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Dalwyn R. Davidson
VICE PRESIDENT
SYSTEM ENGINEERING AND CONSTRUCTION

June 2, 1982

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licen[illegible]ng
U. S. Nuclear Re[illegible]latory Commission
Washington, D. C. 20555

Dear Mr. Schwencer:

Perry Nuclear Power Plant
Docket Nos. 50-440; 50-441
Mechanical Engineering Branch

In meetings held with the Mechanical Engineering Branch during August 1981, CEI committed to supplying our Preoperational Vibration Monitoring Program for BOP Systems.

The subject plan is attached for your review.

Very truly yours,

Dalwyn R. Davidson

Dalwyn R. Davidson
Vice President
System Engineering and Construction

DRD:dlp

cc: Jay Silberg, Esq.
John Stefano
Max Gildner

B001

BOP SYSTEM VIBRATION TESTING

BOP System Vibration Testing is conducted in two phases, System Vibration Preoperational Testing and Post Fuel Load BOP System Vibration Testing.

I. SYSTEM VIBRATION PRE-OPERATIONAL TESTING

System vibration pre-operational testing of BOP safety related piping designated as ASME Class 1, 2, or 3 will be conducted. In addition, certain non-safety related piping which is seismically supported to preclude gross failure and subsequent damage to essential components will be tested. Testing will include a visual observation that steady state and transient induced vibrations during acceptance and pre-operational testing are within acceptable limits. Additionally, testing will include a verification that snubber and spring hanger movements (travel) are within the predicted operating limits for the test conditions and that they will restrain component movement and vibration.

Details of the test (including systems) are included as Attachment 1.

II. POST FUEL LOAD BOP SYSTEM VIBRATION TESTING

Post fuel load BOP system vibration testing includes those safety related, and certain nonsafety related, piping systems and components (as previously identified in Section I) which will not be monitored during acceptance and preoperational tests. Testing, by remote monitoring, will be performed to ensure that steady state and transient induced vibration of such piping are within acceptable limits in accordance with ASME Code Section III paragraphs NB-3622.3, NC-3622.3 and ND-3622.3.

Details of the test (including systems) are included as Attachment 2.

III. ACCEPTANCE CRITERIA

Piping steady state and transient vibrations for BOP safety related piping system and/or other systems as previously identified in Sections I and II; will be tested using acceptance limits which will ensure that the piping stresses, as a result of cyclic vibration in the range of 10^8 - 10^9 cycles will be limited to 1/2 of the fatigue endurance limit, at 10^6 cycles, as defined in the ASME Code Appendix I. Those piping systems for which the plant life cycle vibrations are expected to be 10^6 cycles or less, stress limits of

III. ACCEPTANCE CRITERIA (Cont'd)

the ASME Code Appendix I will be applied. Acceptance criteria establishing such limits will be developed for the steady state and transient vibration testing conditions.

Spring hanger movement shall be within the cold and hot setpoints and snubbers shall operate within their predicted range and not become fully extended or retracted.

ATTACHMENT 1

SYSTEM VIBRATION PRE-OPERATIONAL TESTING

TEST METHOD

1. Steady State Vibration

a. The following systems (or designated portions of) will be visually inspected for vibration during acceptance or pre-operational testing:

SYSTEM

1) Standby Liquid Control (C-41)

2) Control Rod Drive Hydraulics (C-11)

3) Residual Heat Removal (E-12)

4) Low Pressure Core Spray (E-21)

5) High Pressure Core Spray (E-22)

6) Reactor Core Isolation Cooling (E-51)

7) Reactor Water Cleanup (G-33)

8) Fuel Pool Cooling and Cleanup (G-41)

9) Suppression Pool Make-Up (G-42)

10) Liquid Radwaste (G-50)

SYSTEM

11) Service Water
(P-41)

12) Emergency Closed Cooling
(P-42)

13) Nuclear Closed Cooling
(P-43)

14) Emergency Service Water
(P-45)

15) Safety Related Instrument Air
(P-57)

16) Service Air
(P-51)

17) Instrument Air
(P-52)

18) Standby Diesel Generators Starting Air
(R-44)

19) Standby Diesel Generator Fuel Oil
(R-45)

20) Standby Diesel Generator Jacket Water Cooling
(R-46)

21) Standby Diesel Generator Lube Oil System
(R-47)

22) Feedwater Leakage Control System
(N-27)

23) Reactor Water Cleanup Filter Demineralizer
(G-36)

24) Liquid Radwaste Sump
(G-61)

25) Condensate Storage & Transfer
(P-11)

SYSTEM

26) Mixed Bed Demineralized Water
(P-22)

27) Control Complex Chilled Water
(P-47)

28) Containment Vessel Chilled Water
(P-50)

29) Fire Service Water
(P-54)

30) Nitrogen Supply
(P-86)

31) Standby Diesel Generator Exhaust, Intake & Crankcase
(R-48)

32) Combustible Gas
(M-51)

33) Emergency Service Water Screen Wash
(P-49)

b. If visual inspection detects questionable vibration, the portion of testing which produced that vibration will be repeated and the piping vibration will be monitored with a portable vibration monitor.

c. During the course of the repeat tests, regular vibration readings will be taken to determine compliance with acceptance criteria. If trends indicate that acceptance criteria may be violated, the frequency at which vibration readings are taken will be increased. The test will be subjected to a hold or terminated as soon as acceptance criteria are violated.

d. As soon as possible after establishment of a test hold or termination of the test, the following corrective actions will be taken:

1) Installation Inspection - a walkdown of the piping and suspension will be performed to identify any obstruction or improperly operating suspension components. The source of the excitation must be identified to determine whether it is related to equipment failure. Action will be taken to correct any discrepancies prior to repeating the test.

2) Instrumentation Inspection - the instrument installation and calibration are checked and discrepancies will be corrected. Additional instrumentation will be added as necessary.

3) If items d.1) and d.2) above identify discrepancies that could account for failure to satisfy acceptance criteria, the test will be repeated.

e. During visual observation of the above test conditions/retests close attention will be given to small attached piping and instrument connections to ensure that they are not in resonance with the major sources of vibration in their respective systems. If excessive vibration is observed and confirmed by portable vibration monitor, then the piping should be reviewed and revised to alleviate the excessive vibration and the final piping arrangement retested.

2. Transient Vibration

a. During pre-operational testing designated system piping will be observed for vibration in response to various transients on the following systems:

SYSTEM

1) Residual Heat Removal (E-12)

2) Low Pressure Core Spray (E-21)

3) High Pressure Core Spray (E-22)

4) Reactor Core Isolation Cooling (E-51)

5) Reactor Water Cleanup (G-33)

6) Fuel Pool Cooling and Cleanup (G-41)

7) Suppression Pool Make-Up (G-42)

8) Liquid Radwaste (G-50)

SYSTEM

9) Service Water
(P-41)

10) Emergency Closed Cooling
(P-42)

11) Nuclear Closed Cooling
(P-43)

12) Emergency Service Water
(P-45)

13) Service Air
(P-51)

14) Instrument Air
(P-52)

15) Standby Diesel Generators Starting Air
(R-44)

16) Standby Diesel Generators Fuel Oil
(R-45)

17) Standby Diesel Generators Jacket Water Cooling
(R-46)

18) Standby Diesel Generators Lube Oil
(R-47)

19) Safety Related Instrument Air
(P-57)

20) Standby Liquid Control
(C-41)

21) Control Rod Drive Hydraulics
(C-11)

22) Reactor Water Cleanup Filter Demineralizer
(G-36)

23) Liquid Radwaste Sump
(G-61)

SYSTEM

24) Condensate Storage & Transfer (P-11)

25) Mixed Bed Demineralized Water (P-22)

26) Control Complex Chilled Water (P-47)

27) Containment Vessel Chilled Water (P-50)

28) Standby Diesel Generator Exhaust Intake & Crankcase (R-48)

29) Emergency Service Water Screen Wash (P-49)

b. During observation of each transient close attention will be given to small attached piping and instrument connections to ensure that they are not in resonance with the major sources of vibration, and to verify that they do not exceed transient vibration limits. If excessive vibration is observed and confirmed by portable vibration monitor, then the piping should be reviewed and revised to alleviate the excessive vibrations and the final piping arrangement retested.

c. During piping system transients system suspension components will be observed. Verification will be made that pipe hangers remain between their hot and cold setpoints, and that snubbers do not become fully extended or retracted.

d. When visual inspection detects questionable vibration, the transient which produced that vibration will be repeated and the piping response will be monitored with a portable vibration monitor.

e. During the course of the repeat tests if vibration readings exceed acceptance criteria, the test will be subjected to a hold or terminated.

f. As soon as possible after establishment of a test hold or termination of the test, the following corrective actions will be taken:

1) Installation Inspection - a walkdown of the piping and suspension will be performed to identify any obstruction or improperly operating suspension components. The source of the excitation must be identified to determine whether it is related to equipment failure. Action will be taken to correct any discrepancies prior to repeating the test.

2) Instrumentation Inspection - the instrument installation and calibration will be checked and discrepancies corrected. Additional instrumentation will be added as necessary.

3) If items f.1) and f.2) above identify discrepancies that could account for failure to comply with acceptance criteria, the test will be repeated.

ATTACHMENT 2

POST FUEL LOAD BOP SYSTEM VIBRATION TESTING

TEST METHOD

1. Thermal Expansion Monitoring Only

Designated piping in the following systems will be remotely monitored for thermal expansion during various test conditions. Monitoring equipment used are transducers and a data acquisition system.

SYSTEM

1) Residual Heat Removal (E-12)

2) Low Pressure Core Spray (E-21)

3) High Pressure Core Spray (E-22)

4) RCIC (E-51)

5) RWCU (G-33)

6) Standby Liquid Control (C-41)

2. Thermal Expansion Monitoring and Vibration Testing

a. Designated piping in the following systems will be remotely monitored for thermal expansion and steady state vibration during various test conditions. Monitoring equipment used are transducers, accelerometers and a data acquisition system.

SYSTEM

1) Main Steam (N-11)

2) Main Steam System Drains (N-22)

SYSTEM

3) Feedwater
(N-27)

4) MSIV Leakage Control
(E-32)

5) Main Steam Bypass and Pressure Regulation
(C-85)

b. Systems as listed in part 2.a. of this attachment will also be remotely monitored for transient vibration during various transients. Monitoring equipment used are accelerometers and a data acquisition system.

3. Remote Monitoring Equipment Details

a. Piping, snubber and spring hanger movement is obtained by use of transducers.

b. Piping vibrations are obtained by use of accelerometers.

c. A data acquisition system is used to collect transducer and accelerometer data.