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CURTIS,N.W. Pennsylvania Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
YOUNGBLOOD,B.J. Licensing Branch 1

SUBJECT: Forwards marked-up copy of FSAR,Subsection 3.9.2 & Table 3.9-33,corrected to agree w/preoperational & startup tests program.Changes will be discussed at draft SER meeting during wk of Jul 14.

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Docket Nos. 50-387
50-388

July 3, 1980

Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUSQUEHANNA STEAM ELECTRIC STATION
FSAR CHANGES
ER 100450 FILE 841-1
PLA - 503

Dear Mr. Youngblood,

Attached is a marked up copy of FSAR Subsection 3.9.2 and Table 3.9-33 which have been corrected to agree with Susquehanna's Preoperational and Startup Tests program.

We are planning to discuss these changes with you during the draft SER meeting the week of July 14.

If you have any questions, please call.

Very truly yours,

N. W. Curtis

Attachment

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generate loadings. This analysis utilizes appropriate seismic floor response spectra and combines loads at frequencies up to 33 HZ in three directions. Imposed stresses are generated and combined for normal, upset, and faulted conditions. Stresses are compared, depending on the specific safety class of the equipment, to Industrial Codes, ASME, ANSI or Industrial Standards, AISC, allowables.

3.9.1.4.12 Seismic Category I Items Other than NSSS

For statically applied loads, the stress allowables of Appendix F of ASME Section III, Winter 1972 were used for code components. For noncode components, allowables were based on tests or accepted standards consistent with those in Appendix F of the code.

Dynamic loads for components loaded in the elastic range were calculated using dynamic load factors, time history analysis, or any other method that assumes elastic behavior of the component.

The limits of the elastic range are defined in Paragraph 1323 of Appendix F for the code components. The local yielding due to stress concentration is assumed not to affect the validity of the assumptions of elastic behavior. The stress allowables of Appendix F for elastically analyzed components were used for code components. For noncode components, allowables were based on tests or accepted material standards consistent with those in Appendix F for elastically analyzed components.

The methods used in evaluating the pipe break effects are discussed in Section 3.6.

3.9.2 DYNAMIC TESTING AND ANALYSIS

3.9.2.1a Preoperational Vibration and Dynamic Effects Testing on Piping

The test program is divided into three phases: preoperational vibration, startup vibration, and operational transients.

3.9.2.1a.1 Preoperational Vibration Testing

The purpose of the preoperational vibration test phase is to verify that operating vibrations in the recirculation ~~system~~ piping are ~~within~~ acceptable ~~limits~~. This phase of the test uses visual observation, ~~[illegible]~~.

If, during steady state operation, visual observation indicates that vibration is significant, measurements will be made with a hand held vibrograph. Visual observations, manual and remote measurements will be made during the following steady state conditions:

a) Recirculation pumps minimum flow;

b) Recirculation pumps at 50% of rated flow;

c) Recirculation pumps at 75% of rated flow;

d) Recirculation pumps at 100% of rated flow;

e) RHR suction piping at 100% of rated flow in the shutdown cooling mode.

3.9.2.1a.2 Small Attached Piping

During visual observation of each of the above test conditions (a) through (e), special attention will be given to small attached piping and instrument connections to ensure that they are not in resonance with the recirculation pump motors or flow induced vibrations. If the operating vibration acceptance criteria are not met, appropriate corrective action will be taken. No vibration analysis of small piping has been done.

3.9.2.1a.3 Startup Vibration

The purpose of this phase of the program is to verify that the main steam and recirculation piping vibration are within acceptable limits. Because of limited access due to high radiation levels, no visual observation is made during this phase of the test. Remote measurements shall be made during the following steady state conditions:

(a) Main steam flow at 25% of rated;

(b) Main steam flow at 50% of rated;

(c) Main steam flow at 75% of rated;

(d) Main steam flow at 100% of rated;

(e) HPCI and RCIC turbine steam line at 100% of rated;

(f) RHR suction piping at 100% of rated flow in the shutdown cooling mode.

3.9.2.1a.4 Operating Transient Loads

The purpose of the operating transient test phase is to verify that pipe stresses are within Code Limits. The amplitude of displacements and number of cycles per transient of the main steam and recirculation piping will be measured and the displacements compared with acceptance criteria. The deflections are correlated with the calculated deflections to assure that the stresses remain within Code limits. Remote vibration and deflection measurements shall be taken during the following transients:

a) Recirculation pump starts;

b) Recirculation pump trip at 100% of rated flow;

c) Turbine stop valve closure at 100% power;

d) Manual discharge of ~~each~~ REPRESENTATIVE S/R valve(s) at 1,000 psig and at planned transient tests that result in S/R valve discharge.

3.9.2.1a.5 Test Evaluation and Acceptance Criteria

The piping response to test conditions shall be considered acceptable if the organization responsible for the stress report reviews the test results and determines that the tests verify that the piping responded in a manner consistent with the predictions of the stress report and/or that the tests verify that piping stresses are within Code limits. To insure test data integrity and test safety, criteria have been established to facilitate assessment of the test while it is in progress. These criteria, designated Level 1 and 2, are described in the following paragraphs.

3.9.2.1a.5.1 Level 1 Criteria

If in the course of the tests, measurements indicate that the piping is responding in a mannner that would make test termination prudent, the test shall be terminated. Level 1 criteria establishes bounds on movement that, if exceeded, make a test hold or termination mandatory. The limits on movement are based on maximum allowable Code stress limits.

seismic event by dynamic analysis only. Piping systems having significant anticipated transients loads, caused by main stop valve closure or relief valve blow for example, are analyzed for the time dependent forces. In addition, piping steady state vibration and dynamic transient tests will be performed as summarized below, to ensure that 4

a) Excessive steady state vibration is not present in the piping that would result in piping stresses and restraint loads above the allowables

b) The piping is adequately restrained to withstand the dynamic transient loads.

Cognizant design personnel familiar with the systems to be tested will develop the test plans, and evaluate the test results. Also the cognizant design personnel will witness the test. The data acquired from the tests will be compared with the expected results to determine the acceptability of the total system response.

A list of all piping systems in the BOP is provided in Table 3.9-33. ASME Section III Class 1, 2 and 3 piping systems, high energy piping systems, moderate energy piping systems, seismic Category I and seismic Category II systems are identified in the Table. The Table also identifies the [redacted] tests to be performecd for each system.

Piping thermal expansion tests are performed for the safety-related piping systems with normal operating temperature exceeding 300 °F. Safety related piping systems with normal operating temperature less than 300 °F do not have significant thermal expansion to warrant thermal expansion tests. 12 Engineering review of all seismic Category I piping systems including their supports, restraints or snubbers is performed after completion of construction and prior to fuel load to ensure that no restraint of normal thermal movement occurs due to interferences and obstructions and that the support and restraints are in accordance with the design intent. For the systems receiving thermal expansion tests, the pipe movements are monitored to ensure that no restraint of normal thermal movement occurs at locations other than at the designed restraint locations.

The thermal expansion test program verifies that the free thermal expansion of piping systems take place at the snubbers by monitoring the thermal movement. Performance of the snubbers designed for transient loads such as due to Main Stop Valve Closure or Main Steam Relief Valve Discharge are verified by measuring the load in the snubber during the dynamic transient tests. The snubbers are qualified by dynamic testing for cyclic loading as described in Subsection 3.9.3.4.1

Acceptance criteria for thermal expansion tests and dynamic transient tests is that the measured pipe displacements or restraint loads shall be below the calculated or design values.

Acceptance criteria for the steady state (4) vibration tests is that the maximum measured amptitude of the piping vibration shall not induce a stress in the pipe more than the endurance limit of the material. By limiting the maximum stress in the pipe due to steady state vibration below the endurance limit (allowable stress corresponding to 10^6 cycles or greater), the steady state vibration induced stress will not contribute to the reduction of fatigue life of piping. 12

The Table 3.9-33 provides cross reference between the FSAR Section 3.9 and the appropriate test description in FSAR Chapter 14.

3.9.2.1b.1 Piping Dynamic Transient Tests

During the preoperational and/or startup testing the following piping dynamic transient tests will be performed for the indicated modes of operation.

a) Main steam piping outside the containment for main steam turbine stop valve closure at 50 percent, 75 percent and 100 percent power TO THE ANCHOR NEAR THE BYPASS VALVES

b) Main steam bypass piping for the turbine stop valve closure

c) Main steam safety/relief valve discharge piping for the SELECTED brackets main steam relief valve opening, THE SELECTED SRV DISCHARGE PIPING ALL THE SRV DISCHARGE PIPING.

d) HPCI turbine steam supply piping for HPCI turbine trip.

e) REACTOR FEED PUMP DISCHARGE PIPING FOR REACTOR FEED PUMP TRIP.

From past experience, the dynamic transients in other piping systems are not significant.

Dynamic transient analysis of the subject lines except for (e) above has been performed to determine the response of the piping system and the restraint loads. During the test the displacement of the pipe, loads in the snubbers and restraints and pressure at representative locations will be measured.

Acceptance criteria for this test are that the measured loads in the snubbers and restraints shall be below the design values of the snubbers and restraints. In the case (e) the acceptance criteria is that the measured response shall be less than the acceptable response determined by analysis.

3.9.2.1b.2 Piping Steady State Vibration Testing

The piping system associated with the following components' operation will be observed for steady state vibration during preoperational test programs or power ascension:

a) RHR pump
b) HPCI pump and turbine
c) RCIC pump and turbine
d) Core spray pump
e) Main Steam
f) Feedwater
g) Reactor Water Cleanup

From experience on other nuclear power plants, the steady state vibration in other piping systems is not critical. However, abnormal vibrations of other systems during system walkdown on initial startup or power escalation will be noted and instrumented if necessary to determine the acceptability of such vibration.

Steady state vibration in the subject piping systems is primarily induced by the flow in the pipe and the equipment motion. In general, the specific causes of the steady state vibration is not known beforehand; therefore, design engineers with stress analysis experience and familiarity with the subject piping system will visually observe the lines during all significant modes of system operation and classify each line as acceptable if the vibration is not significant, or questionable if vibration is significant. The lines with questionable steady state vibration will be monitored by suitable instrumentation to determine the system response.
or monitor inaccessible lines with suitable instrumentation
The type of the instrumentation, if necessary, will be determined by the design engineer so that the maximum amplitude and frequency response of the piping system can be determined. The instrumentation will not screen out the significant frequencies.

For lines with questionable steady state vibration, the acceptance criterion is that the maximum measured amplitude shall not induce a stress in the pipe more than the endurance limit of the material. This is applicable to nuclear and non-nuclear piping.

When required, additional restraints will be provided to reduce the steady state vibration and to keep the stresses below the acceptance criteria levels.

TABLE 3.9-33

BOP PIPING SYSTEMS POWER ASCENSION TESTING

Piping System	Code(s)/ S.C/H.E M.E (1)	Temp >200°F	Thermal Expansion Test (2)	Dynamic Transient Test (3)	Steady State Vibration Test (4)	Remarks
Process Sampling	B31.1 SC II, M.E.	No	N/A	N/A	N/A	
Chlorination	B31.1, SC II ME	No	N/A	N/A	N/A	
Compressed Air	B31.1, SC II ME	No	N/A	N/A	N/A	
Instrument Gas	ASME III-2,3 B31.1, SC I SC II, ME	No	N/A	N/A	N/A	
Feed Pump Turbine Steam	B31.1, SC II H.E	Yes	N/A	N/A	N/A	
Makeup Water	B31.1, SC II, ME	No	N/A	N/A	N/A	
Valve Stem Leakoff	B31.1, SC II, ME	Yes	N/A	N/A	N/A	
Acid Injection	B31.1, SC II ME	No	N/A	N/A	N/A	
Hydrogen Storage	B31.1, SC II ME	No	N/A	N/A	N/A	
Diesel Engine Auxiliaries	ASME III-3 B31.1, SC I & II, ME	Yes (See Remarks)	Yes (6)	N/A	N/A	Emergency Diesel Exhaust Has T >300°F and Thermal Expansion Test Performed.
MSIV Leakage Control	ASME III-1,2 B31.1, SC I SC II, ME	Yes	N/A	N/A	N/A	
Reactor Recirc Motor / Generator	B31.1, SC II ME	No	N/A	N/A	N/A	
High Pressure Coolant Injection	ASME III-1,2 B31.1, SC I SC II, H.E, ME	Yes	Yes	Yes	Yes and Turbine Exhaust	HPCI Turbine Stop Valve Closure Transients for Steam Supply, Steady State Vibration for Steam Supply HPCI. Pump System and discharge lines under S.S. Vibration

RCIC pump suction and discharge piping under SS vibration test

TABLE 3.9-33

BOP PIPING SYSTEMS POWER ASCENSION TESTING

Piping System	Code(s)/ S.C/H.E M.E (1)	Temp >200°F	Thermal Expansion Test (2)	Dynamic Transient Test (3)	Steady State Vibration Test (4)	Remarks
:actor Core Isolation ;oling	ASME III-1,2 B31.1, SC I SC II, ME, ME	Yes	Yes	N/A	Yes	Steady State Vibration for RWCU Steam Supply and Turbine Exhaust
:actor Water .ean up	ASME III-1,2 B31.1, SC I SC II, ME, ME	Yes	Yes	N/A	Yes	Steady State Vibration for RWCU Line Inside Containment
:sidual Heat :moval	ASME III-1,2, 3, B31.1, SC I & II, ME, ME	Yes (See Remarks)	Yes	N/A	Yes	Majority of the System has Normal Operating Temperature less than 300°F Thermal Expansion Tests are done for SCI Systems WAA T >300°F. Steady State Vibration for Inside Containment Piping and RHR Pump Discharge.
leanup Filter :mineralizer	ASME III-2 B31.1, SC II ME	No	N/A	N/A	N/A	
ontrol Rod Drive	ASME III-2 B31.1, SC I SC II, ME	No	N/A	N/A	N/A	
tandby Liquid Control	ASME III-1,2 B31.1, SC I & II, ME, ME	No (See Remarks)	N/A	N/A	N/A	Only a small portion of the Line near RPV has Temperature >200°F
ore Spray	ASME III-1,2 B31.1, SC I & II, ME, ME	Yes	Yes(5)	N/A	Yes	Steady State Vibration For Core Spray Pump Discharge

TABLE 3.9-33

BOP PIPING SYSTEMS POWER ASCENSION TESTING

Piping System	Code(s)/ S.C/M.E M.E (1)	Temp >200°F	Thermal Expansion Test (2)	Dynamic Transient Test (3)	Steady State Vibration Test (4)	Remarks
Fuel Pool Cooling, Cleanup & Demineralizer	ASME III-3 B31.1, SC I SC II, ME	No	N/A	N/A	N/A	
Containment Atmospheric Control	ASME III-2 B31.1, SC I & II, ME	No	N/A	N/A	N/A	
Solid Radwaste and Radwaste Solidification	B31.1 SC II ME	No	N/A	N/A	N/A	
Off-Gas Recombiner	ASME III-3 B31.1, SC I SC II, M.E	Yes	N/A	N/A	N/A	
Ambient Temperature Charcoal Off-Gas Treatment	B31.1, SC II ME	No	N/A	N/A	N/A	
Chilled Water	ASME III-3 B31.1, SC I SC II, ME	No	N/A	N/A	N/A	

NOTES

(1) Code(s): ASME III Boiler and Pressure Vessel Code, -1, -2, or -3 Denotes Nuclear Class 1, 2 or 3 Piping.

S.C I or II Denotes Seismic Category I or II

H.E: Denotes High Energy Piping System i.e. Pressure ≥275 PSI or Temperature ≥200° During Normal Plant Operation

M.E: Denotes Moderate Energy Piping System

(2) Thermal Expansion Tests for the indicated systems corresponds to test description ~~PT-X~~ ST-38, Chapter 14.

(3) Dynamic Transient Tests for the indicated systems corresponds to test description ~~PT-Y~~ ST-39, Chapter 14.

(4) Steady State Vibration Tests for the indicated systems corresponds to test description ~~PT-Z~~ ST-40, Chapter 14.

(5) N/A - Denotes Not Applicable and it means test is not performed for the below reasons:

A) For Thermal Expansion Rests: The system is not safety-related or the normal operating temperature is less than 300°F.

B) For Dynamic Transient Test: The system is not safety-related or does not experience any significant transients.

C) For steady State Vibration Tests: The system is not safety-related or no significant vibration expected.

(6) Test to be done during Preoperational Test Program.

(7) For the effect of RPV expansion only. No flow in the Core Spray line.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

June 30, 1980

GC-388
MA/4

TO ALL APPLICANTS FOR CONSTRUCTION PERMITS, POWER REACTOR LICENSEES, ARCHITECT/ENGINEERS AND REACTOR VENDORS

I am enclosing for your information a notice which has been forwarded to the Office of the Federal Register for publication. This notice relates to regional meetings which will be held, beginning July 14, 1980, to address the portion of the Commission's Memorandum and Order dated May 23, 1980, which describes requirements pertaining to environmental qualification of electrical equipment installed in safety systems.

Sincerely,

Darrell G. Eisenhut

Darrell G. Eisenhut, Director
Division of Licensing

Enclosure:
Notice

cc w/encl:
Service Lists

7590-01

FEDERAL REGISTER NOTICE

IMPLEMENTATION OF REQUIREMENTS FOR ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

AGENCY: U. S. Nuclear Regulatory Commission

ACTION: NOTICE OF MEETING

SUMMARY: On May 23, 1980, the NRC issued a Memorandum and Order that defines Commission's requirements with respect to the environmental qualification of electrical equipment at nuclear power plants. In connection with these new requirements, the NRC will hold regional meetings to explain in more detail each of the requirements.

Dates and Locations of Regional Meetings

to be Held from 8:30 A.M. to 3:00 P.M.

July 14, 1980 - Region I	- Holiday Inn 260 Goodard Boulevard King of Prussia, Pennsylvania
July 15, 1980 - Region II	- Hyatt Regency Lancaster Room 265 Peachtree Street, N.E. Atlanta, Georgia
July 16, 1980 - Region III	- Marriott O'Hare Motel 8535 W. Higgins Road Chicago, Illinois
July 17, 1980 - Region IV & V	Holiday Inn North Irving, Texas

FOR FURTHER INFORMATION CONTACT:

Robert A. Purple, Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
(301) 492-7672

SUPPLEMENTAL INFORMATION:

The primary purpose of these meetings will be to: (1) provide a more detailed technical explanation of the new NRC requirements; (2) provide a description of the NRC approach, schedule, and administrative procedures to be followed in implementing these requirements; and (3) provide a forum for discussion of the requirements.

Persons other than the NRC staff and licensee representatives may observe the proceedings but will be permitted to participate in the discussions only as time will allow.

Registration of attendees will be conducted prior to each meeting at the designated locations.

Dated at Bethesda, Maryland, this 27th day of June 1980.

FOR THE NUCLEAR REGULATORY COMMISSION

Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation

ALL POWER REACTOR LICENSEES

50-388

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Docket No. 50-313
Arkansas Unit 1

Docket No. 50-368
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Calvert Cliffs Unit 1

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