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

NRC INSPECTION MANUAL

EMEB

TEMPORARY INSTRUCTION 2515/114

INSPECTION REQUIREMENTS FOR GENERIC LETTER 89-04, ACCEPTABLE INSERVICE TESTING PROGRAMS

SALP CATEGORY: SOETS-0

APPLICABILITY: One trial inspection in each of the five regions. Subsequent inspections to be determined after evaluation of the results from the trial inspections.

2515/114-01 OBJECTIVE

To provide uniform guidance to Nuclear Regulatory Commission (NRC) headquarters, regional, and site resident personnel for inspecting the activities of nuclear power plant licensees regarding inservice testing (IST) of pumps and valves in general, and particularly in response to the positions in NRC Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," dated April 3, 1989.

2515/114-02 BACKGROUND

The NRC, through 10 CFR 50.55a, "Codes and Standards," requires certain pumps and valves designed and constructed according to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Classes 1 2, or 3, to be designed to enable IST. Section XI, Subsections IWP and IWV, of the Code provide requirements for testing to assess operational readiness of pumps and valves. Generally, these requirements are included as surveillance requirements in plant technical specifications (TS) Section 4.0 (4.0.5 for plants with standardized TS), which requires testing of pumps and valves per ASME Section XI, except where specific written relief is granted by the Commission.

Criterion 1, "Quality Standards and Records," to 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," states, in part, that structures, systems, and components important to safety shall be designed, fabricated, built, and tested to quality standards commensurate with the importance of the safety functions to be performed. The quality assurance program (which includes testing) to be applied to safety-related components is described in 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

The purpose of IST of pumps and valves is to assess operational readiness of these components, to detect degradation that might affect their operation and

to assess safety margins with provisions for increased surveillance and corrective action. GL 89-04 provides guidance on meeting the requirements of 10 CFR 50.55a(g), "Inservice Inspection Requirements." GL 89-04 addresses several generic IST program deficiencies identified during previous program reviews and site inspections.

A series of public meetings followed this letter. These meetings are addressed in the "Minutes of the Public Meetings on GL 89-04," dated October 25, 1989. This TI complements NRC Inspection Procedure (IP) 73756, "Inservice Testing of Pumps and Valves." It contains guidance beyond that contained in the IP on specific issues raised in GL 89-04.

This TI also complements TI 2515/110, "Effectiveness of Licensee Activities Regarding the Performance of Safety-Related Check Valves." Inspection of IST activities for check valves should be conducted using the sections of TI 2515/110 related to testing. Inspections to both TIs may be done concurrently. If TI 2515/110 inspection has already been performed, efforts need not be duplicated.If not, ensure TI 2515/110 receives credit for inspection purposes.

2515/114-03 INSPECTION REQUIREMENTS

03.01 Select Sample Systems to Review. Select three to five systems to review and assess IST of the systems' components.

03.02 General IST Program Review. Review the following aspects of IST for components in the selected systems.

a. Verify that all ASME Code Class 1, 2, and 3 pumps and valves with safety-related functions in the selected systems are in the program.

b. Verify tests done on the pumps and valves of 03.02a, above, meet the Code test method and frequency requirements, except where relief has been granted.

c. Verify that relief requests are submitted if component test method or frequency does not comply with the Code or GL 89-04.

d. Verify adequacy of testing of non-Code pumps and valves that perform safety-related functions in the selected system.

e. Review relief request bases and proposed alternate tests.

f. Review cold shutdown justification bases.

g. Review administrative controls for tracking tests required during cold shutdown.

h. Review the test plan or test records to ensure reference values and acceptance criteria are identified.

i. Review program controls and IST procedures for reverifying or establishing reference values after component maintenance or replacement.

j. Ensure post-maintenance testing is performed before returning a component to service.

03.03 Current Testing Activities. Review ongoing testing activities for components in the selected systems.

a. Observe and evaluate testing and test procedures for system components, if possible.
b. Verify the instruments used for the tests meet the Code specified range and calibration accuracies.

03.04 Test Results. Evaluate test results for a sample of components in the selected systems.

a. Review at least one fuel cycle of test data for selected pumps and valves.

b. Ensure the Code specified corrective actions were taken for any test results in the "Alert Range" or "Required Action Range."

c. Verify compliance with applicable TS ACTION statements when components are declared inoperable per the Code and applicable reporting requirements.

d. Review method of test data comparison to previous tests and actions taken on components indicating a degrading condition or a repetitive problem.

e. Review the documented results of engineering evaluations done for inoperable components, particularly root cause analysis of the problem and the bases for returning the components to operable status.

f. Review administrative controls for design modifications or replacement of safety-related components.

03.05 Valve Testing. Evaluate the following areas for testing of a sample of valves in the selected systems.

a. Evaluate the test method, acceptance criteria, and corrective action for stroke timing power-operated valves.

b. Evaluate the test method, acceptance criteria, and corrective action for stroke timing "rapid-acting" valves.

c. Inspect testing of BWR control rod drive system scram valves.

d. Ensure containment isolation valves are in the program as Category A or A/C and that measured leakage rates are evaluated for individual valves, if practicable.

e. Verify that pressure isolation valves (PIVs) identified in the TS or facility safety analysis report (SAR) are listed as Category A or A/C valves in the program, and that TS leak rate testing requirements for these valves are referenced in the program.

f. Evaluate leak rate testing of PIVs in the program.

g. Evaluate the testing of check valves per TI 2515/110.

h. Review the program for testing safety and relief valves.

03.06 Pump Testing. Evaluate the following areas for testing of a sample of pumps in the selected systems.

a. Review pump testing methods, acceptance criteria, and corrective action requirements in the test procedures.

b. Review pump testing for the selected systems in cases where minimum-flow recirculation flow paths are used during testing to ensure testing conforms to GL 89-04, Position 9.

c. Verify the ranges and calibration accuracies of test instruments meet Code requirements.

d. Verify that pumps are declared inoperable for test results in the "Required Action Range."

e. Ensure testing is done at established reference values.

2515/114-04 INSPECTION GUIDANCE

General Guidance

The inspector shall review the licensee's IST program for compliance with the requirements of ASME Code Section XI in general, as addressed in IP 73756 and specifically, in response to the positions in GL 89-04.

The TI inspections should be announced to (1) enable the licensee to provide requested information to the inspectors for review prior to arrival at the plant site, and (2) request the licensee to provide test schedule for the selected period of the inspection.

Inspection Preparation. The lead inspector should contact NRR/EMEB before the inspection to ensure the inspectors have current information. He should gather sufficient materials to review prior to the visit. The material list should include, as a minimum, the safety evaluation (SE) or interim SE (for certain plants), the current revision of the program, any new or revised relief requests, and piping and instrumentation diagrams (P&IDs). Other materials that can aid the inspection effort include plant TS, portions of the SAR, portions of the probabilistic risk assessment (PRA), and various program correspondence, such as requests for additional information (RAIs).

Inspection. The inspection group should consist of two inspectors familiar with IST and GL 89-04. Initial inspection members may consist of (1) an EMEB staff member or contract IST engineer, (2) a member of the NRR inspection staff (such as the Special Inspection Branch), and (3) a regional inspector. The initial inspection in each Region will involve NRR or an NRR contractor for training the Regional inspectors. Following an initial inspection in each region, two regional inspectors could complete the inspections in each region. Resident inspectors should be involved with the inspection during the on-site inspection period, if possible, to provide knowledge of specific aspects of the plant. This inspection is not a "team" inspection as described in IMC 2515, Section 06.02.

Inspection of Plants. The inspection approach will differ based on the status of the plant IST program as described below. There are (1) plants with an SE, and (2) plants without an SE.

(1) Plants with an SE. The program should be assessed by ensuring compliance with commitments made in the approved IST program. Relief requests for components in systems selected for inspection should be considered. Component tests should be as identified in the IST program and relief requests. Program changes made after the SE should be in compliance with the Code or an applicable GL 89-04 position. For plants with SEs issued after GL 89-04, NRR has evaluated the program and written the SE considering the positions listed in GL 89-04. The inspector should verify that the items identified in the "Anomaly" section of the SE are resolved.

(2) Plants without an SE. The program should be assessed by inspecting for compliance with the Code and GL 89-04 positions. GL 89-04 constitutes approval for implementing certain relief requests if the licensee reviewed the IST program per the generic letter and amended it as necessary. Relief requests submitted before issuance of GL 89-04 and not affected by the positions are approved until the start of the next ten-year IST interval. For a relief request approved in this manner, if the licensee's alternate test appears to be inadequate and there is an apparent significant safety concern, it should be identified to EMEB and to the licensee with the reasons for the inspector's safety concerns.

Specific Guidance

04.01 Select Sample Systems to Review. There are many components in a plant IST program and limited time for inspection. The inspection should focus on components in only a few selected systems. The selection process should consider plant risk (associated with component failure), maintenance, identified programmatic weaknesses, and current testing activities as discussed below. The selected systems should contain a variety of pump and valve types. For boiling water reactors (BWRs) the control rod drive (CRD) system should be selected. Where possible, the inspector should maximize the inspection effectiveness by evaluating areas involving multiple inspection requirements.

° System Risk : The results of an individual plant evaluation (IPE) or PRA might provide insights on important systems and components. Another tool might be a facility risk-based inspection guide (RIG), if one exists. An RIG considers the PRA results and shows the relative importance of some systems and components. IMC 2515, Appendix C, "Risk-Based Inspection Guides," lists the RIGs that have been issued. Plant IST program correspondence also might provide insights on programmatic weaknesses to aid in the selection.

° System Maintenance: Components with a high incidence of corrective maintenance are good candidates. The inspector might identify these through discussions with the resident inspector, plant maintenance personnel, a review of inspection reports, or by a search of licensee event reports (LERs) or the Nuclear Plant Reliability Data System (NPRDS) database.

° Testing Activities: The inspection should evaluate any on-going testing activities; therefore, systems with tests scheduled during the inspection period should be considered.

04.02 General IST Program Review: Determine if the licensee's actions are adequate in the identified areas.

a. No inspection guidance.

b. An example of appropriate test method and frequency is a Category A, air-operated valve with remote position indication which should be full-stroke exercised, fail-safe tested, and stroke timed quarterly.

Valve position indication should be checked and the valve should be leak rate tested at least every two years. These tests should be identified in the IST program.

c. No inspection guidance.

d. The intent of 10 CFR Part 50, Appendix A, GDC-1, and Appendix B, Criterion XI, is that all components, such as pumps and valves important to safety, are to be tested to ensure they will perform satisfactorily in service. Therefore, component testing is not limited to those covered by 10 CFR 50.55a. Pumps and valves which are not in the program, but which are in systems with safety-related functions, should be tested in some manner which provides a level of assurance of reliability and operational readiness. Examples may include diesel fuel oil pumps, instrument air system valves, and diesel air start system valves.

The inspector should evaluate the testing done on these components to ensure the testing adequately monitors for degradation.

e. Evaluate proposed and/or approved relief requests to assess the technical validity of the bases for relief for each included component given the actual limitations of the plant or system configuration. Evaluate implementing procedures for the alternate tests of approved relief requests to ensure the licensee's commitments are met.

f. and g. Assess the validity of cold shutdown justifications for system components. The administrative mechanism for tracking components identified for testing during cold shutdowns should be evaluated to determine if adequate controls exist such that identified tests are performed at the required frequency.

h. Limits should be clearly stated in test procedures such that the test performer can make an immediate determination on the operational readiness of the pump or valve being tested and notify the appropriate personnel for declaring the component operable or inoperable.

i. The elements of the procedures for determining reference values, such as instrumentation ranges, accuracy, and calibration, should comply with the Code.

j. Post-maintenance testing will generally require performance of the inservice test procedure utilized for quarterly or cold shutdown testing. For check valves disassembled and inspected or repaired, a partial stroke test following reassembly, in addition to other required testing, should be performed.

04.03. Current Testing Activities

a. Tests should satisfy the applicable Code requirements.

b. Instruments used for pump tests should meet the Code accuracy and range requirements of Table IWP-4110-1 and Paragraph IWP-4120, respectively.

04.04 Test Results

a, b, and c. Review results from completed tests of pumps and valves performed during at least one fuel cycle. Appropriate action should have been taken for test results in the "Alert Range." The component should have been declared inoperable in a timely fashion and appropriate action taken for test results in the "Required Action Range." For components addressed by TS that, if declared inoperable, would result in entering an ACTION statement, verify appropriate information is in the test plans or test records such that those responsible for the test can make a timely determination whether the data meets the acceptance criteria and the component is operable. Determine if the licensee is complying with applicable reporting requirements of Section XI, Articles IWP-6000, IWV-6000, and 10 CFR 50.72 and 50.73.

d. and e. Evaluate the test data trending, if the licensee trends the data, and actions taken for components found to be degraded or that require frequent corrective maintenance. For these components, determine if an engineering evaluation was performed that adequately addressed the root cause. Assess the licensee's actions if the components represent a generic class of components at the plant or if the mode of degradation is likely to affect other components in the system. Review any engineering evaluations which were performed to return a component to operable status in lieu of other corrective actions.

f. The licensee's controls should consider the system design basis and Code required test provisions as part of the modification or replacement process.

04.05 Valve Testing

a. The licensee should determine changes in stroke times of power-operated valves by comparing measurements to either a reference stroke time value or the previous test measurement. If stroke time measurements are compared to reference values this method of comparison should be documented in the program.

The inspector should evaluate a sample of the bases for assigning limiting values to full-stroke times of power-operated valves. Ensure limiting values are based on stroke times measured when the valve is in good condition and operating properly. The limiting value should

represent a reasonable deviation from the reference stroke time. Ensure stroke time limits are readily accessible during testing. Assess whether corrective actions of ASME Code, Paragraph IWV-3417(b), and plant TS, if applicable, will be taken if these limits are exceeded.

b. Evaluate the testing of and corrective actions for power-operated valves identified as "rapid-acting" as described in Position 6 of GL 89-04. These valves should be identified as such in the program. Verify a maximum limiting value of full-stroke time of state basis for 2 seconds, based on the GL 89-04 guidance, is assigned. The test should be written such that upon exceeding the 2-second limit, the valve will be declared inoperable and corrective action will be taken per IWV-3417(b).

c. For BWRs: Assess testing of ASME Code Class control rod drive (CRD) system valves that must change position or block reverse flow to provide the scram function. Verify at least the following CRD system valves are in the program:

- the scram discharge volume vent and drain valves
- scram inlet and outlet valves
- scram discharge header check valves
- charging water header check valves
- cooling water header check valves.

Determine if the licensee assesses the closure capability of the charging water header check valves using methods described in TI 2515/110. If testing is performed at an interval greater than specified in the Code, the inspector should verify that the interval is documented in the program. Specific requirements for CRD scram valves can be found in GL 89-04, Position 7.

d. Ensure the valves in the plant 10 CFR Part 50, Appendix J containment leakage test program are in the IST program identified as Category A or A/C valves. These valves should be tested as specified in 10 CFR Part 50, Appendix J. Also, verify the licensee complies with the analysis of leakage rates and corrective action requirements of ASME Code, Paragraphs IWV-3426 and 3427(a). Leak rate testing according to Appendix J in lieu of IWV-3421 through IWV-3425 must be documented in the program.

e. PIVs will be identified in TS, SAR, and/or licensee's response to GL 87-06.

f. Verify PIVs are individually leak rate tested per the requirements of ASME Code, Section XI, and/or TS, and the leakage rates are evaluated against the specified leakage limits. Ensure these valves are not tested in series as opposed to individually.

g. Evaluate, as applicable, the forward flow, reverse flow, and leak rate testing of check valves using the requirements of TI 2515/110. If the TI 2515/110 inspection has already been performed on the selected systems, efforts need not be duplicated. If not, ensure TI 2515/110 receives credit for inspection performed.

h. Evaluate the testing of safety and relief valves relative to the requirements of Performance Test Code, (PTC) 25.3-1976 or OM-1, as applicable. Determine if the personnel qualifications are adequate. Include in the review of test results the as-found setpoints. Determine if the sample expansion (IWV-3513) and corrective actions (IWV-3514) are taken as required. If a lower setpoint tolerance is allowed by test procedure, ensure the tolerance is consistent with the 3 percent tolerance previously approved by NRC in Dresden 2/3 Safety Evaluation, letter from NRC to Commonwealth Edison, dated June 26, 1991.

04.06 Pump Testing

a. Test procedures should conform to ASME Section XI, Article IWP-3000.

b. Evaluate cases where the minimum-flow line is the only pump test flow path and verify the installation of flow rate instruments. Ensure the requirements of IWP-4110 and IWP-4120 are met. Evaluate the basis for determining that the flow rate through pumps tested in a low flow condition is sufficient to prevent pump damage.

Determine if there are cases where flow can be established only through a non-instrumented minimum-flow path during quarterly pump testing, but a path exists at cold shutdowns or refueling outages to perform pump testing under full or substantial flow conditions. In these cases, an increased interval between tests is acceptable. Ensure that pump differential pressure, flow rate, and bearing vibration are measured during cold shutdown or refueling outage testing. Verify at least pump differential pressure and vibration are measured quarterly. Ensure data is recorded consistent with ASME Code IWP-6000. Trending of test data is desirable. Ensure that pumps tested in this manner are identified in the program.

The GL 89-04 position does not supersede NRC Bulletin 88-04, "Potential Safety-Related Pump Loss," dated May 5, 1988, which advised licensees of the potential for pump damage while running pumps in the minimum-flow condition. If a situation similar to that addressed in the bulletin exists, an evaluation should have been performed by the licensee.

c. Pump test instrument ranges and calibration accuracies should meet the requirements of Paragraph IWP-4120 and Table IWP-4110-1.

d. The provisions of IWP-3230(d) to recalibrate instruments and rerun the test to show the pump can still fulfill its function are to be used only as an alternative to replacement or repair, and not as an additional action that can be taken before declaring the pump inoperable. If during a test a gauge is obviously malfunctioning, the test may be stopped and the gauge recalibrated without immediately declaring the pump inoperable.

e. For systems with constantly changing demand, the licensee might establish multiple sets of reference values per the Code. The use of a reference curve based on a few measured points of flow and differential pressure does not meet the Code requirements and requires relief.

2515/114-06 REPORTING REQUIREMENTS

The lead inspector is responsible for assembling the input from inspection members and reporting the inspection activities and findings in an inspection report. Besides the normal distribution, one copy of the report should be sent to James A. Norberg, Chief, Mechanical Engineering Branch (EMEB), Division of Engineering Technology (DET), NRR (OWFN 7-E-23).

2515/114-07 COMPLETION SCHEDULE

EMEB will assist in conducting five trial inspections to be completed by the end of June 1992: one in each region. Therefore, the regions should coordinate inspection schedules with the EMEB contact. Following the trial inspections, EMEB will evaluate the results and make any necessary changes to the TI regarding scope of the inspection, required resources, and number of plants requiring inspection.

2515/114-08 EXPIRATION

This TI shall remain in effect for 24 months at which time it will be incorporated into the existing IP 73756, "Inservice Testing of Pumps and Valves."

2515/114-09 NRR CONTACT

Any questions regarding this TI should be directed to Edmund J. Sullivan, EMEB/DET/NRR, at (301-504-3266) or Patricia L. Campbell EMEB/DET/NRR, at (301-504-1311).

2515/114-10 STATISTICAL DATA REPORTING

The direct inspection effort for this TI should be reported against 2515/114 for RITS reporting. The SIMS issue number for this TI is GL-89-04. The SIMs multiplant code is MPA X904. The Lead Project Manager for this TI is Joseph Shea, NRR/PD1-2.

2515/114-11 ORIGINATING ORGANIZATION INFORMATION

11.01 Organization Responsibilities. EMEB/NRR initiated this TI as part of its responsibility for coordination of the NRC review of the IST activities of licensees in response to 10 CFR 50.55a and more specifically to GL 89-04. EMEB will review the results of inspections performed by headquarters and regional personnel. Following the review EMEB will evaluate the need for additional regulatory action.

11.02 Estimated Resources. Six inspector-days should be used preparing for the inspection. Follow-up administrative time, such as report writing, is estimated at 5 inspector-days. Direct inspection effort will involve 2 or 3 inspectors for 4.5 days each.

2515/114-12 REFERENCES

GL 87-06, "Periodic Verification of Leak Tight Integrity of Pressure Isolation Valves," (NUDOCS 49208/320 - 49209/030).

GL 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," (NUDOCS 49208/320 - 49209/030).

Bulletin 88-04, "Potential Safety-Related Pump Loss," (NUDOCS 45459/042 - 45459/045).

NRC letter to Commonwealth Edison, Dresden 2/3 Safety Evaluation for Relief Request VR-25 dated 06/29/91, (NUDOCS 58279/038-58279/042).

NRC Letter (October 25, 1989) from J. Partlow, NRC, to all holders of nuclear power plant operating licenses and construction permits, and meeting attendees, forwarding minutes of public meetings on GL 89-04, (NUDOCS 52212/114-198).

NRC memorandum from Christopher Grimes, NRR/OTSB, to Suzanne Black, NRR/PDIV, subject "Request for Assistance Concerning Emergency Core Cooling System (ECCS) Subsystem Operability During Inservice Testing," dated October 3, 1991 (NUDOCS 71006/104).

NRC memorandum from James G. Partlow, ADPR to all NRR project managers, subject, "Supplement to Minutes of the Public Meeting on Generic Letter 89-04," dated September 23, 1991 (NUDOCS 59359/093).

Title 10, Code of Federal Regulations, Part 50; Sections 50.55a, 50.72, and 50.73; and Appendices A and B.

Inspection Procedure 73756, "Inservice Testing of Pumps and Valves."

Temporary Instruction 2515/110, "Effectiveness of Licensee Activities Regarding the Performance of Safety-Related Check Valves."

END