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October 22, 1985
ST-HL-AE-1390
File No.: G9.17

Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Responses to DSER/FSAR Items Regarding Section 3.10

Dear Mr. Knighton:

The enclosed attachment provides STP's response to Draft Safety Evaluation Report (DSER) or Final Safety Analysis Report (FSAR) items.

The item numbers listed below correspond to those assigned on STP's internal list of items for completion which includes open and confirmatory DSER items, STP FSAR open items and open NRC questions. This list was given to your Mr. N. Prasad Kadambi on October 8, 1985 by our Mr. M. E. Powell. Note, that the item numbers referenced with (P) are partial responses only. For these items the response reflects the Non-NSSS Scope.

The attachment includes mark-ups of FSAR pages which will be incorporated in a future FSAR amendment unless otherwise noted below.

The items which are attached to this letter are:

Attachment	Item No.*	Subject
1	D 3.10-2 (P)	Section 3.10:
	D 3.10-3 (P)	Equipment Qualification (Non-NSSS Scope)
	D 3.10-5 (P)	
	D 3.10-11 (P)	
	D 3.10-12 (P)	
	D 3.10-13 (P)	
	D 3.10-19	
	D 3.10-20	
	F 3.10-21	

* Legend
D - DSER Open Item C - DSER Confirmatory Item
F - FSAR Open Item Q - FSAR Question Response Item

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E PDR

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Should you have any questions concerning this matter, please contact Mr. Powell at (713) 993-1328.

Very truly yours,

M. R. Wisenburg
Manager, Nuclear Licensing

CAA/bl

Attachments: See above

L1/DSER/e

cc:

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Revised 9/25/85

ATTACHMENT I
ST-HL-AE-1390
PAGE 1 OF 18

Pressurizer safety valves will be qualified by the following procedures (these valves are also subjected to tests and analysis similar to check valves): (1) stress and deformation analyses of critical items that might affect operability for faulted condition loads, (2) in-shop hydrostatic and seat leakage tests, and (3) periodic in situ valve inspection. In addition, a static load equivalent to that applied by the faulted condition is applied at the top of the bonnet, and the pressure is increased until the valve mechanism actuates. Successful actuation within the design requirements of the valve assures its overpressurization safety capabilities during a seismic event. 41

Using these methods, all safety-related valves in the systems will be qualified for operability during a faulted event. The methods outlined above conservatively simulate the seismic event and assure that the active valves will perform their safety-related function when necessary. 41

The above testing program for valves is conservative. Alternate valve operability testing, such as dynamic vibration testing will be allowed if it is shown to adequately assure the faulted condition functional ability of the valve system. 41

3.9.3.2.1.3 Pump Motor and Valve Operator Qualification (NSSS Scope) - Motors for active pumps and motor operators for active valves and all vital electrical appurtenances thereto, will be seismically qualified in accordance with IEEE 344-1975. If the testing option is chosen, sine-beat testing will be justified. This justification may be provided by satisfying one or more of the following requirements to demonstrate that multi-frequency response is negligible or that the sine-beat input is of sufficient magnitude to conservatively account for this effect. 41

1. The equipment response is basically due to one mode.
2. The sine-beat response spectra envelops the floor response spectra in the region of significant response.
3. The floor response spectra consists of one dominant mode and has a peak at this frequency.

If the degree of coupling in the equipment is small, then single-axis testing is justified. Multi-axis testing will be required if there is considerable cross-coupling; however, if the degree of coupling can be determined, then single-axis testing can be used with the input sufficiently increased to include the effect of coupling on the response of the equipment.

Seismic qualification by analysis alone, or by a combination of analysis and testing, may be used when justified. The analysis program can be justified by demonstrating: (1) that equipment being qualified is amenable to analysis, and (2) that the analysis be correlated with tests or be performed using standard analysis techniques.

3.9.3.2.2 Pump Operability (BOP Scope): The operability of ASME active pumps under plant conditions, when their safety function is relied upon to safely shut down the plant or to mitigate the consequences of an accident, has been demonstrated by seismic analysis or tests to the extent of availability and capability of test equipment by any of the following programs: 41

Insert A

INSERT A

Safety-related active pumps are qualified by in-shop tests as appropriate for each type of pump and seismic qualification prior to installation in the plant. The in-shop tests include: (1) hydrostatic tests of pressure-retaining parts; and (2) performance tests to determine total developed head versus flow over the range of anticipated operating conditions and other pump parameters. After the pump is installed in the plant startup tests are conducted. A range of operating temperatures is experienced during the power ascension stage. The required periodic inservice inspection and operational testing are performed. These tests demonstrate that the pump will function as required during all normal operating conditions for the design life of the plant.

The post accident operating conditions for safety related pumps do not differ significantly from normal operating conditions. The range of temperature, net positive suction head (NPSH), and flow experienced by each pump during preoperational testing, normal operation and inservice testing is similar to post accident conditions. In addition to the above tests, the operability during the seismic event is shown by one of the following programs:

ATTACHMENT I
ST-HL-AE-1390
PAGE 3 OF 18

1. An individual pump, selected as a prototype, has been tested in the manufacturer's shop, with the test conditions equivalent to the combined plant conditions which the pump is expected to withstand at the time the active function is required. Vibratory excitation of the pump to simulate seismic loading is demonstrated: (a) by a separate test under conditions sufficiently severe to provide adequate margins for assurance of operability under combined plant loading conditions: or (b) by seismic analysis of critical pump components. | 41

2. An individual pump, selected as a prototype, has been tested partially: (a) in the manufacturer's shop under those test conditions as limited by the test facility, e.g., hydrostatic tests, seat leakage test, and performance test (also during these tests, bearing temperature and vibration levels have been monitored); (b) in a testing laboratory for simulated seismic excitation loadings; and (c) in the plant after pump installation for confirmation of operability under flow conditions during system preoperational hot functional tests.

3. Pumps which are equivalent to a prototype pump that has successfully met the test requirements of a pump operability assurance program, are not tested if the loading conditions for those pumps are equivalent to or less than those imposed during testing of the prototype pump.

The test results of the prototype pump are documented according to ANSI N45.2, Section 18. ~~and ANSI N45.2.11, Section 6.3.3.~~

The prototype pump is selected from a group of similar pumps which are used in the plant. A prototype pump used in one nuclear power plant is deemed to qualify as a prototype pump for other plants provided that the system operating conditions of both plants and the pump loading conditions at the time when the active function is required are equivalent or less severe.

(4) The pump manufacturer is required to show by testing, analysis, or existing documented data that the pump will perform its safety function when subjected to the maximum seismic accelerations and maximum faulted nozzle loads. The pumps are tested or analyzed for the lowest natural frequency. The pump, when having a natural frequency above 33 Hz, is considered essentially rigid. This frequency is considered sufficiently high to avoid problems with amplification between the component and structure for all seismic areas. A static shaft deflection analysis of the rotor is performed using ~~the applicable seismic response spectra.~~ The deflections determined from the static shaft analysis are compared to the allowable rotor clearances. If rubbing or impact occurs, its duration must be short and shown by prototype test or existing documented data to not to unacceptably damage or prevent the pump from performing its design function. In order to avoid damage during the faulted plant condition, the stresses caused by the combination of normal operating loads, SSE, and dynamic system loads are kept limited to the material elastic limit, as indicated in Table~~s~~ 3.9-4 ~~and 3.9-5.~~ The maximum seismic nozzle loads are considered in an analysis of the pump supports to assure that a system misalignment cannot occur.

41 Q110.27

Insert B

Insert Z

Faulted nozzle loads are provided in the pump design specification. External piping loads on the pump nozzles are kept within these specified limits. The pump specification requires the vendor to demonstrate the

INSERT B

the zero period acceleration (ZPA) of the applicable seismic response spectra in two orthogonal horizontal directions and in the vertical direction simultaneously.

INSERT Z

R In cases where the natural frequency is found to be below 33 Hz, a dynamic analysis has been performed using the applicable seismic response spectra. The deflections determined from the analysis are compared to the allowable rotor clearances.

ATTACHMENT 1
ST-HL-AE-1390
PAGE 5 OF 18

3.9-2.3A

operability of the pump when subjected to the load combinations given in Table 3.9-2.4. In addition, the pump casing stresses resulting from the maximum faulted nozzle loads are limited to the values given in Table 3.9-4A. 41 Q110 27

Environmental service conditions for normal, abnormal and accident conditions are identified in Section 3.11. Safety-related active pumps are environmentally qualified for operability during conditions where their operation is essential.

Performing these analyses with the conservative loads stated and with the restrictive stress limits as allowables assures that critical parts of the pump do not get damaged during the faulted condition; therefore, the reliability of the pump for post-faulted condition operation is not impaired by the seismic event. 41

~~In cases where the natural frequency is found to be below 33 Hz, a dynamic analysis has been performed using the applicable seismic response spectra.~~ To complete the qualification procedures, the pump motor has been qualified for operation during the maximum seismic event. Any auxiliary equipment which is vital to the operation of the pump motor qualification has been separately qualified by meeting IEEE 344-1975. 41

Similarity is established between the prototype and a group of pumps by virtue of the following characteristics.

1. Manufacturer - Pumps should be from the same manufacturer.

2. Geometry & structure - Pumps should be of same type, size and physical characteristics. 6 Q11 27

3. Hydraulic rating - Pumps should be of same capacity and head.

Operability of the pump is verified by analysis by assuming that the rotor of the pump does not interfere with the casing while rotating. Deflection of rotor is maintained within certain tolerance such that operation of the pump and its hydraulic characteristics remain unchanged. Deflection of the rotor depends upon the stiffness of shaft, bearing, pedestal and the body of the pump.

Insert C →

Insert D

3.9.3.2.3 Valve Operability (BOP Scope): The operability of active valves, including valve operators, under plant conditions when their respective safety function is relied upon to effect either a plant shutdown or to mitigate the consequences of an accident, has been demonstrated to the extent of availability and capability of test equipment by any one of the following acceptable programs:

1. An individual valve, selected as a prototype valve, has been tested with the test conditions imposed during the demonstration of (pressure, SSE, nozzle loads) valve opening and/or closing equivalent to the combined plant conditions ~~(including SSE seismic conditions)~~ that the valve is expected to withstand at the time the active function is required. (Such a test program is done for ~~Some~~ ~~small-size~~ valves with a maximum size of six inches ~~only.~~) 6 Q11 27

INSERT C

The qualification of pump and pump drivers as an assembly is performed by analysis and/or by testing. In cases where the pump and the driver are qualified separately by either analysis or testing, the coupling between the components is analyzed to demonstrate that misalignment does not occur.

INSERT D

The safety related active valves will be subjected to a series of stringent tests prior to service and during plant life. Prior to installation, the following functional tests are performed: (1) shell hydrostatic test to ASME Section III requirements, (2) seat leakage tests or disc hydrostatic tests, and (3) operational tests to verify that the valves will open and close within the specified time limits when subjected to the design differential pressure (except check valves). For qualification of motor operators for environmental conditions, refer to Section 3.11. Cold hydro-tests, periodic inservice inspections, and periodic inservice operations are performed in-situ to verify the functional ability of the valve. A range of operating temperatures is experienced during the power ascension stage. With required periodic maintenance, these tests demonstrate reliability of the valves for the design life of the plant.

2. An individual valve, selected as a prototype valve, has been tested under conditions which simulate separately each of the plant loadings (including SSE seismic loadings) that the valve is expected to withstand in combination during valve opening and/or closing. 6 Q110.27

Sometimes such a test program has been supplemented by analyses which demonstrate that the individual test loadings are sufficiently higher than the plant loadings, to provide adequate margins for assurance of operability under combined loading conditions.

3. An individual valve, selected as a prototype, has been tested partially: (a) in the manufacturer's shop under those test conditions as limited by the test facility, e.g., shell hydrostatic test, back-seat and main seat leakage tests, disc hydrostatic test, and operational tests to verify the opening and closing of the valve; (b) in a testing laboratory for simulated seismic excitation loadings; and (c) in the plant after valve installation for confirmation of operability under flow conditions during system preoperational hot functional tests. 41

The test results of the prototype valve are documented according to ANSI N45.2, Section 8. ~~and ANSI N45.2.11, Section 6.3.3.~~ 41

The prototype valve is selected from a group of similar valves which are used in the plant. A prototype valve used in one nuclear power plant is deemed to qualify as a prototype valve for another plant provided the system operating conditions of both plants and the valve loading conditions at the time when the active function is required are equivalent or less severe. 41

4. ~~In some cases,~~ When valves have been qualified by similarity analysis ~~only when~~ they are similar to a valve which has been already qualified by test~~ing and~~ or combination of test and analysis. Following are the characteristics considered in determining that a valve is similar to the tested prototype valve and forms the technical basis for qualification by similarity: 41

Insert E

a. Similar pressure rating. 41

b. Similar size and thickness except the size of the operator. 41

c. Same manufacturer and model number.

The mathematical model used in the prototype valve has been checked to agree with the experimental results. A substantially similar mathematical model has been used for the other valve with a slight change in the size of the operator. 6 Q110.25

Similarity is established between the prototype and a group of valves by virtue of the following characteristics:

1. Manufacturer - Valves should be from the same manufacturer.

2. Geometry & structure - Valves should be of the same type, size and physical characteristics. Where more than one material exists, the pressure, temperature ratings and the standard calculation pressures are chosen for the weakest material which yield the highest stress. These stresses are

INSERT E

a. Manufacturer - valves are from the same manufacturer.

b. Geometry and Structure - valves are of the same type and ~~physical charateristics~~ configuration. A valve is not considered similar to a qualified valve if the ratio of the sizes between the valve and the qualified valve is greater than 1.5.

c. Pressure Rating - in general, a valve of lower pressure rating is selected for qualification and extended to the valves of higher pressure rating.

The mathematical model used in the prototype valve has been checked to agree with the experimental results. A substantially similar mathematical model has been used for the other valve with a slight change in the size of the operator and/or size of the valve. Based on the similar mathematical model, the natural frequencies are computed to confirm the dynamic characteristics of the valve and to determine the method for the stress analysis. Where more than one material exists, the pressure, temperature rating and the standard calculation pressures are chosen for the weakest material in the stress calculation. These stresses are then compared with allowable stresses for the weakest material in the temperature range of interest.

~~then compared with allowable stresses for the weakest material in the temperature range of interest.~~

Functional operability of safety-related active valves is assured by showing that the boundary joints, yokes, and similar structures have not failed, actuators do not freeze or bind, and structural integrity of the valve internals is not degraded. Valve end loads are provided in the valve design specification for safety-related active valves. External piping loads are kept within these specified limits. The faulted condition nozzle loads are considered in one of the following ways: (1) loads equivalent to the faulted condition nozzle loads are simultaneously applied to the valve through its mounting during the test, or (2) by analysis, the loads are shown to not affect the operability of the valve. The valve ~~purchase~~ specifications require the vendor to demonstrate the operability of the active valve when subjected to the loading combinations given in Tables 3.9-2.4. In addition, the stresses are limited to the valves given in Tables 3.9-5 and 3.9-6A.

Environmental service conditions for normal, abnormal and accident conditions are identified in Section 3.11. Safety-related active valves are qualified for operability during conditions where their operation is essential.

The valve specification requires that active valves be stroked during dynamic or static testing. ~~Appropriate required input motion (RIM) curves are specified for the seismic testing.~~ Acceptance criteria is provided for structural failure, permanent deformation, performance characteristics, seat leakage, and malfunction of any appurtenances. 41

Valves that are safety-related but can be classified as not having an extended structure, such as check valves are considered separately. ~~Check~~ valves are characteristically simple in design, and their operation will not be affected by seismic accelerations or the maximum applied nozzle loads. The ~~check~~ valve design ~~is~~ compact, and there are no extended structures or masses whose motion could cause distortions that could restrict operation of the valve. The nozzle loads due to maximum seismic excitation will not affect the functional ability of the valve since the valve disc is typically designed to be isolated from the body wall. The clearance supplied by the design around the disc will prevent the disc from becoming bound or restricted due to any body distortions caused by nozzle loads. Therefore, the design of these valves is such that once the structural integrity of the valve is assured ~~using standard methods,~~ the ability of the valve to operate is assured by the design features. The valve will also undergo the following: (1) in-shop hydrostatic test, (2) in-shop seat leakage test, ~~and~~ (3) periodic in situ valve exercising ~~and~~ inspection to assure functional ability of the valve.

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27

The above methods provide assurance that safety-related active valves are qualified for operability during conditions where their operation is required.

3.9.3.3 Design and Installation Details for Mounting of Pressure-Relief Devices.

3.9.3.3.1 Design and Installation Details for Mounting of Pressure-Relief Devices (NSSS Scope): Safety valves and relief valves are analyzed in accordance with the ASME Section III Code.

INSERT F

For line-mounted valves, enveloping acceleration values ~~form~~ From piping analysis are specified as Required Input Motion (RIM). Values of 3g for each of the two horizontal directions and 2g for the vertical direction are specified unless lower values are justified. For floor or wall mounted valves, required response spectra (RRS) are specified. The seismic accelerations in the three orthogonal directions are assumed to act simultaneously

INSERT G

The qualification of valve body and extended structure as an assembly is performed by dynamic testing or static operability test supplemented by analysis.

INSERT H

by test and/ or stress analysis of critical parts which may affect operability, including the faulted condition ~~loads~~. ← Stet

ATTACHMENT I
ST-HL-AE-1390
PAGE 11 OF 18

3.10 SEISMIC QUALIFICATION OF SEISMIC CATEGORY I MECHANICAL AND ELECTRICAL EQUIPMENT

the Seismic Master List Submittal.

Seismic Category I mechanical and electrical equipment, instrumentation and supports are identified in Table 3.10-1. The information to demonstrate that they are capable of performing their designated safety-related functions in the event of an earthquake is also presented in this section. The seismic qualification criteria applicable to the seismic Category I equipment, and supports are provided. Methods and procedures used to qualify seismic Category I mechanical and electrical equipment, instrumentation, and supports are also provided. 38

Insert X →

The results of seismic qualification tests and/or analyses for non-Nuclear Steam Supply System (NSSS) equipment are provided in Table 3.10-1. Seismic qualification for NSSS equipment is discussed in Section 3.10N. 41

3.10.1 Seismic Qualification Criteria

The STP design criteria meet the general requirements of the seismic qualification of seismic Category I equipment.

The seismic qualification and documentation procedures used for safety-related equipment and their supports meet the intent of IEEE Standard 344-1975 and Regulatory Guide (RG) 1.100. The project compliance to RG 1.48 is noted in Section 3.12, and Table 3.9-2.5.

Seismic qualification of equipment by analysis and/or tests demonstrates that the equipment is able to withstand seismic loads as a result of the Safe Shutdown Earthquake (SSE) preceded by five Operating Basis Earthquakes (OBE) without loss of function in the operating mode. 38

The acceptance criteria for qualification of seismic Category I mechanical and electrical equipment and instrumentation are specified, to the supplier.

The functional operability criteria such as the operability of equipment during and/or after the SSE, and/or maintaining pressure integrity are specified, to the supplier.

The requirements for designing seismic Category I mechanical equipment that are qualified to maintain the pressure boundary integrity are in accordance with ASME B&PV Code Section III.

Equipment that has been previously qualified using methodologies equivalent to those described herein are acceptable provided that proper documentation is submitted and the loads and load combinations used in qualification envelop the project criteria.

3.10.1.1 Functional Monitoring. Seismic Category I mechanical and electrical equipment and instrumentation are qualified to demonstrate their operability.

To demonstrate proper functional operability, the normal mode of operation has been monitored during and after the seismic simulation or after the seismic simulation, whichever is applicable.

INSERT X

The environmental qualification of the equipment including qualified life is discussed in Section 3.11. The operability of active pumps and valves is discussed in Sections 3.9.3.2.2 and 3.9.3.2.3, respectively.

Monitoring equipment is required to monitor both input and output of the test specimen. The records confirm that the specimen performs all its safety-related functions within its "allowable" tolerance. 38

3.10.2 Methods ~~and Procedures~~ for Qualifying Electrical Equipment and Instrumentation

3.10.2.1 Means of Qualification. IEEE Standard 344-1975 and RG 1.100 are used for seismic qualifications. ~~The qualified equipment will be identified with the method of seismic qualification in Table 3.10-1 for non-NSSS equipment.~~ 41

The horizontal and vertical OBE and SSE required response spectra (RRS) curves, as discussed in Section 3.7, form the basis for the seismic qualification of equipment, systems, and components. The RRS curves are identified with the building elevation and are a part of the ~~purchase~~ specification, along with ~~the equipment location or locations, and~~ the acceptance criteria for the safety-related functions for each item of equipment.

The seismic qualification reports ~~when prepared by the supplier and submitted for review~~ demonstrate (in accordance with Section 3.10.1) that the equipment performs its required safety-related function before, during, and after (as required) five OBEs followed by one SSE. For components that have been previously tested to generic criteria, test inputs are reviewed to assure that the test response spectra (TRS) envelops the applicable RRS over the frequency range of interest. Test reports are reviewed to confirm the required operability. 38

For active mechanical equipment (i.e., pumps and valves) ~~a combination of~~ test and/or analysis is used to demonstrate operability and structural integrity of components. Other seismic Category I safety-related mechanical equipment is qualified by analysis to demonstrate structural integrity. Load combinations, combining of dynamic responses for mechanical equipment, and the pump and valve operability assurance program are discussed in Section 3.9.

3.10.2.2 Method of Qualification. The methods for seismic qualification are listed below: 41

- Analysis.
- Test.
- Combination of analysis and test. 38

3.10.2.2.1 Analysis: Mathematical analyses without testing are acceptable if the structural integrity alone ensures the intended design function of the equipment (see Section 3.10.1) or if testing is impractical because of the size and weight of the equipment. The ~~procedures~~ methodology used ~~are~~ is in accordance with Section 5 of IEEE 344-1975. 41

When an equivalent static coefficient analysis is performed, justification for its use is provided. ~~by the supplier.~~ See Section 3.7.3A.1.2 for additional information on use of equivalent static load method of analysis. 38

as applicable

Analytical results are evaluated for mechanical strength, fatigue, alignment,
and noninterruption of function as related to the functional requirements of
the equipment during an SSE event. Maximum stresses under all loading condi- 38
tions are computed and compared with the allowables. Interference effects as
well as interaction effects are considered in the analysis when significant.

3.10.2.2.2 Testing: Seismic tests are performed by subjecting equipment 41
to vibratory motion that conservatively simulate the seismic vibratory envi-
ronment at the equipment mounting location.

Seismic qualification by testing is performed using either multifrequency or
single frequency inputs. These test inputs and methods are in accordance with
IEEE 344-1975, Section 6.

The multifrequency test method is used for floor- and wall- mounted equipment.
In addition, in special cases it is used for equipment mounted on structural
steel, piping, ducts, or other types of supports or equipment where an analy-
sis or test has been performed to determine the RRS at the equipment mounting
location. These tests or analyses consider the dynamic amplification charac-
teristics of the support system.

For equipment qualified by multifrequency testing, the measured Test Response
Spectra (TRS) envelops the RRS in the frequency range of interest ~~as identi-~~ 38
~~fied in Table 3.10-1~~.

Single-frequency tests are used for line-mounted equipment, which includes
equipment mounted in piping systems and in ducts. The equipment is tested to
a required input motion (RIM). The RIM is the peak acceleration of the input
motion (sine wave or sine beats) at a specified frequency. The piping and
duct systems are designed and supported to limit the peak acceleration experi-
enced by the equipment to a value less than the specified RIM acceleration.

Single-frequency tests may also be used for other types of equipment as per-
mitted by IEEE 344-1975 and RG 1.100.

~~Table 3.10-1 identifies the equipment qualified by single-frequency tests with~~
~~the acceleration levels exceeding or equal to the specified RIM acceleration~~
~~levels.~~

3.10.2.2.3 Combined Test and Analysis: When equipment cannot be quali- 41
fied practically by analysis or testing because of its complexity, size, or
weight, combined analysis and testing is utilized. This method of qualifica-
tion is applied to equipment such as cabinets that may contain several differ- 38
ent configurations of internally mounted devices.

The combined analysis and test method is in accordance with Section 7 of IEEE
344-1975, and the equipment qualification methods of Section 3.10.2.2.1 and 41
3.10.2.2.2.

Equipment that has been previously qualified by means of test and analysis
equivalent to those described herein is acceptable if proper documentation is 38
provided.

Table 3.10-1 identifies the equipment qualified using combined analysis and test methods. The results of the qualification are provided in the appropri- 38
ate equipment qualification reports.

3.10.2.3 Test Sequence Verification. As defined in Part B of RG 1.100, 41
IEEE 344-1975 is an ancillary standard of IEEE 323-1974. In accordance with this standard, seismic testing as part of the overall qualification is performed in its proper sequence as indicated in Section 6 of IEEE 323-1974.

3.10.3 Methods and Procedures of Analysis or Testing of Supports of Mechanical and Electrical Equipment and Instrumentation

Analysis and/or test is performed for seismic Category I equipment supports to ensure their structural capability to withstand seismic excitation.

Information concerning the structural integrity of pressure-retaining components, their supports, and core supports is presented in Section 3.9.3. The following bases are used in the analysis and design of cable tray supports, heating, ventilating and air conditioning (HVAC) ducts supports and instrument tubing supports.

1. The methods used in the seismic analysis of cable tray and HVAC duct supports are described in Sections 3.7.3A.1.2 and 3.7.3A.15. The amplification of seismic loads due to the flexibility of the supporting system, if any, is accounted for in the design of the cable trays and in the qualification of duct mounted equipment.

2. The seismic Category I instrument tubing systems are supported so that the allowable stresses permitted by Section III of ASME B&PV Code are not
exceeded when the tubing is subjected to the loads specified in Section 38
3.9 for Class 2 and 3 piping.

For field-mounted instruments the supports are tested or analyzed to meet the following:

1. The field mounting supports for seismic Category I instruments excluding line-mounted instruments have a fundamental frequency of 33 Hz or greater, with the weight of the instrument included. If, however, the mounting should be flexible (i.e., frequency <33 Hz), the dynamics of the support are considered in the qualification of the supported instrument.

2. The stress level in the mounting support does not exceed the material allowable stress when subjected to the maximum acceleration level of the mounting location. The weight of the instrument is included. In some cases, panels and racks supporting seismic Category I devices are tested and/or analyzed with equipment installed. If the devices are in an inoperative mode during the support test, the response at the devices' mounting location is monitored. In such a case, devices are qualified separately, and the actual input to the devices is more conservative in amplitude and frequency content than the response monitored at the devices' location. The RRS for devices (i.e., in-cabinet response spectra) are generated and, as shown in the individual qualification reports as applicable to the device and the test response spectra to

which the device is qualified, envelops the RRS measured at the device mounting location. 38

3.10.4 Operating License Review 41

~~A summary of the results of the tests and analyses of qualified equipment is presented in Table 3.10-1. The referenced non-NSSS equipment qualification reports contain the required backup data and test results.~~ The documentation procedures for safety-related seismic Category I ~~non-NSSS~~ are in accordance with the recommendations contained in IEEE 344-1975 and RG 1.100. 38

INSERT Y

The method of qualification and the results are identified in the Seismic Master List submittal. Equipment qualification documentation is stored in the Record Management ~~Storage~~ System (RMS) in a retrievable and auditable form. This documentation will be available for the life of the plant.

ATTACHMENT 1
ST-HL-AE-1390
PAGE 18 OF 18

REFERENCES

Delete

Section 3.10:

3.10-1 "Environmental Qualification of Westinghouse Class IE Equipment," WCAP-8587, Revision 1. 2

3.10-2 Morrone, A., "Seismic Vibration Testing with Sine Beats," WCAP-7558 (October 1971).

3.10-3 Vogeding, E. L., "Seismic Testing of Electrical and Control Equipment," WCAP-7817, Nonproprietary (December 1971).

3.10-4 Vogeding, E. L., "Seismic Testing of Electrical and Control Equipment (WCID Process Control Equipment)," WCAP-7817, Supplement 1 (December 1971).

3.10-5 Potochnik, L. M., "Seismic Testing of Electrical and Control Equipment (Low Seismic Plants)," WCAP-7817, Supplement 2 (December 1971).

3.10-6 Vogeding, E. L., "Seismic Testing of Electric and Control Equipment (Westinghouse Solid-State Protection System) (Low Seismic Plants)," WCAP-7817, Supplement 3 (December 1971).

3.10-7 Reid, J. B., "Seismic Testing of Electrical and Control Equipment (WCID NUCANA 7300 Series) (Low Seismic Plants)," WCAP-7817, Supplement 4 (November 1972).

3.10-8 Vogeding, E. L., "Seismic Testing of Electrical and Control Equipment (Instrument Bus Distribution Panel)," WCAP-7817, Supplement 5 (March 1974).

3.10-9 Figenbaum, E. K., and E. L. Vogeding, "Seismic Testing of Electrical and Control Equipment (Type DB Reactor Trip Switchgear)," WCAP-7817, Supplement 6 (August 1974).

3.10-10 Vogeding, E. L., "Seismic Testing of Electrical and Control Equipment for Low Seismic Plants," WCAP-7817, Supplement 7 (September 1976).

3.10-11 Miller, R. B., "Seismic Testing of Electrical and Control Equipment (Low Seismic Plants)," WCAP-7817, Supplement 8 (June 1975).