

18-0-0-0

2010 SECTION XI, DIVISION 1

NONMANDATORY APPENDIX R

TABLE R-S2-1 DEGRADATION MECHANISMS

'd' changed to 'and'

Mechanisms	Chapter Two Attributes	Susceptible Regions
TF	TASCS <ul style="list-style-type: none"> - piping > NPS 1 (DN 25) <i>d</i> - pipe segment has a slope < 45 deg from horizontal (includes elbow or tee into a vertical pipe); and - potential exists for a low flow in a pipe section connected to a component allowing mixing of hot and cold fluids, or potential exists for leakage flow past a valve (i.e., in-leakage, out-leakage, cross-leakage) allowing mixing of hot and cold fluids, or potential exists for convection heating in dead-end pipe sections connected to a source of hot fluid, or potential exists for two phase (steam/water) flow, or potential exists for turbulent penetration in branch pipe connected to header piping containing hot fluid with high turbulent flow; and - calculated or measured $\Delta T > 50^\circ\text{F}$ (10°C) and - Richardson number > 4.0 	nozzles, branch pipe connections, safe ends, welds, heat affected zones (HAZ), base metal; and regions of stress concentration
	TT <ul style="list-style-type: none"> - operating temperature > 270°F (130°C) for stainless steel, or operating temperature > 220°F (105°C) for carbon steel, and - potential for relatively rapid temperature changes including cold fluid injection into hot pipe segment, or hot fluid injection into cold pipe segment, and - $\Delta T > 200^\circ\text{F}$ (93°C) for stainless steel, or $\Delta T > 150^\circ\text{F}$ (65°C) for carbon steel, or $\Delta T > \Delta T$ allowable (applicable to both stainless and carbon) 	nozzles, branch pipe connections, safe ends, welds, heat affected zones (HAZ), base metal; and regions of stress concentration nozzles, branch pipe connections, safe ends, welds, heat affected zones (HAZ), base metal; and regions of stress concentration nozzles, branch pipe connections, safe ends, welds, heat affected zones (HAZ), base metal; and regions of stress concentration
SCC	IGSCC (BWR) <ul style="list-style-type: none"> - evaluated in accordance with existing plant IGSCC program per NRC Generic Letter 88-01 	austenitic stainless steel welds and HAZ
	IGSCC (PWR) <ul style="list-style-type: none"> - operating temperature > 200°F (93°C); and - susceptible material (carbon content $\geq 0.035\%$); and - tensile stress (including residual stress) is present; and - oxygen or oxidizing species are present OR - operating temperature < 200°F (93°C), the attributes above apply; and - initiating contaminants (e.g., thiosulfate, fluoride, chloride) are also required to be present 	austenitic stainless steel welds and HAZ
	TGSCC <ul style="list-style-type: none"> - operating temperature > 150°F (65°C), and - tensile stress (including residual stress) is present, and - halides (e.g., fluoride, chloride) are present, or caustic (NaOH) is present, and - oxygen or oxidizing species are present (only required to be present in conjunction w/halides, not required w/caustic) 	austenitic stainless steel base metal, welds, and HAZ
	EGSCC <ul style="list-style-type: none"> - operating temperature > 150°F (65°C), and - tensile strength is present, and - an outside piping surface is within five diameters of a probable leak path (e.g., valve stems) and is covered with nonmetallic insulation that is not in compliance with NRC Regulatory Guide 1.36, or an outside piping surface is exposed to wetting from chloride-bearing environments (e.g., seawater, brackish water, brine) 	austenitic stainless steel base metal, welds, and HAZ
	PWSCC <ul style="list-style-type: none"> - piping or weld material is Alloy 600/B2/182; and - exposed to primary water at $T > 570^\circ\text{F}$ (300°C); and - the material is mill-annealed and cold worked, or cold worked and welded without stress relief 	nozzles, welds, and HAZ without stress relief
LC	MIC <ul style="list-style-type: none"> - operating temperature < 150°F (65°C), and - low or intermittent flow; and - pH < 10; and - presence/intrusion of organic material (e.g., raw water system), or water source is not treated w/biocides (e.g., refueling water tank) 	fittings, welds, HAZ, base metal, dissimilar metal joints (e.g., welds, flanges), and regions containing crevices
	PIT <ul style="list-style-type: none"> - potential exists for low flow; and - oxygen or oxidizing species are present; and - initiating contaminants (e.g., fluoride, chloride) are present 	
	CC <ul style="list-style-type: none"> - crevice condition exists (e.g., thermal sleeves); and - operating temperatures > 150°F (65°C); and - oxygen or oxidizing species are present 	

27° (ΔT > 27 °C)

111° (|ΔT| > 111 °C)

83° (|ΔT| > 83 °C)

33