NEI White Paper

Revision 1

Treatment of Operational Leakage from ASME Class 2 and 3 Components

October 2006

Acknowledgements

NEI acknowledges the assistance of the following individuals during the development of this White Paper:

Jerry Burford, Entergy
John Dosa, Constellation
Rick Graham, Southern Nuclear Co.
Lesa Hill, Southern Nuclear Co.
Richard Kersey, South Texas Project
Steve Lewis, Entergy
Mike Schoppman, NEI
Joe Weicks, Entergy
Ed Weinkam, NMC

1.0 PURPOSE

The purpose of this White Paper is three-fold:

1. Describe the operational implications of Appendices C.11 and C.12 in the NRC Inspection Manual chapter *[Reference 1]* that was published in Regulatory Issue Summary (RIS) 2005-20 *[Reference 2],*

2. Propose near-term, interim guidance for the acceptable treatment of through-wall flaws in ASME Class 2 and 3 components.

3. Provide a basis for working meetings to reach consensus on the treatment of operational leakage and the evaluation of flaws in ASME Code Class 2 and 3 components.

2.0 PROBLEM STATEMENT

The NRC guidance in Appendices C.11 and C.12 of the Inspection Manual chapter on the operability determination process *[Reference 1]* defines an ASME Class 2 or 3 component as inoperable if it has a through-wall flaw, i.e., if it exhibits any amount of pressure boundary leakage. This guidance was distributed publicly by a Regulatory Issue Summary 2005-20 *[Reference 2]*. Thus, it appears that NRC has used internal processes (i.e., the NRC Inspection Manual and a Regulatory Issue Summary) to define operability differently from the way it is defined in the Standard Technical Specifications. Industry is concerned that a default definition of inoperability that precludes a licensee from conducting an "immediate determination" of operability may constitute a backfit because it was not promulgated as a formal licensing action.

A default definition of inoperability establishes a potential shutdown scenario for any small operational leak in a Code Class component that is subject to a Technical Specification (TS) Limiting Condition for Operation (LCO). The NRC guidance states that the plant operator must enter the LCO and restore component operability within a specified time or take additional action in accordance with the LCO action statement. In many cases, the additional action is a plant shutdown. To preclude plant shutdown, the plant operator must characterize the flaw geometry by non-destructive examination (NDE) in accordance with Code requirements within the time allowed by the LCO and, if supported by the NDE results, declare the component operable or "operable but degraded." If the LCO time limit is not long enough to complete the Code characterization of the flaw, the plant operator must initiate reactor shutdown. The time constraint is most acute if the flaw is in a common header that affects an entire system. If the system is declared inoperable, the plant operator may have as little as 1 hour to initiate shutdown. It is NEI's position that a plant shutdown may not be the most effective response, from either a safety or risk perspective, to the discovery of a through-wall flaw in a Code component during plant operation. Furthermore, operability is defined by plant-specific Technical Specifications, which have precedence over guidance documents and generic communications.

3.0 EVALUATION

3.1 Impact of NRC Guidance

At least 12 utility companies, with 37 units at 23 sites, could experience a shutdown scenario if they implement the NRC's operability guidance as currently written (see Table 1 for a summary by reactor type and Region).

3.1.1 Single-Train Inoperability

At least 12 utility companies, with 37 units at 23 sites, have TS LCOs for Class 2 and 3 systems. If a Class 3 component with operational leakage were to be declared inoperable, as discussed in NRC Appendices C.11 and C.12, a through-wall leak would render one train of the system inoperable.

3.1.2 Multiple-Train Inoperability

As a subset of Section 3.1.1, several units have common headers in Class 2 and 3 systems. If a Class 2 or 3 component with operational leakage in a common header were to be declared inoperable, as discussed in NRC Appendices C.11 and C.12, a through-wall leak would require initiation of unit shutdown within one hour.

3.1.3 Value-Impact

Implementing the operability determination guidance in NRC Appendices C.11 and C.12 will have cost and risk impacts at operating commercial nuclear plants. The impacts derive from:

- shutdown transition safety/risk implications
- procedure changes
- training program changes
- the cost of additional shutdowns

NEI considers the value of initiating a plant shutdown due to a through-wall leak in a Class 2 or 3 component to be offset by the impacts listed above.

3.2 Comparison of NRC Guidance with Industry Practice

3.2.1 NRC Guidance

The first paragraph, 7th sentence, of NRC Appendix C.11 (Flaw Evaluation) states:

> "If the flaw is through-wall or does not meet the limits established by the Code, the component and part of the system containing the flaw is inoperable."

The third paragraph, 3rd sentence, of NRC Appendix C.12 (Operational Leakage from Class 1, 2, and 3 Components) states:

> "Upon discovery of leakage from a Class 1, 2, or 3 pressure boundary component (pipe wall, valve body, pump casing, etc.), the licensee must declare the component inoperable."

Alternatively, other sections in Reference 1 allow more flexibility than Appendices C.11 and C.12. For example, Section 3.9 (Reasonable Expectation) underscores the importance of flexibility in making sound operability determinations:

> "Reasonable Expectation: The discovery of a degraded or nonconforming condition may call the operability of one or more SSCs into question. <u>A subsequent determination of operability should be based on the licensee's "reasonable expectation," from the evidence collected, that the SSCs are operable and that the operability determination will support that expectation. Reasonable expectation does not mean absolute assurance that the SSCs are operable.</u> The SSCs may be considered operable when there is evidence that the possibility of failure of an SSC has increased, but not to the point of eroding confidence in the reasonable expectation that the SSC remains operable. The supporting basis for the reasonable expectation of SSC operability should provide a high degree of confidence that the SSCs remain operable. It should be noted that the standard of "reasonable expectation" is a high standard, and that there is no such thing as an indeterminate state of operability; an SSC is either operable or inoperable." [<u>emphasis added</u>]

Similarly, Section 6.0 (Operations Based on Operability Determinations) states that a component or system in a degraded or nonconforming condition may be considered "operable but degraded" if it is capable of performing its required safety function and meets applicable technical specification requirements.

In contrast to the language in the body of Reference 1, NRC Appendices C.11 and C.12 default to a restrictive definition of inoperability that precludes a licensee from exercising judgment to reach a "reasonable expectation" of operability for Class 2 or 3 components with through-wall leaks.

3.2.2 Industry Practice

Plant shutdown in response to operational leakage from moderate energy components is contrary to typical industry practice. For example, in the event of a pinhole leak in moderate energy Class 3 piping, licensees apply engineering judgment to determine if the component remains operable based on its ability to accomplish its intended safety function. A follow-up evaluation is then conducted in accordance with the guidance in Generic Letter 90-05 *[Reference 3]* for temporary acceptance of flaws in Class 3 piping. If the acceptance criteria of GL 90-05 are satisfied, a followup relief request is submitted to NRC in accordance with 10 CFR 50.55a *[Reference 4]*. If the acceptance criteria are not satisfied, the component is declared inoperable and the licensee enters the TS LCO for the affected component or system.

In addition, ASME Code Cases approved by the NRC in Regulatory Guide 1.147 *[Reference 5]* may provide different methods of evaluating and establishing structural integrity of piping with through-wall flaws.

The factors that can be used to support a presumption of operability upon discovery of a thru-wall flaw in a Class 2 or 3 component are:

- TS surveillance requirements are met
- Design basis safety functions (i.e., specified safety functions) can be accomplished
- System pressure and temperature
- Applicability of relevant ASME Code and Code Cases
- Flaw location
- Low impact on surrounding equipment due to leakage
- Low potential for flaw propagation (based on visual examination)
- Bounding operating experience from previous leakage events and associated inspections and analyses
- Risk information (PRA considerations)
- Engineering judgment

3.3 10 CFR 50.55a and the ASME Code

10 CFR 50.55a invokes the inservice inspection rules of ASME Section XI *[Reference 6]*. However, Section XI rules are not intended to apply to all flaws in all components at all times.

3.3.1 Applicability of ASME Section XI

NRC Appendix C.11 currently states:

> "If a flaw is discovered by any means (including surveillance, maintenance activity, or inservice inspection) in a system subject to Code requirements (whether during normal plant operation, plant transition, or shutdown operation) the flaw must be promptly evaluated using Code rules."

This guidance applies Section XI flaw acceptance and evaluation standards to all component flaws regardless of how they are identified. However, the inservice inspection rules of Section XI apply only to Section XI inservice inspections and tests, not to flaws identified during the performance of maintenance activities, plant walk-downs, or other inspection activities that are not under the jurisdiction of Section XI. For example:

- IWA-1100 states, "This Division provides requirements for inservice inspection and testing of light water nuclear power plants."
- IWA-3100(a) states, "Evaluation shall be made of flaws detected during an inservice examination as required by IWB-3000 for Class 1 pressure retaining components, IWC-3000 for Class 2 pressure retaining components, IWD-3000 for Class 3 pressure retaining components, IWE-3000 for Class MC pressure retaining components, or IWF-3000 for component supports."
- IWA-3300(a) states, "Flaws detected by the pre-service and inservice examinations shall be sized by …."
- IWB-1100 states, "This Subsection provides requirements for inservice inspection of Class 1 pressure retaining components and their welded attachments in light-water cooled plants."

The limited applicability of the inservice inspection rules of ASME Section XI is illustrated by the three ASME Section XI interpretations described below:

3.3.1.1 XI-1-89-67

Question: Is it a requirement of Section XI that additional examinations be performed within the same Examination Category for flaws detected <u>outside</u> the course of an inservice examination that exceed the standards of IWB/IWC/IWD/IWF-3000?

Response: Section XI does not address additional examinations for flaws detected outside the course of an inservice examination.

3.3.1.2 XI-1-92-03

Question: Do the provisions of Section XI, IWA-5250 apply to leakage found at times other than during a system pressure test?

Response: No

3.3.1.3 XI-1-92-19

Question 1: If leakage identified during the conduct of a visual (VT-2) examination performed in conjunction with a Section XI required pressure test (Table IWA-5210-1) exceeds the acceptance criteria of IWB-3000, IWC-3000, and IWD-3000, are corrective measures required in accordance with IWA-5250(a) prior to continued service?

Response 1: Yes.

Question 2: Does leakage identified during the conduct of normal plant operation, but not in conjunction with a Section XI required pressure test (Table IWA-5210-1), require corrective measures in accordance with IWA-5250(a)?

Response 2: No. Section XI, IWA-5250(a) does not apply during normal plant operation.

This position is also supported by Volume 2 of the Companion Guide to the ASME Boiler & Pressure Vessel Code *[Reference 7]*. With respect to the three interpretations cited above, paragraph 28.4.1 of the Companion Guide states:

> "The referenced interpretations … include several examples of how ASME Section XI does not provide requirements for the evaluation and acceptance of flaws identified by means other than a required inservice inspection or examination. Thus, if a flaw is found by other than a required inservice examination, no corrective action is prescribed by Section XI."

As described above, the inservice inspection rules of ASME Section XI apply only to flaws identified during the performance of Section XI inservice inspections and tests. Nevertheless, the repair/replacement rules of IWA-4000 always apply regardless of how a flaw is identified. For example, flaws identified during an ASME Section XI inservice inspection, plant walkdown, or plant maintenance are subject to the repair/replacement rules of IWA-4000. As stated in IWA-4110(a):

> "The requirements of this Article apply regardless of the reason for the repair/replacement activity or the method that detected the condition requiring the repair/replacement activity."

3.3.2 Section XI Acceptance Standards and Flaw Evaluation Rules

Appendix C.11 applies Section XI acceptance standards and flaw evaluation rules to any flaw that could be identified in the Section XI pressure boundary. However, Section XI acceptance standards and flaw evaluation rules apply only to welds and materials for which an inservice inspection is required. There are many flaws (e.g., through-wall flaws in pipes or pipe elbows) that could be identified during plant maintenance or inspection activities for which there are no applicable Section XI acceptance standards or flaw evaluation rules.

3.3.2.1 Acceptance Standards

Section XI inservice inspection requirements are specified in the tables of IWB, IWC, IWD, IWE, and IWF-2500 depending on the classification of the component (e.g. ASME Class 1, 2, 3, MC, or NF, respectively). For a given examination category, these tables identify all required inservice inspections for specific welds (and materials), examination methods, inspection acceptance standards, and other pertinent information. Because Section XI acceptance standards are delineated in IWB, IWC, IWD, IWE -3500 and IWF-3400 (for supports), the tables of IWX-2500 simply refer to the applicable paragraphs in IWX-3000 to invoke the required acceptance standards.

Section XI acceptance standards either do not apply or do not exist for welds and materials that do not require inservice inspection pursuant to the tables in IWX-2500. While Section XI acceptance standards may exist for some welds and materials that are exempt from inservice inspections, there are many cases where there are no Section XI acceptance standards. Examples of cases for which ASME Section XI acceptance standards do not exist are:

- Base materials including base material repair welds in ASME Class 1 vessels (other than reactor pressure vessels) such as pressurizers, steam generators, and heat exchangers

- Base materials including base material repair welds in ASME Class 1, 2, and 3 piping

- Base material including base material repair welds in ASME Class 2 and 3 vessels, pumps, and valves

- ASME Class 1, 2, and 3 partial penetration welds such as those used to attach instrument nozzles to reactor coolant pressure boundary components

3.3.2.2 Flaw Evaluation Rules

Flaws that comply with the acceptance standards of IWB, IWC, IWD, IWE - 3500 and IWF-3400 (for supports) are "acceptable as is" without further action. If flaws do not comply with these acceptance standards, the components containing the flaws may be corrected by a repair or replacement activity, or may be accepted by a supplemental examination or an IWX-3600 flaw evaluation. This position is consistent with IWA-3100(a), which is quoted on page 5.

3.3.3 Section XI and Operability

The inservice inspection requirements of Section XI are established to identify and monitor degradation in components and systems due to mechanisms such as corrosion and fatigue. When a flaw is detected during a Section XI inservice inspection, the flaw is evaluated in accordance with IWA-3100(a). If the flaw complies with these standards, it is "acceptable as is," and the component containing the flaw is acceptable for continued service. If the flaw does not comply with these standards, the component containing the flaw cannot be returned to service until the component is repaired, replaced, accepted by supplemental examination, or accepted by a flaw evaluation in accordance with IWX-3600. In these cases, the acceptable continued service of a component is directly affected by the performance of Section XI inservice inspections.

However, the inservice inspection provisions of Section XI do not apply to flaws identified by plant maintenance and inspection activities outside the scope of Section XI. Therefore, if a flaw (through-wall or non-through-wall) is identified in an ASME Class 2 or 3 component during activities not associated with ASME Section XI, the acceptability of continued service of the component or system is not covered by Section XI.

The ASME Code does not address "operability" in the same context as the Technical Specifications. The senior reactor operator on shift is responsible for making Technical Specification operability determinations. Information from many sources, including ASME Code inspections and evaluations, may be factored into an operability determination. The ASME Code by itself should not be the sole determinant of operability.

4.0 Proposed Guidance

The technical guidance in Part 9900 of the NRC Inspection Manual *[Reference 1]* establishes criteria for determining whether a structure, system, or component (SSC) is operable, inoperable, or degraded but operable. Based on this guidance, an SSC is "operable" when it complies with applicable Technical Specifications and is capable of performing the specified safety function(s) specified by design. Conversely, an SSC is inoperable when it fails to comply with applicable Technical Specifications or is unable to perform a specified safety function due to a degraded or nonconforming condition. Finally, an SSC is operable even though it is in a "degraded condition" (commonly referred to as degraded but operable) if it complies with applicable Technical Specifications and there is a "reasonable expectation" that it remains capable of performing its specified safety function(s) even though it has experienced a loss of quality or functional capability. The "functionality" (or non-functionality) of SSCs that are not controlled by Technical Specifications are addressed in a manner similar to that specified in Reference 1, Section 5.0 (Functionality Assessment).

Section 3.0 (Defined Terms) of Reference 1 defines the key terms in the preceding paragraph (operable, degraded condition, reasonable expectation, specified safety function, and functionality).

The technical guidance in Reference 1 is the basis for operability/functionality determinations for ASME Class 2 and 3 components. However, because of the potential significance of a known through-wall leak in an SSC pressure boundary, this section of the NEI White Paper contains additional guidance.

4.1 Flaws Identified by Inservice Inspection

Inservice inspections (ISI) performed in accordance with ASME Section XI are used to identify and monitor degradation caused by corrosion, fatigue, and other metallurgical phenomena. If a flaw detected during a Section XI inservice inspection (IWX-2500) does not meet the acceptance standards of IWC-3500, IWD-3500, IWE-3500, or IWF-3400 (for supports), an IWX-3600 evaluation can be the basis for accepting continued operation of the component that contains the flaw. However, if the acceptance criteria of IWX-3600 are not satisfied, the licensee cannot return the component to service unless one of the following is accomplished:

- Repair or replace the component containing the unacceptable flaw in accordance with IWA-4000, or

- Submit a relief request in accordance with 10 CFR 50.55a(a)(3) to obtain NRC approval of an alternative to the acceptance criteria of IWX-3600.

A flaw identified by inservice inspection during a planned outage does not require an operability determination if the system is not required to be operable at the time of the inspection. However, a flaw identified by inservice inspection performed while the system is required to be operable warrants an operability determination in accordance with the timing guidelines of section 4.2.4 below.

4.2 Flaws Identified by Plant Activities other than ISI per ASME Section XI

Plant inspection activities include quality assurance inspections, engineering inspections, system walkdowns, operator checks, maintenance activities, and other inspection activities that are not under the jurisdiction of ASME Section XI. A flaw identified by plant inspection activities requires an operability determination in accordance with the guidance in Reference 1, supplemented by the following NEI guidance, if the system containing the flaw is required to be operable at the time the flaw is identified. The acceptability of a component or system for continued service is not based on ASME Section XI except when the flaw is identified while performing a Section XI inservice inspection.

4.3 Scope and Timing of Operability Determinations

Reference 1 (section 4.4), supplemented by this White Paper, describes the scope of an operability determination. Industry guidance for the conduct of immediate and prompt operability determinations is given below. Figure 1 is a flow chart for a typical operability/nonconformance determination.

4.3.1 Immediate Operability Determination

The licensee conducts an "immediate operability determination" to establish whether a flawed component satisfies applicable Technical Specification requirements and there is "reasonable expectation" that the component is capable of performing its specified safety function(s). Guidelines for conducting an immediate operability determination are contained in Section 4.6.1 of Reference 1 and in sections 4.3.1.1, 4.3.1.2, and 4.3.1.3 of this White Paper. The licensee's technical resources (i.e., personnel knowledgeable of the plant's operating characteristics, engineering design, non-destructive examination techniques, welding techniques, and metallurgical issues) participate as needed to assist licensed operators in making the determination.

4.3.1.1 Initial Flaw Characterization

Characterize the size, configuration, location, and wall thickness to the extent practical. Use visual inspection, physical measurement, or other information to conservatively bound the affected area. Use non-destructive examination techniques if they can be performed fast enough to support the immediate operability determination.

4.3.1.2 Initial Apparent Cause

Determine the initial apparent cause of the through-wall leak. Base the determination on an evaluation of the material properties of the affected component, the system service conditions, inspection records or other available information, known failure mechanisms, and operating experience. Include NDE results, if available.

4.3.1.3 Initial Evaluation

Perform an initial evaluation to assess the structural integrity of the component that contains the through-wall leak. Base the initial evaluation on the initial flaw characterization data, initial apparent cause, calculations, technical data, or expert judgment that there is reasonable assurance that the flawed or degraded component can perform its specified safety function. Consider the consequences of leakage on the system and other SSCs.

4.3.2 Prompt Operability Determination

If necessary, the licensee conducts a "prompt operability determination" as follow-up to the immediate determination to confirm that the flawed component satisfies applicable Technical Specifications and there is reasonable expectation that it is capable of performing its specified safety function(s). Guidelines for conducting a prompt operability determination are contained in Section 4.6.2 of Reference 1 and in sections 4.3.2.1 and 4.3.2.2 of this White Paper. The licensee's technical resources (i.e., personnel knowledgeable of the plant's operating characteristics, engineering design, non-destructive examination techniques, welding techniques, and metallurgical issues) participate as needed to assist licensed operators in making the determination.

The prompt determination supplements the immediate determination by adding supporting information not available at the time of the immediate determination. Additional information that can be added as part of a prompt determination includes:

4.3.2.1 Flaw Characterization

Use non-destructive examination (NDE) techniques to determine the size, configuration, and location of the flaw. When feasible, use ultrasonic examination to measure wall thickness. If NDE cannot determine flaw size and location, use visual inspection, physical measurement, or remote inspection/evaluation methods to estimate conservatively or bound the size of the flaw.

4.3.2.2 Apparent Cause

Determine the apparent cause of the flaw based on an evaluation of the material properties of the affected component, system service conditions, NDE inspection data, known failure mechanisms, and industry operating experience. Known failure mechanisms include stress corrosion cracking, fatigue, vibration, flow accelerated corrosion, microbiological corrosion, pitting, and galvanic corrosion.

4.3.2.3 Engineering Analysis

Perform an engineering analysis to evaluate the structural integrity of the flawed component. Consider the minimum design thickness, reinforcement, allowable flaw size, flaw growth, predicted degradation for erosion or corrosion, and predicted service life as appropriate. Base the analysis on one or more of the following criteria, and verify flaw growth predictions in accordance with section 4.3.3.4:

- ASME Section XI (including code cases)
- Construction Code or ASME Section III (including code cases)
- Generic Letter 90-05 (Reference 3)
- Proven industry evaluation methods

Address the potential impact of leakage, including spray and flooding, on system flow and external corrosion of nearby equipment.

4.3.2.4 Monitoring Plan

Develop a monitoring plan based on nondestructive examination to validate the flaw growth predictions from the engineering analysis:

- A licensee may use flaw/growth monitoring techniques based on ASME Section XI , code cases, or Generic Letter 90-05.

- Absent monitoring precedent for the configuration in question, develop a volumetric examination monitoring plan to examine flawed components at intervals not to exceed approximately three months. If volumetric examination is impractical due to configuration, limited accessibility, radiological concerns, or personnel safety concerns, use an alternative method to monitor flaw growth (e.g., surface examination, visual inspection, physical measurement, or other remote method).

- Consider periodic walkdowns to monitor for structural degradation due to leakage. Assess the extent and rate of progress of any degradation to determine whether remedial measures are necessary. Evaluate the impact of the degradation on the engineering analysis (section 4.3.2.3).

4.3.2.5 Extent of Condition

Identify other locations susceptible to the flaw. Susceptible locations should be evaluated in accordance with the licensee's corrective action process of 10CFR50, Appendix B.

4.3.3 Timing of Operability Determinations

Section 4.6 of Reference 1 contains guidance on the timing of operability determinations. The following supplemental industry guidance is provided to assist in the determination of operability for Class 2 and 3 components that exhibit operational leakage through the system pressure boundary. Typical timing goals are shown in Table 2.

- Complete the immediate operability determination as soon as practicable. In general, 24 hours is a reasonable time. However, it is neither an expected value nor a time limit. The timing of an operability determination is a function of plant safety and a reasonable expectation of operability on the part of the senior reactor operator in the control room.

- If necessary, complete the follow-up prompt operability determination as soon as practicable. In general, 120 hours (5 days) is a reasonable time because the necessary evaluations normally can be performed within that time frame depending on (1) the availability of plant resources, NDE equipment, and technical consultants, (2) NDE challenges during flaw characterization, and (3) the complexity of the analytical evaluations.

- The risk significance of the affected system may be considered to establish an appropriate amount of time to complete a prompt determination.

- The timing goals contained in Table 2 include a reasonable amount of time for inspection planning (accessibility, need for scaffolding, occupational dose management, and other factors).

5.0 CONCLUSIONS

A Class 2 or 3 component should not be declared inoperable, as specified in NRC guidance (Reference 1), based solely on the discovery of a through-wall leak if the leak would not prevent the component from performing its design-basis safety function. The corresponding operability determination should be conducted based on flaw characterization, degradation mechanism, structural integrity, flaw evaluation, and leakage effects. The full range of analytical information and techniques should be applied to determine if the component is operable, operable but degraded, or inoperable. The acceptability of a component or system for continued service is not based on ASME Section XI except when the flaw is identified while performing a Section XI inservice inspection.

A typical sequence for identifying, evaluating, and repairing a through-wall flaw in an ASME moderate energy Class 2 or 3 component is:

- discover the flaw,
- establish the scope of the operability determination,
- determine if there is reasonable assurance that component failure will not occur before repair,
- perform an "immediate determination" of operability to determine if the leaking component is operable, "operable but degraded," or inoperable,
- include engineering judgment and operating experience in the immediate operability determination,
- if the component is determined inoperable, follow the plant-specific TS,
- if the component is determined operable but degraded, perform expeditious NDE to characterize the flaw,
- use the results of the NDE in an engineering analysis to make a timely confirmation of operability in support of the immediate determination,
- perform expeditious flaw repair in accordance with the corrective action program, and
- keep the NRC resident inspector informed during the process.

Operability is defined by plant-specific Technical Specifications, which take precedence over NRC Regulatory Issue Summaries and the NRC Inspection Manual. For components that exhibit operational leakage, licensees should base immediate determinations of operability on a reasonable expectation that a leaking component is capable of performing its design-basis safety function(s) and that subsequent flaw characterization will confirm that expectation.

6.0 REFERENCES

1. NRC Inspection Manual, Part 9900: Technical Guidance, "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety," September 26, 2005.

2. NRC Regulatory Issue Summary 2005-20, "Revision to Guidance Formerly Contained in NRC Generic Letter 91-18, 'Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability,'" September 26, 2005.

3. NRC Generic Letter 90-05, "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2, and 3 Piping," June 15, 1990.

4. 10 CFR 50.55a, Codes and standards.

5. NRC Regulatory Guide 1.147, Revision 14, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," August 2005.

6. American Society of Mechanical Engineers (ASME) Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 1998 Edition and 2000 Addenda.

7. ASME Boiler and Pressure Vessel Code, Companion Guide, Volume 2.

Figure 1

Operability/Nonconformance Determination Flowchart

[under development]

Table 1

Industry Survey (in progress)

Units that could experience a TS shutdown scenario if a
Class 3 component with a pinhole leak is defined as inoperable on discovery

Utility	# units	PWR	BWR	Region		Utility	# units	PWR	BWR	Region
A	1	x		1						
A	2	x		2						
A	2	x		2						
B	2	x		1						
B	2		x	1						
B	1	x		1						
C	1		x	3						
C	1	x		3						
C	2	x		3						
C	2	x		3						
D	2	x		4						
E	2		x	2						
E	1	x		2						
F	1	x		4						
F	2	x		4						
F	1		x	1						
F	1		x	4						
G	2	x		2						
H	2	x		1						
I	2	x		4						
J	2	x		4						
K	1	x		1						
L	2	x		2						

Table 2

Typical Timing Goals for Immediate and Prompt Operability Determinations

Description of Activity	Timing Goals
Immediate Determination • Planning • Develop Design Inputs • Initial Flaw Characterization • Initial Apparent Cause • Initial Evaluation	24 hours
Prompt Determination (if necessary) ▪ Flaw Characterization ▪ Apparent Cause ▪ Engineering Analysis ▪ Monitoring Plan ▪ Extent of Condition Plan	Immediate Determination + 120 hours

NOTE:

These are goals, not requirements. They are typical values based on operating experience. They do not represent expected values or time limits. A particular situation may warrant a shorter or longer timing goal depending on the safety significance and risk significance of the affected system. They should be reviewed continually and adjusted as necessary based on information developed during the operability determination.