

REACTOR COOLANT SYSTEM

STEAM GENERATORS

LIMITING CONDITION FOR OPERATION

3.4.5 Each steam generator shall be OPERABLE.

APPLICABILITY: MODES 1,2, 3 and 4.

ACTION:

With one or more steam generators inoperable, restore the inoperable generator(s) to OPERABLE status prior to increasing T_{avg} above 200°F.

SURVEILLANCE REQUIREMENTS

4.4.5.0 Each steam generator shall be demonstrated OPERABLE by performance of the following augmented inservice inspection program and the requirements of Specification 4.0.5.

4.4.5.1 Steam Generator Sample Selection and Inspection - Each steam generator shall be determined OPERABLE during shutdown by selecting and inspecting at least the minimum number of steam generators specified in Table 4.4-1.

4.4.5.2 Steam Generator Tube Sample Selection and Inspection - The steam generator tube minimum sample size, inspection result classification, and the corresponding action required shall be as specified in Table 4.4-2. The inservice inspection of steam generator tubes shall be performed at the frequencies specified in specification 4.4.5.3 and the inspected tubes shall be verified acceptable per the acceptance criteria of Specification 4.4.5.4. The tubes selected for inservice inspections shall be selected on a random basis except:

- a. Where experience in similar plants with similar water chemistry indicates critical areas to be inspected, then at least 50% of the tubes inspected shall be from these critical areas.
- b. The first sample of tubes selected for each inservice inspection (subsequent to the preservice inspection) of each steam generator shall include:

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REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS (Continued)

1. All nonplugged tubes that previously had detectable wall penetrations (>20%).
 2. Tubes in those areas where experience has indicated potential problems, except where specific groups are inspected per Specification 4.4.5.2.c.
 3. A tube inspection (pursuant to Specification 4.4.5.4.a.9) shall be performed on each selected tube. If any selected tube does not permit the passage of the eddy current probe for a tube inspection, this shall be recorded and an adjacent tube shall be selected and subjected to a tube inspection.
- c. Inspections performed on the following special interest groups are not considered part of the general tube inspections performed to satisfy Specification 4.4.5.3. No credit will be taken for tubes in these groups in meeting the minimum sample size requirements for an inspection conducted per Specification 4.4.5.3. When inspections of any of these groups are performed in conjunction with a general tube inspection, any tubes or portions of tubes not inspected as part of a group will be subjected to random inspection.
1. Group A-1: The hot leg expansion transition area of tubes.*
 2. Group A-2: The cold leg expansion transition area of tubes.*
 3. Group A-3: Sleeves in unplugged tubes.
 4. Group A-4: Known tube dents at partial drilled support plates.
 5. Group A-5: The U-bend of tubes at the steam blanket region.
- * The area of interest may be limited to tubes within the sludge pile region.
- d. The tubes selected as the second and third samples (if required by Table 4.4-2) during each inservice inspection may be subjected to a partial tube inspection provided:
1. The tubes selected for these samples include the tubes from those areas of the tube sheet array where tubes with imperfections were previously found.
 2. The inspections include those portions of the tubes where imperfections were previously found.

The result of each sample inspection shall be classified into one to the following three categories:

<u>Category</u>	<u>Inspection Results</u>
C-1	Less than 5% of the total tubes inspected are degraded tubes and none of the inspected tubes are defective.
C-2	One or more tubes, but not more than 1% of the total tubes inspected are defective, or between 5% and 10% of the total tubes inspected are degraded tubes.
C-3	More than 10% of the total tubes inspected are degraded tubes or more than 1% of the inspected tubes are defective.

Note: In all inspections, previously degraded tubes must exhibit significant (>10%) further wall penetrations to be included in the above percentage calculations.

TABLE 4.4-2

STEAM GENERATOR TUBE INSPECTION^{1,2,3}

1ST SAMPLE INSPECTION			2ND SAMPLE INSPECTION		3RD SAMPLE INSPECTION	
Sample Size	Result	Action Required	Result	Action Required	Result	Action Required
A minimum of S tubes per S.G.	C-1	None	N/A	N/A	N/A	N/A
	C-2	Plug or sleeve defective tubes and inspect additional 2S tubes in this S.G.	C-1	None	N/A	N/A
			C-2	Plug or sleeve defective tubes and inspect additional 4S tubes in this S.G.	C-1	None
					C-2	Plug or sleeve defective tubes
			C-3	Perform action for C-3 result of first sample	C-3	Perform action for C-3 result of first sample
	C-3	Inspect all tubes in this S.G., plug or sleeve defective tubes and inspect 2S tubes in each other S.G. Special Report to NRC per Specification 6.9.2	C-3	Perform action for C-3 result of first sample	N/A	N/A
			All other S.G.s are C-1	None	N/A	N/A
			Some S.G.s C-2 but no additional S.G. are C-3	Perform action for C-2 result of second sample	N/A	N/A
			Additional S.G. is C-3	Inspect all tubes in each S.G. and plug or sleeve defective tubes. Special Report to NRC per Spec. 6.9.2.	N/A	N/A

$S = 3 \frac{N}{n}$ Where N is the number of steam generators in the unit, and n is the number of steam generators inspected during an inspection.

¹ If an inspection is conducted per Specification 4.4.5.2.c, the term "tubes" used in this table is defined to be "tubes in the special interest group", not tubes in the steam generator. Additionally, if a circumferential crack indication is identified on the periphery of the sludge pile region for an inspection of Groups A-1 or A-2, the sample area at the location of the flaw shall be expanded to bound the detected indication by two tubes. Should more than one circumferential crack indication be found on the periphery of the sludge pile region, the periphery of the entire sample area will be expanded by two tubes. The peripheral expansion shall be continued until no further circumferential indications are found.

² Defective or degraded tubes found as a result of an inspection of a special interest area shall be included in determining the inspection results category for that special inspection, but shall not be included in determining the inspection results category for the general steam generator inspection.

³ Defective or degraded tubes found in special interest areas of tubes as part of a general inspection shall be included only in determining the inspection results category for the applicable special interest group inspections, if those special interest groups are being inspected coincident with the general inspection. Otherwise, the indications shall be categorized with the results of the general inspection.

REACTOR COOLANT SYSTEM

BASES

Demonstration of the safety valves' lift setting will occur only during shutdown and will be performed in accordance with the provisions of Section XI of the ASME Boiler and Pressure Vessel Code.

3/4.4.4 PRESSURIZER

A steam bubble in the pressurizer ensures that the RCS is not a hydraulically solid system and is capable of accommodating pressure surges during operation. The steam bubble also protects the pressurizer code safety valves against water relief. The steam bubble functions to relieve RCS pressure during all design transients.

The requirement that 150 KW of pressurizer heaters and their associated controls be capable of being supplied electrical power from an emergency bus provides assurance that these heaters can be energized during a loss-of-offsite power condition to maintain natural circulation at HOT STANDBY.

3/4.4.5 STEAM GENERATORS

The Surveillance Requirements for inspection of the steam generator tubes ensure that the structural integrity of this portion of the RCS will be maintained. The program for inservice inspection of steam generator tubes is based on a modification of Regulatory Guide 1.83, Revision 1. Inservice inspection of steam generator tubing is essential in order to maintain surveillance of the conditions of the tubes in the event that there is evidence of mechanical damage or progressive degradation due to design, manufacturing errors, or inservice conditions that lead to corrosion. Inservice inspection of steam generator tubing also provides a means of characterizing the nature and cause of any tube degradation so that corrective measures can be taken.

The plant is expected to be operated in a manner such that the secondary coolant will be maintained within those chemistry limits found to result in negligible corrosion of the steam generator tubes. If the secondary coolant chemistry is not maintained within these limits, localized corrosion may likely result in stress corrosion cracking. The extent of cracking during plant operation would be limited by the limitation of steam generator tube leakage between the primary coolant system and the secondary coolant system (primary-to-secondary leakage = 0.5 GPM per steam generator). Cracks having a primary-to-secondary leakage less than this limit during operation will have an adequate margin of safety to withstand the loads imposed during normal operation and by postulated accidents. Operating plants have demonstrated that primary-to-secondary leakage of 0.5 GPM per steam generator can readily be detected by radiation monitors of steam generator blowdown. Leakage in excess of this limit will require plant shutdown and an unscheduled inspection, during which the leaking tubes will be located and plugged or repaired.

Wastage-type defects are unlikely with proper chemistry treatment of the secondary coolant. However, even if a defect should develop in service, it will be found during scheduled inservice steam generator tubes examinations. Plugging or sleeving will be required for all tubes with imperfections exceeding the plugging or repair limit as defined in Surveillance Requirement 4.4.5.4.a. Defective tubes may be repaired by sleeving in accordance with the B&W Topical Report BAW-2045PA-00 as supplemented by the information provided in B&W Report 51-1212539-00, "BWNS Kinetic Sleeve Design-Application to ANO Unit 2" or CENS Report CEN-601-P, "ANO-2 Steam Generator Tube Repair Using Leak Tight Sleeves", Revision 01-P, dated July 1992. Steam generator tube inspections of operating plants have demonstrated the capability to reliably detect degradation that has penetrated 20% of the tube wall thickness. For sleeved tubes, the adequacy of

REACTOR COOLANT SYSTEM

BASES

the system that is used for periodic inservice inspection will be validated. Additionally, upgraded testing methods will be evaluated and appropriately implemented as better methods are developed and validated for commercial use.

Special interest groups have been defined which include areas of tubes where experience has indicated known or potential problems, e.g., circumferential cracking in the expansion transition region. By defining these groups, emphasis can be placed on areas of concern without diluting the random inspection. Additionally, defects in these regions generally are better observed using different eddy current techniques than that used for general tube inspections. For groups A-1 and A-2, the sludge pile region is bounded by an arc between lines 10 and 156 extending up to row 122 of the steam generator. The steam blanket region for Group A-5 is bounded by rows 8 through 11 and runs across the diameter of the steam generator from line 1 through line 167.

Whenever the results of any steam generator tubing inservice inspection fall into Category C-3 certain results will be reported in a Special Report to the Commission pursuant to Specification 6.9.2 as denoted by Table 4.2-2. Notification of the Commission will be made prior to resumption of plant operation. Such cases will be considered by the Commission on a case-by-case basis and may result in a requirement for analysis, laboratory examinations, tests, additional eddy-current inspection, and revision of the Technical Specifications, if necessary.

3/4.4.6 REACTOR COOLANT SYSTEM LEAKAGE

3/4.4.6.1 LEAKAGE DETECTION SYSTEMS

The RCS leakage detection systems required by this specification are provided to monitor and detect leakage from the Reactor Coolant Pressure Boundary. These detection systems are consistent with the recommendations of Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems" May 1973.

3/4.4.6.2 REACTOR COOLANT SYSTEM LEAKAGE

Industry experience has shown that while a limited amount of leakage is expected from the RCS, the unidentified portion of this leakage can be reduced to a threshold value of less than 1 GPM. This threshold value is sufficiently low to ensure early detection of additional leakage.

The 10 GPM IDENTIFIED LEAKAGE limitation provides allowances for a limited amount of leakage from known sources whose presence will not interfere with the detection of UNIDENTIFIED LEAKAGE by the leakage detection systems.

The Surveillance Requirements for RCS Pressure Isolation Valves provide added assurance of valve integrity thereby reducing the probability of gross valve failure and consequent intersystem LOCA. Leakage from the RCS Pressure Isolation Valves is IDENTIFIED LEAKAGE and will be considered as a portion of the allowed limit.

MARKUP OF CURRENT ANO-2 TECHNICAL SPECIFICATIONS

(FOR INFORMATION ONLY)

REACTOR COOLANT SYSTEM

STEAM GENERATORS

LIMITING CONDITION FOR OPERATION

3.4.5 Each steam generator shall be OPERABLE.

APPLICABILITY: MODES 1,2, 3 and 4.

ACTION:

With one or more steam generators inoperable, restore the inoperable generator(s) to OPERABLE status prior to increasing T_{avg} above 200°F.

SURVEILLANCE REQUIREMENTS

4.4.5.0 Each steam generator shall be demonstrated OPERABLE by performance of the following augmented inservice inspection program and the requirements of Specification 4.0.5.

~~Note: The surveillance requirements of Specification 3.4.5 do not apply to the special steam generator tube inspection to be performed during the 2P95-1 outage scheduled to begin on January 6, 1995. The scope and expansion criteria for this inspection are specified in correspondence to the NRC submitted under separate cover. The scope and criteria shall be approved by the NRC prior to exiting Mode 5. The results of this inspection shall be reviewed by the Plant Safety Committee prior to resumption of plant operation and reported to the NRC within 30 days of resumption of plant operation.~~

4.4.5.1 Steam Generator Sample Selection and Inspection - Each steam generator shall be determined OPERABLE during shutdown by selecting and inspecting at least the minimum number of steam generators specified in Table 4.4-1.

4.4.5.2 Steam Generator Tube Sample Selection and Inspection - The steam generator tube minimum sample size, inspection result classification, and the corresponding action required shall be as specified in Table 4.4-2. The inservice inspection of steam generator tubes shall be performed at the frequencies specified in specification 4.4.5.3 and the inspected tubes shall be verified acceptable per the acceptance criteria of Specification 4.4.5.4. ~~The tubes selected for each inservice inspection shall include at least 3% of the total number of tubes in all steam generators; the tubes selected for these inservice inspections shall be selected on a random basis except:~~

- a. Where experience in similar plants with similar water chemistry indicates critical areas to be inspected, then at least 50% of the tubes inspected shall be from these critical areas.
- b. The first sample of tubes selected for each inservice inspection (subsequent to the preservice inspection) of each steam generator shall include:

REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS (Continued)

1. All nonplugged tubes that previously had detectable wall penetrations (>20%).
 2. Tubes in those areas where experience has indicated potential problems, except where specific groups are inspected per Specification 4.4.5.2.c.
 3. A tube inspection (pursuant to Specification 4.4.5.4.a.9) shall be performed on each selected tube. If any selected tube does not permit the passage of the eddy current probe for a tube inspection, this shall be recorded and an adjacent tube shall be selected and subjected to a tube inspection.
- c. Inspections performed on the following special interest groups are not considered part of the general tube inspections performed to satisfy Specification 4.4.5.3. No credit will be taken for tubes in these groups in meeting the minimum sample size requirements for an inspection conducted per Specification 4.4.5.3. When inspections of any of these groups are performed in conjunction with a general tube inspection, any tubes or portions of tubes not inspected as part of a group will be subjected to random inspection.
1. Group A-1: The hot leg expansion transition area of tubes.*
 2. Group A-2: The cold leg expansion transition area of tubes.*
 3. Group A-3: Sleeves in unplugged tubes.
 4. Group A-4: Known tube dents at partial drilled support plates.
 5. Group A-5: The U-bend of tubes at the steam blanket region.
- * The area of interest may be limited to tubes within the sludge pile region.
- de. The tubes selected as the second and third samples (if required by Table 4.4-2) during each inservice inspection may be subjected to a partial tube inspection provided:
1. The tubes selected for these samples include the tubes from those areas of the tube sheet array where tubes with imperfections were previously found.
 2. The inspections include those portions of the tubes where imperfections were previously found.

The result of each sample inspection shall be classified into one to the following three categories:

<u>Category</u>	<u>Inspection Results</u>
C-1	Less than 5% of the total tubes inspected are degraded tubes and none of the inspected tubes are defective.
C-2	One or more tubes, but not more than 1% of the total tubes inspected are defective, or between 5% and 10% of the total tubes inspected are degraded tubes.
C-3	More than 10% of the total tubes inspected are degraded tubes or more than 1% of the inspected tubes are defective.

Note: In all inspections, previously degraded tubes must exhibit significant (>10%) further wall penetrations to be included in the above percentage calculations.

TABLE 4.4-2

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1ST SAMPLE INSPECTION			2ND SAMPLE INSPECTION		3RD SAMPLE INSPECTION	
Sample Size	Result	Action Required	Result	Action Required	Result	Action Required
A minimum of S tubes per S.G.	C-1	None	N/A	N/A	N/A	N/A
	C-2	Plug or sleeve defective tubes and inspect additional 2S tubes in this S.G.	C-1	None	N/A	N/A
			C-2	Plug or sleeve defective tubes and inspect additional 4S tubes in this S.G.	C-1	None
					C-2	Plug or sleeve defective tubes
			C-3	Perform action for C-3 result of first sample	C-3	Perform action for C-3 result of first sample
	C-3	Inspect all tubes in this S.G., plug or sleeve defective tubes and inspect 2S tubes in each other S.G. Special Report to NRC per Specification 6.9.2	All other S.G.s are C-1	None	N/A	N/A
			Some S.G.s C-2 but no additional S.G. are C-3	Perform action for C-2 result of second sample	N/A	N/A
			Additional S.G. is C-3	Inspect all tubes in each S.G. and plug or sleeve defective tubes. Special Report to NRC per Spec. 6.9.2.	N/A	N/A

$S = 3 \frac{N}{n}$ Where N is the number of steam generators in the unit, and n is the number of steam generators inspected during an inspection.

¹ If an inspection is conducted per Specification 4.4.5.2.c, the term "tubes" used in this table is defined to be "tubes in the special interest group", not tubes in the steam generator. Additionally, if a circumferential crack indication is identified on the periphery of the sludge pile region for an inspection of Groups A-1 or A-2, the sample area at the location of the flaw shall be expanded to bow in the detected indication by two tubes. Should more than one circumferential crack indication be found on the periphery of the sludge pile region, the periphery of the entire sample area will be expanded by two tubes. The peripheral expansion shall be continued until no further circumferential indications are found.

² Defective or degraded tubes found as a result of an inspection of a special interest area shall be included in determining the inspection results category for that special inspection, but shall not be included in determining the inspection results category for the general steam generator inspection.

³ Defective or degraded tubes found in special interest areas of tubes as part of a general inspection shall be included only in determining the inspection results category for the applicable special interest group inspections, if those special interest groups are being inspected coincident with the general inspection. Otherwise, the indications shall be categorized with the results of the general inspection.

REACTOR COOLANT SYSTEM

BASES

Demonstration of the safety valves' lift setting will occur only during shutdown and will be performed in accordance with the provisions of Section XI of the ASME Boiler and Pressure Vessel Code.

3/4.4.4 PRESSURIZER

A steam bubble in the pressurizer ensures that the RCS is not a hydraulically solid system and is capable of accommodating pressure surges during operation. The steam bubble also protects the pressurizer code safety valves against water relief. The steam bubble functions to relieve RCS pressure during all design transients.

The requirement that 150 KW of pressurizer heaters and their associated controls be capable of being supplied electrical power from an emergency bus provides assurance that these heaters can be energized during a loss-of-offsite power condition to maintain natural circulation at HOT STANDBY.

3/4.4.5 STEAM GENERATORS

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The plant is expected to be operated in a manner such that the secondary coolant will be maintained within those chemistry limits found to result in negligible corrosion of the steam generator tubes. If the secondary coolant chemistry is not maintained within these limits, localized corrosion may likely result in stress corrosion cracking. The extent of cracking during plant operation would be limited by the limitation of steam generator tube leakage between the primary coolant system and the secondary coolant system (primary-to-secondary leakage = 0.5 GPM per steam generator). Cracks having a primary-to-secondary leakage less than this limit during operation will have an adequate margin of safety to withstand the loads imposed during normal operation and by postulated accidents. Operating plants have demonstrated that primary-to-secondary leakage of 0.5 GPM per steam generator can readily be detected by radiation monitors of steam generator blowdown. Leakage in excess of this limit will require plant shutdown and an unscheduled inspection, during which the leaking tubes will be located and plugged or repaired.

Wastage-type defects are unlikely with proper chemistry treatment of the secondary coolant. However, even if a defect should develop in service, it will be found during scheduled inservice steam generator tubes examinations. Plugging or sleeving will be required for all tubes with imperfections exceeding the plugging or repair limit as defined in Surveillance Requirement 4.4.5.4.a. Defective tubes may be repaired by sleeving in accordance with the B&W Topical Report BAW-2045PA-00 as supplemented by the information provided in B&W Report 51-1212539-00, "BWNS Kinetic Sleeve Design-Application to ANO Unit 2" or CENS Report CEN-601-P, "ANO-2 Steam Generator Tube Repair Using Leak Tight Sleeves", Revision 01-P, dated July 1992. Steam generator tube inspections of operating plants have demonstrated the capability to reliably detect degradation that has penetrated 20% of the tube wall thickness. For sleeved tubes, the adequacy of

REACTOR COOLANT SYSTEM

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Whenever the results of any steam generator tubing inservice inspection fall into Category C-3 certain results will be reported in a Special Report to the Commission pursuant to Specification 6.9.2 as denoted by Table 4.2-2. Notification of the Commission will be made prior to resumption of plant operation. Such cases will be considered by the Commission on a case-by-case basis and may result in a requirement for analysis, laboratory examinations, tests, additional eddy-current inspection, and revision of the Technical Specifications, if necessary.

3/4.4.6 REACTOR COOLANT SYSTEM LEAKAGE

3/4.4.6.1 LEAKAGE DETECTION SYSTEMS

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3/4.4.6.2 REACTOR COOLANT SYSTEM LEAKAGE

Industry experience has shown that while a limited amount of leakage is expected from the RCS, the unidentified portion of this leakage can be reduced to a threshold value of less than 1 GPM. This threshold value is sufficiently low to ensure early detection of additional leakage.

The 10 GPM IDENTIFIED LEAKAGE limitation provides allowances for a limited amount of leakage from known sources whose presence will not interfere with the detection of UNIDENTIFIED LEAKAGE by the leakage detection systems.

The Surveillance Requirements for RCS Pressure Isolation Valves provide added assurance of valve integrity thereby reducing the probability of gross valve failure and consequent intersystem LOCA. Leakage from the RCS Pressure Isolation Valves is IDENTIFIED LEAKAGE and will be considered as a portion of the allowed limit.