP SCREWS 1-5/16" X 3" LG. S-25-2 WITH FLAT WASHERS & LOCKWASHERS	16	16			
64	2	JACK SCREWS 1" X 1/4" LG. S-25-2	2	2			
8	2	DOWELL PINS A-30076-8 W/HEX NUTS	2	2			
8	2	" " A-30076-10 " "	2	2			
8	2	" " INSULATED A-19794-A-1 W/NUTS	1	1			
4	1	SETS INSTRUCTIONS W/B/L & PACKING LISTS	1	1			
4	1	DELAVAL FORM P-321	1	1			
4	1	TVA RELEASE FOR SHIPMENT TVA 105260	1	1			
4	1	CERTIFICATE OF COMPLIANCE	1	1			

0 9 0 5

Address all communications except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401
 Telephone 615-755-3011
 Telex 55-8417

CHANGE OF CONTRACT

QEB '79 1220 132
 This block to be completed by TVA

State or Country Code	04	Contract No.	78761-86181	Change In	11
Vendor Code		Change Date	December 11, 1979	Change Amount	plus \$1,400.00
Buying Code	L. A.	Performance Date	Same as below		
Commodity Code	6115				
Account Number	26.12				

Project Bellefonte Nuclear Plant
Units 1 and 2

Vendor Reference No. _____

To _____

Balval Turbine, Inc.
3379 Peachtree Road, N.E.
Atlanta, GA 30326

**EMERGENCY DIESEL ENGINE-DRIVEN
 GENERATORS**

Add

791226F0116 ①

One only flywheel runner Lump Sum \$1,400.00

*Performance date - This change only ship November 2, 1979.

In accordance with A. T. Olsson's letter to J. Marcel Anderson dated November 2, 1979

Payment for this change only shall be due and payable in full no more than 30 days after receipt of correct invoice at the accounting office.

FILMED FROM BEST
 AVAILABLE COPY

(Refer to C. A. Chandley's memo to J. M. Anderson dated December 6, 1979.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total	\$6,879,711.12	Dahms 6
Correct Total	\$6,881,111.12	TS
		Sherrod
		Specs 9

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

MEDS, E4B37 C-K

By _____
 Purchasing Agent
(61) J. Marcel Anderson/dg

Address all communications except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401
 Telephone 615-755-3011
 Telex 55-8417

This block to be completed by TVA

QAS 790619 511

State or Country Code	OK	Contract No.	7865-86181	Change No.	10
Vendor Code		Change Date	JUNE 22, 1979	Change Amount \$	No Change
Buying Code	L A	Performance Date	No Change		
Commodity Code	6115				
Account Number	24 39				

CHANGE OF CONTRACT

Project **Bellefonte Nuclear Plant**
Units 1 and 2

Vendor Reference No. _____

To

Delaval Turbines, Inc.
 3379 Peachtree Road, N.E.
 Atlanta, GA 30326

**EMERGENCY DIESEL ENGINE
 DRIVEN GENERATORS**

The change corrects the error in "Previous Total" and
 "Correct Total" in Change No. 9 to read:

Previous Total	\$6,878,068.60
Correct Total	6,879,711.12

MEB'79 06 20 000

JAR
 SAC
 JAH

223 JAH 200 JWH
 JAH
 TA H
 21

WEB MASTER FILE

WEB MASTER FILE

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total \$6,879,711.12
 Correct Total \$6,879,711.12

Drawings 36
 TB
 Sharded
 Specs 9

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

By _____
 Purchasing Agent
(61) J. Marcel Anderson,

TVA 394 (DP-3-77)

CONTRACT NUMBER must be shown on all invoices, packages, shipping papers and correspondence.

- | | | | | |
|---------------|----------------------|----------------------|------------------|---------------------|
| 1. Contractor | 3. Contract File | 5. Accounting Office | 7. Requisitioner | 9. Plant Accounting |
| 2. Auditor | 4. Purchasing A File | 6. Consignee | 8. Requisitioner | 10. & i, Extra |

4

11

Address all communications except invoices to

TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
Chattanooga, Tennessee 37401
Telephone 615-755-3011
Telex 55-8417

CHANGE OF CONTRACT

OAS 90504 511
This block to be completed by TVA

State or Country Code	06	Contract No.	76K61-86181	Change No.	
Vendor Code		Change Date	April 24, 1979		
Buying Code	L A	Change Amount \$	1,642.52		
Commodity Code	6115E	Performance Date			
Account Number	84 39				

Project Bellfonte Nuclear Plant
Units 1 and 2

Vendor Reference No. _____

To _____

Delaval Turbine, Inc.
3379 Peschtree Road, NE.
Atlanta, GA 30326

**EMERGENCY DIESEL ENGINE-DRIVEN
GENERATORS**

Add

Services of generator manufacturer's representative,
including expenses, to repair damage to generator.
Repairs were completed February 1, 1978.

Lump Sum \$1,642.52

In accordance with P. B. Ricci's telex dated
January 26, 1978, and Delaval's invoice
No. 27701 dated November 7, 1978.

MEB179 05 7 000
JAN 1979
CAG
JAH
SID
1/24/79

(Refer to Walter Dahnke's memo to J. Marcel Anderson dated April 19, 1979.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total	\$6,876,350.60
Correct Total	\$6,877,993.12

Dahnke 46
IB
Sherrrod
Specs 9

TENNESSEE VALLEY AUTHORITY
Division of Purchasing

By _____
(61) J. Marcel Anderson/dg
Purchasing Agent

TVAPURTRF CTA

0*
TVAPURTRF CTA
1/26/78
DELAVALTUR ATL

ATTN: MR. J M ANDERSON NUCLEAR PROCUREMENT

SUBJECT: STANDBY DIESELS FOR BELLEFONTE NUCLEAR PLANT
TVA REF # 76K61-86181
D/L SN 75080-83

DELAVAL SERVICE REPRESENTATIVE REPORTS DAMAGE TO
GENERATOR ROTOR BY YOUR CONTRACTOR. DO YOU WISH DELAVAL TO
OBTAIN SERVICES OF GENERATOR MANUFACTURER IN YOUR BEHALF
FOR REPAIR?

P B RICCI
DELAVALTUR ATL

TVAPURTRF CTA

7/26/78 called Edlyn in old Delaval office to tell him to get more up. in. GMA
7/27/78 not invoiced 10% deducted with acct
more up. with a response letter

*Edlyn sent to Audit W 11/11
Contract Change No. 2*

MORT.	NAME	Marcel Anderson	DATE	3/28/79
	ADDRESS	640 CUBB-C	Chatt	<input checked="" type="checkbox"/>
			Knox	<input type="checkbox"/>
			M. S.	<input type="checkbox"/>

MORT.	NAME	Accounts Payable Section	EXTENSION	2504
	ADDRESS	LINDA HOUSER E9D88 C-K	Chatt	<input type="checkbox"/>
			Knox	<input checked="" type="checkbox"/>
			M. S.	<input type="checkbox"/>

76K-86181 DeLaval

She never paid attached invoice
27701 dated 11-7-78 which you
sent to me in Dec.

Subject contract does not cover
repair work ~~by~~ by an engineer
so you will have to add it
by a change. Kim Patterson &
I have discussed this billing
& agreed it would probably
be best for you to write
the change for the entire amt.
payable once you have rec'd all
your approvals. Normally TVA
does not pay any subsistence.
However, APS will pay whatever
you recommend & write the change for.

MAR 30 1979



A Transamerica Company

ENGINE AND COMPRESSOR DIVISION
550-85TH AVENUE
P.O. BOX 2161
OAKLAND, CALIFORNIA 94621

INVOICE

SEND REMITTANCE TO:
P.O. BOX 360433M
PITTSBURGH, PA 15251

Customer P.O. No. M. ANDERSON	Our Order No. S-2-375	Date Entered 1/26-78	Shipping Date	W/T	Code	No. Inv. 4	Invoice No. 24701
Req./Br. Code				(Acct. No.)		Invoice Date 7 NOVEMBER 1978	
TENNESSEE VALLEY AUTHORITY DIVISION OF PURCHASING CHATTANOOGA - TENN. 37401						Date Shipped	
				Product S.I.C. Territory % Split State Renegotiable		Carrier	
Markings BELLEFONTE NUCLEAR PLANT						Bill of Lading No.	
						Total Weight	
						Shipping Tag No.	
E.O.B. Point CLEVELAND-OH.	Terms NET 30 DAYS	Sales Tax	Resale No. or Tax Code SERVICE	Routing Request		PPD COL	

Domestic Package
 Air Domestic Package
 Domestic Box
 Export
 Government - See Below

Partial Shipments	Engine Model and Serial Number DSRV-16-4 475080-083	Government Inspection
-------------------	---	-----------------------

Item	Qty.	Part Number and Description	Box No.	Wt.	Unit Price	Ord. Bal.	Qty. Ship.	Amount
1	1	TO INVOICE FOR SERVICES OF GENERATOR MANUFACTURER'S REPRESENTATIVE AND MATERIALS REQUIRED FOR REPAIR OF ROTOR POLE WASHER DAMAGE - GENERATOR S/N 175105 52						
		E.P. PORTEC INVOICE #7803021						\$1,642.52
		IN ACCORDANCE WITH SUPPORTING DOCUMENTS ATTACHED:						
		TOTAL AMOUNT DUE THIS INVOICE						\$1,642.52

Original Sent to Addis Ababa
Contact Charge No. 9

MAR 30 1978

We hereby certify that these goods were produced in compliance with all applicable requirements of Sections 6, 7, and 12 of the Fair Labor Standards Act, as amended, and of regulations and orders of the United States Department of Labor issued under Section 14 thereof.

Electric Products Division
 1725 Clarkson Road, Cleveland, Ohio 44112
 Telephone: (216) 481-1500, TWX: 810-421-8224

for your approval / comments prior to payment. Please return to me

DATE SHIPPED	GROSS WEIGHT	NUMBER OF PACKAGES	C - COMPLETE P - PARTIAL	INVOICE DATE	INVOICE NO.
				3-7-78	7803021

8
NT
10
VIA SERVICE TRIP TO
TVA BELLEFONTE NUCLEAR PLANT - END SHOWN
SCOTTSBORO, ALA.

Bruce 10/13/78

PLEASE MAIL REMITTANCE TO:
 PORTEC INC.
 ELECTRIC PRODUCTS DIV.
 P.O. BOX 92949 S
 CLEVELAND, OHIO 44101

8
OT
10
DELAVAL ENGINE DIV.
 BOX 2273
 OAKLAND, CA 94614

PAGE 1 OF 2 PAGES

S. O. NO. 4-2605	CUSTOMER ORDER NO. 81575	DATE 02:22:78	CUSTOMER CODE 04150	SALES CODE 5	1
F. O. B. CLEVELAND	ROUTING VIA SERVICE TRIP	TERMS: NET 30 DAYS-NO CASH DISC.			

ITEM/DESCRIPTION	QTY.	UNIT PRICE	AMOUNT
SERVICE REPRESENTATIVE REPAIR ROTOR POLE - WASHER DAMAGE TO SO# 17510552			
TRAVEL TIME			
1/30/78 7.5 HOURS		@30.00/HR	\$ 225.00
2/2/78 6.0 HOURS		@30.00/HR	180.00
2/2/78 2.0 HOURS		@45.00/HR	90.00
TIME ON SITE			
1/30/78 .5 HOURS		@30.00/HR	15.00
1/30/78 3.0 HOURS		@45.00/HR	135.00
1/31/78 7.5 HOURS		@30.00/HR	225.00
2/1/78 6.0 HOURS		@30.00/HR	180.00
2/2/78 2.0 HOURS		@30.00/HR	60.00
AIR TRAVEL			
1/30/78 CLEVELAND-CHAT.			67.00
2/2/78 ATLANTA-CLEVELAND			72.00

SELLER REPRESENTS THAT WITH RESPECT TO THE PRODUCTION OF THE ARTICLES AND/OR THE PERFORMANCE OF THE SERVICES COVERED BY THIS INVOICE IT HAS FULLY COMPLIED WITH THE FAIR LABOR STANDARDS ACT OF 1938, AS AMENDED.

PLEASE PAY THIS AMOUNT **PAGE 2**

COLLECTION COPY

reference your memo of 10/10/78

RECEIVED
 OCT 17 1978
 SERVICE DEPT.

RECEIVED
 OCT 16 1978
 PROJECT CONTROL

PORTEC INC.**INVOICE**

Electric Products Division
 1725 Clarkstone Road, Cleveland, Ohio 44112
 Telephone: (216) 461-1500, TWX: 810-421-8224

DATE SHIPPED	GROSS WEIGHT	NUMBER OF PACKAGES	C - COMPLETE P - PARTIAL	INVOICE DATE	INVOICE NO.
				3-7-78	7803021

**VIA SERVICE TRIP TO
 TVA BELLEFONTE NUCLEAR PLANT - ESS SHOWN
 SCOTTSBORO, ALA.**

PLEASE MAIL REMITTANCE TO:
 PORTEC INC.
 ELECTRIC PRODUCTS DIV.
 P.O. BOX 92949 S
 CLEVELAND, OHIO 44101

**DELAVAL ENGINE DIV.
 BOX 2273
 OAKLAND, CA 94614**

PAGE 2 OF 2 PAGES

S. O. NO.	CUSTOMER ORDER NO.	DATE	CUSTOMER CODE	SALES CODE
4-2605	81575	02 22 78	04150	5
F. O. B. CLEVELAND	ROUTING	TERMS: NET 30 DAYS-NO CASH DISC		

VIA SERVICE TRIP

ITEM/DESCRIPTION	QTY.	UNIT PRICE	AMOUNT
HOTEL 3 NIGHTS		@20.14	\$ 60.42
CAR RENTAL			173.22
SUBSISTENCE			73.51
SUPPLIES: SAW BLADES, EPOXY, MAT'L			46.76
MISC: PARKING, TEL. LAUNDRY & MILEAGE PERSONEL AUTO			39.61
			<hr/>
			\$1,642.52

SELLER REPRESENTS THAT WITH RESPECT TO THE PRODUCTION OF THE ARTICLES AND/OR THE PERFORMANCE OF THE SERVICES COVERED BY THIS INVOICE, IT HAS FULLY COMPLIED WITH THE FAIR LABOR STANDARDS ACT OF 1938, AS AMENDED

**PLEASE PAY
THIS AMOUNT**

\$1,642.52

COLLECTION COPY

Name (Full)

RANDALL ST. JULIAN

EXPENSE PORT

Division

ELECTRIC DEPT.

Send Check to

30066

Period Covered

1/23/78 THRU 2/2/78

From	To	Mileage Own Auto	TRAVEL EXPENSE-OUT OF TOWN					Total Travel Expense (Code No. 1)	Business Meals & Business Meetings (Code No. 2 or 3)	Entertainment (Code No. 4)	OTHER EXPENSES INCLUDING LOCAL TRANSPORTATION (Give Brief Explanation)	GRAND TOTALS		
			Transportation Other Than Own Auto	Lodging	Meals When Alone	Tel. Taxi & Misc. Tips	Total							
CLARKSTONE - PHOENIX (HOME)											TELEPHONE .50			
TO CLEVELAND	HEIKINS LAST DATE	130									AIRPORT PARKING .50			
HEIKINS CLOSED	FLYING	0												
CLEVELAND	SCOTTSDALE, ILLA	22	67	26	14	11	62	2.10	103.86		LONG DIST TEL. 3.74	100.00		
				26	14	18	45	2.50	41.09		L.D. TEL. 2.49	43.00		
				20	14	18	71	2.75	41.60		LAUNDRY 1.90	43.00		
SCOTTSDALE	CLEVELAND	22	22	00			12	88	1.50	86.38	CALCULATOR 13.99	100.00		
(VIA ATLANTA, GA.)	HERTZ		73	22					173.22			173.22		
											31 GASOLINE 12.77	12.77		
											5 GASOLINE 5.00	5.00		
											2 AIRPORT PARKING 23.50	23.50		
FOR R-2575	HONOLULU													
CLARKSTONE	EASTON													
	AIR FREIGHT													
	(To AIR CHISELS & GRIND WHEELS)													
Sub-totals			312	22	60	72	64	66	8.55	446.15		510.00		
Total miles own auto			174	Out of town @ _____¢ per mile									64.39	446.15
			In town @ .12¢ per mile									29.58	540.00	
			Totals									93.97	540.00	

certify that the expenses detailed above were incurred for the benefit of PORTEC Inc.

Signed by

Randall St. Julian

My permanent address is \$ 200.00

Checked:

2/21/78 J.C.

Reviewed:

J.M. 2/20/78

Approved:

R.S.J. 2/21/78

Noted:

L.M. 2/25/78

Noted:

Less amt. charged thru air travel card

Less temporary advance

Net amt. to be reimbursed

Acct'g. Dept. Distribution:

Note: Encircle air travel amounts paid direct by company and include in "Totals"

100 Over

EASTERN AIRLINES

PASSENGER TICKET AND BAGGAGE CHECK
SUBJECT TO CONDITIONS
OF CONTRACT
ON PAGE 10

007:4460984

ENDORSEMENTS (CARBON)

CONTRACT
NUMBER

PASSENGER'S COUPON

NAME OF PASSENGER
NOT TRANSFERABLE

PASSENGER'S CLOTHES

ST JULIAN/MR. R

5 ATO CLEF
CLEVELAND OH
83

1/2	NOT GOOD FOR PASSAGE	CARRIER	FLIGHT	CLASS	DATE	TIME	STATUS	FARE BASIS/TKT. DESIGNATOR	NOT VALID BEFORE	NOT VALID AFTER
	CLEVELAND	EA	725	Y	02JAN	725A	OK			
	YINCHARLOTTE	EA	959	Y	02JAN	0430A	OK			
	CHATTANOOGA									
	VOID									
	VOID									

FARE	
TAX	
TAX	
TOTAL	

007 4460984999 2 □

UNITED AIRLINES

PASSENGER TICKET AND BAGGAGE CHECK
SUBJECT TO CONDITIONS
OF CONTRACT ON
PASSENGER'S COUPON

016:24 44 832 CT
UNITED AIR LINES
ATLANTA
ATLANTA 81350
83

ENDORSEMENTS (CARBON)

PASSENGER'S COUPON

Mr. Julian

DATE OF ISSUE

25 FEB 76

T JULIAN/MR

NOT TRANSFERABLE

TOUR CODE

1/2	NOT GOOD FOR PASSAGE	CARRIER	FLIGHT	CLASS	DATE	TIME	STATUS	FARE BASIS/TKT. DESIGNATOR	NOT VALID BEFORE	NOT VALID AFTER
	ATLANTA	EA	650	Y	02 FEB	0650	OK			
	CLEVELAND				VOID					
	VOID				VOID					
	VOID				VOID					
	VOID				VOID					

FARE 66.67

TAX 6.97

TOTAL 73.64

1016 33247 001353
1016 33247 001353

2641025491 6

016 24 46542307 3

ORTEC INC ELEC PROD UAPW
ST JULIAN

ROOM NO. 219 LAST NAME Smith FIRST John INITIAL P
 NO. GUESTS 1 CITY Mobile STATE Alabama

FOLIO NUMBER 010362
 RATE 19.00

STATEMENT

Holiday Inn OF SCOTTSBORO

TELEPHONE 574-1115 A.C. 205 U.S. 72 EAST-BOX 928
 SCOTTSBORO, ALABAMA 35768

DATE REF. NO. CODE AMOUNT



LAST BALANCE IS
 AMOUNT DUE UNLESS
 OTHERWISE INDICATED →

HURRY BACK

From Folio _____ To _____

DELAVAL

ENGINE & COMPRESSOR DIVISION
550 85TH AVE - OAKLAND, CALIF. 94621

most Packing Lists MUST show actual contents of packages, as shown on Purchase Order

TO ELECTRIC PRODUCTS DIVISION
PORTEC, INC.
124 PAUL DRIVE
SAN RAFAEL, CA 94903

DELAVAL

ADDRESS: 550 85TH AVE, OAKLAND, CALIF. 94621
INVOICE NUMBER: 81575
PURCHASE ORDER NUMBER: 81575

PURCHASE ORDER
PURCHASE ORDER NUMBER MUST APPEAR ON ALL INVOICES, PACKAGES, BILLS OF LADING AND CORRESPONDENCE

No. 81575

DATE 02/22/78 mk
B. C. GUNTRUM

LATTN:

(HEREIN CALLED "SELLER")

THIS ORDER IS SUBJECT TO THE SPECIFICATIONS TERMS AND CONDITIONS STIPULATED ON THE FACE AND REVERSE SIDES HEREOF.

SHIP TO

SEE BELOW
RECEIVING DEPT
550-85TH AVE
OAKLAND, CALIF 94621

FOR RESALE
DONTAXABLE
PERMIT
SR CH.21-643640

NOT FOR RESALE
TAXABLE

DELIVERY REQUIRED IN OUR PLANT
WORK COMPLETED
02/01/78

TERMS NET 30 DAYS

N/A

SHIP VIA
N/A

PAINTED SURFACES MUST BE PROTECTED WITH PAINT AND REMOVED BEFORE USE

ITEM	QUANTITY	DESCRIPTION	PRICE
1	1/EA	<p>TIME, MATERIALS AND EXPENSES FOR THE SERVICES OF A TECHNICAL REPRESENTATIVE TO REPAIR BROKEN ROTOR WASHERS. GENERATOR S/N 17510552</p> <p>WORK COMPLETED 02/01/78 DO NOT DUPLICATE</p> <p>10 CFR 21 IS APPLICABLE TO THIS CONTRACT</p>	<p>NOT TO EXCEED \$850.00/LOT</p>

NUCLEAR

CONFIRMING ORDER CONDITIONS UPON ACCEPTANCE OF TERMS HEREOF PLACED VERBALLY WITH M. R. DOBRRINGTON

MARK FOR:

JOB NO
75080

DEPT. NO
68.41-S-2-375

ACKNOWLEDGMENT COPY MUST BE RETURNED PROMPTLY SHOWING PRICE AND DELIVERY DATE
FAILURE TO COMPLY WITH ANY OF ABOVE MAY DELAY INVOICE PAYMENT.

INVOICES ONLY MAIL TO:
BOX 2273 OAKLAND, CA 94614

DELAVAL TURBINE INC.
ENGINE & COMPRESSOR DIVISION

BY: 
BUYER

DELAVAL TURBINE, INC.

FORNAC inc.

Electric Products Division

1725 Clarkstone Road, Cleveland, Ohio 44112

Telephone: (216) 481-1500

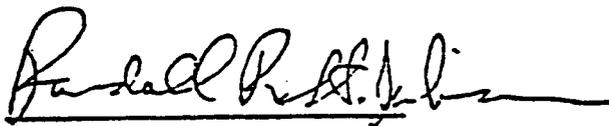
Date

March 7, 1978

Certification of Conformance

We hereby certify that the repair work done on the damaged washer on the rotor pole on Electric Products rotating element Serial Number 17516552 has been repaired in accordance with Electric Products Engineering Specification EP-6.1. The material and the test sample used was in accordance with specification and quality, test was satisfactory.

Certified by



Service Engineer

Customer: DELAVAL - FORT T VA - BELLEFONTAINE
SCOTTSBORO, ALA.
 Equipment Purchaser: DELAVAL

Company P.O.# UNKNOWN Contract and/or Amendment No. _____

Service Requested By TOM BECK / BOB GENT Title TVA ELECT ENGR. / DELAVAL FIELD SERV. Date 1/24/78

Supervisor Directly Involved TOM BECK DAN FREEMAN Dept. ELECT ENGR.

Area Information: Area 205 No. 259-0420 Ext. 257

Priority Clearance: Yes _____ No _____ Ship Name or Null No. _____

Equipment Involved E.P. S.O.# 12510551

Service Requested REPAIR DAMAGE TO (2) ROTOR POLES INSULATING WASHERS IN (5) PLACES

Representative Assigned R. S. TOLAN Date 1/25/78

Date	From	To	Hours	Manner and/or Mileage	Expenses
1/25/78	CLARKSTONE	PRVILLE - AIRPORT		FLIGHT CANCELLED 120 MI @ .17/MI	\$20.40
1/30/78	CLEVELAND	SCOTTSBORO	7.5	ATC - EA 729 EA 533	PLUS HERTZ CAR
2/2/78	SCOTTSBORO	CLEVELAND	8.5	HERTZ TO ATLANTA VA-432 ATL-CLE (AT)	

Job	Date	Time In	Time Out	Hours	Remarks & Initials
1	1/30	11:15	2:45	3.5	INSPECT DAMAGE LOCATE M.E.K & SOL. GR.
2	1/31	7:30	3:00	7.5	REPAIRING DAMAGE W. RANGE END
3	2/1	7:30	1:30	6.0	REPAIRING DAMAGE W. BUILDING END COMPLETED GLUEING
4	2/2	7:00 AM	9:00 AM	2.0	FINISH & PAINT
5					
6					

Approved - Signatures:
 Customer Representative: Danay Budget for DAF Title Elec Super Date 2/2/78
 Rep. Representative: Randall Tolman Date 2/2/78

2572

SR
PH.
P
VE
S
OTHERS PMS
FILES
JFC
HR
Dis. Rep.
LCM

SERVICE REPORT
Intercompany Only
(Confidential)
R# 2605

SERIAL NO: 17510552

Customer: Delaval for TVA Bellefonte

Location: Scottsboro, Ala.

Phone: (205) 259-0420 Ext. 257

Equipment Purchaser: Delaval

Shipped Date:

Customer P.O. No.: 81575

Charges:

Service Requested By: Tom Beck/Bob Gray

Title: TVA Elect. Eng. Date: 1/24/78

Contact at Job Site: Tom Beck

Title: Elect. Eng.

Date of Service: 1/30/78 thru 2/2/78

Service Eng.: R. St. Julian

PROBLEM: Broken pole washers.

CAUSE: Improper lifting procedure.

RESPONSIBILITY: Others not Electric Products Division.

EQUIPMENT: 8750 KVA, 7000 KW, 450 RPM, 6900/3/60 Synchronous Generator.

SERVICE PERFORMED: 1/30/78 - Travel Painesville to Scottsboro, Ala. Time 7-1/2 hours. On site 3-1/2 hours. Proceeded to Bellefonte Nuke Plant, contacted Tom Beck. Mr. Beck directed me to the Diesel Room where S.O. 17510551 generator is being installed. He pointed out the damage to the pole washers, inflicted by lifting slings improperly positioned during unloading. I examined the damage and determined that it could be repaired on-site per Engineering Specification ER-6.1. The damage is limited to two adjacent poles. The top washers of both are broken at both ends. Also the bottom washer was damaged on one of the poles at the opposite drive end. Squared the broken edges of the affected poles and measured for new pieces of glass laminate MI-10.1.

Located MEK and gram scale on site.

1/31/78 - Cut new pieces of glastic. Glued in new pieces on drive end, one on each pole as required.

1/31/78 - Glued in new pieces on bearing end. Completed repair of cracked bottom washer.

2/2/78 - Finished and repainted. Since machines are outside, I used heat lamps to pre-heat area and keep temperature above 70 degrees throughout cure cycle. All operations were per Engineering Specification ER-6.1 dated 1/25/78. (Attached)

Due to the irregular edges left by the breakage, replacement pieces were cut and ground to conform to these edges. (2) Test pieces were glued to verify proper mix and cure, one for each batch MV-20.10 mixed. Test pieces were placed next to repaired areas during cure so

QAS '78 0502 547

Address all communications except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401
 Telephone 615-755-3011
 Telex 55-8417

This block to be completed by TVA

State or Country Code	04	Contract No.	70X61-86181	Change	8
Vendor Code		Change Date	April 21, 1978		
Buying Code	L A	Change Amount	plus \$1,718.00		
Commodity Code	6115E	Performance Date	no change		
Account Number	N4139				

CHANGE OF CONTRACT

To _____

Delaval Turbine, Inc.
 3379 Peachtree Road, NE.
 Atlanta, GA 30326

Project **Bellefonte Nuclear Plant**
Units 1 and 2

Vendor Reference No.

780508A0233 (2)

Emergency Diesel Engine
Driven Generators

Add

Handling and transportation charges for reshipping to TVA at the Bellefonte Nuclear Plant one set of lifting brackets for use in setting the engine in place.

Lump Sum \$722.00

One additional relay to each control panel to monitor the 125 volt DC control power to the field flashing circuit.

Lump Sum 996.00

In accordance with P.B. Ricci's letter to J. M. Anderson dated March 14, 1978.

FILMED FROM BEST
 AVAILABLE COPY

(Refer to D. R. Patterson's memo to J. M. Anderson dated April 13, 1978.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total \$6,876,350.60

Correct Total \$6,878,068.60

Aydelott 4
TB
Sherrod
Specs 9
HEB
MEDS, E4B37 C-K

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

By _____
(61) J. Marcel Anderson/dg

VA 374 (10-3-77)

CONTRACT NUMBER must be shown on all invoices, packages, shipping papers and correspondence.

4 1. Contractor
 2 Auditor

3. Contract File
 4. Purchasing A File

5. Accounting Office
 6. Consignee

7. Requisitioner
 8. Requisitioner

9. Plant Accounting
 10. & 11. Extra

CONDENSER AND FILTER DIVISION
DELTA DIVISION
ENGINE AND COMPRESSOR DIVISION
TURBINE DIVISION

DELAVAL TURBINE INC.
3379 PEACHTREE ROAD N.E.
ATLANTA GA 30326
PHONE 404 261 7063

March 14, 1978

3-21-78 - DG - Copies to:

Tennessee Valley Authority
Division of Purchasing
633 Chestnut Street
Chattanooga, Tennessee 37401

Accounts Payable Section, E9D88 C-K
W. W. Aydelott, Bellefonte NP (4)
R. M. Hodges, W7C126 C-K
J. E. Kerley, E9A16 C-K
J. L. Parris, W11B67 C-K (2)
* D. R. Patterson, W10C126 C-K

Attention: Mr. J. M. Anderson
Nuclear Procurement

*Note the addition of the relay.
Who is Ed Irwin and what authority
did he have to amend the contract?

Subject: Standby Diesel Generators
for Bellefonte Nuclear Plant
TVA No. 76K61-86181
Delaval No. 75080-83

FILMED FROM BEST
AVAILABLE COPY

Dear Mr. Anderson:

On January 10, 1978, the lifting brackets were shipped to the subject plant site for your use in setting the subject engines in place. Please be advised that the handling charge applicable to the use of these brackets is \$500.00. The freight charge for shipment of these brackets is \$222.60. I have attached, for your information, TVA Form 413 (DP-6-74) which we received on February 9, 1978, which shows the shipping charges to be \$1,191.00. Please note that TVA will only be billed \$222.60 as mentioned above. Also, an additional relay was added to each of the four generator control panels as a result of discussion between your Mr. Ed Irwin and our Mr. Roger Davidson, resulting in an increase in the contract price of \$996.00. Would you please amend the contract to cover the above charges?

If you should require any further information please feel free to contact me at your earliest convenience.

Very truly yours,

Delaval Turbine Inc.

P. B. Ricci

P. B. Ricci
Sales Engineer

Original Sent
C-111

PBR:eh
enclosure

MAR 20 1978

TENNESSEE VALLEY AUTHORITY
 DIVISION OF PURCHASING
 1000 GLENN AVENUE
 MEMPHIS, TENNESSEE 38103

78010560469 QAS 78 0103 519

Order No.	78261-46131
Order Date	December 28, 1977
Order Code	L A
Change Amount	\$722.60
Change Description	NO CHANGE
Account Number	39

CHANGE OF CONTRACT

Project Bellefonte Nuclear Plant
SALES 1 and 2

Vendor Reference No. _____

To _____

Delaval Turbine, Inc.
 3379 Peachtree Road, NE.
 Atlanta, GA 30326

Emergency Diesel Engine
 Driven Generators

ADD

Handling and transportation charges for shipping to TVA
 at the Bellefonte Nuclear Plant one set of lifting brackets
 for use in unloading the engine from the railroad cars.

Lump Sum \$722.60

Payment in full for this change shall be due and payable
 upon receipt of invoice at the proper accounting office.
 In accordance with P. J. Ricci's letter to J. M. Anderson
 dated December 19, 1977.

FILMED FROM BEST AVAILABLE COPY

All other terms and conditions of the original contract and previous changes of contract (if any) shall apply.

Previous Total	\$6,875,628.00	Aydalott 4	TENNESSEE VALLEY AUTHORITY
Correct Total	\$6,876,350.60	TD	Division of Purchasing
		Sherrod	
		Specs. 9/10	
		hcs	
		MEDS, E4B37 C-K	By _____
			(61) J. Marcel Anderson/dg

Address all communications except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401
 Telephone 615 755-3011
 Telex 55-8417

QEB '77 0712 402

This block to be completed by TVA

State or Country Code <u>64</u>	Contract No. <u>76K61-36181</u> Change <u>6</u>
Vendor Code _____	Change Date <u>June 28, 1977</u>
Buying Code <u>L A</u>	Change Amount \$ <u>no change</u>
Commodity Code _____	Performance Date <u>no change</u>
Account Number <u>77071560310</u>	

CHANGE OF CONTRACT

77071560310 Project Bellefonte Nuclear Plant

To _____

Delaval Turbine Inc.
 3379 Peachtree Road, NE
 Atlanta, GA 30326

Vendor Reference No. _____

Emergency Diesel Generator

The correct total after Change of Contract No. 5 should have been \$6,875,628. The credit due to TVA as the result of Change No. 5 was erroneously added to the previous total. It should have been deducted.

This Change of Contract hereby establishes the correct contract total.

7/12/77 - JLPa:NJN
 cc: R. M. Hodges, W7C126 C-K
 MEDS, E4B37 C-K



CC: LH
 7-5-77

FILMED FROM BEST COPY AVAILABLE FROM BEST COPY AVAILABLE

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total	\$7,770,684.00	Aydellott 4	MEDS	TENNESSEE VALLEY AUTHORITY
			ME-3	Division of Purchasing
Correct Total	\$6,875,628.00	IB		
		Sherrrod		By _____
		Specs. 9		(61) J. Marcel Anderson/dg Purchasing Agent

TVA 394 (DP-2-77)

CONTRACT NUMBER must be shown on all invoices, packages, shipping papers and correspondence.

4

1. Contractor
 2. Auditor

3. Contract File
 4. Purchasing A File

5. Accounting Office
 6. Consignee

7. Requisitioner
 8. Requisitioner

9. Plant Accounting
 10. & 11. Extra

12

Address all communications except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401
 Telephone 615 755-3011
 Telex 55-8417

CHANGE OF CONTRACT

This block to be completed by TVA

770621J0660

State or Country Code	04	Contract No.	76K61-86181	Change No.	5
Vendor Code		Change Date	June 17, 1977	Change Amount	minus \$447,528.00
Buying Code	L A	Performance Date	no change		
Commodity Code					
Account Number	B4 39				

Project Bellefonte Nuclear Heat

Vendor Reference No. _____

Emergency Diesel Generator

To _____

Delaval Turbine Inc.
 3379 Peachtree Road, NE
 Atlanta, GA 30326

TVA hereby accepts the option offered by item 5 (alt.) of the contract to accept results of previous test on similar units for the Grand Gulf Nuclear Plant in lieu of the 300-start test specified in the contract.

Lump Sum Credit \$447,528.00

In accordance with A. T. Olson's letters of September 4, 1975, and December 24, 1975, to J. Marcel Anderson, and Carl. H. Moeller's letter of March 7, 1977, to J. Marcel Anderson.

Approved by Director of Purchasing on 6/13/77.

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(Refer to D. R. Patterson's memo to J. M. Anderson dated June 10, 1977.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total	\$7,323,156.00	Aydellott 4	MEDS ✓	TENNESSEE VALLEY AUTHORITY
Correct Total	\$7,770,684.00	ASB		Division of Purchasing
		TB		
		TB		
		Sherrad		By <u>J. Marcel Anderson</u>
		Spaca, 9		(61) J. Marcel Anderson/dg Purchasing Agent

TVA 394 (DP-2-77)

CONTRACT NUMBER must be shown on all invoices, packages, shipping papers and correspondence.

4 1. Contractor
 2. Auditor

3. Contract File
 4. Purchasing A File

5. Accounting Office
 6. Consinee

7. Requisitioner
 8. Requisitioner

9. Plant Accounting
 10. & 11. Extra

Address all communications except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401
 Telephone 615 265-3551
 TWX 810 573-5274

CHANGE OF CONTRACT

This block to be completed by TVA **77051780102** ④

State or Country Code <u>06</u>	Contract No. <u>76561-86181</u>	Change No. <u>4</u>
Vendor Code _____	Change Date <u>May 13, 1977</u>	
Buying Code <u>L A</u>	Change Amount \$ <u>\$52,256.00</u>	
Commodity Code <u>6115E</u>	Performance Date <u>No change</u>	
Account Number <u>46 39</u>		

Project Bellefonte Nuclear Plant

Vendor Reference No. _____

Emergency Diesel Generator

To _____

Delaval Turbine Inc.
3379 Peachtree Road, NE
Atlanta, GA 30326

AND

- | | |
|---------------------------------------|-----------------------------------|
| 1. Air Intake Plenums | Lump sum \$44,304.00 |
| 2. Modifications to exhaust silencers | Lump sum \$ 5,660.00 |
| 3. Modifications to the generators | Lump sum \$ 2,292.00 |
| | Lump sum total \$52,256.00 |

In accordance with P. B. Ricci's letter to J. H. Anderson dated February 2, 1977.

EILMED FROM BEST AVAILABLE COPY

(Refer to D. R. Patterson's memo to J. H. Anderson dated March 14, 1977, and May 10, 1977.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total	\$7,270,900.00	Aydelott & MEDS	TENNESSEE VALLEY AUTHORITY
Correct Total	\$7,323,156.00	AFS TB TB FAB Sherrod Specs: 9	Division of Purchasing
			By _____ Purchasing Agent (61) J. Harold Anderson/bh

Address all communications except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401
 Telephone 615 265-3551
 TFX 810 573-5274

CHANGE OF CONTRACT

This block to be completed by TVA **770517B0103** ④

State or Country Code 04	Contract No. 76651-86181
Vendor Code	Change Date May 13, 1977
Buying Code LA	Change Amount \$5,440.00
Commodity Code 6152	Performance Date No change
Account Number 45 39	

Project Bellefonte Nuclear Plant

Vendor Reference No. _____

To _____
 [**Delaval Turbine, Inc.**
3379 Peachtree Road, NE
Atlanta, Georgia 30326]

Emergency Diesel Generator

ADD

**Grounding pads for auxiliary equipment in accordance with
 TVA drawing SD-E-16.2.1**

\$5,440.00

**In accordance with P. E. Ricci's letters to J. M. Anderson
 dated January 10, 1977, and March 25, 1977.**

**FILMED FROM BEST
 AVAILABLE COPY**

(refer to D. E. Patterson's memo to J. M. Anderson dated ~~EMERGENCY~~ February 9, 1977.)
 All other terms and conditions of the original contract and previous change of contract (if any) shall apply.

Previous Total	\$7,265,460.00	Aydlett 4	MEDS	TENNESSEE VALLEY AUTHORITY
Correct Total	\$7,270,900.00	AFB		Division of Purchasing
		TB		
		X FAB		
		Sherrad		
		Specs: 9		
		Contractor - 4		

By _____ Purchasing Agent
(61) J. Marcol Anderson

TVA 334 (27-12-72)

CONTRACT NUMBER must be shown on all invoices, packages, shipping papers and correspondence.

- | | | | | | |
|---|---------------|----------------------|----------------------|------------------|---------------------|
| 4 | 1. Contractor | 3. Contract File | 5. Accounting Office | 7. Requisitioner | 9. Plant Accounting |
| | 2. Auditor | 4. Purchasing A File | 6. Comptroller | 8. Requisitioner | 10. & 11. Entry |

ATTACHMENT B

E74164.05

RECEIVING INSPECTION CHECKLIST

IB RT 1.1.6.

DESCRIPTION: DIESEL ENGINE DRIVE GEN. SET, SYSTEM/
GENERATOR ROTOR & STATOR STRUCTURE RT UNIT 1
SEE BACK TVA MK. NA
PROJECT MK. KFFA
ASME CLASS 1 QUALITY LEVEL I CLASS IE VENDOR MK. NA
CLASS 2 QUALITY LEVEL II OTHER CONTRACT 86181
CLASS 3 ANSI B31.1 1(E) ITEM(S) 3
SPECIFICATION TVA 2411

ASSIGNED STORAGE LEVEL: A B C D SHIPPING DAMAGE: YES NO

SPECIAL INSTRUCTIONS STORE AND MAINTAIN IN ACCORDANCE
WITH MFG. REQUIREMENTS. (ATTACHED)

INSPECTION REQUIREMENTS		SAT	UNSAT	N/A	SOURCE INSP. YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> If no	SAT	UNSAT
					perform the following:		
1	Identification & Marking	X			11	Physical Properties	
2	Mfg. Documentation	X			12	Chemical Properties	
3	Prot. Covers & Seals	X			13	Dimensions	
4	Coatings & Preservatives			X	14	Weld Preparations	
5	Inert Gas Blanket			X	15	Workmanship	
6	Desiccant			X	16	Lubricants & Oils	
7	Physical Damage	X			17	Electrical Insulation	
8	Cleanliness	X			18		
9					19		
10					20		

Notes: VISUAL INSPECTED

DIESEL ENGINE STORAGE LEVEL (C)

GENERATOR ROTOR & STATOR STORAGE LEVEL (B)

ITEM RECEIVED: YES NO IF NO NCR No. _____

INSPECTOR Robert Turner DATE 10-18-77

_____ TVA Contract _____
 _____ Item _____
 _____ S.O. _____ Release No. _____

_____ Equipment _____ TVA Project _____

V. $\frac{\text{Amt Released}}{\text{Amt Required}} = \frac{\text{ }}{\text{ }} \text{ } \boxed{11} \% \text{ Complete}$

on or Serial No. _____

above is released by TVA Inspector. All boxes

X = Inspection made.
 C = Item requiring Contractor's QC representative clearance
 and signature prior to shipping.
 V = Verification of records.

	DED QA Reqd	I&T QA Repr	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	

ions have been approved by the responsible TVA Engineer.):

hereby certifies that the equipment and/or material released meets all contractual requirements. Approved deviations,
 above by number.

's QAR _____ Title _____ Date _____

ctor's approval for shipment of the above described equipment and/or material is subject to the provisions of the con-
 g inspection and, notwithstanding such approval, the contractor is in no way released from complying with all provisions

_____ Title _____ Date _____

- Knoxville I&T
- To project
- Inspector's field office file

(2)

CERTIFICATE OF COMPLIANCE

TO: Tennessee Valley Authority
400 Commerce Avenue
Knoxville, Tennessee
37902

REFERENCE: PURCHASE ORDER NUMBER 76K61-86181

SUPPLIER: Delaval, Engine & Compressor Division

WE HEREBY CERTIFY THAT THE PRODUCTS OR SERVICES FURNISHED ON THE REFERENCED PURCHASE ORDER MEET THE REQUIREMENTS OF THE APPLICABLE DRAWINGS AND/OR SPECIFICATIONS, To include Testing. Final Test Reports To Be Submitted AT A LATER DATE.

PARTS LISTED ON THE ATTACHED PACKING LIST ARE SPECIFICALLY COVERED BY THIS CERTIFICATE.

* DOCUMENTATION IN MANUFACTURERS FILE TO BE SUBMITTED AS REQUIRED AT A LATER DATE.

E. J. Deane
DELAVAL REPRESENTATIVE

9-16-77
DATE

Salvador Espinosa
CUSTOMER REPRESENTATIVE

9-16-77
DATE

PURCHASE ORDER NUMBER _____

STRAIGHT BILL OF LADING — SHORT FORM — ORIGINAL — Not Negotiable

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading.

Bill of Lading

No. 22003

The property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. If it mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Official, Southern, Western and Illinois Freight Classifications in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

CARRIER SHOW
B/L NO. ON ALL
FREIGHT BILL

From **DELAVAL TURBINE INC., ENGINE AND COMPRESSOR DIVISION**
At **550 - 85th AVE., OAKLAND, CALIF. 94621** **P.O. BOX 2161 FITCHBURG STATION**
DATE SHIPPED **9/16/77** NAME OF CARRIER **Southern Pacific Co.**

CONSIGNEE TO **Tennessee Valley Authority** (Mail or street address of consignee — For purposes of notification)

DESTINATION **Bellefonte Nuclear Plant, Hollywood** STATE **Alabama** COUNTY

DELIVERY ADDRESS (To be filled in only when shipper desires and governing tariffs provide for delivery there)

ROUTE **Southern Pacific, New Orleans---Southern RRY.**

DELIVERING CARRIER **SP NO. 500519** CAR OR VEHICLE INITIALS

Number Packages	KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS, AND EXCEPTIONS	WEIGHT (Subject to Correction)	Class or Rate	Ch. Col.
1	Diesel Engine I/S Serial No. 75080-2843	230,000#	Est.	
1	Flywheel I/S	15,000#	Est.	
Lading has been inspected and accepted as loaded and braced per S.P. Car inspector.				
Weight tags to be mailed to above address to attn. Traffic Dept.				
Est. Value \$800,000.00				
Contract No. 76K61-86151				
2843-75080 1				

Subject to Section 7 of conditions, of applicable bill of lading, if this shipment is to be delivered to the consignee without receipt on the consignor, the consignor shall sign the following statement: The carrier shall not make delivery of this shipment until payment of freight and all lawful charges.

(Signature of Consignor)
If charges are to be prepaid, write or stamp here, "To be prepaid."

Prepaid

Rec'd \$
apply in payment of the charges on the property described here

Agent or Cashier.

Per
(The signature here acknowledges only the amount prepaid.)

Charges advanced:

\$

Collected On Delivery and remit to \$ C. O. D. Charge to be paid by Shipper Consignee

If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."
NOTE—Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding

Shipper's imprint in lieu of stamp: not a part of bill of lading approved by the Interstate Commerce Commission

DELAVAL TURBINE INC., ENGINE & COMPRESSOR DIVISION, per
Shipper, *[Signature]* Per Agent, Per

Permanent postoffice address of shipper,
550 - 85th AVE., OAKLAND, CALIF. 94621 P.O. BOX 2161 FITCHBURG STATION
Form P-217 (R-1) 11/71

DELAVAL ENGINE
AND COMPRESSOR DIVISION
550 - 85TH AVENUE
OAKLAND, CALIF. 94621

PACKING LI

SHEET NO. 1 OF 1 SHEET

SHIPPED TO: Tennessee Valey Authority
Bellefonte Nuclear Plant
Hollywood, Alabama

DATE SHIPPED 9/16/77
SHIPPING TAG NO. _____
OUR JOB NO. 2843-75080
CUST. ORDER NO. _____

VIA Southern Pacific Co.
Car SP-500519
SP-Southern
B/L 22003

MARKS:

Cont. No. 76K61-86181

QTY.	DESCRIPTION	H	W	L	BOX NO. OR PIECE NO.	EXPORT INFORMATION		
						GROSS WEIGHT	NET WEIGHT	CI ME.
1	Diesel Engine, Serial No. 75080-2843				16	230,000//	Est.	
1	Flywheel 1/3				17	15,000//	Est.	

DELAWARE

ENGINE
AND COMPRESSOR
DIVISION

ENGINE SPECIFICATIONS
ON ENGINE PARTS LIST

SHEET 1 OF 1

-11-77
-8-77
-10-77
-13-77
-26-77
-4-77
-26-77

CUSTOMER T.V.A.

JOB NUMBER 2843-46 DATE SHIPPED _____

INSPECTION _____ PAINT SPEC. FE-001-002
FE-008-001

MODEL DSRV-10
BORE 17
STROKE 21
HP 9734
RPM 450
HAND RH
ROTATION CW

DRAWINGS

INSTALLATION R-3940
FOUNDATION R-3041
ON ENGINE WIRING 09-688-75080
INTAKE, EXHAUST & CRANKCASE VACUUM 00-805-75080
PLATFORM INSTALLATION 09-530-75080

JACKET WATER 09-810-75080
RAW WATER _____
LUBE OIL 09-820-75080
FUEL OIL 09-827-75080
STARTING 09-835-75080
GAS _____
SHUTDOWN _____

GROUP PARTS LIST OR PART NUMBER	QUANTITY	DESCRIPTION	SHIPS ON ENGINE
02-305-07-01	1	BASE AND BEARING CAPS	✓
02-307-03-02	1	LUBE OIL FITTINGS - INTERNAL	✓
02-310-09-01	1	CRANKSHAFT AND MAIN BEARINGS	✓
02-311-03-07	1	CRANKCASE	✓
02-315-04-04	1	CYLINDER BLOCK	✓
02-316-04-01	1	WATER INLET MANIFOLD	✓
02-317-18-01	1	WATER DISCHARGE MANIFOLD	✓
02-330-02-05	1	FLYWHEEL	✓
02-331-04-01	1	FLYWHEEL GUARD	✓
02-335-03-06	1	GEAR CASE	✓
02-340-13-01	1	RODS - <i>See 2843-2844 only</i>	✓
02-340-11-04	8	CONNECTING ROD (MASTER ON R.B. <i>See 2845-4.</i>)	✓
02-341-02-01	16	PISTON	✓
02-345-03-02	16	TAPPETS	✓
02-350-06-08	1	CAMSHAFT - CAM GEARS - CAM BEARINGS	✓
02-355-03-09	1	IDLER GEAR - MISC. GEARS	✓
02-359-03-02	16	AIR START VALVE	✓

DELAWARE
ENGINE
AND COMPRESSOR
DIVISION

ENGINE SPECIFICATIONS
ON ENGINE PARTS LIST

GROUP PARTS LIST OR PART NUMBER	QUANTITY	DESCRIPTION	SHIPS ON ENGINE
02-445-06-01	1	F.O. BOOSTER PUMP	✓
02-450-15-01	1	FUEL OIL HEADER - R. & L. BANK	✓
02-455-02-01	1	FUEL OIL FILTER	✓
SE-025-000*	2	LUBE OIL PRESSURE - STRAINER	
02-465-FOR 75080	1	L.O. FITTINGS - EXTERNAL PARTIAL SHIP	
02-467-21-01	1	TURBO L.O. FITTINGS	✓
F-068-077*	2	INTERCOOLER	✓
02-475-22-02	1	BRACKETS - TURBO AND INTERCOOLER PARTIAL SHIP	
MP-022-000*	1	TURBOCHARGER - R.B.	✓
MP-023-000*	1	TURBOCHARGER - L.B.	✓
00-491-01-10	2	AIR INLET ADAPTER	
00-495-03-08	1	EXHAUST OUTLET ADAPTER	
02-500 FOR 75080	1	CONTROL PANEL	
02-520-01-01	1	INSTRUCTION PLATES	✓
00-520-01-01	1	WARNING PLATES (AVOID SPEEDS 180 TO 250 RPM)	
02-525-06-01	1	BARRING DEVICE	
02-530-32-01	1	PLATFORM	
02-531-02-01	1	STAIRS	
02-540-07-01	1	SUMP TANK - LUBE OIL	
02-550 FOR 75080	1	FOUNDATION BOLTS - MISC.	
02-550-03-04	1	FOUNDATION BOLTS - ENGINE	
F-139-013*	1	TURBOCHARGER TOOLS (FOR 75080 ONLY)	

BELVA

ENGINE
AND COMPRESSOR
DIVISION

ENGINE SPECIFICATIONS

GROUP PARTS LIST OR PART NUMBER	QUANTITY	DESCRIPTION
02-590-025	1	TOOLS ENGINE (FOR 75080 ONLY)
02-595 FOR 75080	1	SPARES (FOR 75080 ONLY)
00-621 FOR 75080 F-161-005#	1 750	FUEL OIL DRIP TANK PYROMETER WIRE
02-630-10-01	1	PYROMETER CONDUIT
02-688-FOR 75080	1	ON ENGINE WIRING
02-689 FOR 75080	1	ENGINE WIRING (OFF ENGINE)
02-691 FOR 75080	1	SAFETY ALARM (OFF ENGINE)
02-690 FOR 75080	1	SAFETY ALARM
02-695 FOR 75080	1	SAFETY SHUTDOWN
02-700-FOR 75080	1	STANDPIPE
02-717 FOR 75080	1	AUX. SUB-BASE
02-795 FOR 75080	1	REASSEMBLY SPARES
02-805 FOR 75080	1	INTAKE & EXHAUST EQUIPMENT
02-810 FOR 75080	1	JACKET WATER SYSTEM EQUIPMENT
02-820 FOR 75080	1	LUBE OIL SYSTEM EQUIPMENT
02-825 FOR 75080	1	FUEL OIL SYSTEM EQUIPMENT
02-835 FOR 75080	1	STARTING AIR SYSTEM EQUIPMENT

Preparation for Shipment and Recommended Storage
Procedures for Diesel/Generator Sets

1.1 Scope

1.1.1 This procedure depicts the general requirements for the preservation and maintenance during storage of diesel engine/generator sets.

2.1 Preparation of Engines and its Appurtenances Prior to Shipment.

2.1.1 The Diesel Engine & Appurtenances are prepared for storage and shipment by the assembly and shipping departments.

2.1.2 The Diesel Engines & Engine Appurtenances are prepared for storage and shipment in the following manner:

2.1.2.1 A mixture of 50% Techtyl and 50% Lube Oil is pumped through the L.O. System with enough pressure to reach the turbochargers. Once preservative is applied, all flanges are sealed.

2.1.2.2 A mixture of 50% Techtyl and 50% Fuel Oil is pumped through the fuel oil lines. The fuel racks and indicator cocks are moved to full open position and the engine barred over a min. of 6 revolutions to assure that the internals of the fuel injectors are thoroughly coated with preservative.

2.1.2.3 Fuel injectors are removed and Techtyl 502-C is sprayed inside the combustion chambers, coating the cylinder liners, piston crowns and cylinder head faces.

2.1.2.4 Fuel injection pump follower cups are removed and Techtyl 502-C is applied by spraying the lower internals of each pump. Cups are replaced immediately

after application of preservative.

2.1.2.5 Valve covers are removed and all areas inside subcovers are thoroughly coated with Techtyl 502-C.

2.1.2.6 Cam gallery side door covers are removed and the entire camshaft and housing thoroughly coated with Techtyl 502-C.

2.1.2.7 Cover plates and inspection doors on the gear case are removed and the gear train coated with Techtyl 502-C.

2.1.2.8 Relief doors and side doors are removed. All machined surfaces internal and accessible within the crankcase is sprayed with Techtyl 502-C.

2.1.2.9 Gaskets for equipment removed from the engine are carefully examined for any damage prior to re-installation on the engine. All gaskets that show signs of damage are replaced.

2.1.2.10 All openings are sealed using gaskets and steel shipping covers, pipe plugs, or tube plugs.

2.1.2.11 The rear crankshaft oil seal is wrapped with duct tape.

2.1.2.12 All machined and unpainted surfaces on the exterior of the equipment is protected by coating with hard Techtyl.

3.1 Preparation of Generators & Appurtenances Prior To Shipment.

3.1.1 The Generator and its appurtenances are prepared for storage

and shipment by the assembly and shipping departments.

3.1.2 The Generator & Generator appurtenances are prepared for shipment and storage in the following manner:

3.1.2.1 The generator and its appurtenances are prepared and packaged for shipment in accordance with the applicable levels of ANSI N45.2.2.

3.1.2.2 The packaging provides for the use of desiccants and protection of the unit.

4.1 On site preparation, maintenance, and examination requirements for storage of Diesel Engines and Appurtenances.

4.1.1 The diesel engine should be off-loaded onto hardwood blocks. The engine mounting flange must be supported by 50% of its area, equally spaced.

4.1.3 The engine should be completely tarped and the tarp securely fastened to its skid.

4.1.4 Quarterly inspections of the unit should be conducted to the following criteria:

4.1.4.1 Examine all engine cover plates for tightness and sealing ability.

4.1.4.2 Examine all heating elements.

4.1.4.3 Remove all of the engine side covers, two valve covers, and one camshaft gallery cover from each

side of the engine. Visually examine the internal areas for moisture, contaminants or any signs of deterioration.

Observe humidity indicators for signs of moisture. Indicators and desiccants should be replaced when inspection

indicates the necessity for replacement.

4.1.4.4 Examine gaskets for all covers removed and replace if any damage exists. Re-install covers.

4.1.4.5 Inspect the hardwood supports for any indication of settling. If settling has occurred during storage, supports should be replaced or adjusted as necessary.

4.1.4.6 Replace tarp and secure. Activate heating elements.

4.1.5 Annual inspections of the unit, in addition to the quarterly examinations should be performed to the following criteria:

4.1.5.2 Examine intake manifolds and turbochargers for deterioration. Clean and preserve as necessary.

4.2 On site preparation, maintenance, and examination requirements for storage of Generators and Generator appurtenances.

4.2.1 The generator must be stored under-cover in a dry, clean location, protected from low, rapid, extreme variations in temperature or humidity. Windings should be protected against rodents and termites. The windings should also be protected against sweating and freezing utilizing a safe and reliable heating system which should be adequate for keeping the temperature of the machine above the dew point of the surrounding area. Fac-

tory installed strip heaters should be energized during storage of equipment.

4.2.2 The equipment must be examined frequently and the windings meggered at periodic intervals.

C. E. Jones
9/16/77

RECEIVING INSPECTION PROCEDURE
DIESEL ENGINE/GENERATOR SETS

1. Scope.

1.1 Procedure for inspection and examination of Diesel Engine/Generator equipment for potential shipping damage prior to off loading and final storage.

2. Diesel Engine and Auxilliary Skid inspection requirements.

2.1 Upon arrival at job site the canvas tarp should be examined for tears, openings, or other deterioration. The location of any damage to the covering should be noted prior to removal to provide for examination of any equipment which may have been exposed as a result of this damage.

2.2 The tarp should be carefully removed to avoid catching header pipes, brackets, or other attachments.

2.3 Once the tarp is removed the equipment should be inspected visually for damage.

2.4 The equipment should be off-loaded onto hardwood blocks supporting 50% of the mounting flange area equally spaced. The tarp should be reinstalled and the equipment examined periodically to the requirements of the long-term storage procedure.

3. Generator Inspection Requirements.

3.1 Upon arrival at the job site each crate/container should be visually examined for shipping damage.

3.2 Equipment should be carefully removed from the container and the vapor proof barrier examined. If the

barrier is not found^W to be intact, then the stator or rotor should be megger tested to the manufacturers requirements prior to storage.

5.3 The generator must be stored and periodically examined in accordance with the recommended long term storage procedures.

 9/16/77
APPROVED: C. Renfro
Manager
Quality Engineering

RECEIVING INSPECTION CHECKLIST

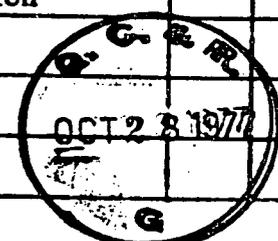
II RT 1.1.6.

DESCRIPTION: DIESEL ENGINE SYSTEM/STRUCTURE RT UNIT 1
DRIVEN GENERATOR SET TVA MK. NA
S/N 75081-2844 QTY 1 PC. PROJECT MK. KFFA
 ASME CLASS 1 QUALITY LEVEL I CLASS I E
 CLASS 2 QUALITY LEVEL II OTHER
 CLASS 3 ANSI B31.1
 SPECIFICATION TVA 2411 ITEM(S) NA

ASSIGNED STORAGE LEVEL: A B C D SHIPPING DAMAGE: YES NO

SPECIAL INSTRUCTIONS RECOMMENDED STORAGE
PROCEDURES FOR DIESEL GENERATOR SETS
COPY ATTACHED

INSPECTION REQUIREMENTS	SAT	UNSAT	N/A	SOURCE INSP. YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> If no		SAT	UNSAT	N/A
				perform the following:				
1 Identification & Marking	X			11	Physical Properties			
2 Mfg. Documentation	X			12	Chemical Properties			
3 Prot. Covers & Seals	X			13	Dimensions			
4 Coatings & Preservatives	X			14	Weld Preparations			
5 Inert Gas Blanket			X	15	Workmanship			
6 Desiccant			X	16	Lubricants & Oils			
7 Physical Damage	X			17	Electrical Insulation			
8 Cleanliness	X			18				
9				19				
10				20				



notes: VISUAL INSPECTED, REC. ONE DIESEL
ENGINE WITH OUT FLYWHEEL

ITEM ACCEPTED: YES NO IF NO NCR No. _____
 INSPECTOR Oscar Turner DATE 10/21/77

Contractor DELAVAL TURBINE INC.

TVA Contract 76K61-56181

Purchase Order NA s.o. 75081

Item

Release No. 5

Subcontractor NA Equipment DIESEL ENGINE TVA Project

Drawing & Rev. DAVAL GENERATOR SET BALTIMORE NUCLEAR PLANT

✓ DRAWING R-3940 (GENERATOR OUTLINE REV. 9.) Amt Released = 18 % Complete

Identification or Serial No. Amt Required =

 w/o SERIAL NO. 75081-2974

The equipment above is released by TVA Inspector. All boxes must be marked.
 N = Not applicable.
 R = Required.

X = Inspection made.
 C = Item requiring Contractor's QC representative clearance and signature prior to shipping.
 V = Verification of records.

- | DED | I&T | QA | QA | Reqd | Repr |
|--------------------------|-------------------------------------|----------------------|--|------|------|
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>MATERIAL</u> | <u>CERTIFICATION</u> | | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>NDE RECORDS</u> | <u>(SHAFT) UT/RT</u> | | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>VISUAL</u> | | | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>DIMENSIONAL</u> | <u>(INSPECTION OF BOLT HOLE LOCATIONS)</u> | | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>PRESSURE TEST</u> | | | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>NAME PLATE</u> | | | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>CLEANLINESS</u> | | | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>PACKAGING</u> | | | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>MARKING</u> | <u>(TAGS THROUGH ALL PERFORATIONS)</u> | | |

- | DED | I&T | QA | QA | Reqd | Repr |
|--------------------------|-------------------------------------|----------------------------------|----|------|------|
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>CERTIFICATE OF COMPLIANCE</u> | | | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>SPECIAL HANDLING</u> | | | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>SEISMIC</u> | | | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <u>PERFORMANCE TEST</u> | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | | | | |

Remarks (Deviations have been approved by the responsible TVA Engineer.):

QUALITY CONTROL RECEIVED
 OCT 3 1977
 T. J. ...

The undersigned hereby certifies that the equipment and/or material released meets all contractual requirements. Approved deviations, if any, are listed above by number.
 Contractor's QAR C. Baker Title QC Manager Date 9/27/77

The TVA inspector's approval for shipment of the above described equipment and/or material is subject to the provisions of the contract concerning inspection and, notwithstanding such approval, the contractor is in no way released from complying with all provisions of the contract.
 Inspector Salvador E. Martinez Title NAT'L INSPECTION Date 9/29/77

- Distribution:
- 1 - Knoxville I&T
 - 2 - To project
 - 3 - Inspector's field office file

1

TVA 1140C (DES-3-68)

TENNESSEE VALLEY AUTHORITY

TVA Contract 76K61-86181

This form is to be used only for succeeding pages along with TVA form No. 1140A as page 1.

Inspection and Testing Branch

Contractor Delaval Turbine, Inc.

INSPECTION REPORT

Subcontractor _____

Report No. 16 Date 9-28-77

THIS REPORT FOR USE INSIDE TVA ONLY

Page 2 of 3

without the flywheel. Reason given for shipment without flywheel was that the flywheel for this engine was being used on another engine for another customer. A new flywheel was being manufactured for TVA. Writer reviewed copies of data package and found them to be acceptable.

INSPECTION: GENERATOR ASSEMBLY

Visual and dimensional inspections were conducted on the rotor and stator. These two (2) components will ship separately. Inspection for cleanliness, name plate and markings were also made. After minor clean up in the stator terminal box all inspections were satisfactory.

PACKAGING: Stator and rotor will be completely packaged in foil with desiccative bags, vacuum induced into package and package is thermally sealed. Entire component is then packaged in wood container. Writer witnessed rotor packaging up to the vacuum seal.

Due to the rework that will take place on the off-skid components, the update status report will change. Writer will attempt to get a more accurate report. Also changing the status will be the rework on equipment from Thermexchanger (lube oil coolers, J.W. coolers, etc.). Writer was advised that Thermexchanger has just submitted a rework procedure and Delaval Engineering will review and if acceptable forward to TVA for approval.

Writer was advised by Delaval Engineering that the TVA test reports will be ready in three (3) weeks.

As told by E. Aquilino

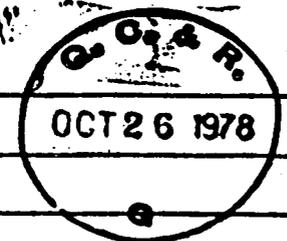
RECEIVING INSPECTION CHECKLIST

BNP-QCP-1.1 R4
Attachment A

DESCRIPTION: DIESEL ENGINE + SYSTEM/STRUCTURE RT UNIT 2
FLYWHEEL FOR EMERGENCY TVA MK. N/A
GENERATOR SYSTEM QTY 1 EA PROJECT MK. KFFA-93+KFFA91
 ASME CL. 1 ASME CL.2 ASME CL.3 VENDOR MK. 75082-2845
 QUALITY LVL I QUALITY LVL II CONTRACT 86181
 CLASS I ANSI B31.1 OTHER ITEM(S) N/A
 SPECIFICATION TVA-2411
 ASSIGNED STORAGE LEVEL: A B C D SHIPPING DAMAGE: YES NO
 SPECIAL INSTRUCTIONS NONE

INSPECTION REQUIREMENTS	SAT	UNSAT	N/A	SOURCE INSP. YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> If no		
				SAT	UNSAT	N/A
1 Identification & Marking	<input checked="" type="checkbox"/>			11	Physical Properties	
2 Mfg. Documentation	<input checked="" type="checkbox"/>			12	Chemical Properties	
3 Prot. Covers & Seals	<input checked="" type="checkbox"/>			13	Dimensions	
4 Coatings & Preservatives			<input checked="" type="checkbox"/>	14	Weld Preparations	
5 Inert Gas Blanket			<input checked="" type="checkbox"/>	15	Workmanship	
6 Desiccant			<input checked="" type="checkbox"/>	16	Lubricants & Oils	
7 Physical Damage	<input checked="" type="checkbox"/>			17	Electrical Insulation	
8 Cleanliness	<input checked="" type="checkbox"/>			18		
9				19		
10				20		

Notes: ENGINE S/N 75082-2845



ITEM ACCEPTED: YES NO If no QCIR No. _____
 INSPECTOR Robert Turner DATE 10-20-78

Contractor LAVAL

TVA Contract 72K81-54181

Purchase Order S.O.

Item

Release No.

Subcontractor N/A Equipment TVA Project

Drawing & Rev. R3970 Amt Released = 2.244 % Complete

Identification or Serial No. 1 ea DIESEL ENGINE W/FLYER SN 75006-2345

The equipment above is released by TVA Inspector. All boxes must be marked.
N = Not applicable.
R = Required.

X = Inspection made.
C = Item requiring Contractor's QC representative clearance and signature prior to shipping.
V = Verification of records.

DED	I&T	QA	QA	Reqd	Repr
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<u>MATERIAL CERTIFICATION</u>					
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<u>NDE RECORDS (SHEET)</u>					
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<u>VISUAL</u>					
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<u>DIMENSIONAL</u>					
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<u>PRESSURE TEST</u>					
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<u>NAME PLATE</u>					
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<u>CLEANLINESS</u>					
<input type="checkbox"/>	<input type="checkbox"/>				
<u>PAINT</u>					
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<u>MASKING</u>					

DED	I&T	QA	QA	Reqd	Repr
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<u>CERTIFICATE OF COMPLIANCE</u>					
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<u>SPECIAL HANDLING</u>					
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<u>SEISMIC RECORDS</u>					
<input type="checkbox"/>	<input type="checkbox"/>				
<u> </u>					
<input type="checkbox"/>	<input type="checkbox"/>				
<u> </u>					
<input type="checkbox"/>	<input type="checkbox"/>				
<u> </u>					
<input type="checkbox"/>	<input type="checkbox"/>				
<u> </u>					

Remarks (Deviations have been approved by the responsible TVA Engineer.):

The undersigned hereby certifies that the equipment and/or material released meets all contractual requirements. Approved deviations, if any, are listed above by number.

Contractor's QAR Title Date

The TVA inspector's approval for shipment of the above described equipment and/or material is subject to the provisions of the contract concerning inspection and, notwithstanding such approval, the contractor is in no way released from complying with all provisions of the contract.

Inspector Title Date

- Distribution:
- 1 - Knoxville I&T
 - 2 - To project
 - 3 - Inspector's field office file



DELAVAL ENGINE
AND COMPRESSOR DIVISION
550 - 85TH AVENUE
OAKLAND, CALIF. 94621

PACKING LIST

SHEET NO. _____ OF _____ SHEETS

SHIPPED TO: Tennessee Valley Authority
Bellefonte Nuclear Plant
Hollywood, Alabama

DATE SHIPPED: _____
SHIPPING TAG NO. _____
OUR JOB NO. 2845-75082
CUST. ORDER NO. _____

via Southern Pacific
Route SP-SSW-Southern

MARKS:

QTY.	DESCRIPTION	H.	W	L	BOX NO. OR PIECE NO.	EXPORT INFORMATION		
						GROSS WEIGHT	NET WEIGHT	CL MEAS
	On Rail Car No. SP-500519							
1	Diesel Engine Serial No. 75082-2845					240,000#	Est.	
1	Flywheel					9,000#	Est.	

10-17-78

RECEIVING INSPECTION CHECKLIST

BNP-QCP-1.1 R4
Attachment A

DESCRIPTION: DIESEL GENERATOR
MOTOR & FLYWHEEL

SYSTEM/
STRUCTURE RT UNIT 2

TVA MK. N/A

QTY 1 & 1

PROJECT MK. KFEA-93 & KFEA-91

ASME CL. 1 ASME CL. 2 ASME CL. 3
QUALITY LVL I QUALITY LVL II
CLASS IE ANSI B31.1 OTHER

VENDOR MK. N/A

CONTRACT 86181

SPECIFICATION TVA 2411

ITEM(S) N/A

ASSIGNED STORAGE LEVEL: A B C D

SHIPPING DAMAGE: YES NO

SPECIAL INSTRUCTIONS NDNE

INSPECTION REQUIREMENTS		SAT	UNSAT	N/A	SOURCE INSP. YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> If no	SAT	UNSAT	N/A
					perform the following:			
1	Identification & Marking	<input checked="" type="checkbox"/>			11	Physical Properties		
2	Mfg. Documentation	<input checked="" type="checkbox"/>			12	Chemical Properties		
3	Prot. Covers & Seals			<input checked="" type="checkbox"/>	13	Dimensions		
4	Coatings & Preservatives			<input checked="" type="checkbox"/>	14	Weld Preparations		
5	Inert Gas Blanket			<input checked="" type="checkbox"/>	15	Workmanship		
6	Desiccant			<input checked="" type="checkbox"/>	16	Lubricants & Oils		
7	Physical Damage	<input checked="" type="checkbox"/>			17	Electrical Insulation		
8	Cleanliness	<input checked="" type="checkbox"/>			18			
9					19			
10					20			

Notes: SN # 75083-2846



ITEM ACCEPTED: YES NO If no QCIR No. _____

INSPECTOR Charles D. Tucker DATE 11-8-78

Contractor _____

TVA Contract _____

Purchase Order _____ S.O. _____

Item _____

Release No. _____

Subcontractor _____

Equipment _____

TVA Project _____

Drawing & Rev. _____

$\frac{\text{Amt Released}}{\text{Amt Required}} = \text{_____} \square \% \text{ Complete}$

Identification or Serial No. _____

The equipment above is released by TVA Inspector. All boxes must be marked.
 N = Not applicable.
 R = Required.

X = Inspection made.
 C = Item requiring Contractor's QC representative clearance and signature prior to shipping.
 V = Verification of records.

DED	I&T	QA	QA	Reqd.	Repr
<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>				
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<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>				

DED	I&T	QA	QA	Reqd.	Repr
<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>				
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<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>				

Remarks (Deviations have been approved by the responsible TVA Engineer.):

The undersigned hereby certifies that the equipment and/or material released meets all contractual requirements. Approved deviations, if any, are listed above by number.

Contractor's QAR _____ Title _____ Date _____

The TVA inspector's approval for shipment of the above described equipment and/or material is subject to the provisions of the contract concerning inspection and, notwithstanding such approval, the contractor is in no way released from complying with all provisions of the contract.

Inspector _____ Title _____ Date _____

- Distribution:
- 1 - Knoxville I&T
 - 2 - To project
 - 3 - Inspector's field office file

CERTIFICATE OF COMPLIANCE

TO: Tennessee Valley Authority
Bellefonte Nuclear Plant
Holly wood, Alabama

Attention: Chief Steve Kagan

REFERENCE: PURCHASE ORDER NUMBER TKW-8481

SUPPLIER: Delaval Turbine, Inc.

WE HEREBY CERTIFY THAT THE PRODUCTS OR SERVICES FURNISHED ON THE REFERENCED PURCHASE ORDER MEET THE REQUIREMENTS OF THE APPLICABLE DRAWINGS AND/OR SPECIFICATIONS.

- PARTS LISTED ON THE ATTACHED PACKING LIST ARE SPECIFICALLY COVERED BY THIS CERTIFICATE.
- PARTS LISTED BELOW ARE SPECIFICALLY COVERED BY THIS CERTIFICATE.
- DOCUMENTATION IN MANUFACTURERS FILE TO BE SUBMITTED AS REQUIRED AT A LATER DATE.
- DOCUMENTATION ATTACHED/SHIPPED SEPARATELY.

Dean W. Wolfe 10-12-78
DELAVAL REPRESENTATIVE DATE
MANAGER Quality Engineering -

CUSTOMER REPRESENTATIVE DATE

PURCHASE ORDER NUMBER

TKW-8481

ATTACHMENT C

E74164.05

MEB '84 0316 512

March 9, 1984

Tennessee Valley Authority
400 West Summit Hill Drive
W7C126 C-K
Knoxville, Tennessee 37902

Attention: Mr. C. A. Chandley

Subject: Bellefonte Nuclear Plant
Standby Diesel Generators DSRV-16-4
Units S/N 75080/83
Contract 76K61-86181

Reference: Your letter No. 42-420 of March 5, 1984
to Mr. David Wulf (Re: Product Improvements)

Enclosed, please find a copy of Drawing No. 102632 which has been recently developed as a result of customer request for this product improvement. This drawing in conjunction with the Turbocharger and Intercooler Brackets Assembly Drawing No. 02-475-22 can be utilized by field personnel to facilitate generic installation instructions in accordance with the requirements of The Instruction Manual, Volume . . . Because of the likelihood of lube oil piping interference the shield assembly would most likely require notching to allow proper installation around the upper lube oil supply pipe and flange connection (Reference Drawing No. 02-465-21 Item 43).

In addition to the shield assembly we have compiled a list of other product improvements that are applicable to the diesel units at the Bellefonte site which may be of particular interest to the Utility;

1. Spray Shield Assembly

Spray shield should be incorporated to isolate the front fuel oil crossover header and connections from the turbocharger exhaust gas inlet in order to prevent a fire, in the event spray from a broken fuel oil or lube oil line is directed to these hot surfaces. In addition to the shield assembly, it is also recommended that a pipe flange shield be installed on the upper flange of the lube supply pipe to accessories and rocker headers. This pipe flange can be identified as part of item 43 on the attached drawing 02-465-21. The pipe flange safety shield can be purchased through our Parts Sales Department, identified as P/N CL-042-007.

MEB
MAR 10 1984
CAC
GPE
HGS
FGG
JAH
CEG
FSG
JPL
TIN
BWPE
PWPE
WBPE
BLPE
DNPE
FDPE
HDPE
IRPE

MEDS, WSB63 C-K

MEB. MASTER FILE

10410-20

Additional components for installation of the shield assembly are:

<u>Qty</u>	<u>Part No.</u>	<u>Description</u>
1	02-475-22-AW	Shield, Spray
5	02-475-22-AQ	Support, Spray Shield
1	02-475-22-AU	Shield, Spray
1	02-475-22-AT	Shield, Spray
10	GB-001-117	Capscrew, Hex. Hd. - 5/8-11 X 1-1/4 Lg.
6	GB-034-006	Nut, Hex. - 5/8-11
10	GB-001-115	Capscrew, Hex. Hd. - 5/8-11 X 7/8 Lg.
3	GB-001-046	Capscrew, Hex. Hd. - 3/8-16 X 1/2 Lg.

2. Fuel Injection Pump Return Line (released for factory production, June 1982).

The injection pump return line has been redesigned to provide a line less susceptible to damage during engine maintenance and installation. This line also reduces the possibility of fuel spray which could potentially cause a fire should a failure occur. The new tube P/N is 102507 and is used with clamp P/N CK-006-003.

3. Piston Assembly (released for factory production, September 1982).

The piston has been changed from a full stack "Belleville" washer to a half stack "Belleville" washer arrangement with modification to the pin bosses, roof and ribbings of the skirt, and to the piston crown for optimum strength versus weight. The piston skirt plating now incorporates a copper flash procedure prior to the tin plate operation to improve the bond between the plating and the skirt.

Note: This product improvement automatically incorporates the piston crown, head land cutback (S.I.M. 350).

- 3A Piston Crown Cutback (released for factory production, January 1981).

The O.D. of the piston crown above the first ring groove is cutback from 16.880/16.875 inches to 16.785/16.775 inches. This improvement is effective on all new "R" and "RV" piston crowns sold. This modification will improve lube oil consumption

March 9, 1984
Tennessee Valley Authority
Page 3

lube oil filter life, and reduce piston ring/liner wear by minimizing carbon buildup. This improvement is most effective on continuously running engines.

4. Fuel Injection Nozzle Tip (released for factory production June 1983).

The spray angle has been changed from 140° to 135° to promote better combustion and improve cylinder liner life by reducing fuel spray impingement. This improvement is effective on all new nozzle tips sold. The P/N of the new tip (135°) is HD-004-000. We recommend that all nozzle tips installed in any one engine be of the same angle. Therefore it is important to record nozzle tip spray angles as well as pop pressure when maintenance is performed on the injectors.

5. Shrouded Fuel Lines

Shrouded fuel lines, long a standard in the marine industry, have recently been incorporated on nuclear jobs. These lines will contain fuel spray in the event of a ruptured fuel injection line; preventing the spray from potentially causing a fire prior to the diesel being safely shut down. The P/N of the shrouded fuel line is 03-365-03-AD.

6. Friction Welded Push Rods (released for factory production, November 1983).

TDI has developed a friction welded push rod to replace the present ball and tube push rod. This new design promotes optimum weld quality. The new push rod P/N's are 02-390-06-AB and 02-390-07-AG.

7. Piston Pin Retaining Ring (released for factory production, March 1982).

The piston pin retaining ring has since been redesigned from a spiral type ring to a snap ring to provide a ring less susceptible to damage during maintenance and to facilitate ease of assembly. The new snap ring P/N is GE-003-067. Also, pliers for use with this snap ring is AR-050-008.

March 9, 1984
Tennessee Valley Authority
Page 4

Please do not misinterpret our Product Improvement Program to be a Product Correction Program as this is not the case. When we facilitate an improvement to a part or component it does not imply that the previous design was inadequate for the intended purpose.

Price and delivery quotation can be obtained on request through our Parts Sales Department.

If this office can be of further assistance, please do not hesitate to contact us.

Very truly yours,


Lee Duck
Engineer, Customer Service

LD:dmh

cc: A. T. Olssen - Atlanta

Enclosures: Dwgs 02-465-21
102632

MED '84 U41 / 247

CHANGE OF CONTRACT

(THIS BLOCK TO BE COMPLETED BY TVA)

Address all communication except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Telex 55-8417 Telephone 615-755-3011

ANSWERBACK-TVAPURTRFCTA

Telecopier 615-755-3214

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence.

VENDOR CODE 010410-01	STATE OR COUNTRY CODE 04	TVA REFERENCE NO. 77K61-86181	CHANGE NO 31
BUYING CODE L A	COMMODITY CODE 6115-B	CHANGE AMOUNT \$ plus 4194.00	
VENDOR REFERENCE NO.		CHANGE DATE 4-11-84	PERFORMANCE DATE ★
ACCOUNT NO. N4 39			
PROJECT Bellefonte Nuclear Plant			

TO _____

Transamerica Delaval, Inc.
 Engine and Compressor Division
 3379 Peachtree Road, NE
 Atlanta, GA 30326

EMERGENCY DIESEL ENGINE
DRIVEN GENERATORS

ADD:

A.	75080-115-06	Switch	3 each	342.00	\$1,026.00
B.	74080-115-07	Valve	3 each	581.00	1,743.00
C.	74080-115-08	Valve	3 each	475.00	1,425.00
					\$4,194.00

MEB
APR 18 1984
CAC
GPC
HCG
TAT 4/18
FGG
DEB 4/18
FSG
JPL WRC
TIN YOM 4-11-84
BWPE
PWPE
WEPE
BLPE
DNPE
FDPE
HDPE
IRPE

F. O. B. Oakland California
 Ship prepaid U.P.S. and add charges to your invoice.

*Performance date - this change only June 4, 1984.
 A certificate of compliance will be furnished for each item.
 Payment in full by U. S. Treasury check mailed with 30 days of the receipt of
 the material or receipt of the invoice which ever is later.
 In accordance with Sandra K. Savage's letter to J. Marcel Anderson dated
 March 8, 1984.

MAILED - PURCHASING
 APR 13 1984

Referenced to memo from C. A. Chandley to J. Marcel Anderson dated March 26, 1984

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total \$7,074,975.23

SPECS 16

Correct Total \$7,079,169.73

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

By *J. Marcel Anderson*
 J. Marcel Anderson Purchasing Agent
 /sar

TVA 394 (DP-7-80)

Contractor

Contract File

MEB. MASTER FILE

Requisitioner (2)

MED '84 0327 504

CHANGE OF CONTRACT

Address all communication except invoices to
TENNESSEE VALLEY AUTHORITY
 DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Telex 55-8417 Telephone 615-755-3011

ANSWERBACK-TVAPURTRFCTA

Telecopier 615-755-3214

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence.

(THIS BLOCK TO BE COMPLETED BY TVA)

VENDOR CODE 010410-01	STATE OR COUNTRY CODE 0A	TVA REFERENCE NO. 77661-86181	CHANGE NO. 30
BUYING CODE	COMMODITY CODE 6115-E	CHANGE AMOUNT \$ Plus 99,719.00	
VENDOR REFERENCE NO.	CHANGE DATE 3/20/84	PERFORMANCE DATE 4/17/84	
ACCOUNT NO. NA 39			
PROJECT Bellefonte Nuclear Plant			MEB

840402X0079 (1)

TO

Transamerica Delaval, Inc.
 Engine and Compressor Division
 3379 Peachtree Road, NE
 Atlanta, GA 30326

EMERGENCY DIESEL ENGINE
DRIVER GENERATORS

This change is written to cover the repair of the four Woodward Governor actuators and one EGA control box inspection in accordance with change 27.

Part	Price
<u>EGA Control Box Actuators</u>	<u>\$105.00</u>
S/N 1402056	\$2,565.00
1402057	2,410.00
1402058	2,475.00
1402059	2,460.00

MEDS, W5B63 C-K

Total for examination and repair of governors ————— \$10,015.00

The above prices include cost for examination added by change 27, therefore there will be no billing against change 27 ————— credit ————— 300.00

*This change only.

MAILED-PURCHASING

MAR 26 '84

Ref: Lonnie S. Cox's memo to J. Marcel Anderson dated March 12, 1984.

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total	\$7,065,260.23	SPECS 16	TENNESSEE VALLEY AUTHORITY
Correct Total	\$7,074,975.23		Division of Purchasing
			By <u>J. Marcel Anderson</u>
			Purchasing Agent
			(61) J. Marcel Anderson/mag

TVA 394 (DP-7-80)

Contractor
 Auditor

Contract File
 Agent
LINE BRISON

Accounting Office
 Consignor

Registrator (2)
 Plant Accounting

20

0 9 7 4

MED '84 0224 509

CHANGE OF CONTRACT

Address all communication except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Telex 85-8417 Telephone 615-759-3011

ANSWERBACK-TVAFURTRFCTA

Teletype 615-759-2514

CONTRACT NUMBER must be shown on all
 invoices, orders, shipping orders and
 correspondence.

(THIS BLOCK TO BE COMPLETED BY TVA)			
VENDOR CODE 010410-01	STATE OR COUNTRY CODE 06	TVA REFERENCE NO. 77661-25181	CHANGE NO. 29
BUYING CODE	COMMODITY CODE 6115	CHANGE AMOUNT \$ Plus \$3,082.00	
VENDOR REFERENCE NO.		CHANGE DATE 2/27/84	PERFORMANCE DATE See Below
ACCOUNT NO.			
PROJECT Bellafonte Nuclear Plant			

840229X0106

**EMERGENCY DIESEL ENGINE
 DRIVEN GENERATORS**

TO
Transamerica Delaval, Inc.
Engine and Compressor Division
3379 Peachtree Road, NE
Atlanta, GA 30326

1. Add

1 only

75080-124-01 Annunciator Power Supply Ronan
 Model No. 125-24-124-300N - including a
 Certificate of Compliance Lamp Sum - \$3,082.00

In accordance with Sandra K. Savaga's
 letter dated December 13, 1983.

**2. Correct the "Correct Total" shown on Change 27 to read
 \$7,054,170.23 and reflect that correction on Change 28
 and on the "Previous Total" shown below on this change.****

*Performance date this change only - May 16, 1984.

MAILED - PURC

FEB 23 '84

Refer to C. A. Chandley's memo to J. M. Anderson dated Feb. 13, 1984.

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

SPECS 16		TENNESSEE VALLEY AUTHORITY
		Division of Purchasing
Previous Total	\$7,062,176.23	By <i>J. Marcal Anderson</i> Purchasing Agent (61) J. Marcal Anderson/mag
Correct Total	\$7,065,260.23	

TVA 394 (DP-7-80)

Contractor
Auditor

Contract File
Purchasing A File

Accounting Office
Consignee

Requisitioner (31)
Plant Accounting

0 9 4 4

MED 84 0201 508

CHANGE OF CONTRACT

ADDRESS OF ORGANIZATION ORDER INVOLVED IN
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
Chattanooga, Tennessee 37401

TELE: 86-6417 TELETYPE: 615-750-0611

AGREEMENT-TVA/UNT/PCTA

TELETYPE: 615-750-0614

CONTRACT NUMBER must be shown on all
invoices, packages, shipping orders and
correspondence.

VERSION CODE 010410-01	STATE OR COUNTRY CODE 04	TVA REFERENCE NO. 76851-06181	ISSUE NO 28
BUYING CODE L A	COMMODITY CODE 6115E	CHANGE AMOUNT \$ Plus 8,000.00	
VERSION REFERENCE NO.	CHANGE DATE 1/30/84	PERFORMANCE DATE *See Below	
ACCOUNT NO. 84 39			
PROJECT Balfonte Nuclear Plant			MEB

84020680039

① ~~MEB, WBS, PK~~

TO
Transamerica Daleval, Inc.
Engine and Compressor Division
1379 Peachtree Road, N.E.
Atlanta, Georgia 30326

EMERGENCY DIESEL ENGINE-
DRIVEN GENERATORS

Add

Automatic voltage regulator reset package including all the
necessary hardware and drawing changes with markups for
field installation.

4 each at \$2,002.00

\$8,008.00

Services of KIK/Delta Service Representative if required will
be in accordance with Special Condition, "Services of Contractor's
Engineers and/or Mechanics", at a rate of \$775.00 per day. Travel
and living expenses shall be at cost to Transamerica Daleval plus
30 percent.

In accordance with Michael Dowlin's letter dated December 21,
1983.

*Performance data - this change only - May 7, 1984.

MARKET PURCHASING

JAN 31 '84

(Refer to C. A. Chandley's memo to J. Marcel Anderson dated January 24, 1984.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

SPECS 16

Previous Total \$7,054,270.23

Correct Total \$7,062,278.23

TENNESSEE VALLEY AUTHORITY
Division of Purchasing

By *J. Marcel Anderson*
(61) J. Marcel Anderson, Purchasing Agent
/s/

TVA 394 (DP-7-80)

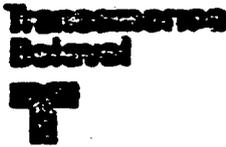
Contractor
Address

Contract File
LINDA MORRISON

Accounting Office
Comments

Responsible (S)
Plant Accounting

20



Transamerica Delaval Inc.
Engine and Control Division
850 8th Avenue
P O Box 2181
Oakland California 94621
(415) 677-7600

1/5/84-plb-cc: CAB, 29088 C-K
Mr. A. Gansley, WDC126 G-E
I. S. Cor. Bellefonte NP CONST
Reg. Staff, 400 CST2-C

*Please give us your recommendation.

December 21, 1983

840111T0130 (1)

MEB:01 06 505

Tennessee Valley Authority
640 Commerce Union Bank Building
Chattanooga, Tennessee 37401

Attn: Mr. J. Marcal Anderson

Subj: Automatic Voltage Regulator Reset Package;
Contract 76K61-86181; Bellefonte Nuclear Plant;
PA letter no. 36 dated May 9, 1983

Dear Mr. Anderson;

To accommodate your automatic voltage regulator reset package, one Agastat 7000 series time delay and one six-pole contact ARD relay would be furnished per panel. Price of this modification is \$2,002.00 for each panel for a total of \$8,008.00. This price includes all necessary hardware and drawing changes with markups for field installation.

Upon request, an KIZ/Delta Service Representative can be available to install this modification at a service rate of \$775.00 per day. Travel and living expenses will be invoiced at cost plus 30 percent. Estimated time required to complete this modification is one week per panel for a total of 20 working days. We require 12 to 14 weeks from receipt of order to complete drawing revisions and acquire all necessary materials.

Please note that this quotation does not include any qualification effort as equipment under the original contract was not bound to the present IEEE 323 requirements. Transamerica Delaval, Inc. is not responsible for any seismic re-qualifications. However, we feel that this modification is minor in aspect and will have no impact on the present seismic integrity of the control cabinets.

If you have any questions regarding this quotation, please do not hesitate to call me at (415) 577-7602.

Sincerely,

Michael Donlin

Michael Donlin
Parts Sales Analyst

cc: Ted Olson - Atlanta Ofc

MD/lap

NYM-20

<input checked="" type="checkbox"/>	X MDR: 118263C-K
<input type="checkbox"/>	F. A. Stone; 304 ESTC-K
<input type="checkbox"/>	G. L. Buchanan; WDC126C-K
<input type="checkbox"/>	R. M. Madson; 1117 ISAK-K
<input type="checkbox"/>	O. P. Thomson; 102 SPT K
<input type="checkbox"/>	J. E. Hester; W73734-K
<input type="checkbox"/>	J. C. Standler; 701 CS-K
<input type="checkbox"/>	J. P. Vinograd; 701 CS-K
<input type="checkbox"/>	G. R. Hall; 6204 AL3-K
<input type="checkbox"/>	X Mech. Engr. Br. Manier FCS

JAN 03 1984

CHANGE OF CONTRACT

THIS CONTRACT IS SUBJECT TO THE TERMS AND CONDITIONS OF THE ORIGINAL CONTRACT AND PREVIOUS CHANGES OF CONTRACT (IF ANY). ALL OTHER TERMS AND CONDITIONS OF THE ORIGINAL CONTRACT AND PREVIOUS CHANGES OF CONTRACT (IF ANY) SHALL APPLY.

Telephone 615 755 3211

TELETYPE 615 755 3214

CONTRACT NUMBER must be shown on all invoices, packages, shipping orders and correspondence.

MEB 83 0920 516

PROJECT NAME	04	7001-00101	27
ISSUE DATE	01/29	FILE	700 00
ISSUE REFERENCE NO.		9/16/83	*See Below
ACCOUNT NO.	04 1 29		
PROJECT	Bellefonte Nuclear Plant MEB		

TO
Transmission Delevel, Inc.
Engine and Compressor Division
3379 Peachtree Road, N.E.
Atlanta, Georgia 30326

830921C0282

EMERGENCY DIESEL ENGINE-DRIVEN GENERATORS

Inspect four Woodward Governor Actuators and one Woodward EGA Control and quote on any necessary repairs and/or recalibrations.

Lump Sum \$300.00

The lump sum inspection charge shall be credited against any repair costs.

Shipment to Woodward shall be on Government Bills of Lading. Return shipment shall be prepaid with charges added to the invoice as a special item. Return shipment shall be to the destination specified in the original contract.

MEDS W5863 C-K

In accordance with A. T. Olsson's letter dated September 6, 1983.

*For this change only - by January 1, 1984.

MAILED-PURCHASING

SEP 19 '83

(Refer to C. A. Chandley's memo to J. Marcel Anderson dated May 25, 1983).

All other terms and conditions of the original contract and previous changes of contract (if any) shall apply.

Previous Total **\$7,055,870.23**

SPECS 16

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

Correct Total **\$7,056,270.23**

(61) *J. Marcel Anderson*
J. Marcel Anderson, Purchasing Agent
 /plb

TVA 1984 (CP) 1-001

Contracting
 Auditor

Contract File
 Purchasing & Proc.

Accounting Office
 Contracting

Administrative Liaison
 Audit Accounting

CHANGES OF CONTRACT

MEB 83 0831 515

TO: [REDACTED]	DATE: 8/23/83
BY: [REDACTED]	TIME: 10:00 AM
Ballfante Nuclear Plant	

MEB

830906A0073

①

Transamerica Delaval, Inc.
 Engine and Compressor Division
 3379 Peachtree Road, N.E.
 Atlanta, Georgia 30326

EMERGENCY DIESEL ENGINE-DRIVEN GENERATORS

Add:

Repair and place in first class condition Lube Oil pump sent to Delaval for examination and repair April 13, 1983 on TVA's shipping ticket C-228364 (Delaval RNR 9565)

Lump Sum \$6070.00

The old casing is to be disposed of by Delaval.

F.O.B. Oakland, California. Transportation charges shall be prepaid and added to your invoice as a separate item.

In accordance with Susan Knisner's letter dated April 4, 1983 and A. T. Olsson's letter of July 7, 1983.

*Contract performance date (this change only) - September 1, 1983

MEB 83 0831 515

This confirms the telephone order for this repair given to A. T. Olsson on July 7, 1983.

MAILED-PURCHASING

83 26 83

(Refer to Lonnie S. Cox's memo to J. Marcel Anderson dated August 16, 1983)

All other terms and conditions of the original contract and previous changes of contract (if any) shall apply.

Previous Total \$7,047,008.23

Specs 18

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

Current Total \$7,833,870.23

J. Marcel Anderson
 (61) J. Marcel Anderson

20

CHANGES OF CONTRACT

MED 83 0819 521

04	70801-08181	25
81138	Plan 3,082.00	
	8/17/83	*See Below
California Nuclear Plant Units 1 and 2		

TO
Transamerica Delaval, Inc.
 Engine and Compressor Division
 3379 Peachtree Road, N.E.
 Atlanta, Georgia 30326

830822F0386 ①
**EMERGENCY DIESEL ENGINE-
 DRIVEN GENERATORS**

Add
 Annunciator, Part No. 75080-124-01 1 Only For \$3,082.00
 Complete with Certificate of Compliance.

*Contract Performance Date (this change only) - October 10, 1983
 P.O.B. Oakland, California. Ship prepaid UPS and add to invoice.
 In accordance with Sandra K. Savage's letter dated July 22, 1983.

MAILED - PURCHASING
 AUG 18 '83
 MEDS W5863 C-K

(Refer to Lonnie S. Cox's memo to J. M. Anderson dated August 4, 1983).
 This was coordinated with Bill Eastler.

Amount	\$7,044,718.23
	\$7,047,800.23

(s) J. Marcel Anderson

MED '83 0524 511

CHANGE OF CONTRACT

(THIS BLOCK TO BE COMPLETED BY TVA)

Address all communication except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Tel: 615-8437 Telephone 615-789-3211

ANSWERBACK-TVA PURTRPCTA

Teletype 615-789-3214

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence.

VENDOR CODE	STATE OR COUNTRY CODE	TVA REFERENCE NO.	CHANGE NO
	04	76K61-86181	24
BUYING CODE	COMMODITY CODE	CHANGE AMOUNT	
L A	6115-R	Plus 22,030.60	
VENDOR REFERENCE NO.	CHANGE DATE	PERFORMANCE DATE	
ACCOUNT NO.			
84 39			
PROJECT			
	Bellefonte Nuclear Plant Units 1 and 2		

TO Transamerica Delaval, Inc.
 Engine And Compressor Division
 3379 Peachtree Road, N.E.
 Atlanta, Georgia 30326

830526C0173

EMERGENCY DIESEL ENGINE-
 DRIVEN GENERATORS

DESIGN CHANGE

Add:

	Unit Price	Amount
a. 2 each ED-015-000 Lube Oil Heater	\$3,974.00	\$ 7,948.00
b. 4 each ED-017-000 Jacket Water Heater	3,520.65	14,082.60
	Lump Sum	\$22,030.60

F.O.B. Oakland, California. Ship prepaid UPS and
 add transportation charges to your invoices.

In accordance with Susan Kaiser's letter dated April 25,
 1983 except that the terms and conditions of this contract
 apply except as noted above.

MAILED - PURCHASING

MAY 19 '83

(Refer to C. A. Chandley's memo to J. Marcel Anderson dated May 11, 1983).

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total \$7,022,657.63

Specs 16

TENNESSEE VALLEY AUTHORITY

Division of Purchasing

Correct Total \$7,044,718.23

(61)

J. Marcel Anderson
 J. Marcel Anderson
 Purchasing Agent

/plb

TVA 204 (OP-7-80)

Contractor
 Auditor

Contract File
 Purchasing A.F. #

Accounting Office
 Computer

Department (2)
 Dept Accounting

20

MED '82 1217 525

CHANGE OF CONTRACT

(THIS BLOCK TO BE COMPLETED BY TVA)

Address all communication except invoices to
TENNESSEE VALLEY AUTHORITY
 DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

T 55-8417 Telephone 615-755-3011

ANSWERBACK-TVAPURTRFCTA

Teletypewriter 615-755-3214

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence.

VENDOR CODE	STATE OR COUNTRY CODE	TVA REFERENCE NO.	CHANGE NO.
	04	76K61-86181	23
BUYING CODE	COMMODITY CODE	CHANGE AMOUNT \$	
L A	6115-E	Plus 3,274 00	
VENDOR REFERENCE NO.		CHANGE DATE	PERFORMANCE DATE
		12/14/82	*
ACCOUNT NO.			
N4 39			
PROJECT			
Bellefonte Nuclear Plant Units 1 and 2			

TO
Transamerica Delaval, Inc.
 Engine and Compressor Division
 3379 Peachtree Road, N.E.
 Atlanta, Georgia 30326

EMERGENCY DIESEL
 ENGINE-DRIVEN GENERATORS

MED '82 1217 525
 CAC
 FSG
 FSG
 SKZ
 JPL
 TIN

Add the following items:

- | | | |
|---|-----------------|-------------------|
| a. Dowel Pin with Nut, Portec Part No. 70053-8 | 8 each \$ 76.75 | \$ 614.00 |
| b. Dowel Pin with Nut, Portec Part No. 70053-10 | 8 each \$153.50 | \$1,228.00 |
| c. Dowel Pin with Nut (Insulated), Portec Part No. A49794-A-1 | 8 each \$179.00 | \$1,432.00 |
| | | \$3,274.00 |

Performance date for this change only - By December 30, 1982.

F.O.B. Oakland, CA, ship prepaid UPS and add transportation charges to your invoice.

In accordance with Sue Kaisner's telex dated November 23, 1982.
 (Confirming telephone award - Do Not Duplicate).

Refer to Lonnie Cox's memo to R. M. Hodges dated December 7, 1982.

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total \$7,014,453.63

Specs 16

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

Correct Total \$7,022,687.63

By Marcel Anderson
 (61) J. Marcel Anderson, Purchasing Agent

N4m-20
 20

MED '82 0820 511

CHANGE OF CONTRACT

(THIS BLOCK TO BE COMPLETED BY TVA)

Address all communication except invoices to
TENNESSEE VALLEY AUTHORITY
 DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Telex 55-2417 Telephone 615-755-3011

ANSWERBACK-TVAPURTRPCTA

Teletypewriter 615-755-3214

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence.

VENDOR CODE	STATE OR COUNTRY CODE 04	TVA REFERENCE NO. 76K61-86181	CHANGE NO. 22
BUYING CODE L A	COMMODITY CODE 6115-E	CHANGE AMOUNT \$ Plus 4,960.00	
VENDOR REFERENCE NO.		CHANGE DATE 8/18/82	PERFORMANCE DATE *See Below
ACCOUNT NO. H4 39			
PROJECT Bellefonte Nuclear Plant Units 1 and 2			

TO
Transamerica Delaval, Inc.
 Engine and Compressor Division
 3379 Peachtree Road, N.E.
 Atlanta, Georgia 30326

82082500514
**EMERGENCY DIESEL ENGINE-
 DRIVEN GENERATORS**

Add the nuts, bolts, and washers shown on Attachment 1.
 Contractor shall certify that the material shipped is
 equal to or better than that supplied on the original
 equipment.

Lump Sum \$4,960.00

*This change only - Performance date September 13, 1982.

In accordance with Sue Kaiser's telex dated May 10, 1982.

Confirming telephone award of these items to Sue Kaiser
 on July 6, 1982.

(Refer to Walter Dahnke's memo to J. M. Anderson dated July 27, 1982.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total \$7,014,453.63

Specs 16

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

Correct Total \$7,019,413.63

MEDS, W5863 C-K

By *J. Marcal Anderson*
 (61) J. Marcal Anderson, Purchasing Agent
 /plb

TVA 394 (DP-7-80)

Contractor
 Auditor

Contract File
 Purchasing A File

Accounting Office
 Consignee

Requestor (2)
 Plant Accounting

20

1974

ATTACHMENT 1

	<u>Bolt Size</u>	<u>Bolts</u>	<u>Nuts</u>	<u>Flat Washers</u>	<u>Lock Washers</u>
NGR (Resistor Bank)	1/4" x 3/4"	32	32	32	32
	1/2" x 1"	4	8	12	8
CT-A	1/2" x 1"	4	--	4	4
CT-B	1/2" x 1"	4	--	4	4
CT-C	1/2" x 1"	4	--	4	4
CD1327-A Transformer, Bus, T1 Insulating Board	5/16" x 1"	6	6	12	6
	3/8" x 1"	3	1	4	3
	1/2" x 1"	4	4	8	4
	1/2" x 1-1/2"	8	8	16	8
CD1327-B Transformer, Bus, T2 Insulating Board	5/16" x 1"	6	6	12	6
	3/8" x 1"	3	1	4	3
	1/2" x 1"	4	4	8	4
	1/2" x 1-1/2"	8	8	16	8
CD1327-C Transformer, Bus, T3 Insulating Board	5/16" x 1"	6	6	12	6
	3/8" x 1"	3	1	4	3
	1/2" x 1"	4	4	8	4
	1/2" x 1-1/2"	8	8	16	8
For all Thread Rods on Transformers	1/2" x all Thread	--	108	72	72
CD1326-A Transformer	1/2" x 1-1/4"	4	14	18	18
CD1326-B Transformer	1/2" x 1-1/4"	4	14	18	18
CD1326-C Transformer	1/2" x 1-1/4"	4	14	18	18
Frame Bolts	10/32" x 3/4"	56	--	--	--
	1/4" x 3/4"	20	20	20	20
	1/4" x 1-1/4"	5	5	5	5
	3/8" Studs	--	8	8	8
	3/8" x 1"	68	48	68	68
	1/2" x 1-1/4"	10	10	20	10
Bus	1/2" x 1-3/4"	18	18	36	18
PDP (located in front)	8/32" x 1/4"	20	--	--	--
Transformers located back bottom Hori- zontal Door	3/8" x 1-1/4"	28	28	56	28
	1/2" x 1-1/4"	3	3	6	3
	1/2" x 1-3/4"	3	3	6	3
PTS-in back- Center and Top Horizontal Door	8/32" x 1/4"	6	--	6	6
	8/32" x 1/2"	6	6	6	6
	8/32" x 3/4"	6	12	6	6
	10/32" x 1/2"	10	--	10	10
	3/8" x 1"	16	16	32	16
	3/8" x 1-1/2"	8	8	16	8
	1/2" x 1-3/4"	4	4	12	--
1/2" x 2"	4	8	12	--	

CHANGE OF CONTRACT

Address all communication except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Telex 55-8417 Telephone 615-755-3011

ANSWER BACK-TVAPURTRFCTA

Teletypewriter 615-755-3214

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence.

(THIS BLOCK TO BE COMPLETED BY TVA)

VENDOR CODE	STATE OR COUNTRY CODE 04	TVA REFERENCE NO. 76K61-86181	CHANGE NO 21
BUYING CODE L A	COMMODITY CODE 6115-R	CHANGE AMOUNT \$ Plus \$2890.26	
VENDOR REFERENCE NO.	CHANGE DATE 4/12/82	PERFORMANCE DATE *See Below	
ACCOUNT NO. N4 39	PROJECT Bellefonte Nuclear Plant Units 1 and 2		

TO _____

Transamerica Delaval, Inc.
Engine and Compressor Division
 3379 Peachtree Road, N. E.
 Atlanta, Georgia 30326

82042000133 ①

**EMERGENCY DIESEL ENGINE-
 DRIVEN GENERATORS**

Services to repair damage to generator stator caused by
 construction at the Bellefonte Nuclear Plant.

Lump Sum Total \$2890.26

*Performance data: This work has been completed.

In accordance with Invoice No. 45156 dated March 23, 1982.

(Refer to signed time sheet attached to Invoice No. 45156)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total \$7,011,563.37

Specs 16

TENNESSEE VALLEY AUTHORITY

Division of Purchasing

Correct Total \$7,014,453.63

MEDS; 100 110 v

By

(61) J. Marcel Anderson, Jr.

Purchasing Agent

TVA 394 (DP-7-80)

Contractor
Auditor

Contract File
Purchasing A File

Accounting Office
Consignee

Requisitioner (2)
Plant Accounting

20

0 4 7 2

MED '82 0223 557

CHANGE OF CONTRACT

(THIS BLOCK TO BE COMPLETED BY TVA)

Address all communication except invoices to:
 TENNESSEE VALLEY AUTHORITY
 DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Telex 55-8417 Telephone 615-755-3011

ANSWERBACK TVAPURTRFCTA

Teletypewriter 615-755-3214

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence.

VENDOR CODE	STATE OR CONTRACT CODE	TVA REFERENCE NO.	CHANGE NO.
	04	76K61-86181	20
BUYING CODE	COMMODITY CODE	CHANGE AMOUNTS	
L A	6115-E	Plus	55,000 00
VENDOR REFERENCE NO.		CHANGE DATE	PERFORMANCE DATE
		2/18/82	*See Below
ACCOUNT NO.			
N4 39			
PROJECT			
Ballafonte Nuclear Plant Units 1 and 2			

TO
 Transamerica Delaval, Inc.
 Engine and Compressor Division
 3379 Peachtree Road, N.E.
 Atlanta, Georgia 30326

EMERGENCY DIESEL ENGINE-
 DRIVEN GENERATORS

820225D0659 (1)

Add

Replacement panel for the static exciter voltage regulator (SEVR) panel for the SEVR panel damaged at the Bellefonte plant for diesel generator No. 2846.

Lump Sum \$55,000.00

*Performance Date, this change only, - June 23, 1982.

The lump sum price is firm and not subject to escalation. Payment of 100% will be by U. S. Treasury check mailed within 30 (thirty) days from receipt of the panel in satisfactory condition at the destination or receipt of your invoice whichever is later.

This confirms the telephone purchase of this panel on February 11, 1982 to Mrs. Sandra Savage.

In accordance with Howard Wong's letter dated January 20, 1982 as revised by his telex dated February 4 and February 8, 1982.

MEDS. 100 11P.V

(Refer to C. A. Chandley's memo to J. M. Anderson dated February 9, 1982.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total \$6,956,563.37

SPECS 16

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

Correct Total \$7,011,563.37

By
 (61) J. Marcel Anderson, Purchasing Agent
 /plb

TVA 394 (DA 7-80)

Contractor
 Auditor

Contract File
 Purchasing A File

Accounting Office
 Consignee

Requisitioner (2)
 Plant Accounting

2184

MED '81 1007 531

CHANGE OF CONTRACT

(THIS BLOCK TO BE COMPLETED BY TVA)

VENDOR CODE	STATE OR COUNTRY CODE 04	TVA REFERENCE NO 76K61-86181	CHANGE PERCENT 19
BUYING CODE L A	COMMODITY CODE 6115-E	CHANGE AMOUNT \$ Plus 551.25	
VENDOR REFERENCE NO.	CHANGE DATE 10/5/81	PERFORMANCE DATE 10/30/81*	
ACCOUNT NO N4 39			
PROJECT Bellefonte Nuclear Plant Units 1 and 2			

Press all communication except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
Chattanooga, Tennessee 37401

FA 55-8417 Telephone 615-755 3011

SWERBACK-TVAPURTRFCTA

TELEPHONE 615-755-3214

INTRAC MBEH must be shown on all
invoices, packages, shipping papers and
correspondence

TO

Transamerica Delaval, Inc.
Engine and Compressor Division
3379 Peachtree Road, NE.
Atlanta, Georgia 30326

81 1009F0866 (1)

EMERGENCY DIESEL ENGINE-
DRIVEN GENERATORS

*For this change only.

Add the following to this contract:

Description	Part No.	Item No.	Qty.	Price
Timer	75080-121-06	9	1	\$275.00
Toggle Switch	75080-121-07	10	1	\$ 17.25
Clay Control	75080-121-43	K1	1	\$259.00

Lump Sum \$551.25

Terms of Payment: 100% payment will be made by U. S. Treasury
check mailed not more than thirty (30) days after receipt of
proper invoice.

In accordance with Transamerica Delaval's letter dated
September 11, 1981.

Refer to Walter K. Dahnke's memorandum to J. Marcel Anderson dated September 18, 1981
and confirmed by J. M. Anderson's October 2, 1981 telecon with Tom Hogan.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total \$6,956,012.12

Specs 16

TENNESSEE VALLEY AUTHORITY

Division of Purchasing

Correct Total \$6,956,563.37

MEDS. 100 UB-E

By *J. Marcel Anderson*
(61) J. Marcel Anderson, Purchasing Agent
/plb

VA 394 (DP-7-88)

Contractor
Auditor

Contract File
Purchasing A File

Accounting Office
Comptroller

Requester (2) *SL*
Plant Accounting

2 2 1 3

CHANGE OF CONTRACT

Address on communication except invoices to
TENNESSEE VALLEY AUTHORITY
DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Telex 56-8417 Telephone 615-755-3011

ANSWERBACK-TVAFURTRFCTA

Teletypewriter 615-755-3214

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence.

(THIS BLOCK TO BE COMPLETED BY TVA)

VENDOR CODE	STATE OR COUNTRY CODES	TVA REFERENCE NO.	CHANGE NO.
	04	76K61-86181	18
BUYING CODE	COMMODITY CODE	CHANGE AMOUNT \$	
L A	6115E	No Change	
VENDOR REFERENCE NO.		CHANGE DATE	PERFORMANCE DATE
		'9/23/81	No Change
ACCOUNT NO.			
N4139			
PROJECT			
Bellefonte Nuclear Plant Units 1 and 2			

TO
Transamerica Delaval, Inc.
Engines and Compressor Division
3379 Peachtree Road, N.E.
Atlanta, Georgia 30326

810930F0794

**EMERGENCY DIESEL ENGINE-
 DRIVEN GENERATORS**

The sensor purchased by Change 17 is F.O.B. Oakland, CA and will be shipped prepaid with charges to be added to the invoice.

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total No Change

Specs 16

Correct Total No Change

MFDS. 100 UB-K

TENNESSEE VALLEY AUTHORITY

Division of Purchasing

By *Marcel Anderson*
 (61) J. Marcel Anderson, Purchasing Agent
 /plb

TVA 304 (DP-7-00)

Contractor
 Address

Contract File
 Purchasing A File

Accounting Office
 Copy

Regulation (2)
 Plant Accounting

27

2 2 9 3

CHANGE OF CONTRACT

Address all communication except invoices to
 TENNESSEE VALLEY AUTHORITY
 DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Telex 55-8417 Telephone 815-755-3011

ANSWERBACK-TVAPURTRFCTA

Telecopier 615-755-3214

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence.

MED 61 0921 524

(THIS BLOCK TO BE COMPLETED BY TVA)

VENDOR CODE	STATE OR COUNTRY CODE	TVA REFERENCE NO.	CHANGE NO.
	04	76K61-86181	17
BUYING CODE	COMMODITY CODE	CHANGE AMOUNT \$	
L A	6115E	Plus 404.00	
VENDOR REFERENCE NO.		CHANGE DATE	PERFORMANCE DATE
		9/16/81	10/8/81*
ACCOUNT NO.			
N4 39			
PROJECT			
Bellefonte Nuclear Plant Units 1 and 2			

TO
 Transamerica Deleva, Inc.
 Engine and Compressor Division
 3379 Peachtree Road, N.E.
 Atlanta, Georgia 30326

81092200159 (1)

EMERGENCY DIESEL ENGINE-
 DRIVEN GENERATORS

*For this change only.

Add

One only complete pneumatic sensor unit part no. F-573-330

Lump Sum \$404.00

Payment in full for this equipment shall be made by U. S. Treasury check mailed not more than thirty (30) days after receipt of proper invoice at the Central Accounting Office or receipt of the equipment at the plant whichever is later.

In accordance with A. T. Olsson's letter dated August 20, 1981 to J. Marcel Anderson.

(Refer to W. R. Dahnke's memo to J. Marcel Anderson dated September 8, 1981.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total \$6,955,608.12 Specs 16
 Correct Total \$6,956,012.12 MEDS. 100 U.S.K.

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

By *J. Marcel Anderson*
 (61) J. Marcel Anderson, Purchasing Agent
 /plb

TVA 394 (0A-7-80)

Contractor
 Auditor

Contract File
 Purchasing A File

Accounting Office
 Custodian

Requisitioner (2)
 Plant Accounting

JJ

0393

CHANGE OF CONTRACT

Address all communication except invoices to
 TENNESSEE VALLEY AUTHORITY
 DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Telex 55-8417 Telephone 815-755-3011

ANSWERBACK-TVAPURTRFCTA

Teletypewriter 615-755-3234

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence.

(THIS BLOCK TO BE COMPLETED BY TVA)

VENDOR CODE	STATE OR COUNTRY CODE 04	TVA REFERENCE NO. 76K61-86181	CHANGE NO. 16
BUYING CODE L A	COMMODITY CODE 6115-E	CHANGE AMOUNT \$ No Change	
VENDOR REFERENCE NO.		CHANGE DATE 9/4/81	PERFORMANCE DATE No Change
ACCOUNT NO. N4 39			
PROJECT Bellafonta Nuclear Plant Units 1 and 2			

TO
 Transamerica Delaval, Inc.
 Engine and Compressor Division
 3379 Peachtree Road, N.E.
 Atlanta, Georgia 30326

81091500768

EMERGENCY DIESEL ENGINE-
 DRIVEN GENERATORS

Effective July 1, 1981 payment for Service of Erecting Engineers under item 2 shall be paid in accordance with the Transamerica Delaval published rates in effect at the time the services are rendered. As new rates are published, Transamerica Delaval, Inc. will submit them to TVA's contracting officer.

In accordance with Howard Wong's letter dated April 9, 1981 and A. T. Olson's letter dated July 24, 1981.

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 AVAILABLE COPY

(Refer to C. A. Chandley's memo to J. Marcal Anderson dated September 1, 1981.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Previous Total No Change

Space 16

Correct Total No Change

MEDS. 100 UB-K

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

By *J. Marcal Anderson*
 (61) J. Marcal Anderson, Purchasing Agent
 /plb

TVA 394 (DP-7-80)

Contractor
 Auditor

Contract File
 Purchasing A File

Accounting Office
 Custodian

Requisitioner (2)
 Plant Accounting

22

2 2 8 7

CHANGE OF CONTRACT

Address all communication except invoices to
 TENNESSEE VALLEY AUTHORITY
 DIVISION OF PURCHASING
 Chattanooga, Tennessee 37401

Telex 55-9417 Telephone 615-755-3011

ANSWERBACK TVAPURTRFCTA

Teletypewriter 615-755-3214

CONTRACT NUMBER must be shown on all
 invoices, packages, shipping papers and
 correspondence.

VENDOR CODE	STATE OR COUNTRY CODE	TVA REFERENCE NO.	Contract No.
BUYING CODE	COMMODITY CODE	CHANGE AMOUNT	
L A	6115-E	Plus 2,467.00	
VENDOR REFERENCE NO.	CHANGE DATE	PERFORMANCE DATE	
	4/7/81	No Change	
ACCOUNT NO.	310416A0260		
N4 39			
PROJECT	Bellafonte Nuclear Plant Units 1 and 2		

TO
 Transamerica Delaval, Inc.
 Engine and Compressor Division
 3379 Peachtree Road, N.E.
 Atlanta, Georgia 30326

EMERGENCY DIESEL ENGINE-
 DRIVEN GENERATORS

This change provides compensation for the generator service
 engineer at the plant site from October 13 to October 16,
 1980, to evaluate and repair damage to the unit 1-1A
 generator stator.

Lump Sum \$2,467.00

In accordance with Delaval Invoice No. 39065.

MEDS, E4B37 C-R

(Refer to W. R. Dahnke's memo to J. M. Anderson dated April 1, 1981.)

All other terms and conditions of the original contract and previous changes of contract (if any), shall apply.

Specs 16
 Previous Total \$6,886,123.12
 Correct Total \$6,888,590.12

TENNESSEE VALLEY AUTHORITY
 Division of Purchasing

By *J. Marcel Anderson*
 (61) J. Marcel Anderson, Purchasing Agent
 /plb

TVA 394 (DP-7-80)

Contractor
 Auditor

Contract File
 Purchasing A File

Accounting Office
 Consigner

Requisitioner (2)
 Plant Accounting

1 3 2 2