

SECTION 3.9

CONTENTS (Continued)

<u>Section</u>	<u>Title</u>	<u>Page</u>
3.9.5.2	Loading Conditions	3.9-41
3.9.5.2.1	Events to be Evaluated	3.9-41
3.9.5.2.2	Pressure Differential During Rapid Depressurization	3.9-41
3.9.5.2.3	Feedwater Line and Main Steam Line Break	3.9-42
3.9.5.2.3.1	Accident Definition	3.9-42
3.9.5.2.3.2	Effects of Initial Reactor Power and Core Flow	3.9-42
3.9.5.2.4	Seismic and Other Reactor Building Vibration Events	3.9-42
3.9.5.3	Design Bases	3.9-43
3.9.5.3.1	Safety Design Bases	3.9-43
3.9.5.3.2	Power Generation Design Bases	3.9-43
3.9.5.3.3	Design Loading Categories	3.9-43
3.9.5.3.4	Response of Internals Due to Steam Line Break Accident	3.9-43
3.9.5.3.5	Stress and Fatigue Limits for Core Support Structures	3.9-43
3.9.5.3.6	Stress, Deformation, and Fatigue Limits for Safety Class Reactor Internals (Except Core Support Structures)	3.9-44
3.9.6	<u>Testing of Pumps and Valves</u>	3.9-44
3.9.6.1	Testing of Safety-Related Pumps	3.9-44
3.9.6.2	Testing of Safety-Related Valves	3.9-44.1
3.9.6.2.1	Check Valves	3.9-44.1
3.9.6.2.2	Motor Operated Valves	3.9-44.3
3.9.6.2.3	Power Operated Valves	3.9-44.4
3.9.6.2.4	Isolation Valve Leak Test	3.9-44.6

3.9-x

Amendment

ance with the ASME Boiler and Pressure Vessel Code Section III. For Class 1 piping, stresses are calculated on an elastic basis and evaluated in accordance with NB-3600 of the ASME Code, Section III. For Class 2 and 3 piping, stresses are calculated on an elastic basis and evaluated in accordance with NC/ND-3600 of the Code.

3.9.3.2 Pump and Valve Operability Assurance

Active mechanical (with or without electrical operation) equipment are Seismic Category I and each is designed to perform a mechanical motion for its safety-related function during the life of the plant under postulated plant conditions. Equipment with faulted condition functional requirements include active pumps and valves in fluid systems such as the residual heat removal system, emergency core cooling system, and main steam system.

This Subsection discusses operability assurance of active ASME Code Section III pumps and valves, including motor, turbine or operator that is a part of the pump or valve (See Subsection 3.9.2.2). The COL applicant must ensure that specific environmental parameters are properly defined and enveloped in the methodology for its specific plant and implemented in its equipment qualification program.

Safety-related valves and pumps are qualified by testing and analysis and by satisfying the stress and deformation criteria at the critical locations within the pumps and valves. Operability is assured by meeting the requirements of the programs defined in Subsection 3.9.2.2, Section 3.10, Section 3.11 and the following subsections.

Section 4.4 of GE's Environmental Qualification Program (Reference 6) applies to this subsection, and the seismic qualification methodology presented therein is applicable to mechanical as well as electrical equipment.

3.9.3.2.1 ECCS Pumps, Motors and Turbine

Dynamic qualification of the ECCS (RHR, RCIC and HPCF) pumps with motor or turbine assembly is also described in Subsections 3.9.2.2.2.6 and 3.9.2.2.2.7.

3.9.3.2.1.1 Consideration of Loading, Stress, and Acceleration Conditions in the Analysis

In order to avoid damage to the ECCS pumps during the faulted plant condition, the stresses caused by the combination of normal operating loads, SSE, other RBV loads, and dynamic system loads are limited to the material elastic limit. A three dimensional finite-element model of the pump and associated motor (see Subsections 3.9.3.2.2 and 3.9.3.2.1.5 for RCIC pump and turbine, respectively) and its support is developed and analyzed using the response spectrum and the dynamic analysis method. The same is analyzed due to static nozzle loads, pump thrust loads, and dead weight. Critical location stresses are compared with the allowable stresses and the critical location deflections with the allowables; and accelerations are checked to evaluate operability. The average membrane stress σ_m for the faulted condition loads is limited to $1.2S$ or approximately $0.75 \sigma_y$ (σ_y = yield stress), and the maximum stress in local fibers (σ_m + bending stress σ_b) is limited to $1.8S$ or approximately $1.1 \sigma_y$. The maximum faulted event nozzle loads are also considered in an analysis of the pump supports to assure that a system misalignment cannot occur.

Performing these analyses with the conservative loads stated and with the restrictive stress limits as allowables assures that critical parts of the pump and associated motor or turbine will not be damaged during the faulted condition and that the operability of the pump for post-faulted condition operation will not be impaired.

3.9.3.2.1.2 Pump/Motor Operation During and Following Dynamic Loading

Active ECCS pump/motor rotor combinations are designed to rotate at a constant speed under all conditions. Motors are designed to withstand short periods of severe overload. The high rotary inertia in the operating pump

3.9.5.3.6 Stress, Deformation, and Fatigue Limits for Safety Class and Other Reactor Internals (Except Core Support Structures)

For safety class reactor internals, the stress deformation and fatigue criteria listed in Tables 3.9-4 through 3.9-7 are based on the criteria established in applicable codes and standards for similar equipment, by manufacturers standards, or by empirical methods based on field experience and testing. For the quantity SF_{min} (minimum safety factor) appearing in those tables, the following values are used:

Service Level	Service Condition	SF_{min}
A	Normal	2.25
B	Upset	2.25
C	Emergency	1.5
D	Faulted	1.125

Components inside the reactor pressure vessel such as control rods which must move during accident condition have been examined to determine if adequate clearances exist during emergency and faulted conditions. No mechanical clearance problems have been identified. The forcing functions applicable to the reactor internals are discussed in Subsection 3.9.2.5.

The design criteria, loading conditions, and analyses that provide the basis for the design of the safety class reactor internals other than the core support structures meet the guidelines of NG-3000 and are constructed so as not to adversely affect the integrity of the core support structures (NG-1122).

The design requirements for equipment classified as non-safety (other) class internals (e.g., steam dryers and shroud heads) are specified with appropriate consideration of the intended service of the equipment and expected plant and environmental conditions under which it will operate. Where Code design requirements are not applicable, accepted industry or engineering practices are used.

3.9.6 Testing of Pumps and Valves

Inservice testing of safety-related pumps and valves will be performed in accordance with the requirements of ASME/ANSI OMa-1988 Addenda to ASME/ANSI OM-1987, Parts 1, 6 and 10. Table 3.9-8 lists the inservice testing parameters and frequencies for the safety-related pumps and valves. The reason for each code defined testing exception or justification for each code exemption request is noted in the description of the affected pump or valve. Valves having a containment isolation function are also noted in the listing. Inservice inspection is discussed in Subsection 5.2.4 and 6.6.

Details of the inservice testing program, including test schedules and frequencies will be reported in the inservice inspection and testing plan which will be provided by the applicant referencing the ABWR design. The plan will integrate the applicable test requirements for safety-related pumps and valves including those listed in the technical specifications (Chapter 16) and the containment isolation system, (Subsection 6.2.4). For example, the periodic leak testing of the reactor coolant pressure isolation valves in Table 3.9-9 will be performed in accordance with Chapter 16 Surveillance Requirement SR 3.6.1.5.10. This plan will include baseline pre-service testing to support the periodic in-service testing of the components. Depending on the test results, the plan will provide a commitment to disassemble and inspect the safety related pumps and valves when limits of the OM Code are exceeded, as described in the following paragraphs. The primary elements of this plan, including the requirements of Generic Letter 89-10 for motor operated valves, are delineated in the subsections to follow. (See Subsection 3.9.7.3 for COL license information requirements).

3.9.6.1 Testing of Safety-Related Pumps

For each pump, the design basis and required operating conditions (including tests) under which the pump will be required to function will be established. These designs (design basis and

required operating) conditions include flow rate and corresponding head for each system mode of pump operation and the required operating time for each mode, acceptable bearing vibration levels, seismic/dynamic loads, fluid temperature, ambient temperature, and pump motor minimum voltage.

The COL applicant will establish the following design and qualification requirements and will provide acceptance criteria for these requirements. For each size, type, and model the COL applicant will perform testing encompassing design conditions that demonstrate acceptable flow rate and corresponding head, bearing vibration levels, and pump internals wear rates for the operating time specified for each system mode of pump operation. From these tests the COL applicant will also develop baseline (reference) hydraulic and vibration data for evaluating the acceptability of the pump after installation. The COL applicant will ensure that the pump specified for each application is not susceptible to inadequate minimum flow rate and inadequate thrust bearing capacity. With respect to minimum flow pump operation, the sizing of each minimum recirculation flow path is evaluated to assure that its use under all analyzed conditions will not result in degradation of the pump. The flow rate through minimum recirculation flow paths can also be periodically measured to verify that flow is in accordance with the design specification.

The safety-related pumps and piping configurations accommodate inservice testing at a flow rate at least as large as the maximum design flow for the pump application. The safety-related pumps are provided with instrumentation to verify that the net positive suction head (NPSH) is greater than or equal to the NPSH required during all modes of pump operation. These pumps can be disassembled for evaluation when Part 6 testing results in a deviation which falls within the "required action range." The Code provides criteria limits for the test parameters identified in Table 3.9-8. A program will be developed by the COL applicant to establish the frequency and the extent of disassembly and inspection based on suspected degradation of all safety-related pumps, including the basis for the frequency and the extent of each disassembly. The program may be revised throughout the plant life to minimize disassembly based on past disassembly

experience. (See Subsection 3.9.7.3(1) for COL license information requirements.)

3.9.6.4 Testing of Safety-Related Valves

3.9.6.2.1 Check Valves

(1) Design and Qualification

For each check valve with an active safety related function, the design basis and required operating conditions (including testing) under which the check valve will be required to perform will be established.

The COL applicant will establish the following design and qualification requirements and will provide acceptance criteria for these requirements. By testing each size, type, and model the COL applicant will ensure the design adequacy of the check valve under design (design basis and required operating) conditions. These design conditions include all the required system operating cycles to be experienced by the valve (numbers of each type of cycle and duration of each type cycle), environmental conditions under which the valve will be required to function, severe transient loadings expected during the life of the valve such as waterhammer or pipe break, life-time expectancy between major refurbishments, sealing and leakage requirements, corrosion requirements, operating medium with flow and velocity definition, operating medium temperature and gradients, maintenance requirements, vibratory loading, planned testing and methods, test frequency and periods of idle operation. The design conditions may include other requirements as identified during detailed design of the plant systems. This testing of each size, type and model shall include test data from the manufacturer, field test data for dedication by the COL applicant, empirical data supported by test, or test (such as prototype) of similar valves that support qualification of the required valve where similar must be justified by technical data. The COL applicant will ensure proper check valve application including selection of the valve size and type based on the

system flow conditions, installed location of the valve with respect to sources of turbulence, and correct orientation of the valve in the piping (i.e., vertical vs horizontal) as recommended or required by the manufacturer. The COL applicant will ensure that valve design features, material, and surface finish will accommodate non-intrusive diagnostic testing methods available in the industry or as specified. The COL applicant will also ensure that flow through the valve is determinable from installed instrumentation and that the valve disk positions are determinable without disassembly such as by use of non-intrusive diagnostic methods. Valve internal parts are designed with self-aligning features for purpose of assured correct installation. The COL applicant will compare the maximum loading on the check valve under design basis and the required operating conditions to the allowable structural capability limits for the individual parts of the check valve. The qualification acceptance criteria noted above will include baseline data developed during qualification testing and will be used for verifying the acceptability of the check valves after installation.

(2) Pre Operational Testing

The COL applicant will test each check valve in the open and/or close direction, as required by the safety function, under all normal operating system conditions. To the extent practical, testing of the valves as described in this section will be performed under fluid temperature conditions that would exist during a cold shutdown as well as under fluid temperature conditions that would be experienced by the valve during other modes of plant operation. The testing will identify the flow needed to open the valve to the full-open position. The testing will include the effects of rapid pump starts and stops as required by expected system operating conditions. The testing will include any other reverse flow conditions that may be required by expected system operating conditions. The COL applicant will examine the disk movement during valve testing and verify the leak-tightness of valve when fully closed. By using methods such as non-intrusive diagnostic equipment, the COL applicant will

examine the open valve disk stability under the flow conditions during normal and other required system operating conditions.

The parameters and acceptance criteria for demonstrating that the above functional performance requirements have been met are as follows:

- (a) During all test modes that simulate expected system operating conditions, the valve disk fully opens or fully closes as expected based on the direction of the differential pressure across the valve.
- (b) Leak-tightness of valve when fully closed is within established limits, as applicable.
- (c) Valve disk positions are determinable without disassembly.
- (d) Valve testing must verify free disk movement whenever moving to and from the seat.
- (e) The disk is stable in the open position under normal and other required system operating fluid flow conditions.
- (f) The valve is correctly sized for the flow conditions specified, i.e., the disk is in full open position at normal full flow operating condition.
- (g) Valve design features, material, and surfaces accommodate non-intrusive diagnostic testing methods available in the industry or as specified.
- (h) Piping system design features accommodate all the applicable check valve testing requirements as described in SSAR Table 3.9-8.

All ABWR safety-related piping systems incorporate provisions for testing to demonstrate the operability of the check valves under design conditions. In-service testing will incorporate the use of advance non-intrusive techniques to periodically assess degradation and the performance characteristics of the check valves. The Part 10 tests will be performed, and check valves that fail to exhibit the required performance can be disassembled for evaluation. The Code provides criteria limits

for the test parameters identified in Table 3.9-8. A program will be developed by the COL applicant to establish the frequency and the extent of disassembly and inspection based on suspected degradation of all safety-related check valves, including the basis for the frequency and the extent of each disassembly. The program may be revised throughout the plant life to minimize disassembly based on past disassembly experience. (See Subsection 3.9.7.3 for COL license information requirements.)

3.9.6.2.2 Motor Operated Valves

For each motor operated valve assembly (MOV) with active safety-related function, the design basis and required operating conditions (including testing) under which the MOV will be required to perform will be established.

(1) Design and Qualifications

The COL applicant will establish the following design and qualification requirements and will provide acceptance criteria for these requirements. By testing each size, type, and model the COL applicant will determine the torque and thrust (as applicable to the type of MOV) requirements to operate the MOV and will ensure the adequacy of the torque and thrust that the motor-operator can deliver under design (design basis and required operating) conditions. The COL applicant will also test each size, type, and model under a range of differential pressure and flow conditions up to the design conditions. These design conditions include fluid flow, differential pressure (including pipe break), system pressure, fluid temperature, ambient temperature, minimum voltage, and minimum and maximum stroke time requirements. This testing of each size, type and model shall include test data from the manufacturer, field test data for dedication by the COL applicant, empirical data supported by test, or test (such as prototype) of similar valves that support qualification of the required valve where similar must be justified by technical data. From this testing the COL applicant will demonstrate that the results of testing under in situ or installed conditions can be used to ensure the capability of the MOV to operate under design conditions. The COL applicant will ensure that the structural capability limits of the individual parts of the MOV will not be exceeded under design

conditions. Additional guidelines to justify prototype qualification testing are contained in Generic Letter 89-10, Supplement 1, Question 22 and 24 through 28. The COL applicant will ensure that the valve specified for each application is not susceptible to pressure locking and thermal binding.

The concerns and issues identified in Generic Letter 89-10 for MOVs will be addressed prior to plant startup. The following testing requirements and acceptance criteria are applicable to each motor operated valve assembly (MOV) with an active safety-related function.

(2) Pre-operational Testing

The COL applicant will test each MOV in the open and close directions under static and maximum achievable conditions using diagnostic equipment that measures torque and thrust (as applicable to the type of MOV), and motor parameters. The COL applicant will test the MOV under various differential pressure and flow to maximum achievable conditions and perform a sufficient number of tests to determine the torque and thrust requirements at design conditions. The COL applicant will determine the torque and thrust requirements to close the valve for the position at which there is diagnostic indication of hard seat contact. The determination of design torque and thrust requirements will be made for such parameters as differential pressure, fluid flow, undervoltage, temperature and seismic dynamic effects for MOVs that must operate during these transients. The design torque and thrust requirements will be adjusted for diagnostic equipment inaccuracies. For the point of control switch trip, the COL applicant will determine any loss in torque produced by the actuator and thrust delivered to the stem for increasing differential pressure and flow conditions (referred to as load sensitive behavior). The COL applicant will compare the design torque and thrust requirements to the control switch trip torque and thrust subtracting margin for load sensitive behavior, control switch repeatability, and degradation. The COL applicant will measure the total thrust and torque delivered by the MOV under static and dynamic conditions (including diagnostic equipment inaccuracy and control switch repeatability) to compare to the allowable structural capability limits for the

individual parts of the MOV. The COL applicant will test for proper control room position indication of the MOV.

The parameters and acceptance criteria for demonstrating that the above functional performance requirements have been met are as follows:

- (a) As required by the safety function: the valve must fully open; the valve must fully close with diagnostic indication of hard seat contact.
- (b) The control switch settings must provide adequate margin to achieve design requirements including consideration of diagnostic equipment inaccuracy, control switch repeatability, load sensitive behavior, and margin for degradation.
- (c) The motor output capability at degraded voltage must equal or exceed the control switch setting including consideration of diagnostic equipment inaccuracy, control switch repeatability, load sensitive behavior and margin for degradation.
- (d) The maximum torque and thrust (as applicable for the type MOV) achieved by the MOV including diagnostic equipment inaccuracy and control switch repeatability must not exceed the allowable structural capability limits for the individual parts of the MOV.
- (e) The remote position indication testing must verify that proper disk position is indicated in the control room.
- (f) Stroke time measurements taken during valve opening and closing must meet minimum and maximum stroke time requirements.

The inservice testing of MOVs will rely on diagnostic techniques that are consistent with the state of the art and which will permit an assessment of the performance of the valve under actual loading. Periodic testing per GL89-10 Paragraphs D and J will be conducted under adequate differential pressure and flow conditions that allow a justifiable demonstration of continuing MOV capability for design basis conditions. The COL applicant will determine the optimal frequency of this periodic

verification. The frequency and test conditions will be sufficient to demonstrate continuing design basis and required operating capability. (See Subsection 3.9.7.3 for COL license information requirements). The Code provides criteria limits for the test parameters identified in Table 3.9-8 for Code inservice testing.

A program will be developed by the COL applicant to establish the frequency and the extent of disassembly and inspection based on suspected degradation of all safety-related "MOV's", including the basis for the frequency and the extent of each disassembly. The program may be revised throughout the plant life to minimize disassembly based on past disassembly experience. (See Subsection 3.9.7.3 for COL license information requirements.)

3.9.6.2.3 Power Operated Valves

(1) Design and Qualification

For each power-operated (includes pneumatic-, hydraulic-, piston-, and solenoid-operated) valve assembly (POV) with an active safety-related function, the design basis and required operating conditions (including testing) under which the POV will be required to perform will be established.

The COL applicant will establish the following design and qualification requirements and will provide acceptance criteria for these requirements. By testing each size, type, and model the COL applicant will determine the force (as applicable to the type of POV) requirements to operate the POV and will ensure the adequacy of the force that the operator can deliver under design (design basis and required operating) conditions. The COL applicant will also test each size, type, and model under a range of differential pressure and flow conditions up to the design conditions. These design conditions include fluid flow, differential pressure (including pipe break), system pressure, fluid temperature, ambient temperature, minimum air supply system (or accumulator) pressure, spring force, and minimum and maximum stroke time requirements. This testing of each size, type and model shall include test data from the manufacturer, field test data for dedication by the COL applicant, empirical data supported by

test, or test (such as prototype) of similar valves that support qualification of the required valve where similar must be justified by technical data. From this testing, the COL applicant will demonstrate that the results of testing under in-situ conditions can be used to ensure the capability of the POV to operate under design conditions. The COL applicant will ensure that the structural capability limits of the assembly and the individual parts of the POV will not be exceeded under design conditions. The COL applicant will ensure that packing adjustment limits are specified for the valve for each application such that it is not susceptible to stem binding.

(2) Pre-operational Testing

The COL applicant will test each POV in the open and close directions under static and maximum achievable conditions using diagnostic equipment that measures or provides information to determine total friction, stroke time, seat load, spring rate, and travel under normal pneumatic or hydraulic pressure (as applicable to the type of POV), and minimum pneumatic or hydraulic pressure. The COL applicant will test the POV under various differential pressure and flow up to maximum achievable conditions and perform a sufficient number of tests to determine the force requirements at design conditions. The COL applicant will determine the force requirements to close the valve for the position at which there is a diagnostic indication of full valve closure (as required for the safety function of the applicable valves). The determination of design force requirements will be made for such parameters as differential pressure, fluid flow, minimum pneumatic or hydraulic pressure, power supply, temperature, and seismic/dynamic effects for POVs that must operate during these transients. The design force requirements will be adjusted for diagnostic equipment inaccuracies.

The COL applicant will measure the total force delivered by the POV under static and dynamic conditions (including diagnostic equipment inaccuracies) to compare to the allowable structural capability limits for the assembly and individual parts of the POV. The COL applicant will test for proper control room position indication of the POV.

The parameters and acceptance criteria for demonstrating that the above functional performance requirements have been met are as follows:

- (a) As required by the safety function, the valve must fully open and/or the valve must fully close with diagnostic indication of hard seat contact.
- (b) The assembly must demonstrate adequate margin to achieve design requirements including consideration of diagnostic equipment inaccuracies and margin for degradation.
- (c) The assembly must demonstrate adequate output capability of the power-operator at minimum pneumatic or hydraulic pressure or electrical supply (or loss of motive force for fail-safe positioning) with consideration of diagnostic equipment inaccuracies and margin for degradation.
- (d) The maximum force (as applicable for the type of POV) achieved by the POV including diagnostic equipment inaccuracies must not exceed the allowable structural capability limits for the assembly and individual parts of the POV.
- (e) The remote position indication testing must verify that proper disk position is indicated in the control room and other remote locations relied upon by operators in any emergency situation.
- (f) Stroke-time measurements taken during valve opening and closing must meet minimum and maximum stroke-time requirements.
- (g) For SOVs, the Class 1E electrical requirements are to be verified. The SOV should be verified to be capable of performing for design requirements for energized or deenergized and rated appropriately for the electrical power supply amperage and voltage.
- (h) Provide leak-tight seating which must meet a specified maximum leakage rate, or meet a leakage rate to ensure an overall containment maximum leakage.

All ABWR safety-related piping systems incorporate provisions for testing to demonstrate the operability of the POVs under design conditions. Inservice testing will incorporate the use of advance non-intrusive techniques to periodically assess degradation and the performance characteristics of the POVs. The Part 10 tests will be performed, and valves that fail to exhibit the required performance can be disassembled for evaluation. The Code provides criteria limits for the test parameters identified in Table 3.9.8. A program will be developed by the COL applicant to establish the frequency and the extent of disassembly and inspection based on suspected degradation of all safety-related POVs including the basis for the frequency and the extent of each disassembly. The program may be revised throughout the plant life to minimize disassembly based on past disassembly experience. (See Subsection 3.9.7.3 for COL license information requirements.)

The fusible plug valves that provide a lower drywell flood for severe accidents are described in Subsection 9.5.12. The valves are safety-related due to the function of retaining suppression pool water as shown in Figure 9.5-3. These special valves are noted here and not in Table 3.9-8. The fusible plug valve is a nonreclosing pressure relief device and the Code requires replacement of each at a maximum of 5 year intervals.

3.9.6.2.4 Isolation Valve Leak Tests

The leak-tight integrity will be verified for each valve relied upon to provide a leak-tight function. These valves include:

- (1) pressure isolation valves - valves that provide isolation of pressure differential from one part of a system from another or between systems;
- (2) temperature isolation valves - valves whose leakage may cause unacceptable thermal loading on supports or stratification in the piping and thermal loading on supports or whose leakage may cause steam binding of pumps; and
- (3) containment isolation valves - valves that perform a containment isolation function in accordance with the Evaluation Against Criterion 54, Subsection 3.1.2.5.5.2, including valves that may be exempted from Appendix J, Type C testing but whose leakage may cause loss of suppression pool water inventory.

Leakage rate testing for valve group (1) is addressed in Subsection 3.9.6. Valve groups (2) and (3) will be tested in accordance with Part 10, Paragraph 4.2.2.3.

3.9.7 COL License Information

3.9.7.1 Reactor Internals Vibration Analysis, Measurement and Inspection Program

The first COL applicant will provide, at the time of application, the results of the vibration assessment program for the ABWR prototype internals. These results will include the following information specified in Regulatory Guide 1.20.

<u>R. G. 1.20</u>	<u>Subject</u>
C.2.1	Vibration Analysis Program
C.2.2	Vibration Measurement Program
C.2.3	Inspection Program
C.2.4	Documentation of Results

NRC review and approval of the above information on the first COL applicant's docket will complete the vibration assessment program requirements for prototype reactor internals.

In addition to the information tabulated above, the first COL applicant will provide the information on the schedules in accordance with the applicable portions of position C.3 of Regulatory Guide 1.20 for non-prototype internals.

Subsequent COL applicants need only provide the information on the schedules in accordance with the applicable portions of position C.3 of Regulatory Guide 1.20 for non-prototype internals. (See Subsection 3.9.2.4).

3.9.7.2 ASME Class 2 or 3 or Quality Group D Components with 60 Year Design Life

COL applicants will identify ASME Class 2 or 3 or Quality Group D components that are subjected to cyclic loadings, including operating vibration loads and thermal transients effects, of a magnitude and/or duration so severe the 60 year design life can not be assured by required Code calculations and, if similar designs have not already been evaluated, either provide an appropriate analysis to demonstrate the required design life or provide designs to mitigate the magnitude or duration of the cyclic loads. (See

Subsection 3.9.3.1.)

3.9.7.3 Pump and Valve Testing Program

COL applicants will provide plant specific environmental parameters for the equipment qualification program in accordance with Subsection 3.9.3.2.

COL applicants will provide a plan for the detailed pump and valve inservice testing and inspection program. This plan will

- (1) Include baseline pre-service testing to support the periodic in-service testing of the components required by technical specifications. Provisions are included to disassemble and inspect the pump, check valves POVs, and MOVs within the Code and safety-related classification as necessary, depending on test results. (See Subsections 3.9.6, 3.9.6.1, 3.9.6.2.1, 3.9.6.2.2, and 3.9.6.2.3)
- (2) Provide a study to determine the optimal frequency of the periodic verification of the continuing MOV capability for design basis conditions. (See Subsection 3.9.6.2.1, 3.9.6.2.2, and 3.9.6.2.3.)
- (3) Address the concerns and issues identified in Generic Letter 89-10; specifically the method of assessment of the loads, the method of sizing the actuators, and the setting of the torque and limit switches. (See Subsection 3.9.6.2.2)

The COL applicant will include the design qualification test, inspection and analysis criteria in Subsections 3.9.6.1, 3.9.6.2.1, 3.9.6.2.2 and 3.9.6.2.3 in the development of the respective safety related pump and valve design specifications.

3.9.7.4 Audit of Design Specification and Design Reports

COL applicants will make available to the NRC staff design specification and design reports required by ASME Code for vessels, pumps, valves and piping systems for the purpose of audit. (See Subsection 3.9.3.1)

3.9.8 References

2. *BWR/6 Fuel Assembly Evaluation of Combined Safe Shutdown Earthquake (SSE) and Loss-of-Coolant Accident (LOCA) Loadings*, NEDE-21175-P, November 1976.
3. NEDE-24057-P (Class III) and NEDE-24057 (Class I) Assessment of Reactor Internals, vibration in BWR/4 and BWR/5 Plants, November 1977. Also NEDO-24057-P, Amendment 1, December 1978, and NEDE-2-P 24057 Amendment 2, June 1979.
4. *General Electric Company, Analytical Model for Loss-of-Coolant Analysis in Accordance with 10CFR50, Appendix K*, NEDE-20566P, Proprietary Document, November 1975.
5. *BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking*, NUREG-0619.
6. *General Electric Environmental Qualification Program*, NEDE-24326-1-P, Proprietary Document, January 1983.
7. Deleted
8. *Generic Criteria for High Frequency Cutoff of BWR Equipment*, NEDO-25250, Proprietary Document, January 1980.