NUREG-75/087

U.S. NUCLEAR REGULATORY COMMISSION

# STANDARD REVIEW PLAN

## OFFICE OF NUCLEAR REACTOR REGULATION

SECTION 3.9.3 ASME CODE CLASS 1, 2, AND 3 COMPONENTS, COMPONENT SUPPORTS, AND CORE SUPPORT STRUCTURES

REVIEW RESPONSIBILITIES

Primary - Mechanical Engineering Branch (MEB)

Secondary - Reactor Systems Branch (RSB)
Auxiliary and Power Conversion Systems Branch (APCSB)

I. AREAS OF REVIEW

Information is presented in the applicant's safety analysis report (SAR) and is reviewed by the MEB concerning the structural integrity and operability of pressure-retaining components, their supports, and core support structures which are designed in accordance with the rules of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III (hereafter "the Code").

The staff review covers the following specific areas:

1. Loading Combinations, Design Transients, and Stress Limits

   The design loading combinations (e.g., design loads or anticipated operational loads including design transients in combination with loads calculated to result from postulated accidents and seismic events) specified for Code constructed items designated as Code Class 1, 2, 3 and CS are reviewed to determine that they have been appropriately categorized with respect to "normal," "upset," "emergency," or "faulted" plant conditions. In addition, the staff review determines that the design stress limits and deformation criteria associated with each of the plant operating conditions and appropriate component operating conditions comply with the applicable limits specified in the Code and other criteria. Design stress limits which allow inelastic deformation of Code Class 1, 2, 3 and CS items are evaluated as are the justifications for the proposed design procedures. Piping which is "field run" should be included. Internal parts of components such as valve discs and seats and pump shafting subjected to dynamic loading during operation of the component should be included.

2. Pump and Valve Operability Assurance Programs

   The component operability assurance program is intended to assure the operability of Code Class 1, 2, and 3 active valves, 2 inches and greater in nominal pipe size, and the ability of active pumps to function under plant conditions where their operation is relied upon for plant shutdown or for mitigating the consequences of an accident. The program is evaluated with respect to test and analytical methods and combinations thereof. The test program may include prototype testing, either individually under simulated test conditions in the shop, or in situ after installation. The staff review covers the following specific information and provisions of the component operability assurance program:

a. A listing of active Class 1, 2, and 3 valves and pumps identified by system and "active" function. The Auxiliary and Power Conversion Systems Branch and the Reactor Systems Branch confirm the acceptability of the listing for Class 1, 2 and 3 pumps and valves.
b. The components, in terms of size, type, design, and manufacturer, for which one prototype test is proposed to confirm operability.
c. The components for which prototype test results are available, from applications for other plants or other sources, and the comparisons that show that the test conditions are equivalent to the plant design conditions.
d. The identification of combinations of plant conditions and loads which the active component is expected to withstand during the "active" function (such conditions are generally specified in the component design specification, as required by Code rules).
e. The test conditions and loads that will be imposed on components to confirm operability, and the comparisons to show that these are representative of plant conditions and loads (where more than one set of conditions may be applicable, the most adverse or bounding combinations should be evaluated).
f. The extent to which analytical methods will be used in lieu or in partial fulfillment of the provisions of the component operability assurance program.

3. Design and Installation of Pressure Relief Devices

The design and installation criteria applicable to the mounting of pressure relief devices (safety valves and relief valves) for the overpressure protection of Code Class 1 and Class 2 components are reviewed. The review includes evaluation of the applicable loading conditions and design stress criteria as related to the normal, upset, and emergency plant operating conditions. The design review extends to consideration of the means provided to accommodate the rapidly applied reaction force when a safety valve or relief valve opens, and the transient fluid-induced loads applied to the piping downstream of a safety or relief valve in a closed discharge piping system.

The design of safety and relief valve systems is reviewed with respect to the load combinations imposed on the safety or relief valves, upstream piping or header, downstream or vent piping, and system supports.

The loading combinations should identify the most severe combination of the applicable loads due to internal fluid pressure, dead weight of valves and piping, thermal load under heatup, steady state and transient valve operation, reaction forces when valves are discharging (thrust, bending, and torsion), and seismic forces, i.e., operating basis earthquake (OBE) and safe shutdown earthquake (SSE).

The structural response of the piping and support system is reviewed with particular attention to the dynamic or time-history analyses employed in evaluating the appropriate support and restraint stiffness effects under dynamic loadings when valves are discharging.

Where the use of hydraulic snubbers is proposed, the snubber performance characteristics are reviewed to assure that their effects have been considered in the analyses under steadystate valve operation and repetitive load applications caused by cyclic valve opening and closing during the course of a pressure transient.

The Auxiliary and Power Conversion Systems Branch verifies that the number and size of valves specified for the steam and feedwater systems have adequate pressure relieving capacity as confirmed by their review and evaluation of the "Overpressure Protection Analysis" that has been prepared in accordance with the requirements of the Code.

The Reactor Systems Branch verifies that the number and size of valves specified for the reactor coolant pressure boundary have adequate pressure relieving capacity as confirmed by their review and evaluation of the "Report on Overpressure Protection" that has been prepared in accordance with the requirements of the Code. The design criteria for pressure-relieving devices which may have an active function during and after a faulted plant condition are judged also against the requirements of the component operability assurance program.

4. Component Supports

The review of information submitted by the applicant includes an evaluation of Code Class 1, 2, and 3 component supports. The review includes an assessment of the design and structural integrity of the supports and their effect on the operability of active components. The review addresses three types of supports: plate and shell, linear, and component standard types, and their function.

Nuclear power plant component supports are those metal supports which are designed to transmit loads from the pressure-retaining boundary of the component.

Linear supports covered in this plan are those which are not included in Standard Review Plan 3.8.3.

## II. ACCEPTANCE CRITERIA

The criteria by which the areas of review defined in Section I are judged to be acceptable are as follows:

1. Loading Combinations, Design Transients, and Stress Limits

The plant and component operating conditions, design transients, and design loading combinations considered for each system should be sufficiently defined to provide the basis for design of Code Class 1, 2, 3 and CS items for all conditions and events expected over the service lifetime of the plant and should satisfy the requirements of General Design Criteria 1, 2, and 4.

The acceptability of the combination of loading conditions and design transients applicable to the design of Code constructed items within a system, including the



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categorization of the appropriate plant and component operating condition for each initiating event (i.e., LOCA, SSE, pipebreak, etc.) which may be used with each loading combination, is judged by comparison with the positions stated in Reference 5, and with appropriate standards acceptable to the staff developed by professional societies and standards organizations. When these combinations have been established, the corresponding stress limits which may be applied to the design of Code constructed items are as specified in the appropriate subsections of Division 1 of Section III of the ASME Code. The need for more conservative stress limits for active components and their supports should be considered in the context and with the other features of the operability assurance program.

2. Pump and Valve Operability Assurance Program

The operation of certain pumps and valves is relied upon to shut down the plant or mitigate the consequences of an accident. These are termed "active" pumps and valves. Certain of these active pumps and valves may be required to function coincidentally with the postulated accident or event. Other active pumps and valves may be required to function only after a postulated accident or event has occurred. Acceptable procedures for demonstrating the operability of active pumps and valves during or after postulated accidents or natural events follow:

a. Pumps and Valves Whose Operability is Required During an Accident or Event

This section presents acceptable procedures for demonstrating the operability of active pumps and valves during accident or event conditions. The pump or valve includes the pressureretaining body, all internal structures, and all appurtenances necessary for component operation. The most desirable operability assurance program consists of testing the pump or valve under simulated accident or event loadings (pressure, external loads due to SSE, etc.) and environmental conditions (temperature, humidity, etc.). When this approach is not practicable, other conservative procedures may be employed. These include more elementary testing or a combination of testing and analysis. In addition, design of the pump and valve supports must be considered and accounted for in the testing and analysis to demonstrate operability. The design specification must be written to include the requirements for operability under the accident conditions; assurance of this must be provided in the SAR. Design stress limits discussed in II.1 are acceptable for active components and their supports if considered in the operability assurance program. The following programs provide an acceptable approach to demonstrate the operability of active pumps and valves requires to operate during an accident or event.

(1) Testing

The following features should be incorporated into a test program:

(a) An individual pump or valve is tested in the manufacturer's shop, or in situ following installation in the system provided the test conditions simulate those conditions under which the "active" function is required.

(b) The pump or valve is tested in the operational mode.



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(c) The test program is based upon selectively testing a representative number of pumps or valves according to type, load level, size, etc. on a prototype basis. Pumps or valves that can be demonstrated to be equivalent (e.g., similar nondestructive examination program, materials, weldments, pressure, and temperature) to a prototype pump or valve, may be exempted from testing provided the test results of the prototype pump or valve are documented and available, and the loading conditions for the exempted pump or valve are equivalent to or less severe than those imposed during testing of the prototype pump or valve.

(d) The characteristics of the required seismic or accident input motion are properly specified as obtained from the system dynamic analysis and are representative of the input motion at the component mounting locations. The characteristics of the required input motion are specified by response spectrum, power spectral density function, or time history. Such characteristics, as derived from the structures or systems analysis, are representative of the input motion at the equipment mounting locations. Seismic excitation generally has a broad frequency content. Random vibration input motion should be used. However, single frequency input motions, such as sine "beats," are acceptable provided the characteristics of the required input motion indicate that the motion is dominated by one frequency (e.g., by structural filtering effects), the anticipated response of the equipment is adequately represented by one mode, or the input has sufficient intensity and duration to excite all modes to the required amplitudes such that the testing response spectra will envelope the corresponding response spectra of the individual modes.

(e) Seismic or accident input motion is applied to one vertical axis and one principal horizontal axis (or two orthogonal horizontal axes) simultaneously, unless it can be demonstrated that the equipment response in the vertical direction is not sensitive to vibratory motion in the horizontal direction, and vice versa. In the case of a single frequency input motion, the time phasing of the inputs in the vertical and horizontal directions must be such that a purely rectilinear resultant input is avoided.

(f) The characteristics of applicable environments such as temperature (at the accident condition) are taken into account.

(g) The fixture design simulates the actual service mounting (same stiffness characteristics) and causes no extraneous dynamic coupling to the test item.

(h) End loads are properly taken into account.

(i) Dynamic coupling to other related systems, if any, such as connected piping and other mechanical components, is considered.

The in situ application of vibratory devices to superimpose vibratory loadings on a complex active device is acceptable for operability assurance when it is shown that a meaningful test can be made in this



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way, with due regard being given to the effects on other parts of the system.

If the dynamic testing of a pump or valve assembly proves to be impracticable, static testing (static application of loads) of the assembly is acceptable provided that the end loadings are conservatively applied and are equal to or greater than accident loads, all dynamic amplification effects are accounted for, the component is in the operating mode during and after the application of loads, and an adequate analysis is made to show the validity of the static application of loads.

(2) A Combination of Test and Analysis

(a) When complete testing is not practicable, a combination of test and analysis is acceptable. Simple and passive elements, such as valve and pump bodies and their related piping and supports may be analyzed to confirm structural integrity under accident loadings. However, complex active devices such as pump motors, valve operator and gate or disk assemblies, and other electrical, mechanical, pneumatic, or hydraulic appurtenances which are vital to the pump or valve operation must be tested for operability in accordance with the section above, or the Institute of Electrical and Electronics Engineers (IEEE) Standard IEEE 344-1975, as appropriate.

(b) The following analyses are acceptable provided they are correlated to classical problems, elementary laboratory tests, or in situ tests:

i. An analysis is performed to determine the seismic input to the valve or pump;

ii. An analysis is performed to determine the system natural frequencies and the movement of the pump or valve during the SSE.

iii. An analysis is performed to determine the pressure differential and the impact energy of a valve disc during a LOCA, and to verify the design adequacy of the disc.

iv. An analysis is performed to determine the forcing functions of the axial and radial loads imposed on a pump rotor due to a LOCA, such that combined LOCA and SSE effects on the shaft and rotor assembly can be evaluated.

v. An analysis is performed to determine the speed of the pump shaft as a result of postulated accidents and to compare it with the design critical speed.

vi. An analysis is performed to verify the design adequacy of the wall thickness of valve and pump pressurecontaining bodies.

vii. An analysis is performed to determine the natural frequencies of a pump shaft and rotor assembly to ascertain whether they are within the frequency range of the seismic excitations. If the minimum natural frequency of the assembly is beyond the excitation

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frequencies, a static deflection analysis for the shaft is acceptable to account for SSE effects. If the assembly natural frequencies are close to the excitation frequencies, an acceptable dynamic analysis must be performed to determine the structural response of the assembly to the excitation frequencies.

(3) Design Adequacy of Pump and Valve Supports

(a) Analyses or tests are performed for all supports of pumps and valves to ensure their structural capability to withstand seismic excitation.

(b) The analytical results must include the required input motions to the mounted equipment which should be obtained and characterized in the manner specified by one of the following:

i. Response spectrum.

ii. Power spectral density function.

iii. Time history.

Such characteristics, as derived from the structures or systems seismic analysis, should be representative of the input motion at the equipment mounting locations. The analytical results must also show that the combined stresses of the support structures are within the limits of the Code, Subsection NF, "Component Supports."

(c) The support is tested with the pump or valve installed or with equivalent mass inertia effects. If the equipment is inoperative during the support test, the response at the equipment mounting locations is monitored and characterized in the manner stated in (b) above. In such a case the equipment is tested separately and the actual input to the equipment should be more conservative in amplitude and frequency content than the monitored response in the support test.

b. Pumps and Valves Whose Operability is Required After an Accident or Event

This section presents acceptable procedures for demonstrating the operability of active pumps and valves that are not required to operate coincident with an accident or event, but are required to operate following the accident or event. The applicant must identify those active pumps and valves considered to meet this description and justify such classification. Components that may operate or may inadvertently be operated coincident with an accident or event should meet the requirements of pumps and valves whose operability is required during an accident or event, unless the applicant can demonstrate by test or analysis that operation coincident with an accident or event will not impair the ability of the component to perform its required operation following an accident or event.

An acceptable operability assurance program for active pumps and valves whose operability is required only after an accident or event consists of design integrity and testing phases.



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(1) Design Integrity

The integrity of active pumps and valves, whose operability is required only after an accident or event, is established by including in the design specification the requirement that the loads due to the accident (emergency or faulted plant conditions) shall be considered as normal loads for the active pump or valve. Design stress limits discussed in II.1 above are acceptable for active components and their supports if considered in the operability assurance program.

(2) Testing

Operability assurance testing of active pumps and valves, whose operability is required after an accident or event, is required only for the component appurtenances vital to the operation of the component, such as operators, motors, switches, relays, etc. The testing of such items may be accomplished independently of the component provided all coupling effects are identified and properly factored into the tests as boundary conditions. Such qualification testing should be in accordance with the requirements of II.2.a(1), above, or IEEE Std 344-1975, as appropriate.

c. Design Specifications

The design specification is the document by which the component (pump or valve) designer is guided relative to the parameters employed to describe the environment in which the component must perform its function. Consequently, it is essential that for "active" pumps and valves, the environment in which the component must perform its function to shut the plant down or mitigate the effects of an accident is adequately specified as a design requirement. Therefore, the applicant shall provide assurance that the following items are included in the design specifications of "active" pumps and valves:

(1) External loads expressed as flange end loadings associated with the accident condition for which the pump or valve must operate; i.e., the loading combinations associated with the faulted plant condition, and with due regard for the proper representation of the supports, if any, become the design loads for the active component. The design loads must be equal to or less than the end loads specified by the component manufacturer as permitted for normal operation.

(2) All other relevant environmental conditions, such as temperature, humidity, etc., associated with the accident condition are specified as a normal design condition.

(3) Operating clearances or deformation limits necessary to assure operation are specified and maintained for the accident condition in which the component must operate. Excessive rubbing (other than ordinary seal rub) on rotating parts is not acceptable for active pumps under the accident conditions.



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(4) All test conditions, including loadings and environmental conditions, are specified and operability requirements stated.

(5) The operability requirements during or after the accident or event are clearly stated.

3. Design and Installation of Pressure Relief Devices

Acceptable design criteria for pressure relief stations in open discharge systems are specified in Regulatory Guide 1.67, "Installation of Overpressure Protection Devices."

As indicated in Code Case 1569, the rules for acceptable design procedures for systems where the pressure-relieving devices discharge into closed systems or systems with long discharge pipes have not reached the stage of final codification. However, for these closed or quasi-closed systems, the safety analysis report must include a commitment to perform a conservative dynamic analysis of the system, including mounting pipe runs or headers where applicable, relief device mountings, and discharge piping systems. The SAR must also include a description of the calculational procedures, computer programs, and other methods to be used in the analysis. The analysis must include the time history or equivalent effects of changes of momentum due to fluid flow changes of direction. The fluid states considered must include postulated water slugs where water seals are used. Stress computations and stress limits must be in accord with applicable rules of the Code.

4. Component Supports

To be acceptable, the component support designs should provide adequate margins of safety under all plant operating conditions.

The acceptability of the combinations of loading conditions and design transients applicable to the design of component supports within a system, including the categorization of the appropriate plant and component support operating condition for each initiating event, (i.e., LOCA, SSE, pipe break, etc.) which may be used with each loading combination, is judged by comparison with the positions stated in Reference 5, and with appropriate standards acceptable to the staff developed by professional societies and standards organizations. When these conditions have been established, the corresponding stress limits which may be applied to the design of component supports are as specified in Subsection NF of Division 1 of Section III of the ASME Code. The need for more conservative stress limits for active component supports should be considered in context with the other features of the operability assurance program.

In addition, if the component support affects the operability requirements of the supported component, then deformation limits should also be specified. The deformation limits for active component supports should be compatible with the operability requirements of the components supported. In establishing allowable deformations, the possible movements of the support base structures must be taken into account.

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III. REVIEW PROCEDURES

The reviewer will select and emphasize material from the procedures described below, as may be appropriate for a particular case.

For each area of review, the following review procedures apply:

1. Loading Combinations, Design Transients, and Stress Limits

The objectives in reviewing the loading combinations and stress limits employed by the applicant in the design of Code Class 1, 2, 3, and CS items are to confirm that each of the plant operating conditions have been included, that the loading combinations and design transients applicable to the design of Code constructed items and the categorization of proposed operating conditions are appropriate, that the design stress levels associated with each imposed loading combination are low enough to provide adequate margins with respect to the structural integrity of the item, and that for active components and their supports, stress levels are considered in the operability assurance program. The review conducted during the CP stage determines that the objectives have been addressed and are being implemented in the design in the form of a commitment by the applicant that specific design criteria will be utilized by checking actual summary analysis results, the OL stage review verifies that the design criteria have been utilized and that components have been designed to meet the objectives. To assure that these objectives are met, the review is performed as follows:

a. The applicant's proposed combination of plant operating conditions and appropriate compensating conditions in terms of anticipated transients and design basis events is reviewed for completeness and for categorization as normal, upset, emergency, or faulted.

b. The combination of design loading conditions, including procedures for combination, proposed by the applicant for each Code constructed item are reviewed to determine if they are adequate. This aspect of the review is made by comparison with the loading combinations set forth in Regulatory Guide 1.48. Deviations from the guide are evaluated on a case-by-case basis by questions addressed to the applicant to determine the rationale and justification for exceptions. Final determination is based on engineering judgment and past experience with prior applications.

c. The design stress limits selected by the applicant for each plant and item operating condition as established in (b) are reviewed to determine if they meet those specified in the appropriate subsection of Division 1 of the Code, and in Regulatory Guide 1.48. Deviations from Regulatory Guide 1.48 may be permitted provided justification is presented by the applicant. The acceptability determination is based on considerations of adequate margins of safety.

d. Analytical methods for components including their internal parts subjected to the faulted component operating condition dynamic loading should meet the criteria set forth in Section 5 of Standard Review Plan 3.9.2 as prescribed for reactor internals.

2. Pump and Valve Operability Assurance Program

The objective of the review of the pump and valve operability assurance program is to determine whether the program submitted will assure the operability of a component which is required to function to shut down the plant or mitigate the consequences of an accident. During the CP stage, a commitment to adopt a program which satisfactorily meets the acceptance criteria is required. At the OL stage, it is verified that the detailed procedures actually meet this objective. To assure the achievement of the objective, the review is performed as follows:

a. The applicant's program is reviewed to determine if it consists of the proper combination of test and analysis.

b. The test and analysis methods and programs are reviewed by comparing the information submitted in the SAR with the acceptance criteria delineated in Section II.2 of this review plan. In those cases that are not directly comparable, the reviewer determines whether an acceptable level of assurance of operability has been reached.

3. Design and Installation of Pressure Relief Devices

The objective of the review of the design and installation of pressure relief devices is to assure the adequacy of the design and installation, so that there is assurance of the integrity of the pressure relieving devices and associated piping during the functioning of one or more of the relief devices. In the CP review, it is determined whether there is reasonable assurance that the final design will meet these objectives. At the OL stage, the final design is reviewed to determine that the objectives have been met.

The review is performed as follows:

a. The design of the pressure-retaining boundary of the device is reviewed by comparison with the Code. Since explicit rules are not yet available within the Code for the design of safety and pressure relief valves, the design is reviewed on the basis of reference to sections of the Code on vessels, piping, and line valves, and on experience with similar installations and good engineering design practice.

   Allowable stress limits are compared with those for the appropriate class of construction in the Code. Deviations are identified and the applicant is requested to provide justification. Stress limits and loading combinations for the various plant operating conditions are covered under the subsections entitled "Loading Combinations, Design Transients, and Stress Limits" in this plan.

b. The design of the installation is reviewed for structural adequacy to withstand the dynamic effects of relief valve operation. The applicant should include and discuss: reaction force, valve opening sequence, valve opening time, method of analysis, and magnitude of a dynamic load factor (if used). In reaching an acceptance determination, the reviewer compares the submission with the requirements in II.3, above.

   Where deviations occur, they are identified and the justification is evaluated. Valve opening sequence effects must consider the worst combination possible and



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forcing functions must be justified with valve opening time data. The review is based in part on comparisons with prior acceptable designs tested in operating plants.

4. Component Supports

The objective in the review of component supports is to determine that adequate attention has been given the various aspects of design and analysis, so that there is assurance as to support structural integrity and as to operability of active components that interact with component supports.

The structural integrity and the effects on operability of the three types of component supports described in I.4 are reviewed against the criteria and guidelines of II.1 and II.4 of this plan.

Also, the ASME Code provides rules for the construction requirements for metal supports which are intended to transmit loads from the pressure-retaining barrier of the component, as defined in Subsection NF of the Code, to the load-carrying structural member, whether concrete or structural steel.

## IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information has been provided in accordance with the requirements of this review plan, and that his evaluation supports conclusions of the following type, to be included in the staff's safety evaluation report:

"The specified design basis combinations of loadings as applied to safety-related ASME Code Class 1, 2, and 3 pressure-retaining components in systems designed to meet seismic Category I standards are such as to provide assurance that in the event of an earthquake affecting the site, or an upset, emergency, or faulted plant transient occurring during normal plant operation, the resulting combined stresses imposed on system components will not exceed allowable stress and strain limits for the materials of construction. Limiting the stresses under such loading combinations provides a conservative basis for the design of system components to withstand the most adverse combination of loading events without loss of structural integrity. The design load combinations and associated stress and deformation limits specified for ASME Code Class 1, 2, and 3 components constitute an acceptable basis for design in satisfying applicable portions of General Design Criteria 1, 2, and 4.

"The component operability assurance program for ASME Code Class 1, 2, and 3 active valves and pumps provides adequate assurance of the capability of such active components (a) to withstand the imposed loads associated with normal, upset, emergency, and faulted plant and component operating conditions without loss of structural integrity, and (b) to perform necessary "active" functions (e.g., valve closure or opening, pump operation) under accident conditions and conditions expected when plant shutdown is required. The specified component operability assurance test program constitutes an acceptable basis for satisfying applicable portions of General Design Criteria 1, 2, and 4 and is acceptable to the staff.

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"The criteria used in the design and installation of ASME Class 1, 2, and 3 safety and relief valves provide adequate assurance that, under discharging conditions, the resulting stresses will not exceed allowable stress and strain limits for the materials of construction. Limiting the stresses under the loading combinations associated with the actuation of these pressure relief devices provides a conservative basis for the design and installation of the devices to withstand these loads without loss of structural integrity or impairment of the overpressure protection function. The criteria used for the design and installation of ASME Class 1, 2, and 3 overpressure relief devices constitute an acceptable basis for meeting the applicable requirements of General Design Criteria 1, 2, 4, 14, and 15 and are consistent with those specified in Regulatory Guide 1.67.

"The specified design basis loading combinations used for the design of safety-related ASME Code Class 1, 2, and 3 component supports in systems classified as seismic Category I provide assurance that in the event of an earthquake or an upset, emergency, or faulted plant transient, the resulting combined stresses imposed on system components will not exceed allowable stress and strain limits for the materials of construction. Limiting the stresses under such loading combinations provides a conservative basis for the design of support components to withstand the most adverse combination of loading events without loss of structural integrity or supported component operability. The design load combinations and associated stress and deformation limits specified for ASME Code Class 1, 2, and 3 component supports constitute an acceptable basis for satisfying applicable portions of General Design Criteria 1, 2, and 4."

Class CS component evaluation findings are covered in Standard Review Plan 3.9.5 in connection with reactor internals.

## V. REFERENCES


1. 10 CFR § 50.55a, "Codes and Standards."

2. 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants."

3. ASME Boiler and Pressure Vessel Code, Section III, Division 1, "Nuclear Power Plant Components," American Society of Mechanical Engineers.

4. IEEE Std 344-1975, "Guide for Seismic Qualification of Class I Electric Equipment for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers.

5. Regulatory Guide 1.48, "Design Limits and Loading Combinations for Seismic Category I Fluid System Components."

6. Regulatory Guide 1.67, "Installation of Overpressure Protection Devices."


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