

Acronyms for Degradation Phenomenon

- Stress Corrosion Cracking
SCC
- Corrosion Fatigue
FAT
- Fracture Resistance
FR
- Erosion-Corrosion - Including Steam Cutting and Cavitation
EC
- Fretting/Wear
WEAR
- Microbially-Induced Corrosion
MIC
- Pitting
PIT
- Boric Acid Corrosion
BAC
- Swelling
SW
- Irradiation creep
IAC
- General Corrosion
GC
- Intergranular Corrosion
IGC
- Flow Assisted Corrosion
FAC
- Crevice Corrosion
CREV
- Debonding
DEBOND
- Thermal Creep
CREEP
- Galvanic Corrosion
GALV

SCORING: 3=High, 2=Medium, 1=Low

Susceptibility Factor - "can significant material degradation develop given plausible conditions?"

Blank or 0 = not considered to be an issue; (Blank - no knowledge about issue; 0 - issue is not a concern (explain why))

1 = conceptual basis for concern from data, or potential problems under unusual operating conditions, etc.;

2 = reasonable basis for concern or some plant experience;

3 = demonstrated, compelling problem or multiple plant observations.

Confidence Level - *personal* confidence in our judgment of *susceptibility*

1 = low confidence

2 = moderate confidence

3 = high confidence

Note, "3" is assumed if Susceptibility Factor is "blank".

Knowledge Factor - extent to which the relevant dependencies have been quantified

1 = poor understanding, little and/or low-confidence data;

2 = some reasonable basis to know dependencies qualitatively or semi-quantitatively from data or extrapolation in similar "systems";

3 = extensive, consistent data covering all dependencies relevant to the component, perhaps with models -- should provide clear insights into mitigation or management of problem.

Notes for BWR Scoring - esp. Normal vs. H2 Water Chemistry

After review, most or all groups/sheets will have "SCC-HWC" and "FAT-HWC", as these are the only degradation phenomena to have significant effects of HWC

HWC only applies in reactor water, not steam or water films along the steam path

HWC not considered important to FR because H2 = 10 vs. 100 ppb, not a huge difference

"H" means moderate H2 (this is really "high H2") and/or "good NobleChem" (no crack flanking).

The onus is of course on the utility/user to "prove" they have low potentials in each area of interest

which, e.g., may not exist in core in moderate H2.

Estimated corrosion potentials for different classes of components are given as a guide:

1 -- NWC

* In vessel, about +200 to +225mV -- a bit higher in core than at the bottom plenum (where recirc water has mixed in)

* Recirc and RWCU (external) piping, about +125 to +150 mV

* Other areas (CRD drive water, ECCS, etc.) are special

2- HWC --- assume < -200 mV (this must be proven by anyone taking advantage of the HWC grading)

These Chemistry Guideline values not used - for reference only

Chemistry Guidelines - Reactor Water - NWC - Power Operation (>10% Power)

Table 4-5a : EPRI BWR Water Chemistry Guidelines - 2000 Version

Control Parameter	Frequency	Action Levels		
		1	2	3
Conductivity (uS/cm)	Continuously	>0.30	>1.0	>5.0
Chloride (ppb)	Daily	>5	>20	>100
Sulfate (ppb)	Daily	>5	>20	>100

NOTE THAT THIS TABLE IS APPLICABLE WHEN COMPONENTS ARE NOT PROTECTED TO -230 mV (SHE)

Chemistry Guidelines - Reactor Water - HWC or HWC+NMCA - Power Operation (>10% Power)

Table 4-5b : EPRI BWR Water Chemistry Guidelines - 2000 Version

Control Parameter	Frequency	Action Levels		
		1	2	3
Conductivity (uS/cm)	Continuously	>0.30	>1.0	>5.0
Chloride (ppb)	Daily	>5	>50	>200
Sulfate (ppb)	Daily	>5	>50	>200

NOTE THAT THIS TABLE IS APPLICABLE WHEN COMPONENTS ARE PROTECTED TO -230 mV (SHE)

BWR Group 1 - Reactor Pressure Vessel Closure Head (RPVCH)									
Identification	Material/Environment combination / Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group	
			1=low, 2=med, 3=high						
1.1	Pressure Vessel Head Flanges and Nozzles SA 508 Cl.2 Forging with or without 309 SS Cladding Reactor Coolant Steam, 547F, 1020 psia	FAT FAT-HWC SCC SCC-HWC FR						8,19,22	
1.2	Pressure Vessel Plate SA-533 GrB Rolled Plate with or without 309 SS Cladding Reactor Coolant Steam, 547F, 1020 psia	FAT FAT-HWC SCC SCC-HWC FR						9,10,11	
1.3	RPV Cladding 309 SS 7/32" thick .08%C max. Reactor Coolant Steam, 547F, 1020 psia	FAT FAT-HWC SCC SCC-HWC FR DEBOND						7	
1.4	Closure Studs, Nuts and Washers SA 540 Carbon Steel Containment Air, < 547F	FAT EC FR						13,14	
1.5	SA508 Nozzle to SA 533 Plate Welds LAS SFA5.5:15-308 Reactor Coolant Steam, 547F, 1020 psia	FAT SCC FR					assumes that cladding is breached	1,15,17	
1.6	A533B Plate to Plate Welds LAS SFA5.5:15-308 Reactor Coolant Steam, 547F, 1020 psia	FAT SCC FR					assumes that cladding is breached	2,3,4,5	
1.7	A508 Nozzle to 304 SS Flange Weld 182 Weld Reactor Coolant Steam, 547F, 1020 psia	FAT SCC FR						16,18	
1.8	304 SS Flange HAZ Reactor Coolant Steam, 547F, 1020 psia	FAT SCC FR						16,18	
1.9	Nozzle Flanges A508 Cl.1 Reactor Coolant Steam, 547F, 1020 psia	SCC FR						20,22	
1.10	Dryer Hold Down Bracket 304 Stainless Steel Reactor Coolant Steam, 547F, 1020 psia	SCC FAT						24	
1.11	Dryer Hold Down Bracket A533 Gr. B LAS Reactor Coolant Steam, 547F, 1020 psia	SCC FR						24	
1.12	Dryer Hold Down Bracket Weld 182 Weld Reactor Coolant Steam, 547F, 1020 psia	SCC FR FAT						23	
1.13	Lifting Lug Welds LAS SFA5.5:15-308 Containment Air	FR						6,12	

BWR Group 2 - Reactor Pressure Vessel Shell (RPVSHL)									
Identification	Material/Environment combination / Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group	
			1=low, 2=med, 3=high						
2.1	Pressure Vessel Flanges and Nozzles SA 508 Cl.2 Forging with or without 309 SS Cladding Reactor Coolant Steam/Water, 547F, 1020 psia	FAT FAT-HWC SCC SCC-HWC FR					assumes that cladding is breached	1, 23, 30, 39, 48, 52, 61	<i>bold items in steam</i>
2.2	Pressure Vessel Plate SA-533 GrB Rolled Plate with 309 SS Cladding Reactor Water, 533-547F, 1020 psia Low Neutron dose	FAT FAT-HWC SCC SCC-HWC FR					assumes that cladding is breached	3, 9	<i>bold items in steam</i>
2.3	SA508 Nozzle/Flange to SA 533 Plate Welds Reactor Water, 533-547F, 1020 psia LAS SFA5.5:15-308 with 309 SS Cladding	FAT FAT-HWC SCC SCC-HWC FR					assumes that cladding is breached	2, 4, 8, 10, 11, 12, 16, 17, 18, 19, 20, 21, 29, 38, 47, 51, 62	
2.4	SA508 Nozzle to SA 533 Plate Welds Reactor Water, 533-547F, 1020 psia LAS SFA5.5:15-308 without Cladding	FAT FAT-HWC SCC SCC-HWC FR						22, 60	<i>bold items in steam</i>
2.5	SA 533 to SA 533 Plate Welds Reactor Water, 533-547F, 1020 psia LAS SFA5.5:15-308 with 309 SS Cladding	FAT FAT-HWC SCC SCC-HWC FR					assumes that cladding is breached	2, 4, 8, 10, 11, 12, 16, 17, 18, 19, 20, 21, 29, 38, 47, 51, 62	<i>bold items in steam</i>
2.6	SA533 to SA 533 Plate Welds Reactor Water, 533-547F, 1020 psia, Belltime, Higher Neutron Dose LAS SFA5.5:15-308 with 309 SS Cladding	FAT FAT-HWC SCC SCC-HWC FR						6, 13, 14, 15	
2.7	SA 533 Gr. B plate Reactor Water, 533-547F, 1020 psia, Belltime, Higher Neutron Dose LAS SFA5.5:15-308 with 309 SS Cladding	FAT FAT-HWC SCC SCC-HWC FR						5, 7	
2.8	Feedwater Safeend Inconel 600 Reactor Water, 427F, 1045 psia	FAT FAT-HWC SCC SCC-HWC FR						25, 26, 32, 50, 54 (LPCI)	
2.9	Feedwater Thermal Sleeve Inconel 600 Reactor Water, 427F, 1045 psia	FAT FAT-HWC SCC SCC-HWC						27	
2.10	Feedwater Thermal Sleeve/A508 Nozzle Weld Dissimilar 182 Weld Reactor Water, 427F, 1045 psia	FAT FAT-HWC SCC SCC-HWC CREV FR						24	
2.11	Nozzle Safeends and Thermal Sleeves SS 316 including HAZ Reactor Water, 427F, 1045 psia	FAT FAT-HWC SCC SCC-HWC FR						32, 36, 58	
2.12	Dissimilar 82/182 Weld Between Carbon Steel Extension and Alloy 600 Safeend Reactor Water, 427F, 1045 psia	FAT FAT-HWC SCC SCC-HWC FR						24, 31, 33, 35, 49, 53, 55, 57	
2.13	82/182 Weld Pad Between Clad A508 Nozzle and Alloy 600 Safeend Reactor Water, 533F, 1059 psia	FAT FAT-HWC SCC SCC-HWC CREV FR						28, 37, 59	
2.14	Safeend Extension Carbon Steel (Unclad) Reactor water Reactor Water, <533F, 1059 psia	FAT FAT-HWC SCC SCC-HWC PIT FR						34, 56	
2.15	PV Cladding, 309 SS Reactor Water or Coolant Steam 533F, 1059 psia	FAT FAT-HWC SCC SCC-HWC DEBOND FR						65	
2.16	Main Steam Outlet Nozzle and Safeend A 508, Carbon Steel in Reactor Coolant Steam 533F, 1059 psia	SCC SCC-HWC EC PIT FR						61, 63	
2.17	Attachment Pads Alloy 182 on Top of SS Cladding or on RPV 575F, Reactor Water or Coolant Steam 1020psia	FAT FAT-HWC SCC SCC-HWC DEBOND FR						66, 67, 69, 70, 72, 73, 75, 76, 78, 79, 80, 82, 83	<i>bold items in steam</i>
2.18	Brackets for Steam Dryer, Guide Rods CF8M Reactor Water or Coolant Steam, 547F, 1020 psia	FAT FAT-HWC SCC SCC-HWC FR						68, 71, 74, 77, 81	<i>bold items in steam</i>
2.19	Jet Pump Riser Bracket 304 SS HAZ Reactor Water, 533F, 1059 psia	FAT FAT-HWC SCC SCC-HWC FR						84	
2.20	CRD Return Nozzle Cap Weld LAS SFA5.5:15-308, Not Stress Relieved Reactor Water, 533F, 1059 psia (Stagnant)	FAT FAT-HWC SCC SCC-HWC FR						39	
2.21	Stabilizer Lug Welds LAS SFA5.5:15-308 Containment Air	FR						87, 88	

BWR Group 3 - Reactor Pressure Vessel - Bottom Head (RPVBH)								
Identification	Material/Environment combination / Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
3.1	Pressure Vessel Head Nozzles SA 508 Cl.2 Forging Reactor Water, 533-547F,1020-1059 psia 309 Cladding	FAT FAT-HWC SCC SCC-HWC FR					assumes that cladding is breached	15,17,19,21, 46,
3.2	Pressure Vessel Plate SA-533 GrB Rolled Plate Reactor Coolant 533-547F,1020-1059 psia 309 Cladding	FAT FAT-HWC SCC SCC-HWC FR					assumes that cladding is breached	2, 11,12,13,
3.3	SA508 Nozzle to SA 533 Plate Welds Reactor Water, 533-547F,1020-1059 psia LAS SFA5.5:15-308 309 Cladding	FAT FAT-HWC SCC SCC-HWC FR					assumes that cladding is breached also include A533B plate to plate welds	1, 3,4,5,6,7,8,9,10,14,16,18,20,45,
3.4	Dissimilar Metal Weld 182/82 e.g. 508 Nozzle to 316L Safeend Reactor Water, 533-547F,1020-1059 psia	FAT FAT-HWC SCC SCC-HWC FR						22
3.5	Dissimilar Metal Weld 182/82 e.g. J-weld incore and CRD penetrations Reactor Water, 533-547F,1020-1059 psia	FAT FAT-HWC SCC SCC-HWC FR						28A,28B,28C,30A,30B,30C
3.6	Safe End and Thermal Sleeve 316NG or 316L SS HAZ Reactor Water, 533-547F,1020-1059 psia	FAT FAT-HWC SCC SCC-HWC FR						23,24,25
3.7	Safe End 304 SS HAZ Reactor Water, 533-547F,1020-1059 psia	FAT FAT-HWC SCC SCC-HWC FR						23
3.8	308 Weldments Reactor Water, 533-547F,1020-1059 psia	FAT FAT-HWC SCC SCC-HWC FR						24
3.9	82/182 Weld Pad Between Thermal Sleeve and Nozzle Reactor Water, 533-547F,1020-1059 psia	FAT FAT-HWC SCC SCC-HWC CREV FR						26
3.10	CRD Stub tube Alloy 600 HAZ Reactor Water, 533-547F,1020-1059 psia	FAT FAT-HWC SCC SCC-HWC FR						27
3.11	Dissimilar 82/182 Welds A533B to Inconel Reactor Water, 533-547F,1020-1059 psia	FAT FAT-HWC SCC SCC-HWC FR						29,31, 35,38,40,43
3.12	Alloy 600 e.g., Shroud Support Leg, Gussets Alloy 600 HAZ Reactor Water, 533-547F,1020-1059 psia	FAT FAT-HWC SCC SCC-HWC FR						32, 34, 37, 39,41,44
3.13	182 Weldments of Inconel to Inconel Reactor Water, 533-547F,1020-1059 psia	FAT FAT-HWC SCC SCC-HWC FR						33,36,42
3.14	Support Skirt SA533B to A508 Forgings Containment Air, 533F	FAT FR						47,48,49,50,51,52,53,54
3.15	Vessel Cladding 309 StSt 0,08%C max Reactor Water, 533-547F,1020-1059 psia	FAT FAT-HWC SCC SCC-HWC FR DEBOND						55

RCS Group 4 of Reactor Vessel Internals - Shroud (SHROUD)

Identification	Material/Environment combination Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
4.1	Various Ring - Ring Segment Weld Metal - Vertical Type 308/308L weld metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						1,5,11
4.2	Various Ring - Ring Segment Welds - Vertical HAZ Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						1,5,11
4.3	Various Ring - Shell Circumferential Weld Metal Type 308/308L weld metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						2,4,6,10,12
4.4	Various Ring - Shell Circumferential Weld HAZ Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						2,4,6,10,12
4.5	Various Shell Plate Vertical Weld Metal Type 308/308L weld metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi Low neutron fluence (<0.5 dpa at end of life)	FAT FAT-HWC SCC SCC-HWC FR						3,13
4.6	Various Shell Plate Vertical Weld HAZ Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi Low neutron fluence (<0.5 dpa at end of life)	FAT FAT-HWC SCC SCC-HWC FR						3,13
4.7	Various Plate Vertical & Circumferential Weld Metal Type 308/308L weld metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi Moderate neutron fluence (0.5 - 3 dpa at end of life)	FAT FAT-HWC SCC SCC-HWC FR						7,8,9
4.8	Various Plate Vertical & Circumferential Weld HAZ Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi Moderate neutron fluence (0.5 - 3 dpa at end of life)	FAT FAT-HWC SCC SCC-HWC FR						7,8,9
4.9	Shell - Shroud Support Ring (H7) Weld Metal Alloy 182 weld metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						14
4.10	Shell - Shroud Support Ring (H7) Weld HAZ Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						14
4.11	Ring material (segments often forged) Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						15,17,20
4.12	Shell material (segments) Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi Low neutron fluence (<0.5 dpa at end of life)	FAT FAT-HWC SCC SCC-HWC FR						16,21
4.13	Shell material (segments) - bellline region Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi Moderate neutron fluence (0.5 - 3 dpa at end of life)	FAT FAT-HWC SCC SCC-HWC FR						18,19
4.14	Miscellaneous brackets, pads, etc. on shroud Type 304 SS (some/all probably with 308L welds) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						22-42
4.15	Entire top guide structure - interlocked (wedged) Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi Moderate to high neutron fluence (3 - 10 dpa at end of life)	FAT FAT-HWC SCC SCC-HWC FR						43
4.16	Top guide wedge Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						44
4.17	Entire core plate structure Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						45
4.18	Core plate bolt assembly Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						46
4.19	Core plate bypass flow plug Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						47
4.20	Core plate bypass flow plug X750 Spring Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						47

RCS Group 5 of Reactor Vessel Internals - Core Control (CORECTRL)

Identification	Material/Environment combination Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
5.1	Fuel Support Structure Wrought or Cast SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						2
5.2	Control Rod Blade 304/316 Stainless Steel, often chemistry controls Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Can achieve ~4 - 6 dpa, variable with duty	FAT FAT-HWC SCC SCC-HWC FR						4
5.3	Control Rod Guide Tube & Housing CF3 A351 Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Top part of guide tube has low-moderate neutron fluence (0.1 - 0.5 dpa at end of its life)	FAT FAT-HWC SCC SCC-HWC FR WEAR						3,5
5.4	Fuel Bundle Alignment Pin Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						6
5.5	Control Rod Drive Housing Flange Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						7
5.6	Control Rod Drive Housing Flange Weld Metal Type 308/L or 309 Weld Metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 105°F, 1059 psi (CRD drive water)	FAT FAT-HWC SCC SCC-HWC FR						8
5.7	Control Rod Drive Housing Flange Weld HAZ Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 105°F, 1059 psi (CRD drive water)	FAT FAT-HWC SCC SCC-HWC FR						8
5.8	RPV Stub Tube - CRD Housing - upper weld metal Alloy 182 weld metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						9
5.9	RPV Stub Tube - CRD Housing - upper weld HAZ Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						9
5.10	RPV Stub Tube - CRD Housing - upper weld HAZ Alloy 600 HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						9
5.11	Misc. CRD & Neutron Monitoring - out of core Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						10-16
5.12	In-core Guide Tube Assembly (no delta P across tube) Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525-550°F, 1059 psi High neutron fluence (50 - 100 dpa)	FAT FAT-HWC SCC SCC-HWC FR WEAR						17
5.13	Misc CRD Support Structures - outside vessel ASTM A36 & A235 Dry <135°F, Containment Atmosphere	FAT SCC PIT						18-24
5.14	Misc DP & Liquid Control Structures - in-vessel Type 304 SS base metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC						25-42
5.15	Misc DP & Liquid Control Structures - in-vessel 308/L SS Weld Metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						25-42
5.16	Misc DP & Liquid Control Structures - in-vessel 182 Weld Metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						25-42
5.17	Misc DP & Liquid Control Structures - in-vessel Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						25-42

RCS Group 6 of Reactor Vessel Internals - Jet Pump Assembly (JETPUMP)

Identification	Material/Environment combination Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
6.1	Misc. Pipes & Elbows & JP Mixer/Diffuser 304SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.5 dpa	FAT FAT-HWC SCC SCC-HWC FR						1-11,13-16
6.2	SS-to-SS Welds in above Pipes & Elbows 308/L SS Weld Metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.5 dpa	FAT FAT-HWC SCC SCC-HWC FR						1-6,8-11,13-16
6.3	SS-to-SS Welds in above Pipes & Elbows (HAZ) 304SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.5 dpa	FAT FAT-HWC SCC SCC-HWC FR						1-6,8-11,13-16
6.4	Restrainer Bracket Support XM-19 (Nitronic 50) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.5 dpa	FAT FAT-HWC SCC SCC-HWC FR						12
6.5	Jet Pump Holddown Beam X750 (mostly HTH) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.5 dpa	FAT FAT-HWC SCC SCC-HWC FR						7
6.6	Access Hole Cover (Ledge in Group 4) Alloy 600 (some covers are SS) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.2 dpa	FAT FAT-HWC SCC SCC-HWC FR						19
6.7	Alloy 182 Welds for Access Hole Cover Alloy 182 Weld Metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.2 dpa	FAT FAT-HWC SCC SCC-HWC FR						9,20
6.8	Slip Fit on Jet Pump Mixer to Diffuser 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Wear from vibration causes leakage	FAT FAT-HWC WEAR						21
6.9	Riser brace or bracket weld to riser 308L weld metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.5 dpa?	FAT FAT-HWC SCC SCC-HWC FR						22
6.10	Riser brace or bracket weld to riser - HAZ 304SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.5 dpa?	FAT FAT-HWC SCC SCC-HWC FR						22
6.11	Jet Pump Adapter to Ledge SS Adapter HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.2 dpa	FAT FAT-HWC SCC SCC-HWC FR						17
6.12	Alloy 182 Welds for Jet Pump Adapter to Ledge Alloy 182 Weld Metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.2 dpa	FAT FAT-HWC SCC SCC-HWC FR						18
6.13	Jet Pump Adapter to JP Diffuser SS HAZ on Adapter and Diffuser Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.2 dpa	FAT FAT-HWC SCC SCC-HWC FR						19
6.14	Jet Pump Adapter to JP Diffuser Weld Metal 308/L SS Weld Metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 525°F, 1059 psi Neutron fluence ~< 0.2 dpa	FAT FAT-HWC SCC SCC-HWC FR						9

RCS Group 7 of Reactor Vessel Internals - ECCS Connections (ECCSCONN)

Identification	Material/Environment combination Full power temperature/pressure	Degradation mechanisms considered	Susceptibilit	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			>					
7.1	Feedwater Pipe & Header to T-Box Weld Metal Type 308/L SS Weld Metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 427°F, 1045 psi	FAT FAT-HWC SCC SCC-HWC FR						6
7.2	Feedwater Pipe & Header to T-Box Welds HAZ Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 427°F, 1045 psi	FAT FAT-HWC SCC SCC-HWC FR						6
7.3	Feedwater Sparger Components Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 427°F, 1045 psi	FAT FAT-HWC SCC SCC-HWC FR						8-20
7.4	Feedwater Sparger Nozzle Weld Metal Type 308/L Weld Metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 427°F, 1045 psi	FAT FAT-HWC SCC SCC-HWC FR						8-20
7.5	Feedwater Sparger Nozzle Weld HAZ Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 427°F, 1045 psi	FAT FAT-HWC SCC SCC-HWC FR						8-20
7.6	Core Spray Components Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						21-42
7.7	Core Spray Component Weld Metal Type 308/L SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						21-42
7.8	Core Spray Component Weld HAZ Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						21-42
7.9	LPCI Components Type 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi	FAT FAT-HWC SCC SCC-HWC FR						43-50
7.10	LPCI Component Weld Metal Type 308/L Weld Metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi Need to deal with ID & OD, normal & operating	FAT FAT-HWC SCC SCC-HWC FR						43-50
7.11	LPCI Component Weld HAZ Type 304 SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 533°F, 1059 psi Need to deal with ID & OD, normal & operating	FAT FAT-HWC SCC SCC-HWC FR						43-50

RCS Group 8 of Reactor Vessel Internals - Steam Separator & Dryer (STMSEP)

Identification	Material/Environment combination Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
8.1	Steam Separator and Dryer Assembly 304SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 550°F, 1045 psi, wet steam	SCC FAT						1,2,5-8
8.2	Steam Separator and Dryer Assembly Welds Type 308/L Weld Metal Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 550°F, 1045 psi, wet steam	SCC FAT FR						1,2,5-8
8.3	Steam Separator & Dryer Assembly Weld HAZ 304SS HAZ Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 550°F, 1045 psi, wet steam	SCC FAT FR						1,2,5-8
8.4	Steam Separator and Dryer Assembly ASTM A193, Gr. B8 Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 550°F, 1045 psi, wet steam	SCC FAT FR						3,4,9
8.5	Steam Separator Guide Pin 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 550°F, 1045 psi, wet steam	SCC FAT FR						10
8.6	RCIC Head Spray Nozzle 304 SS Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) 550°F, 1045 psi, wet steam	SCC FAT FR						11-14

Group 9 - Reactor Recirculation System (RECIRC)

Identification	Material/Environment combination Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this subgroup
			1=low, 2=med, 3=high					
9.1	All Stainless Steel Components External Surfaces When at <150°C Normally Dry When at Low Temp	SCC PIT					ODSCC is possible when external surface is wet with Cl etc.	All SS components
9.2	LAS, SA-508 Cl 2 (Forged Ring) 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) CUF 0.48 w env effect	FAT FAT-HWC SCC SCC-HWC FR CREV						1
9.3	LAS, SA-508 Cl 2 HAZ 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) CUF 0.48 w env effect	FAT FAT-HWC SCC SCC-HWC FR CREV						1
9.4	Dissimilar metal welds LAS to SS 308 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) CUF 0.48 w env effect	FAT FAT-HWC SCC SCC-HWC FR						1
9.5	Safe-end, SS 316NG 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC FR						2
9.6	316 HAZ 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC FR						2
9.7	Welds SS 308 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC FR					delta ferrite content	3,5,7,9,12,14,16,18,22,28,30,31,33,35,38,41,43,45,46,48,50,52,54,56,58,60,62,64,66,67,69,71,73,75,77,79,81,83,85,87
9.8	Straight pipe SS type 316 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC					all pipes and elbows have two seam welds	4
9.9	HAZ 304 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC FR						5,7,9,12,14,16,18,22,28,30,31,33,35,38,41,43,45,46,48,50,52,54,56,58,60,62,64,66,67,69,71,73,75,77,79,81,83,85,87,
9.10	Straight pipe SS type 304 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC					all pipes and elbows have two seam welds	8,10,15,34,40,47,51,55,61,63,68,72,78,80,84,86,
9.11	Elbows SS type 304 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC					all pipes and elbows have two seam welds	6,19,27,44,53,59,82,
9.12	Tee 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC						13
9.13	Socket welds SS 308 on 304 and 316 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl) socketlets and weldolets	FAT FAT-HWC SCC SCC-HWC CREV						17,20,21,24,25,26,32,39,42,65,76
9.14	Flange SA 182, GR F316 - carbon steel 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC CREV						36,37
9.15	Cast SS CF-8 and CF-8M 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC FR						23,29,49,57,88,90
9.16	Reducing branch SS 304 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC						70
9.17	Cap SS 304, 308/L Weld, and HAZ 550 F, 1265 psia (design) Reactor Water (<0.15 uS/cm, <5 ppb SO4/Cl)	FAT FAT-HWC SCC SCC-HWC FR						74
9.18	Pump casing bolting SA 193 GR B7 External Drywell Containment	SCC FAT CREV						89

BWR Group 10 - ECCS Low Pressure Core Spray (LPCS) - (note HWC not relevant to low temp lines)								
Identification	Material/Environment combination / Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
10.1	Various elbows, flanges, & pipe (base metal) in primary & secondary containment SA105,106,216,234 - carbon steel Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment. Inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants); assume O2 present. Operates at ~300 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						1-5-8-18,21-30,33-34,38-41,43-49,52-56,63-65,78-83,86-88,90-92
10.2	Welds and HAZ in various elbows, flanges, & pipe in primary & secondary containment SA105,106,216,234 - carbon steel Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment; inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants) - assume O2 present. Operates at ~300 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						1-5-8-18,21-30,33-34,38-41,43-49,52-56,63-65,78-83,86-88,90-92
10.3	Weldolets and Sockolets SA105,106,234 - carbon steel base & weld Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment; inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants) - assume O2 present. Operates at ~300 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						19-20,35-37,59-61,68-70
10.4	Valves SA105,106,216,234 - carbon steel Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment; inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants) - assume O2 present. Operates at ~300 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						6-7,31-32,42,50-51,57-58,62,66-67,71
10.5	Flange & Bolts at strainer Carbon Steel (including higher strength bolts) in galvanic contact with SS Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment; inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants) - assume O2 present. Operates at ~300 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						93-96
10.6	Strainer & Flange Parts Type 304 SS Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment; inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants) - assume O2 present. Operates at ~300 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT CREV						93-96
10.7	Various elbows, flanges, & pipe (base metal) in primary & secondary containment SA106,234 - carbon steel 100 - 550F stagnant reactor water	FAT FAT-HWC SCC SCC-HWC PIT CREV MIC						73-77
10.8	Welds and HAZ in various elbows, flanges, & pipe in primary & secondary containment SA106,234 - carbon steel 100 - 550F stagnant reactor water	FAT FAT-HWC SCC SCC-HWC CREV MIC PIT						73-77
10.9	Valves SA105,106,216,234 - carbon steel 100 - 200F stagnant reactor water HWC unimportant here (low temp)	FAT SCC PIT CREV MIC						72
10.10	LPCS Pump Parts A106,A516 carbon & low alloy steels Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment; inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants) - assume O2 present. Operates at ~300 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						84-92

BWR Group 11 - ECCS High Pressure Core Spray (HPCS) - Suppression Pool Water - (note HWC not relevant to low temp lines)

Identification	Material/Environment combination / Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
11.1	Various elbows, flanges, & pipe (base metal) in primary & secondary containment SA105,106,216,234 - carbon steel Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment. Inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants); assume O2 present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						1-8,15-18,20-33,35-47,49-56,59,62-67,70-74,79-83
11.2	Welds and HAZ in various elbows, flanges, & pipe in primary & secondary containment SA105,106,216,234 - carbon steel weld metal Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment. Inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants); assume O2 present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						1-8,15-18,20-33,35-47,49-56,59,62-67,70-74,79-83
11.3	Weldolets and Sockolets SA105,106,234 - carbon steel base & weld Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment. Inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants); assume O2 present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						11-13,57-58
11.4	Valves SA105,106,216,234 - carbon steel Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment. Inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants); assume O2 present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						9-10,14,19,34,48,60-61,68
11.5	Various elbows, flanges, & pipe (base metal) in primary & secondary containment SA106,234 - carbon steel 100 - 550F stagnant reactor water	FAT FAT-HWC SCC SCC-HWC CREV MIC PIT						69-74
11.6	Welds and HAZ in various elbows, flanges, & pipe in primary & secondary containment SA106,234 - carbon steel 100 - 550F stagnant reactor water	FAT FAT-HWC SCC SCC-HWC CREV MIC PIT						69-74
11.7	HPCS Pump Parts A106,A516 carbon & low alloy steels Suppression pool water for cooling, typically <100F; once-demineralized but no water treatment; inefficiently N2 blanked (only in Mark 1 and Mark 2, which are most plants) - assume O2 present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality can be poor. MIC certainly possible. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						75-78

BWR Group 11A - ECCS High Pressure Core Spray (HPCS) - Condensate Storage Water - (note HWC not relevant to low temp lines)								
Identification	Material/Environment combination / Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
11A.1	Various elbows, flanges, & pipe (base metal) in primary & secondary containment SA105,106,216,234 - carbon steel Condensate storage water for cooling, typically <100F; demineralized, vented to atmosphere so O2 is present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality is good. MIC relatively unlikely. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						1-8,15-18,20-21,23-33,35-47,49-56,59,62-67,70-74,79-83
11A.2	Welds and HAZ in various elbows, flanges, & pipe in primary & secondary containment SA105,106,216,234 - carbon steel weld metal Condensate storage water for cooling, typically <100F; demineralized, vented to atmosphere so O2 is present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality is good. MIC relatively unlikely. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						1-8,15-18,20-21,23-33,35-47,49-56,59,62-67,70-74,79-83
11A.3	Weldolets and Socklets SA105,106,234 - carbon steel base & weld Condensate storage water for cooling, typically <100F; demineralized, vented to atmosphere so O2 is present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality is good. MIC relatively unlikely. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						11-13,57-58
11A.4	Valves SA105,106,216,234 - carbon steel Condensate storage water for cooling, typically <100F; demineralized, vented to atmosphere so O2 is present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality is good. MIC relatively unlikely. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						9-10,14,19,34,48,60-61,68
11A.5	Various elbows, flanges, & pipe (base metal) in primary & secondary containment SA106,234 - carbon steel 100 - 550F stagnant reactor water	FAT FAT-HWC SCC SCC-HWC CREV MIC PIT						69-74
11A.6	Welds and HAZ in various elbows, flanges, & pipe in primary & secondary containment SA106,234 - carbon steel 100 - 550F stagnant reactor water	FAT FAT-HWC SCC SCC-HWC CREV MIC PIT						69-74
11A.7	HPCS Pump Parts A106,A516 carbon & low alloy steels Condensate storage water for cooling, typically <100F; demineralized, vented to atmosphere so O2 is present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality is good. MIC relatively unlikely. Flushed ~3 months.	FAT SCC MIC PIT GC CREV						75-78
11A.8	Various elbows, flanges, & pipe (base metal) in primary & secondary containment Type 304 SS base metal Condensate storage water for cooling, typically <100F; demineralized, vented to atmosphere so O2 is present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality is good. MIC relatively unlikely. Flushed ~3 months.	FAT SCC MIC						22 and other unlisted parts
11A.9	Welds and HAZ in various elbows, flanges, & pipe in primary & secondary containment Type 304 SS weld metal & HAZ Condensate storage water for cooling, typically <100F; demineralized, vented to atmosphere so O2 is present. Operates at ~1100 psi when active. Always wetted from "keep-fill system"; water quality is good. MIC relatively unlikely. Flushed ~3 months.	FAT SCC MIC						22 and other unlisted parts

Auxiliary System-Group 12, Reactor Core Isolation Cooling (RCIC) - (note HWC not relevant to RCIC)									
Identification	Material/Environment combination Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for Scoring	Critical factors controlling occurrence in plant	Components in this sub-group	1=low, 2=med, 3=high
									12.1
12.2	Welds and HAZ in various elbows, flanges, & pipe in primary & secondary containment SA105,106,234 - carbon steel weld metal Stagnant Wet Steam - HWC not beneficial 547°F 1020 psia	FAT PIT GC SCC						4B,4,2	
12.3	Weldolets and Sockolets SA105 - carbon steel base & weld Stagnant Wet Steam - HWC not beneficial 547°F 1020 psia	FAT PIT GC SCC						4A	
12.4	Various elbows, flanges, & pipe (base metal) in primary & secondary containment SA105,106,216,234 - carbon steel Stagnant Steam Condensate - HWC not beneficial 547°F 1020 psia	FAT GC PIT SCC						6,8,9,10,	
12.5	Welds and HAZ in various elbows, flanges, & pipe in primary & secondary containment SA105,106,216,234 - carbon steel weld metal Stagnant Steam Condensate - HWC not beneficial 547°F 1020 psia	FAT GC SCC CREV						7,5	
12.6	Valves SA216 - carbon steel Stagnant Steam Condensate - HWC not beneficial 250- 547°F 1020 psia	FAT GC CREV PIT SCC						12	
12.7	Various elbows, flanges, & pipe (base metal) in primary & secondary containment SA105,106,216,234 - carbon steel Stagnant condensate storage water, typically <100F, 20-40psia. This water is demineralized, with, initially, 6ppm O2 present. Operates at ~1140 psi and 120-170°F when active during flush every 3 months. No HWC effect here. Always wetted from "keep-fill system"; water quality is good.	PIT MIC GC CREV SCC						15,16,17,19,,22,24,33,35,38, 40, 46, 48,49,70,72,76	
12.8	Welds and HAZ in various elbows, flanges, & pipe in primary & secondary containment SA105,106,216,234 - carbon steel weld metal Stagnant condensate storage water, typically <100F, 20-40psia. This water is demineralized, with, initially, 6ppm O2 present. Operates at ~1140 psi and 120-170°F when active during flush every 3 months. HWC has no benefit. Always wetted from "keep-fill system"; water quality is good.	SCC MIC PIT GC CREV						13,73,11,14,15,18,20,22,24,26,28,34,36,37,39,42,43,44,45,4,5A,47,51	
12.9	Weldolets, Sockolets and Tees SA105,106,234 - carbon steel base & weld Stagnant condensate storage water, typically <100F, 20-40psia. This water is demineralized, with, initially, 6ppm O2 present. Operates at ~1140 psi and 120-170°F when active during flush every 3 months. No HWC benefit here. Always wetted from "keep-fill system"; water quality is good.	FAT SCC MIC PIT GC						23,27,52,53,	
12.10	Valves SA,216 - carbon steel Stagnant condensate storage water, typically <100F, 20-40 psia. This water is demineralized, with, initially 6ppm O2 present. Operates at ~1100 psi and 120-170°F when active during flush every 3 months. No HWC benefit here. Always wetted from "keep-fill system"; water quality is good.	CREV MIC PIT GC SCC						21,25,29,30,31,32,41,50,67,68	
12.11	Low alloy steel pump casing A516Gr 70 Stagnant condensate storage water, typically <100F, 20-40psia. This water is demineralized, with, initially, 6ppm O2 present. Operates at ~1140 psi and 120-170°F when active during flush every 3 months. HWC no benefit here. Always wetted from "keep-fill system"; water quality is good.	FAT MIC PIT GC SCC						74,75,	
12.12	Various elbows, flanges, & pipe (base metal) in primary & secondary containment SA105,106,216,234 - carbon steel Suppression pool water for cooling, typically <100F and atmospheric pressure; once-demineralized but no water treatment. Inefficiently N2 blanketed (only in Mark 1 and Mark 2, which are most plants); assume O2 present. Operates at ~20 psia when active dur Always wetted from "keep-fill system"; water quality can be poor.	FAT SCC MIC PIT GC						54,59,62,64,66,	
12.13	Welds and HAZ in various elbows, flanges, & pipe in primary & secondary containment SA105,106,216,234 - carbon steel weld metal Suppression pool water for cooling, typically <100F and atmospheric pressure; once-demineralized but no water treatment. Inefficiently N2 blanketed (only in Mark 1 and Mark 2, which are most plants); assume O2 present. Operates at ~20 psia when active dur Always wetted from "keep-fill system"; water quality can be poor.	FAT SCC MIC PIT GC						55,56,58,63,65,	
12.14	Weldolets and Sockolets SA105,106,234 - carbon steel base & weld Suppression pool water for cooling, typically <100F and atmospheric pressure; once-demineralized but no water treatment. Inefficiently N2 blanketed (only in Mark 1 and Mark 2, which are most plants); assume O2 present. Operates at ~20 psia when active dur Always wetted from "keep-fill system"; water quality can be poor.	FAT SCC MIC PIT GC						57,	
12.15	Valves SA,216 - carbon steel Suppression pool water for cooling, typically <100F and atmospheric pressure; once-demineralized but no water treatment. Inefficiently N2 blanketed (only in Mark 1 and Mark 2, which are most plants); assume O2 present. Operates at ~20 psia when active dur Always wetted from "keep-fill system"; water quality can be poor.	FAT SCC MIC PIT GC CREV						60,61,	
12.16	RCIC Strainer Flange & misc. components 304 SS Suppression pool water for cooling, typically <100F and atmospheric pressure; once-demineralized but no water treatment. Inefficiently N2 blanketed (only in Mark 1 and Mark 2, which are most plants); assume O2 present. Operates at ~20 psia when active dur Always wetted from "keep-fill system"; water quality can be poor.	FAT SCC MIC PIT GC CREV						77,78,79,80	

BWR Group 13 - RHR Suction Line Piping to RHR Pumps (RHRPMPs)								
Identification	Material/Environment combination / Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
13.1	All Stainless Steel Components External Surfaces When at <150°C Normally less than 90 °F. Possible as high as 300 °F	SCC PIT MIC						
13.2	Straight pipes, Elbows, Tee, Valves 304 SS - weld and base metal Reactor Water normally stagnant 549 °F pressure 1035 psia	SCC SCC-HWC FAT FAT-HWC FR						2,4
13.3	Weld HAZ 304 SS HAZ Reactor Water normally stagnant 549 °F pressure 1035 psia	SCC SCC-HWC FAT FAT-HWC FR						1,3
13.4	Straight pipes, Elbows, Tee, Valves 304 SS Reactor Water normally stagnant 100 - 350 °F pressure 300 psia. No HWC effect	SCC FAT						5,6,7,9,11,14,15,17,18,20,21,23,26,24,27,29,30,3
13.5	Welds SS 308 Reactor Water normally stagnant 100 - 350 °F pressure 300 psia. No HWC effect	SCC FAT						8,10,12,13,16,22,25,27,28,30,32,34,35,38,39
13.6	Socket welds Reactor Water normally stagnant 100 - 350 °F pressure 300 psia. No HWC effect	SCC FAT						12,19
13.7	All Carbon Steel Components External Surfaces When at <150°C Normally less than 90 °F. Possible as high as 300 °F	PIT MIC						
13.8	Carbon Steel welds & HAZ Suppression pool water. Replaced with condensate water before going into shutdown cooling mode. No HWC effect. 120 - 170 °F pressure 20 psia flow rate 7450 gpm NWC water during operation	FAT SCC MIC PIT GC CREV						43,46,48,49,50,52,53,55,57
13.9	CS Straight pipes, Elbows, Tee, Valves SA234 Gr. WPB Suppression pool water. Replaced with condensate water before going into shutdown cooling mode. No HWC effect. 120 - 170 °F pressure 20 psia flow rate 7450 gpm NWC water during operation	FAT SCC MIC PIT GC CREV						42,44,45,47,51,54,56,58

BWR Group 13 - RHR Suction Line Piping to RHR Pumps (RHRPMPs)								
Identification	Material/Environment combination / Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
13.1	All Stainless Steel Components External Surfaces When at <150°C Normally less than 90 °F. Possible as high as 300 °F	SCC PIT MIC						
13.2	Straight pipes, Elbows, Tee, Valves 304 SS - weld and base metal Reactor Water normally stagnant 549 °F pressure 1035 psia	SCC SCC-HWC FAT FAT-HWC FR						2,4
13.3	Weld HAZ 304 SS HAZ Reactor Water normally stagnant 549 °F pressure 1035 psia	SCC SCC-HWC FAT FAT-HWC FR						1,3
13.4	Straight pipes, Elbows, Tee, Valves 304 SS Reactor Water normally stagnant 100 - 350 °F pressure 300 psia. No HWC effect	SCC FAT						5,6,7,9,11,14,15,17,18,20,21,23,26,24,27,29,30,3
13.5	Welds SS 308 Reactor Water normally stagnant 100 - 350 °F pressure 300 psia. No HWC effect	SCC FAT						8,10,12,13,16,22,25,27,28,30,32,34,35,38,39
13.6	Socket welds Reactor Water normally stagnant 100 - 350 °F pressure 300 psia. No HWC effect	SCC FAT						12,19
13.7	All Carbon Steel Components External Surfaces When at <150°C Normally less than 90 °F. Possible as high as 300 °F	PIT MIC						
13.8	Carbon Steel welds & HAZ Suppression pool water. Replaced with condensate water before going into shutdown cooling mode. No HWC effect. 120 - 170 °F pressure 20 psia flow rate 7450 gpm NWC water during operation	FAT SCC MIC PIT GC CREV						43,46,48,49,50,52,53,55,57
13.9	CS Straight pipes, Elbows, Tee, Valves SA234 Gr. WPB Suppression pool water. Replaced with condensate water before going into shutdown cooling mode. No HWC effect. 120 - 170 °F pressure 20 psia flow rate 7450 gpm NWC water during operation	FAT SCC MIC PIT GC CREV						42,44,45,47,51,54,56,58

BWR Group 14 - RHR Pump Discharge Piping to RHR HX (RHRPMPHX) - (HWC has no effect here; used during shutdown or emergency)								
Identification	Material/Environment combination / Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
14.1	All Carbon Steel Components External Surfaces When at <150°C Normally less than 90 °F. Possible as high as 300 °F	PIT MIC						
14.2	Pipes, Elbows, Tees, Flanges, Valves Various carbon steels 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm 125 - 334 F 275 psi operating once a cycle	FAT SCC MIC PIT GC CREV						1,3,5,9,12,13,15,17,18,20,22,24,26,30,32,34,39,40,42,45,48,50,52,54,56,58,61,62,64
14.3	Carbon steel weld and HAZ 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 125 - 334 F 275 psi operating once a cycle	FAT SCC MIC PIT GC CREV						2,4,6,8,10,11,14,16,19,21,23,25,27,29,31,33,35,37,38,41,43,55,47,49,51,53,55,57,59,60,63,65,66,72,73,74
14.4	Weldolet / Sockolet SA234 Gr. WPB 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 125 - 334 F 275 psi operating once a cycle	FAT SCC MIC PIT GC CREV						7,28,36,67
14.5	HX weld in SS, or CS with 1/8" clad/overlay 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 125 - 334 F 275 psi operating once a cycle	FAT SCC MIC PIT GC CREV						68,69,70,71
14.6	Heat exchanger tubes and tubesheet - outside of tubes CS w/outside clad of SS 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 125 - 334 F 275 psi operating once a cycle	FAT SCC MIC PIT						75,76
14.7	Heat exchanger tubes and tubesheet - inside of tubes Carbon steel Service water (treated) - 100F	FAT SCC MIC PIT GC CREV						75,76
14.8	HX Fittings Carbon steel Suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 125 - 334 F 275 psi operating once a cycle	FAT SCC MIC PIT GC CREV						77
14.9	External heat exchanger support structure Carbon steel Secondary containment atmosphere	FAT PIT						78

BWR Group 15 - RHR Normal Shutdown Cooling Piping (RHRSHTDWN) - (HWC has no effect here)								
Identification	Material/Environment combination / Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
15.1	All Carbon Steel Components External Surfaces When at <150°C Normally less than 90 °F. Possible as high as 300 °F	PIT MIC						
15.2	Pipes, Elbows, Tees, Flanges, Valves Various carbon steels 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 120 - 170F 275/1140 psia	FAT SCC MIC PIT GC CREV						1,4,11,13,14,15,21,23,24,26,30,32,34,35,37,41,43,47,49,51,55,60,61,63,65
15.3	Carbon steel welds and HAZ 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 120 - 170F 275/1140 psia	FAT SCC MIC PIT GC CREV						2,3,5,6,8,10,12,16,17,18,20,22,25,27,29,31,33,36,38,40,42,44,46,48,50,52,53,54,56,67,59,62,64,66
15.4	Carbon steel - base metal, welds and HAZ Reactor water, stagnant, 550F, 1140 psia	FAT SCC						68-71
15.5	Weldolet / Sockolet CS SA234 Gr. WPB (etc) 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 120 - 170F 275/1140 psia	FAT SCC MIC PIT GC CREV						7,9,19,28,39,45,58,70

BWR Group 16 - RHR Spray Piping (RHRSPRAY) - (HWC has an effect only in limited areas of RHR)								
Identification	Material/Environment combination / Full power temperature/pressure	Degradation mechanisms considered	Susceptibility	Confidence	Knowledge	Rationale for scoring	Critical factors controlling occurrence in plant	Components in this sub-group
			1=low, 2=med, 3=high					
16.1	All Carbon Steel Components External Surfaces When at <150°C Normally less than 90 °F. Possible as high as 300 °F	PIT MIC						
16.2	Pipes, Elbows, Tees, Flanges, Valves Various carbon steels - base metal and weld 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 125 - 334F, 275 psi operating once a cycle	FAT SCC MIC PIT GC CREV						2,4,6,8,10,14,18,20,22,24,26,34,38,40,42,44,57,59,61
16.3	Carbon steel weld HAZ 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 125 - 334F, 275 psi operating once a cycle	FAT SCC MIC PIT GC CREV						1,3,5,7,9,11,12,13,15,17,19,21,23,25,27,33,35,57,39,41,43,45,47,49,51,52,56,58,60,64,66,67,69
16.4	Weldolet / Sockolet CS SA234 Gr. WPB (etc) 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 125 - 334F, 275 psi operating once a cycle	FAT SCC MIC PIT GC CREV						16,36,53,71
16.5	Elbows, Valves Various carbon steels Reactor water, stagnant, 550F	FAT SCC MIC PIT GC CREV						28,30
16.6	Welds and HAZ associated with elbows and valves Various carbon steels Reactor water, stagnant, 550F	FAT SCC						29,31,32
16.7	Spray header in containment Tee, Reducer and Welds Various carbon steels 100F suppression pool water, stagnant. Only replaced with condensate water prior to shutdown cooling mode. Reactor water flow rate 7450 gpm, 125 - 334F, 275 psi operating once a cycle	FAT SCC MIC PIT GC CREV						46,47,48,49
16.8	Spray header in drywell Tee, Reducer and Welds Carbon Steel SA234 Gr. WPB N2 (when plant is operating) 100F suppression pool water in operating mode.	FAT SCC MIC PIT GC CREV						50,51,52
16.9	Sockolet in spray header in drywell Carbon Steel SA234 Gr. WPB N2 (when plant is operating) 100F suppression pool water in operating mode.	FAT SCC MIC PIT GC CREV						53
16.10	Sockolet in spray header in drywell Carbon steel - Brass joint N2 (when plant is operating) 100F suppression pool water in operating mode.	FAT SCC MIC PIT GALV GC CREV						54
16.11	Spray header in drywell Brass Nozzle N2 (when plant is operating) 100F suppression pool water in operating mode.	FAT SCC MIC PIT GC CREV						55
16.12	Spray header above the suppression pool Pipes, Elbows, Tees, Welds Various carbon steels 100F suppression pool water	FAT SCC MIC PIT GC CREV						62,63,64,65,66,67,68,69,70
16.13	Sockolet spray header above the suppression pool Carbon steel SA234 Gr. WPB N2 (when plant is operating) 100F suppression pool water in operating mode.	FAT SCC MIC PIT GC CREV						71
16.14	Sockolet spray header above the suppression pool Carbon steel - Brass joint (drywell) N2 (when plant is operating) 100F suppression pool water when spraying	FAT SCC MIC GALV PIT GC CREV						72
16.15	Spray header above the suppression pool Nozzle drywell N2 (when plant is operating) 100F suppression pool water in operating mode.	FAT SCC MIC PIT GC CREV						73