

**REVIEWS OF ASME SECTION XI PUMP AND VALVE RELIEF REQUESTS  
POST GENERIC LETTER 89-04'**

Adele DiBiasio

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Engineering and Testing Group  
Department of Nuclear Energy  
Brookhaven National Laboratory  
Upton, New York 11973

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**Abstract**

This paper will present a discussion of ASME Section XI Pump and Valve Inservice Testing relief request reviews by the NRC and their contractors. Topics that will be discussed include the scope of USNRC reviews in Technical Evaluation Reports (TERs) (and Safety Evaluation, SEs); including the basis for granting relief requests, the status of relief requests in IST Program updates, and the Generic Letter 89-04 approval process; and the level of technical detail required in submitted programs. This presentation is based on the experiences of Brookhaven National Laboratory in reviewing IST Programs for the Mechanical Engineering Branch of the US Nuclear Regulatory Commission.

**Introduction**

Experience has shown that there are a number of common problems in the preparation of relief requests that make them difficult to review and grant their approval. Generally these fall in the categories of 1) providing insufficient justification for not performing the Code required tests, 2) not providing adequate information on the alternate tests, 3) numerous "typographical errors", 4) not providing the requests' status, and 5) a lack of understanding of the safety significance of the components.

In order to assist the industry in understanding the approval process, this paper will address the following: the basis for granting relief, relief request status, approval via Generic Letter 89-04, the recommended contents and format of relief requests, the use of ASME Code Cases and later editions of the Code, acceptable alternatives to the Code, and Cold Shutdown Justifications. The focus of this paper will be what information should be included in the relief requests from the perspective of a

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reviewer for the NRC. A discussion of the various means of obtaining relief and the elements necessary to be included in a relief request or cold shutdown justification is provided so that the relief requests and cold shutdown justifications can be reviewed in a prompt and efficient manner, with a minimum number of iterations.

## **Background**

Utilities are required by 10CFR50.55a to perform inservice testing of ASME Class 1, 2, and 3 pumps and valves in accordance with ASME Section XI. Alternatives to the requirements of Section XI may be used when authorized by the NRC Staff. The Regulations allow alternatives to be used when the "proposed alternatives would provide an acceptable level of quality and safety" [10CFR50.55a(a)(3)(i)], when "compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety" [10CFR50.55a(a)(3)(ii)], or when "the Code requirements are impracticable. The Commission may grant relief and may impose alternate requirements as it determines is authorized by law...giving due consideration to the burden upon the licensee if the requirements were imposed on the facility" [10CFR50.55a(g)(6)(i)]. The NRC Staff has also provided generic relief in Generic Letter 89-04, Guidance on Developing Acceptable Inservice Testing Programs. The relief requests submitted to the Staff are reviewed and approved pursuant to the regulations and the Generic Letter. Licensees should ensure that the request can be approved by either the regulations or the generic letter. Relief may be granted unconditionally, for an interim period, or with provisions, or it may be denied.

Since the NRC is no longer conducting detailed reviews of the IST Programs as part of the SEs, and there are generally no meetings with the licensee to discuss the relief requests, it is imperative that the relief requests be self supporting and complete in order to expedite their review and approval. In accordance with the Standard Technical Specifications 4.0.5, testing shall be performed in accordance with Section XI, unless specific relief has been granted. Therefore, relief must be granted prior to implementation.

## **Status of Relief Requests**

Unless the licensee has stated in the IST Program or relief request submittal that the request is "grandfathered" by the Generic Letter (i.e. that the request was submitted by a licensee not listed on

Table 1 or 2 of the Letter before April 3, 1989) or is approved by a position in the Letter, the NRC Staff has performed a detailed evaluation of the request. For future submittals, the licensee should provide a status of all the requests, including the revision and NRC status. Additionally, the licensee should identify each relief request uniquely and maintain the same numbering system, even if some of the requests have been deleted. All requests and documentation of the alternate positions allowed by the Generic Letter are reviewed to ensure that the proposed testing is acceptable, however, detailed evaluations are not included in the TER/SE. Additionally, all relief requests submitted with the next ten year interval update are reviewed and evaluated for consistency with the current NRC regulatory positions. These requests are no longer considered grandfathered.

Licensees often include components in the IST Program that are not within the scope of ASME Section XI, paragraphs IWP-1100 and IWV-1100, and the Regulations. The Section XI IST Program provides an acceptable program for monitoring component operational readiness for components subject to periodic testing in accordance with 10CFR50, Appendix A and B. However, relief is not required to be approved by the Staff in accordance with the regulations. The licensee should, nevertheless, ensure that appropriate documentation exists for these components. The NRC Staff will review and approve all the relief requests submitted, unless the licensee has stated in the relief request that the components are outside the scope of Section XI. Licensee's IST Programs will be inspected in accordance with NRC Inspection Manual, Temporary Instruction 2515/114, *Inspection Requirements for Generic Letter 89-04, Acceptable Inservice Testing Programs*, to ensure all ASME Class 1, 2, and 3 pumps and valves with safety related functions are in the program, and that relief requests have been submitted when the requirements of the Code or the Generic Letter cannot be met.

#### **Relief Granted by Generic Letter 89-04**

The most expeditious way to conduct alternate testing is to implement one of the positions contained in Generic Letter 89-04. The NRC Staff has determined that generic relief is granted to follow the alternate testing delineated in Position 1 (Full-stroke check valve testing), Position 2 (Alternates to Full-Flow Testing), Position 6 (Rapid Acting Valves), Position 7 (BWR Control Rod Scram Valves), Position 9 (Minimum-Flow Pump Testing), and Position 10 (CIV Testing) pursuant to 10CFR50.55a(g)(6)(i).

The licensee should ensure that all the criteria contained in the Generic Letter's positions are met and are adequately documented in the IST Program. Specific relief requests are then not required. The relief request format, however, provides a suitable, and the preferred, method for documentation. The Staff will review the documentation and any deviations from the positions will be identified as an anomaly in the TER/SE. Relief is only preapproved if the licensee complies with all the recommendations. Reviews of recent submittals have identified a number of problem areas related to the Generic Letter.

Position 1 allows check valves to be full-stroke exercised with flowrates less than the maximum required accident condition flowrates, provided that the licensee documents a number of items. Many licensees do not address and document each item in the relief request, including the method and results of the qualification program. The qualification program should ensure that the alternate test method is quantifiable and repeatable, and the documentation should be available for review by the NRC inspectors if it is not included in the request.

Position 2 contains numerous criteria for an acceptable disassembly and inspection program to be used as a means of determining that a valve's disk will full-stroke exercise open, or of verifying closure capability. The NRC staff's position is that a disassembly and inspection program may be instituted as a means of demonstrating the full open and closure capability of the valve provided there are no other means of verification possible. Although such a program is acceptable for verifying valve closure, it is considered by the Staff as a maintenance procedure with inherent risks, and only limited information on the valve's ability to seat promptly upon flow reversal or cessation is gained. It is generally recommended that licensees investigate the use of other testing techniques, such as non-intrusive methods (e.g. acoustics or radiography), and to implement those which are demonstrated effective.

When proposing a disassembly and inspection program, the documentation should clearly identify the sample grouping(s) of valves, as determined in accordance with the Generic Letter, and provide information on why other means are not possible or practical. The licensee should also perform partial valve stroking or provide a justification for not performing it quarterly or during cold shutdowns, or after reassembly. A valve should be inspected each refueling outage and each valve in the group should be inspected at least once every six years. If the licensee is proposing an alternate schedule to this, extreme hardship should be documented and the following information should be developed: Documentation of

each valve in the grouping's condition and capability to be full-stroked, review of industry experience, and a review of the installation of each valve for problematic locations. It is up to the licensee to establish a hardship case.

The licensee should explicitly state that the Generic Letter is being utilized. Often times, licensees propose a disassembly and inspection program without directly referring to Position 2.

Position 10 only applies to containment isolation valves (CIVs). Generic relief has not been approved for pressure isolation valves (PIVs), including CIVs that are also PIVs. The licensee should ensure that relief from paragraph IWV-3427(b) is applied only to CIVs six inches and larger.

### **Contents of Relief Requests**

NUREG-0800, Standard Review Plan Section 3.9.6, *Inservice Testing of Pumps and Valves*, details the information required for NRC review of relief requests. This guidance had previously been issued to operating plants in 1976. ASME Section XI, 1987 Addenda and later editions and addenda, also provides guidance on preparing justification of substitute examinations or tests (i.e. relief requests) in a non-mandatory appendix, Appendix F. The following basic format should be followed when preparing relief requests:

1. Component Identification: Identify the valve or pump name and component identification number, unit (if a multiple unit site), ASME Code Class, safety function, valve category, and reference drawings, including drawing coordinates. The drawings should be submitted with the relief request or IST program submittal and should include system instrumentation and test connections. If the drawings are larger than 8 1/2 X 11 inches, the licensee should submit one copy directly to the NRC Project Manager. All relief requests should be referenced in the pump and valve program tables. Licensees should ensure that there are no typographical errors in the relief requests. Wrong valve numbers, valve categories, or references, to name only a few of the errors found, affect the length of the review time, and the lack of attention and quality may be noted in the SALP Report.

2. **Section XI Code Requirement:** Specifically identify the code paragraph and requirement from which relief is requested. For example, if relief from check valve exercising in accordance with Section XI, paragraphs IWV-3521 and 3522 is requested, the request should state if relief is required for exercising the valve open or closed or both. Do not identify all the test requirements for that component, only those from which relief is requested and ensure that the alternate test and basis address each of these test requirements. A discussion of the tests performed may, however, be appropriate for the Alternate Test or Basis sections.
  
3. **Alternate Tests:** State what alternatives will be performed, the acceptance criteria that will be applied, the test frequency, and the schedule for implementation. Most recently submitted requests do not provide an implementation schedule. Alternate testing should provide a means of determining each component's condition and measuring degradation. The condition of individual components should be assured when there is redundant equipment (e.g. two check valves in series). Alternate tests should not be simply a reference to the Technical Specifications or a procedure number. A complete, detailed description of the test should be provided. If proposing to monitor system parameters, the parameters must be capable of detecting degradation and quantitative acceptance criteria should be provided.
  
4. **Basis:** Document either why the Section XI test requirements are impractical or would result in hardship or unusual burden, or how the proposed alternatives provide an acceptable level of quality and safety (i.e. provide equivalent protection as provided by the Code). When documenting the impracticality, burden, or unusual hardship, the licensee should provide a detailed description of the problems associated with performing the test. Factors such as personnel hazards, radiation exposure (including the radiation levels, estimated man-REMs to perform the testing, possible means to reduce the exposure), high costs, impact on plant startup, operation and safety, manpower required, length of time the component is out of service to perform the testing, and any potential damage to equipment may be discussed. Each relief request should specifically discuss the impracticality or burden of performing tests quarterly and at cold shutdowns, when proposing testing at refueling outages. Entering a Technical Specification limiting

condition of operation (LCO) is, by itself, not sufficient reason not to perform the Code required tests. If the length of time required to perform the testing is less than the allowable outage time (AOT) of the Technical Specification action statement, the testing should be performed. If the testing removes a train or system from service and places the plant in a condition such that the design basis function cannot be met, the testing may be postponed to cold shutdowns. The licensee should directly quote the Technical Specifications and any other documents, or attach copies with the submittal for the reviewer to use. Additionally, as documented in the Generic Letter and the Minutes to the Letter, the addition of instrumentation is not generally considered by the Staff to be impractical.

The Basis should also include a discussion of the function and safety importance of the component. The FSAR, Emergency Operating Procedures, and Probabilistic Risk Assessments (PRAs) may be consulted. Additionally, NRC Generic Communications, such as Bulletins and Information Notices, may assist in determining safety functions. Some recently submitted NRC Information Notices that should be considered in developing the IST Program include 91-56, *Potential Radioactive Leakage to Tank Vented to Atmosphere*, 90-78, *Previously Unidentified Release Path from BWR CRD Hydraulic Units*, and 89-32, *Supplement 1, Surveillance Testing of LTOPS*.

There have been a number of relief requests submitted that employ the plant's PRA to justify not performing testing in accordance with the Code. Relief can be granted in accordance with the Regulations if the Code requirements are impractical, burdensome, or if the proposed alternates provide an acceptable level of quality and safety. As discussed above, the Staff considers alternates that provide an acceptable level of quality and safety to be those that provide an equivalent level of protection as provided in the Code. Licensees should, therefore, provide a discussion of the burden or impracticality in addition to the risk impact of not performing the tests (e.g. a cost/benefit or value/impact analysis).

There is no standardized method of performing PRAs and they are not part of the plant's design basis. Although Generic Letter 88-20 required utilities to complete an Individual Plant Evaluation (IPE) or PRA, the NRC currently does not perform a detailed review or approve them. Many PRAs are developed based on generic industry component and system data as opposed to plant specific data. The level of detail, assumptions, system interactions, human-reliability analysis, and treatment of passive

components, for only a few examples, varies from plant to plant. Additionally, systems' and components' importance to safety and risk varies if based on plant core melt frequency (such as the results of a Level 1 PRA), or on containment failure/fission product release (Level 2 PRA), or public health risk and consequences (Level 3 PRA). There are substantial uncertainties contained in the absolute core melt or containment failure or fatality probabilities. PRAs are useful tools to determine the relative risk significance. If tests are proposed to be deleted based on the low risk significance, then the highly risk significant components should be reviewed to ensure that testing and maintenance activities are adequate. This concept is discussed in the new "Maintenance Rule", 10CFR50.65. Assessments of maintenance (which includes testing in this context) effectiveness should be based on actual component and system reliability/availability and failure histories. There should be a feedback mechanism to revise maintenance (i.e. testing) techniques and frequencies based on the plant and industry operating data. Additionally, PRA configuration control is necessary. It may be acceptable to delete testing of Valve A or Valve B, however the increase in risk may not be acceptable for deleting both Valves A and B. The PRAs must also be kept current to reflect plant operations, testing, maintenance and design. PRA techniques, such as Failure Modes and Effects Analysis (FMEAs), are useful tools to determine efficient and effective test methods and frequencies.

There is a precedent of using PRA to revise Technical Specification allowable outage times and the NRC Staff has evaluated the risk-based relief requests on a case-by-case basis. The industry should, however, consider developing risk-based testing guidelines. An ASME Research Task Group has prepared general risk-based inspection guidelines (ASME Document CRTD-Vol.20-1) and is working on a supplemental guideline specific to nuclear plants. The Section XI Code Committee now has a task group on ISI optimization and will be evaluating changes to the Code as a result of the Research Task Group on Risk-Based Inspection Guidelines' recommendations.

#### **Use of Code Cases and Later Editions of the Code in Relief Requests**

Many utilities have submitted relief requests to utilize the ASME/ANSI-1988 Operation and Maintenance Standards, OM Part 6. OM Part 6 has been approved for use by the Staff via Regulatory Guide 1.147. All ASME Code Cases related to ISI and IST that are acceptable to the NRC, unconditionally and with provisions, are included in this Reg Guide. These Code Cases may be used without prior NRC approval provided that they are used in their entirety and are documented in the IST Program. If only portions of the Code Cases are proposed to be used, a specific relief request is

required. For instance, if only the pump vibration requirements of OM-1988, Part 6 are to be used (Code Case N-465) or only the test supervisor requirements of OM-1-1981 are used (Code Case N-415). Code Cases other than those described in Regulatory Guide 1.147 may be used, provided a relief request is submitted and approved (Reference Footnote 6 of 10CFR50.55a).

Additionally, utilities may use later editions and addenda of Section XI which are incorporated by reference in 10CFR50.55a, subject to NRC approval (i.e., a relief request is required). If portions of these editions and addenda are used, all the related requirements must also be used. For example, in the case of utilizing the OM Part 6 vibration velocity requirements; all requirements related to vibration, including measurement location, acceptance/alert/required action ranges, and test methods, must be used as well as the pump hydraulic requirements for vertical line shaft pumps and positive displacement pumps. The hydraulic parameters for these pumps were made more stringent to compensate for the less stringent vibration alert and required action ranges.

### **Specific Relief Requests**

There are a number of testing issues that are generally acceptable to the NRC. However, specific relief is required and is often not requested. These include:

- Calculating pump inlet pressure from tank/intake structure levels in lieu of measuring pressure directly, as required by IWP-3100. In the absence of installed instrumentation, this may be acceptable provided the licensee properly proceduralizes the calculation and the calculated pressure accuracy meets the requirements of the Code.
- Testing safety valve and relief valve setpoints in accordance with ASME PTC 25.3-1976 (as required by IWW-3512) requires supervisors to be degreed engineers with at least two years experience in fluid-flow measurement. Qualifying personnel in accordance with the Owner's quality assurance program may be acceptable. Additionally, licensees are able to implement OM Part 1, which does not include this requirement, in its entirety without relief. ASME Code Case N-415 allows the use of ANSI/ASME OM-1-1981, and is included in Regulatory Guide 1.147.

- Using reference pump curves in lieu of multiple reference values may be acceptable for pumps that have variable system resistance, e.g. service water or component cooling water pumps. The licensee should develop curves or validate manufacturer's curves when the pumps are known to be operating acceptably. The curves should be based on an adequate number of points. The curves should be revalidated after any maintenance or repair which might affect the reference curve. A method of assigning alert and required action ranges must be developed and should not conflict with the Technical Specification or FSAR operability criteria. Additionally, if vibration levels vary significantly over the range of pump conditions, a method for assigning vibration acceptance criteria should be developed.
- Leak rate testing groups of valves (i.e. valves in parallel) may be acceptable when individual leak testing is impractical due to lack of installed test connections. The maximum assigned group leak rate should be based on the smallest valve in the group.
- Section XI specifies testing intervals without any extensions. The Standard Technical Specifications, however, allow extensions of the surveillance intervals [Weekly, monthly, quarterly, semiannually, every 9 months, and yearly] not to exceed 25% of the specified surveillance intervals. The Staff's position is that relief may not be granted to apply the 25% extension to safety and relief valve testing frequencies (i.e. once every five years).

#### **Cold Shutdown and Refueling Outage Justifications**

Section XI paragraphs IWV-3412 and 3522 allow utilities to delay quarterly valve testing to cold shutdowns when testing during operations is impractical. OMa-1988, Part 10 also allows valve testing to be deferred to refueling outages when exercising is impractical during operation or cold shutdowns. The Staff reviews the cold shutdown and refueling outage justifications for acceptability. These justifications should follow the same format as discussed above for relief requests and should be detailed enough so that it is evident that testing during power operation or cold shutdowns is impractical. Testing inconvenience is not sufficient justification.

OMa-1988, Part 10 provides an acceptable alternative to testing all cold shutdown valves every cold shutdown, regardless of length. The licensee should document the use of OMa-1988, Part 10, paragraphs 4.2.1.2(f) and (g) and 4.3.2.2(f) and (g) in the IST program. If valves cannot be tested during any cold shutdown and can only be tested during certain cold shutdowns, for example only when the reactor coolant pumps are not operating, specific relief is required.

Section XI, paragraph IWV-3417(a) requires monthly testing for power operated valves that experience a 25% increase or more in stroke times, where the stroke time is greater than 10 seconds, or 50% or more for valves with a stroke time less than or equal to 10 seconds. Although paragraph IWV-3412 allows valves that cannot be exercised during plant operation to be tested at cold shutdowns, the licensee should ensure the valve's ability to perform its safety function prior to startup, otherwise relief is required to postpone the monthly testing to cold shutdowns.

### Conclusion

Generic Letter 89-04 was written to help expedite the IST relief request review process. Licensees can assist in the process by writing requests that clearly communicate the basis and the alternate testing, and by submitting reference materials and drawings with the relief requests. The status of relief request approvals should also be provided to assist the reviewers.

The quality of the relief requests greatly affects the approval process. Incorrect valve numbers, drawings, and references to Code requirements; incomplete relief bases which fail to address all the Code requirements from which relief is requested; and abbreviated discussions of alternate testing all contribute to a longer review cycle and possible denial of the request based on insufficient information or justification. Numerous requests have been denied as a result of too little information-none have been denied as a result of too much!

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