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**ASSESSMENT OF CODE IMPROVEMENTS IN THE 1992, 1994, and
1996 ADDENDA OF THE OM CODE¹**

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ABSTRACT

The NRC has initiated a rulemaking to 10CFR50.55a that would allow Owners to voluntarily update their pump and valve inservice testing programs to the 1995 Edition of the OM Code. The 1992 and 1994 Addenda, and 1995 Edition of the OM Code offers many improvements, e.g., clarifications and relaxations, to the 1989 Edition of Section XI or the 1990 Edition of the OM Code. This paper reviews the code changes that may be advantageous for Owners to use, and discusses their related requirements. Additionally, code improvements in the newly issued 1996 Addenda of the OM Code are discussed, as they may be proposed under 10CFR50.55a(a)(3)(i).

INTRODUCTION

In February 1995, the NRC had initiated a rulemaking to 10CFR50.55a that would require all licensees to update their pump and valve inservice testing (IST) programs one final time to the 1990 Edition of the ASME OM Code and eliminate the 120 month periodic IST program update requirement (Reference 1). Future revisions would not have been required, unless justified under the backfit rule, i.e., 10CFR50.109. The rulemaking allowed voluntary updating to the later addenda and edition of the OM Code. Since then, the NRC has revised their approach and has retained the 120 month update provisions. This change in direction was reported in the NRC Liaison Report at the March 1996 OM Main Committee Meeting. The staff has proposed to revise 10CFR50.55a(b) to include the 1990 Edition of the OM Code, which is identical in technical requirements to OMA-1988, Parts 6 and 10 for pump and valve testing. OMA-1988, Parts 6 and 10 are referenced by the 1989 Edition of Section XI, which is currently referenced in 10CFR50.55a(b). Voluntary use of the 1992 and 1994 Addenda, and the 1995 Edition of the OM Code has also been proposed in the recently revised proposed rulemaking.

The 1992 Addenda, 1994 Addenda and 1995 Edition of the OM Code offer many improvements, e.g., clarifications and relaxations, to the 1990 Edition. There were 14 actions incorporated in ISTB and ISTC (no changes to ISTA were included), which effected 135 paragraph changes. The only change in Subsections ISTA, ISTB or ISTC of the 1992 Addenda corrected the inequality sign in Table ISTB 5.2.2a, as errata. The 1994 Addenda, however, contained numerous technical changes to ISTB, ISTC, and Appendix I. The most noteworthy of these changes is the addition of the comprehensive pump test and permission to use analysis to revise pump reference values in ISTB; the addition of a sample disassembly and inspection program and non-intrusive testing for check valves in ISTC; and substantial changes to Appendix I on safety and relief valve testing. The 1995 Edition consists of the 1990 Edition incorporating the changes in the 1992 and 1994 Addenda, and a number of errata in ISTB and Appendix I. Errata should not be considered to be a

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part of the addenda or Edition they appear in, as they simply correct publishing errors (e.g., typographical errors or omissions to what the Code Committees had approved). Therefore, they should, as appropriate, be implemented immediately.

A summary of the most advantageous enhancements added in the 1994 Addenda are included in Table 1. When using portions of editions and addenda, all the related requirements must also be used as required by the Code, ISTA 2.2.1(c) and the regulations. When editions and addenda are issued, it is often difficult to determine which are the related requirements, without reviewing the code changes as they are approved by the Code committees. Table 1 includes the related requirements as specified in the actions approved by the Subcommittees and Main Committee of the OM Code. This information was gathered from committee correspondence and meetings. The following paragraphs describe the code changes in more detail.

Table 1 Advantageous Alternate Requirements in 1994 Addenda

Advantageous Alternate Requirements in 1994 Addenda	Related Requirements
Use of Comprehensive pump test (ISTB 4 and 5)	ISTB 3.1, 3.2, 6.2, 7
Use of new pump reference values based on analyses and evaluation of trends (ISTB 4.6 and 6.2)	ISTB 6.1, 7.3
Use of check valve sample disassembly and inspection (ISTC 4.5.4(c))	ISTC 4.5.6, 6.2(e)
Requirements for Testing Additional Valves, Appendix I, ¶ I 1.3.3(c), (e) and 1.3.5(c), (e)	¶ I 1.2, 1.3.1(e), 5.1, 9.1
Test Frequency for Class 2 and 3 primary containment vacuum relief valves, ¶ I 1.3.7	¶ I 5.2, 9.2
Test sequence requirements, ¶ I 3.1, 3.3, 7.1, 7.3.	None.
Allowance to defer corrective actions, ¶ I 3.4.1(e), 3.4.2(d), 3.4.3(d), 3.4.5(d), 3.4.7(d), 7.4.1(d), 7.4.2(d), 7.4.3(d), 7.4.5(d), 7.4.6(d)	¶ I 5.1, 9.1
Clarifications:	
Clarifications to ISTB 4.7.1(a), ISTB 5.2.1(e) and 5.2.3(e), Footnote to Table 5.2.2-1, ISTB 5.4	None.
Use of non-intrusive testing for check valve exercising (ISTC 4.5.4(a))	ISTC 2
Instrumentation requirements, ¶ I 1.4.1	None
Scope of Appendix I, ¶ I 1.1	None

1994 Addenda

OMa-1988, Part 6 requires quarterly testing of all pumps included in the scope of the standard. There is no distinction for normally operating or standby pumps. The OM Code in the 1994 Addenda has been revised to address standby and normally operating pumps separately. The quarterly requirements in the 1994 Addenda are essentially the same as OMa-1988, Part 6 for normally operating pumps. For standby pumps, however, the quarterly test only involves the measurement of speed, if the pump is variable speed, and flowrate or differential pressure. Owners may wish to implement the reduced quarterly test requirements on pumps that can only be tested on a minimum flowpath, to minimize pump degradation due to low flow. The related requirements that would be required include: performing a comprehensive pump test biennially, performing a preservice test in accordance with ISTB 4.1 prior to implementing this alternate, establishing reference values in accordance with ISTB 4.3, 4.4 and 4.5; complying with the instrument accuracy requirements of ISTB 4.7.1(a), complying with the test method requirements of ISTB 5, complying with the acceptance criteria of ISTB 6.2, and complying with the record requirements of ISTB 7.

OMa-1988, Part 6 requires pumps in the alert range to have their test frequency doubled until the cause of the deviation is determined and the condition corrected. Pumps in the required action range are required to be declared inoperable until the cause of the deviation is determined and the condition corrected. The OM standard does not allow the use of analyses to remove pumps from the alert or required action range. The 1994 Addenda of the OM Code, however, has added a new provision that allows licensees to establish a new set of reference values when the pump is in the alert or required action range, but whose continued operation at the new values is supported by an analysis (ISTB 4.6 and 6.2). The analyses shall include verification of the pump's operational readiness at both the pump level and system level, the cause of the change in pump performance, and an evaluation of trends indicated by available data. When using this alternate, the Owner must document this analysis in the record of tests (ISTB 7.3) and must trend the test parameters (ISTB 6.1).

OMa-1988, Part 10, ¶4.3.2.4(c), allows disassembly every refueling outage, as an alternate to exercising check valves. The NRC, in Generic Letter 89-04, Position 2, also allowed disassembly and inspection, however, the NRC recognized that disassembling all applicable valves every refueling outage may be burdensome to licensees and allowed the use of a sample disassembly and inspection plan (i.e., one valve is inspected every refueling outage and every valve in the group is inspected every 6 years). The NRC guidelines for this plan include extension of the valve disassembly/inspection interval to one valve every other refueling outage or expansion of the group size above 4 valves only in the cases of "extreme hardship" supported by actual in-plant data from previous testing. The Position provides 3 criteria that need to be developed to support extension of the interval to longer than once every 6 years. The 1994 Addenda of the OM Code has added a provision for a sample disassembly and inspection plan. This plan allows a 8 year disassembly/inspection interval, however, it does not include provisions to extend the interval past 8 years or to forego disassembling valves at each refueling outage. The 8 year interval was based on an INPO Technical Paper, "Check Valve Failure Trends in the Nuclear Industry," by Michael Scott and is consistent with the industry trend to 24 month refueling outages. The use of the OM Code sample disassembly and inspection plan requires the related requirements contained in ISTC 4.5.6, Corrective Action, and ISTC 6.2, Test Plans, be implemented.

The requirements for testing additional valves, when valves fail the set pressure test acceptance criteria, in OM-1-1981, OM-1-1987, and the 1990 Edition of the OM Code are very

confusing. The 1994 Addenda clarifies the requirements and additionally allows the use of Owner-established set-pressure criteria or $\pm 3\%$ of valve nameplate pressure as a screening criterion for determining the need to expand the test sample as stated in ¶I 1.3.3(c)(i) and 1.3.5(c)(i). Related to Appendix I, ¶I 1.3.3(c) and 1.3.5(c) are the requirements in ¶I 1.3.1(e), 5.1, and 9.1 for establishing and documenting the acceptance criteria. Also, the 1994 Addenda clarifies that valves subject to additional testing are those of the same valve group, which includes the same system application and service media, as well as manufacturer and type. This change could reduce the number of valves to be additionally tested.

OM-1-1981, OM-1-1987, and the 1990 Edition of the OM Code specify that Class 2 and 3 primary containment vacuum relief valves be tested every six months unless historical data indicates a requirement for more frequent testing. The 1994 Addenda of the OM Code has revised this test frequency to every refueling outage or every two years, whichever is sooner. Use of Appendix I, ¶I 1.37 would require the licensee to establish and implement the test schedule, as required by the related requirements found in ¶5.2 and 9.2. However, licensees must review their Technical Specifications, before proposing this alternative. As discussed in NUREG-1366, the staff recommends retaining the monthly surveillance testing of suppression chamber to drywell vacuum breakers in boiling water reactors.

OM-1-1981, OM-1-1987, and the 1990 Edition of the OM Code specify a sequence of tests, all of which must be performed prior to maintenance or set pressure adjustment. The 1994 Addenda requires only the visual examination, seat tightness determination and set-pressure determination to be performed prior to maintenance or set pressure adjustment. It allows the other tests to be performed after maintenance or adjustments. Additionally, the 1994 Addenda requires the determination of compliance with the Owner's seat tightness criteria to be performed last, after all the other tests are performed. The test sequence in the 1994 Addenda may be proposed in lieu of the requirements in previous editions. There are no related requirements. It should be noted that this paragraph was also revised in the 1996 Addenda, and is discussed later.

The 1994 Addenda of the OM Code, Appendix I now allows an evaluation in lieu of performing corrective actions immediately to meet the valve's acceptance criteria. The basis for this Code change was to allow valves with minor set-pressure deviations to be evaluated and accepted until the next test, provided that the valve is capable of performing its intended function until the next testing interval or maintenance opportunity, and corrective actions are taken to ensure valve operability. Owners may propose deferring corrective actions provided that they perform an evaluation and comply with the requirements in ¶3.4.1(e), 3.4.2(d), 3.4.3(d), 3.4.5(d), 3.4.7(d), 7.4.1(d), 7.4.2(d), 7.4.3(d), 7.4.5(d), or 7.4.6(d); and document the analysis of tests which do not satisfy acceptance criteria and the corrective actions, as required by ¶5.1 and 9.1.

The scope of Appendix I of the OM Code was revised in the 1994 Addenda to clarify that this appendix applies to pressure relief devices required to protect systems or portions of systems that perform a specific safety related function. Previously, the scope of Appendix I stated that the appendix only applied to pressure relief devices which are, themselves, required to perform a specific safety related function. However, ISTC 1.1 of these earlier editions stated that the pressure relief devices covered are those for protecting safety related components. Therefore, there is no change in requirements, only a clarification. Additional clarifications to Appendix I are discussed by the NRC in NUREG-1482, Section 4.3.9.

1994 Addenda Clarifications

As discussed in Section 4.3.9 of NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," the NRC has allowed the use of clarifications provided in later editions and addenda of the Code without approval, provided that they are determined to be clarifications only and are documented in the IST program. The NUREG discusses clarifications made in Appendix I. The 1994 Addenda also includes clarifications concerning pump and check valve testing. These clarifications may be used without NRC approval, prior to the amended rulemaking.

ISTB 4.7.1(a) has been revised to clarify that parameters determined by analytical method shall meet the accuracy requirements of Table ISTB 4.7.1-1. Paragraph ISTB 5.2.1(e) and 5.2.3(e) were revised and now include clarification that vibration measurements are required to be compared to both the relative and absolute acceptance criteria in Table ISTB 5.2.1-1. Additionally, a footnote has been added to Table 5.2.1-1 to clarify that positive displacement pumps, excluding reciprocating pumps, should use the vibration acceptance criteria of centrifugal and vertical line shaft pumps. Previously, no vibration acceptance criteria were supplied for these pumps. ISTB 5.4 was clarified to read "within 3 months before the system is placed in an operable status." The previous wording, i.e., "within 3 months of placing the system," was confusing.

OMa-1988, Part 10, ¶4.3.2.4(a) states that check valve obturator movement may be observed by "a direct indicator such as a position indicating device, or by other indicator(s) such as changes in system pressure, flow rate, level, temperature, seat leakage testing or other positive means." The 1994 Addenda of the OM Code, provides additional clarification that "other positive means" includes nonintrusive testing results. Related requirements concerning nonintrusive technique qualification have been added to ISTC 2(b), Owner's Responsibility.

The instrumentation requirements contained in OM-1-1981, OM-1-1987, and the 1990 Edition of the OM Code are very confusing. Although, the 1994 Addenda's requirements for accuracy are somewhat more restrictive, it clarifies the requirements and Owners may use this clarification. There are no other related requirements.

1996 Addenda

The 1996 Addenda of the OM Code was published in April 1996. This Code addenda contains 13 actions approved by the O&M Main Committee affecting ISTA, ISTB, and ISTC. Although this Code Addenda has not been incorporated by the NRC in the proposed rulemaking, alternates that provide "an acceptable level of quality and safety" may be proposed in accordance with 10CFR50.55a(a)(3)(i). Table 2 summarizes code changes and clarifications that may be candidates for proposal to the staff. It should be noted that no addenda was published in 1995.

ISTC has been revised to allow Owners flexibility in establishing maintenance activities (which includes maintenance, testing, and examination) for check valves. As an alternate to the testing or examination requirements of ISTC, Owners may group check valves and establish a Condition Monitoring Program. Considering that the Maintenance Rule, 10CFR50.65, is required to be implemented by July 10th, the activities required by the Code may already be performed under the maintenance rule and the burden of implementing this change may be minimal and the benefit worthwhile.

Table 2 Advantageous Alternate Requirements in the 1996 Addenda

Advantageous Alternate Requirements in 1996 Addenda	Related Requirements
Check valve condition monitoring program in lieu of exercising.	ISTC 4.5.5, and Appendix II.
Check valve exercising in both directions.	ISTC 4.5.2, 4.5.4, and non-mandatory Appendix E.
Valve position verification and exercising requirement exclusion for safety and relief valves in ISTC 1.2.	None.
Deletion of the requirement for performing certain tests on safety and relief valves in sequence I 3.3.1, 3.3.2, 3.3.3, 3.3.5, 7.3.1, 7.3.2(?), 7.3.3, 7.3.5, 7.3.6.	None.
Testing of check valves in series, ISTC 4.5.6.	ISTC 4.5.7 and 6.2(f).
Testing of MOVs, Code Case OM-N-1	See proposed NRC Generic Letter .
Clarifications: Clarification in ISTB 6.2.1 that analysis in accordance with ISTB 4.6 may be used when pumps are in the alert range.	ISTB 4.6, 6.1, and 7.3.
ISTB 4.7.4, pump vibration measurement in the orthogonal direction.	None.
ISTC 4.3.2 and 4.3.3, containment isolation valve testing.	None.

The Code has been revised to require both a forward and reverse flow test, regardless of the safety function of the check valves, to ensure that obturator degradation is detected. The Code change also included some guidance in the Non-mandatory Appendix E concerning post-disassembly and inspection testing. Generic Letter 89-04, Position 2 requires, if possible, that partial valve stroking be performed after reassembly. Appendix E also requires a partial flow test if practicable. However, for valves that can be reverse closure tested, this test should also be performed following reassembly. Albeit this code change increases the burden on Owners, they may wish to implement this change to ensure a higher level of reliability of their check valves.

ISTC 1.2, Exclusions, has been revised to include an exclusion from the valve position verification and exercising requirements for safety and relief valves. This Code change was written to address the testing of the main steam pressure relief valves with auxiliary actuating device (i.e., automatic depressurization system or ADS valves) in BWRs and would reduce the testing required for these plants.

Appendix I has been revised to delete the requirement to perform tests; other than the visual examination, seat tightness determination, and set-pressure determination; in sequence and before any maintenance or set-pressure adjustments. This code change should eliminate an unnecessary burden for Owners.

ISTC 4.5.6 has been revised to address testing a pair of check valves in series. Related requirements include ISTC 4.5.7, concerning corrective action, and 6.2(f), concerning documentation. This change reflects the guidance provided in NUREG-1482, Section 4.1.1 for preparation of a relief request.

The OM Committee has issue their first Code Case. This Code Case provides alternate rules for testing motor-operated valves, including alternate test frequencies. The NRC, in a Federal Register notice dated February 20, 1996, issued a proposed Generic Letter concerning the periodic verification of design basis capability of safety-related MOVs. In Attachment 1 of the proposed Generic Letter, the NRC states that it "would consider a periodic verification program that provides an acceptable level of quality and safety as an alternate to the current IST requirements for stroke-time testing and could authorize such an alternate, upon application by a licensee, pursuant to the provisions of 10CFR50.55a(a)(3)(i)." The NRC has considered the Code Case as an acceptable periodic verification program given three provisions. These include: (1) The benefits and potential adverse effects are considered when determining appropriate testing, (2) When the test interval is greater than 5 years, an evaluation of information from tests performed during the first 5 years should be performed to validate assumptions made in justifying the longer test interval, and (3) Licensees involved in risk-informed IST programs should specifically address the relationship of the Code Case to their risk-informed initiative.

1996 Addenda Clarifications

In addition to new or revised code requirements, the 1996 Addenda also contains a number of clarifications. The 1994 Addenda included a new provision for establishing new reference values when a pump is in the alert or required action range (ISTB 4.6). ISTB 6.2.2 concerning the required action range provided a direct reference to ISTB 4.6. ISTB 6.2.1 concerning the alert range was not revised, however. The 1996 Addenda, has provided this direct reference in ISTB 6.2.1 to ISTB 4.6 for clarification.

ISTB 4.7.4 has been revised to clarify that when measuring pump vibration, the measurements do not have to be absolutely in orthogonal directions, only approximately. This issue was subject of code interpretation, ASME File #OMI 93-7.

ISTC 4.3.2 and 4.3.3 have been clarified to require that containment isolation valves that also have a leak rate requirement based on other functions, such as reactor coolant pressure isolation, are tested in accordance with ISTC 4.3.3.

Additionally, included with the 1996 Addenda are numerous code interpretations related to pump and valve testing, e.g., concerning testing of thermal relief valves, using rms pump vibration readings, and testing of dual function check valves. The Code Addenda should be consulted for these clarifications.

CONCLUSION

This paper discusses some beneficial alternatives included in the 1992 to 1996 Addenda of the OM Code to the requirements currently contained in the 1989 Edition of Section XI referenced in 10CFR50.55a(b). Until the NRC approves and issues the amended rulemaking that would allow voluntary use of these later Code requirements, these alternatives can only be used if approved by the NRC through the use of 10CFR50.55a(a)(3)(i). The NRC will provide instructions in the revised rulemaking for the use and documentation of alternatives, such that approval pursuant to 10CFR50.55a(a)(3)(i) is no longer required.

REFERENCES

1. Federal Register Notice, Volume 60, Number 88, Monday, May 8, 1995, "Regulatory Agenda; 4957, Codes and Standards for Nuclear Power Plants."
2. Code for Operation and Maintenance of Nuclear Power Plants, American Society of Mechanical Engineers, 1990 Edition through 1995 Addenda.
3. Generic Letter 89-04, Guidance on Developing Acceptable Inservice Testing Programs, April 3, 1989.
4. NUREG-1366, "Improvements to Technical Specification Surveillance Requirements," R. Lobel and T.R. Tjader, December 1992.
5. NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," P. Campbell, April 1995.
6. Federal Register Volume 61, Number 34, Tuesday, February 20, 1996, "Proposed Generic Letter: Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves (M93706); Opportunity for Public Comment."

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