Appendix 5A. Tables

Table 5-1. Reactor Coolant System Pressure Settings

	Pressure, psig	Capacity, lb/hr, total
Design Pressure	2500	
Pressurizer Code Safety Valves	2500	667,000
High Pressure Trip	2355[(1)]	
Pressurizer Electromatic Relief Valve		
Open	2450[(1)]	107,000
Close	2400[(1)]	
High Pressure Alarm	2255[(1)]	
Pressurizer Spray Valve		
Open	2205[(1)]	
Close	2155[(1)]	
Operating Pressure [1]	2155	
Low Pressure Alarm	2055	
Low Low Pressure Alarm	1920[(1)]	
Low Pressure Trip	1800[(1)]	
Hydrotest Pressure	3125	

Note:

1. At sensing nozzle on reactor outlet pipe.

Table 5-2. Transient Cycles for RCS Components Except Pressurizer Surge Line

Transient Number	Transient Description (ASME Category)	Design Cycles	Component Exceptions (See notes)
1A	Heatup from 70°F to 8% Full Power (Normal)		
	Total	360	(1)
1B	First 25% of Plant Life Cooldown from 8% Full Power (Normal)	90	
	Last 75% of Plant Life Cooldown from 8% Full Power (Normal)	270	
	Total	360	(1)
2	Power Change 0 to 15% and 15 to 0% (Normal)	1440	
3	Power Loading 8 to 100% Power (Normal)	18,000	(7)
4	Power Unloading 100 to 8% Power (Normal)	18,000	(7)
5	10% Step Load Increase (Normal)	8,000	
6	10% Step Load Decrease (Normal)	8,000	
7	Step Load Reduction (100 to 8% Power) (Upset)		
	Resulting from turbine trip	160	
	Resulting from electrical load rejection	150	
	Total	310	
8	Reactor Trip (Upset)		
	Type A	40	
	Type B	160	
	Type C	90	
	Trip included in transient numbers 11, 15, 16, 17 and 21	122	
	Total[3]	412	
	Manual Actuation of High Presure Injection System after Reactor Trip	70	(2) (3)
9	Rapid Depressurization (Upset)	40	(2)
10	Change of Reactor Coolant Flow (Upset)	412	
11	Rod Withdrawal Accident (Upset)	40	
12	Hydrotests (Test)		
	All RCS components	10	(7)
13	Steady-state Power Variations (Normal)	∞	
14	Control Rod Drop (Upset)	60	
15	Loss of Station Power (Upset)	40	

Transient Number	Transient Description (ASME Category)	Design Cycles	Component Exceptions (See notes)
16	Steam Line Failure (Faulted)	1	
17A	Loss of Feedwater to One Steam Generator (Upset)	30	
17B	Stuck Open Turbine Bypass Valve (Emergency)	10	
18	Loss of Feedwater Heater (Upset)	620	
19	Feed and Bleed Operations (Normal)	4,000	(3)
20	Miscellaneous (Normal)		
	Miscellaneous A Miscellaneous B Miscellaneous C	30,000 20,000 $4x10^6$	(3)
21	Loss of Coolant (Faulted)	1	(4)
22	Test Transients (Test)		
	High Pressure Injection System Core flooding check valve	40 240	(3)

Component and General Flaw Location	Limiting Transient	Total Allowable Transient Cycles
Deleted row(s) per 2004 update		
Deleted row(s) per 2003 update		

Transient Number	Transient Description (ASME Category)	Design Cycles	Component Exceptions (See notes)

Note:

1. Certain components have flaw tolerance evaluations as allowed by ASME Section XI (Refer to Section 5.2.2 and 5.2.3.12.4) that assume a reduced number of heatup and cooldown cycles. The lowest of the reduced number of cycles is used as the limit for the number of unit heatups and cooldowns. These evaluations will be updated, the flaws will be reexamined, or the flaws will be removed if the reduced number of transient cycles becomes limiting. A tabulation of the evaluations is presented below.
2. In order to analytically demonstrate a usage factor of less than 1.0, certain welds associated with the Emergency HPI nozzles have been qualified for fewer than the design number of cycles of the two, noted transients. The analysis uses a total of 29 cycles for the combined number of occurrences (i.e. the sum of the number of occurrences of Manual Actuation of HPI System after Reactor Trip Transient 8) and the number of occurrences of Rapid Depressurizations (Transient 9) can not exceed 29.

   The AOTC (Allowable Operating Transient Cycle) monitoring program keeps track of the number of occurrences on each unit. The number of allowed transients has been reduced in the AOTC log books to limit the sum of these two transients to 29 for each unit.
3. Not applicable to replacement Steam Generators.
4. Deleted Per 2003 Update
5. Deleted Per 2004 Update
6. Deleted Per 2004 Update
7. The Reactor Vessel closure head assemblies are limited to 5000 power loading and unloading cycles and 15 hydrotests as discussed in Supplement B of OSS-0279.00-00-0003.

Table 5-3. Stress Limits for Seismic, Pipe Rupture, and Combined Loads

Case	Loading Combination	Stress Limits
I	Design loads + operating basis earthquake loads	$P_m \le 1.0\ S_m$ $(P_L + P_b) \le 1.5\ S_m$
II	Design loads + safe shutdown earthquake loads	$P_m \le 1.2\ S_m$ $(P_L + P_b) \le 1.2\ (1.5\ S_m)$
III	Design loads + pipe rupture loads	$P_m \le 1.2\ S_m$ $(P_L + P_b) \le 1.2\ (1.5\ S_m)$
IV	Design loads + safe shutdown earthquake loads + pipe rupture loads	$P_m \le 2/3\ S_u$ $(P_L + P_b) \le 2/3\ S_u$

Where[1]	P_L	=	Primary local membrane stress intensity
	P_m	=	Primary general membrane stress intensity
	P_b	=	Primary bending stress intensity
	S_m	=	Allowable membrane stress intensity
	S_u	=	Ultimate stress for unirradiated material at operating temperature

Note:

1. All symbols have the same definition or connotation as those in ASME B&PV Code Section III, Nuclear Vessels.
2. All components will be designed to insure against structural instabilities regardless of stress levels.

Table 5-4. Reactor Coolant System Component Codes

Component	Codes	Addendum
Reactor Vessel	ASME III Class A	Summer 1967[1]
Replacement Reactor Vessel Head	ASME III Class 1	1989, No addendum[3,4]
Pressurizer	ASME III Class A	Summer 1967[1]
Reactor Coolant System Piping	USAS B31.7	Errata through June[5] 1968
Feedwater Header	USAS B31.1	1967
R. C. Pump Casings	ASME III Class A (not code stamped)	Summer 1967
Safety and Relief Valves	ASME III Art. 9	Summer 1967
Welding Qualifications	ASME III and IX	Summer 1967
Replacement Steam Generator (primary and secondary sides)	ASME III Class 1	1989 No addendum

Note:

1. Welded joints tested in accordance with requirements of Article 7, Summer 1966 Addenda.
2. This table reflects original design/construction code information. Refer to UFSAR Section 5.2.2 for additional information on Reactor Coolant System Codes and Classifications.
3. Input Document for Replacement RVCHA Licensing and Safety Evaluation, Babcock & Wilcox Canada, BWC Report No. 068S-LR-01 Rev 2; OM 201.R-0141.001.
4. History Docket for Closure Heads, Customer Spec.# OSS-0279.00-00-003, Babcock & Wilcox Canada, BWC-Cont. 068S, 068S-01.
5. Reactor Coolant piping was requalified to the 1983 ASME code during the Steam Generator Replacement project.

Table 5-5. Materials of Construction

Component	Section	Materials
Reactor Vessel	Pressure Plate	SA-533, Grade B, Class 1 [1]
	Pressure Forgings	A-508-64, Class 2 (Code Case 1332-3)
	Cladding	18-8 Stainless Steel or Ni-Cr-Fe
	Studs, Nuts and Washers	A-540, Grade B23 or B24 (Code Case 1335-2)
	Thermal Shield and Internals	SA-240, Type 304
	Guide Lugs	Ni-Cr-Fe, SB-168 (Code Case 1336)
Replacement Reactor Vessel Head	Pressure Forging	SA-508, Class 3 [2,3]
	Cladding	308L/309L [2,3]
	CRDM Flange	SA-182, Grade F316LN [2,3]
	CRDM Guide Tube	SB-167 UNS N06690 (ASME Section III Code Case N474-2) [2,3]
Steam Generator	Deleted per 2004 update	
	Pressure Forgings	SA-508 CL.3A
	Cladding for Heads	308L/309L Stainless Steel
	Cladding for Tube Sheets	UNS N06052 (Code Case 2142)
	Tubes	SB-163 UNS N06690 (Code Case N-20-4)
	Studs - Reactor Coolant Side	SA-193, Grade B7
	Nuts - Reactor Coolant Side	SA-194, Grade 7
	Studs - Secondary Side	SA-193, Grade B7
	Nuts - Secondary Side	SA-194, Grade 7
Pressurizer	Shell, Heads, and External Plate	SA-212, Grade B
	Forgings	A-508-64, Class 1 (Code Case 1332-3)
	Cladding	18-8 Stainless Steel
	Studs and Nuts	SA-320, Grade L43
	Internal Plate	SA-240, Type 304
	Internal Piping	SA-312, Type 304
	Sampling and Level Indication Piping Safe Ends	SA-479, Type 316
Reactor Coolant Piping	28 in. and 36 in.	SA-516, Grade 70 (Elbows) A-106, Grade C (Straights)

Component	Section	Materials
	Cladding	18-8 Stainless Steel
	10 in. Surge Line and 2-1/2 in. Spray Line	A-403, Grade WP 316 (Elbows) A-376, Type 316 (Straights)
	Piping Safe Ends	SA-479, Type 316; A-376, Type 316 and Ni-Cr- Fe, SB-166
Reactor Coolant Pumps		
Oconee 1	Forging	
	Stainless Steel	SA182, 304
	Static Casting	
	Stainless Steel	SA-351, Gr. CF8
	Seal Housing	SA-351, Gr. CF3 or SA-182, F316
	Tubing and Pipe	
	Stainless Steel	SA-213, Type 316 or 304 and SA-376 or 312 (Seamless) Type 304 or 316
	Bolting Material	SA-193
	Welding Filler Metals	SA-298 or SA-371
	Plate, Sheet and Strip	SA-240
Oconee 2 & 3	Castings	
	Casing	A-351, Grade CF8M
	Stuffing Box	A-351, Grade CF8M
	Forgings	
	Shaft	A-473, Type 316
	Bolting	
	Casing Studs	A-193, Grade B7
	Casing Nuts	A-194, Type 2H
Valves	Valve Bodies	A-351, Grade CF8M A-182, F316 and F347; SA-479, Type 316

Note:

1. This material is metallurgically identical to SA-302, Grade B, as modified by Code Case 1339.
2. Input Document for Replacement RVCHA Licensing and Safety Evaluation. Babcock & Wilcox Canada, BWC Report No.068S-LR-01 Rev. 2, OM 201.R-0141.001.
3. History Docket for Closure Heads, Customer Spec# OSS-0279.00-00-0003, Babcock & Wilcox Canada, BWC-CONT. 068S, 068S-01 (Vol. 1 of 4).

Table 5-6. Summary of Primary Plus Secondary Stress Intensity for Components of the Reactor Vessel

Area	Stress Intensity psi	Allowable Stress 3 S_m, psi (Operating Temperature)
Control Rod Housing	24,800	69,900
Head Flange	58,000	80,000
Vessel Flange	43,000	80,000
Closure Studs	89,400	107,400
Primary Nozzles -Inlet	24,000	80,000
Outlet	24,000	80,000
Bottom Head to Shell	23,300	80,000
Bottom Instrumentation	10,100	69,900
Nozzle Belt to Shell	32,300	80,000
Core Flooding Nozzle	23,660	80,000
Support Skirt	88,000	93,700

Note:

1. Locations or points of stress analysis are illustrated on Figure 5-10.
2. "The values shown in this table are historical. See calculation OSC-1815 for current values."

Table 5-7. Summary of Cumulative Fatigue Usage Factors for Components of the Reactor Vessel

Item	Usage Factor[1]
Control Rod Housing	0.0
Head Flange	0.10
Vessel Flange	0.05
Stud bolts	0.38
Primary Nozzles – Inlet	0.06
Outlet	0.06
Bottom Head to Shell	0.0
Bottom Instrumentation	0.0
Nozzle Belt to Shell	0.0
Core Flooding Nozzle	0.02
Support Skirt	0.14

Note:

1. As defined in Section III of the ASME Boiler and Pressure Vessel Code, Nuclear Vessels.

   "The values shown in this table are historical. See calculation OSC-1815 for current values."

   Points of stress analysis are illustrated on Figure 5-10.

Table 5-8. Stresses Due to a Maximum Design Steam Generator Tube Sheet Pressure Differential of 2,500 psi at 650°F

Stress	Computed Value	Allowable Value
	Original Steam Generator	
Deleted row(s) per 2004 update		
	Replacement Steam Generator	
Primary Membrane	16.5 Ksi	30.0 Ksi (S_m)
Primary Membrane plus Primary Bending	30.1 Ksi	45.0 Ksi (1.5 S_m)

Table 5-9. Ratio of Allowable Stresses to Computed Stresses for a Steam Generator Tube Sheet Pressure Differential of 2,500 psi

Component Part	Stress Ratio
Original Steam Generator	
Deleted row(s) per 2004 update	
Replacement Steam Generator	
Primary Head	2.21
Primary Head Tube Sheet Joint	1.53
Tubes	1.20
Tube Sheet	
Average Membrane SI ratio	1.82
Membrane plus bending SI ratio	1.50

Table 5-10. Fabrication Inspections

Component	RT	UT	PT	MT	ET
1. Reactor Vessel					
1.1 Forgings					
1.1.1 Flanges		X[1]		X	
1.1.2 Studs, Bar		X			
1.1.3 Studs After Final Machining				X	
1.1.4 Skirt Adaptor		X[1]			
1.1.5 Nozzle Shell Forgings		X		X	
1.1.6 Main Nozzle Forgings		X		X	
1.1.7 Dutchman Forging		X[1]		X	
Deleted row(s) per 2004 update					
1.1.10 Replacement RVH CRDM Nozzle Flange		X [7,8]	X [7,8]		
1.1.11 Replacement RVH CRDM Nozzle Guide Tube		X [7,8]	X [7,8]		
1.1.12 Replacement Reactor Vessel Closure Head		X [7,8]	X [7,8]	X [7,8]	
1.2 Plates					
1.2.1 Head and Shell Plate		X[1]		X[6]	
1.2.2 Support Skirt		X[1]		X[6]	
1.3 Instrumentation Tubes		X	X		
1.4 Closure O-Rings		X	X		
1.5 Weldments					
1.5.1 Longitudinal and Circumferential Main Seams	X			X	
1.5.2 CRD Mechanism Adaptor to Shell	X		X		
1.5.3 CRD Mechanism Adaptor to Flange	X		X		
1.5.4 Main Nozzles	X			X	
1.5.5 Instrumentation Nozzle Connection			X		
1.5.6 Nozzle Safe-Ends, Weld Deposit		X	X		

Component	RT	UT	PT	MT	ET
1.5.7 Temporary Attachment After Removal				X	
1.5.8 All Accessible Welds After Hydrotest				X	
1.5.9 O-Ring Closure Weld	X		X		
1.5.10 Cladding, Sealing Surfaces		X[6,2]	X		
1.5.11 Cladding, All Other		X[6,3]	X		
1.5.12 Insulation Support Lugs				X	
1.5.13 Replacement RVH					
CRDM Nozzle Flange to guide Tube Weld	X[7,8]		X[7,8]		
CRDM Nozzle to Replacement RVCH Weld			X[7,8]		
2. Replacement Steam Generator					
2.1 Tube Sheet					
2.1.1 Forging		X		X	
2.1.2 Cladding		X	X		
2.2 Heads					
2.2.1 Forging		X		X	
2.2.2 Cladding		X	X		
2.3 Shell					
2.3.1 Forging		X		X	
2.4 Tubes		X	X		X
2.5 Nozzles (Forgings)		X	X or	X	
2.6 Studs, Bar					
2.7 Studs After Final Machining				X	
2.8 Weldments					
2.8.1 N/A					
2.8.2 N/A					
2.8.3 Shell, Circumferential	X	X		X	
2.8.4 Cladding, Sealing Surfaces		X	X		
2.8.5 Cladding, all other		X	X		

Component	RT	UT	PT	MT	ET
2.8.6 Nozzle to Shell (Steam Noz)	X	X		X	
2.8.7 Level Sensing/Drain Connection		X	X		
2.8.8 Instrument Connection			X		
2.8.9 Conical Support	X		X		
2.8.10 Tube to Tubesheet		X			
2.8.11 Temporary Attachment after Removal		X or	X		
2.8.12 Hydrostatic Test (All Accessible Welds)		X or	X		
2.8.13 Lifting Lugs		X or	X		
2.8.14 N/A					
3. Pressurizer					
3.1 Heads					
3.1.1 Plate		X[1]		X	
3.1.2 Cladding		X[6,3]	X		
3.2 Shell					
3.2.1 Forging		X[1]		X	
3.2.2 Plate		X[1]		X[6]	
3.2.3 Cladding		X[6,3]	X		
3.3 Heater Bundles					
3.3.1 Cover Plate		X		X	
3.3.2 Diaphragm and Spacer Plate		X	X		
3.3.3 Studs, Bar		X			
3.3.4 Studs and Nuts After Final Machining				X	
3.3.5 Heaters					
3.3.5.1 Tubing		X	X[6]		
3.3.5.2 Positioning of Heater Element in Tube	X				
3.4 Nozzle (Forgings)		X		X	
3.5 Weldments					

Component	RT	UT	PT	MT	ET
3.5.1 Shell, Longitudinal as Deposited by Submerged Arc	X			X	
3.5.2 Shell, Longitudinal as Deposited by Electroslag	X	X		X	
3.5.3 Shell, Circumferential	X			X	
3.5.4 Cladding, Sealing Surfaces		X[6,2]	X		
3.5.5 Cladding, All Other		X[6,2]	X		
3.5.6 Nozzle to Shell	X			X	
3.5.7 Nozzle Safe-Ends (If Weld Deposit)		X	X		
3.5.8 Nozzle Safe-End (If Forging or Bar)	X		X		
3.5.9 Instrumentation and Vent Connections			X		
3.5.10 Support Brackets				X	
3.5.11 Heater Guide Tube Pad		X	X		
3.5.12 Temporary Attachment After Removal				X	
3.5.13 All Accessible Welds After Hydrotest				X	
3.5.14 Insulation Support Pads				X	
4. Piping					
4.1 Pipe					
4.1.1 Forgings		X[1]		X	
4.1.2 Cladding		X[6,3]	X		
4.2 Bends					
4.2.1 Plate		X[1]		X[6]	
4.2.2 Cladding		X[6,3]	X		
4.3 Nozzle Forgings		X		X	
4.4 Weldments					
4.4.1 Longitudinal	X			X	
4.4.2 Circumferential	X			X	
4.4.3 Cladding, Elbows		X[6,3]	X		
4.4.4 Cladding, Straight		X[6,3]	X		

Component	RT	UT	PT	MT	ET
4.4.5 Nozzles to Run Pipe	X			X	
4.4.6 Thermowell Connections			X		
4.4.7 Insulation Support Lug Pads				X	
5. Reactor Coolant Pumps					
5.1 Castings	X		X		
5.2 Forgings		X	X		
5.3 Weldments					
5.3.1 Circumferential	X		X		
5.3.2 Piping Connections			X		
6. Valves					
6.1 Castings	X		X		
6.2 Forgings		X	X		

Note:

1. 100% scanning for longitudinal wave technique and 100% shear wave technique.
2. UT of clad defects and bond to base metal.
3. UT of clad bond to base metal (spot check).
4. Also gas leak test--B&W requirement.
5. Over 12-inch length on each end.
6. Additional B&W requirement.

   RT: Radiographic
   UT: Ultrasonic
   PT: Dye Penetrant
   Mt: Magnetic Particle
   ET: Eddy Current

7. Input Document for Replacement RVCHA Licensing and Safety Evaluation. BWC Report No. 068S-LR-01 Rev. 2, OM 201.R-0141.001.
8. History Docket for Closure Heads, Customer Spec. No. OSS-0279.00-00-003, Babcock & Wilcox Canada, BWC-CONT. 068S, 068S-01 (Vol. 1-2 of 4).

Table 5-11. Reactor Vessel Design Data

Design Pressure, psig			2500
Design Temperature, °F			650
Coolant Operating Temperature, Inlet/Outlet, °F			554/604
Hydrotest Pressure, psig			3125
Coolant Volume (Hot, Core and Internals in Place), ft^3			4058
Reactor Coolant Flow, lb/hr			131.32×10^6
Number of Reactor Closure Head Studs			60
Diameter of Reactor Closure Head Studs, in.			6-1/2
Vessel Dimensions			
Overall Height of Vessel and Closure Head, ft-in.[1]			40-8-3/4
Shell i.d., in.			171
Flange i.d., in.			165
Straight Shell Minimum Thickness, in.			8-7/16
Shell Cladding Minimum Thickness, in.			1/8
Shell Cladding Nominal Thickness, in.			3/16
Insulation Thickness, in.			3
Replacement Closure Head Insulation Thickness, in.			3 1/4[6]
Replacement Closure Head Nominal Thickness, in.			7[4,5]
Lower Head Minimum Thickness, in.			5
Vessel Nozzles			
Function	No.	ID, in.	Material
Coolant Inlet	4	28	Carbon Steel - SS Clad
Coolant Outlet	2	36	Carbon Steel - SS Clad
Core Flooding - LP Injection	2	12	Carbon Steel[2] - SS Clad
Control Rod Drive	61	2.76	Inconel[3]
Axial Power Shaping Rod Drive	8	2.76	Inconel[3]
Row(s) Deleted Per 2000 Update			
In-Core Instrumentation	52	3/4 Sch 160	Inconel
Dry Weight, lbs			
Vessel			646,000
Replacement Closure Head			155,200[4,7]
Studs, Nuts, and Washers			39,500

Note:

1. Instrument nozzle to CRD flange.
2. With stainless steel safe end added after stress relief.
3. With stainless steel flanges.
4. Input Document for Replacement RVCHA Licensing and Safety Evaluation. Babcock & Wilcox Canada, BWC Report No. 068S-LR-01 Rev. 2, OM 201.R-0141.001.
5. History Docket for Closure Heads, Customer Spec. #OSS-0279.00-00-003, Babcock & Wilcox Canada, BWC-CONT. 068S, 068S-01 (Vol. 1 of 4).
6. Transco Drawing RT-48783-DR1, RPV Top Head Service Structure Insulation Drip Panels Key Layout and Details (Layout D1), OM 241.R—0005,001.
7. BWC Drawing 068SE001, RPV Closure Head General Arrangement, OM 201.R—0001.001.

Table 5-12. Reactor Vessel -- Physical Properties (Oconee 1)

Item	Heat No.	Ultimate Strength (10^3 psi)	Yield Strength (10^3 psi)	Elong. in 2 in. (%)	Impact Test Temp. (°F)	Impact Values
Deleted row(s) per 2003 update						
Bottom Head	A 0973-2	87.2	65.0	24.5	+10	35-30-47
Intermediate Shell Plate	C 2197-2	91.5	70.0	25.0	+10	39-45-26
Upper Shell Plate (1)	C 3265-1	87.0	66.2	28.1	+10	34-64-27
Upper Shell Plate (2)	C 3278-1	84.5	63.5	28.1	+10	35-29-53
Lower Shell Plate (1)	C 2800-1	85.0	60.5	29.0	+10	36-39-39
Lower Shell Plate (2)	C 2800-2	90.5	69.0	25.0	+20	32-33-49
Core Flooding Nozzle	94894	98.0	74.0	21.5	+10	45-53-40
Core Flooding Nozzle	94894	92.5	71.0	24.0	+10	37-50-45
Inlet Nozzle	123S346VA1	90.0	67.5	25.0	+10	104-94-142
Inlet Nozzle	123S346VA2	92.7	72.5	26.0	+10	104-121-106
Inlet Nozzle	124S502VA1	97.2	76.0	25.0	+10	120-106-101
Inlet Nozzle	124S502VA1	94.0	73.5	23.5	+10	110-85-77
Outlet Nozzle	122S316VA2	90.0	67.0	26.0	+10	131-110-94
Outlet Nozzle	122S316VA1	90.0	68.5	25.0	+10	92-86-82
Upper Shell Flange	4P16373P156 6	82.5	57.4	29.0	+10	49-41-71
Dutchman Forging	122S347VA1	94.5	74.5	24.0	+10	92-70-70
Deleted row(s) per 2003 update						
Upper Nozzle Belt Forging	ZV-2888	82.0	57.0	30.5	+34 avg	30 avg
Lower Nozzle Belt Forging	ZV-2861	85.0	63.5	29.0	+26 avg	30 avg

Item	Heat No.	Ultimate Strength (10^3 psi)	Yield Strength (10^3 psi)	Elong. in 2 in. (%)	Impact Test Temp. (°F)	Impact Values
Replacement RVH Forging	O1W60-1-1	87.7 avg	66.4 avg	29.4 avg		

Note:

1. From History Docket for Closure Heads, Customer Spec. #OSS-0279.00-00-003, Babcock & Wilcox Canada, BWC-CONT. 068S, 068S-01, Vol. 1 of 4.

Table 5-13. Reactor Vessel - Chemical Properties (Oconee 1). (References 34, 60)

	Element											
Heat Number	**C**	**Mn**	**P**	**S**	**Si**	**Ni**	**Mo**	**Co**	**V**	**Cr**	**Cu**	**A1**
Deleted row(s) per 2003 update												
A 0973-2	.21	1.34	.011	.016	.18	.46	.47	.010	--	--	--	--
C 2197-2	.21	1.28	.008	.010	.17	.50	.46	.021	--	--	--	--
C 3265-1	.21	1.42	.015	.015	.23	.50	.49	.016	--	--	--	--
C 3278-1	.19	1.26	.010	.016	.23	.60	.47	.016	--	--	--	--
C 2800-1	.20	1.40	.012	.017	.20	.63	.50	.014	--	--	--	--
C 2800-2	.20	1.40	.012	.017	.20	.63	.50	.014	--	--	--	--
94894	.22	0.62	.006	.009	.23	.87	.60	.016	--	0.33	--	--
123S346VA1	.22	.61	.010	.010	.20	.69	.56	.01	0.01	.27	--	--
123S346VA2	.21	.62	.010	.008	.20	.69	.57	.01	.01	.28	--	--
124S502VA1	.22	.65	.010	.010	.22	.75	.59	.02	.01	.35	--	--
124S502VA2	.23	.68	.010	.014	.22	.78	.60	.02	.01	.31	--	--
122S316VA2	.20	.62	.010	.009	.28	.73	.57	.013	.01	.33	--	--
122S316VA1	.18	.58	.010	.014	.28	.68	.61	.015	.01	.32	--	--
4P16373P1566	.20	.72	.010	.012	.28	.74	.55	.011	.03	.34	--	--
122S347VA1	.20	.62	.010	.008	.25	.66	.55	.021	.02	.32	--	--
Deleted row(s) per 2003 update												
ZV-2888	.22	.70	.010	.008	.32	.62	.59	.007	.02	.36	--	--
ZV-2861	.18	0.64	0.006	0.010	0.29	0.65	0.57	0.01	0.01	0.31	--	--
O1W60-1-1	.18	1.46	.005	<0.0001	.17	.89	.51	--	<0.003	.15	0.05	0.021

Note:

1. From History Docket for Closure Heads, Customer Spec. #055-0279.00-00-003, Babcock & Wilcox Canada, BWC-CONT. 068S, 068S-01, Vol. 1 of 4

Table 5-14. Reactor Vessel - Mechanical Properties (Oconee 2 & 3). (Reference 33)

	Specimen Description	Drop Weight NDT (F)	Cv Energy at +10°F (ft - lb)	Approximate Upper Shelf Cv Energy (ft-lb)
Oconee 2				
Top Shell Forging	C.1/5 T[1]	+20	86, 46, 79	127
	C.1/4 T	+10	100, 89, 72	140
	C.1/2 T	+20	62, 77, 40	141
Bottom Shell Forging	C.1/5 T[1]	+20	116, 93, 104	140
	C.1/4 T	+20	82, 83, 90	139
	C.1/2 T	+20	101, 89, 92	149
Top Weld Deposit (WF 154)	1/4T	Not Available	41, 37, 43	Not Available
Center Weld Deposit (WF 25)	1/4T	Not Available	38, 28, 49	Not Available
Bottom Weld Deposit (WF 112)	1/4T	Not Available	35, 40, 30	Not Available
Oconee 3				
Top Shell Forging	C 1/5 T[1]	+40	76, 82, 46	116
	C 1/4 T	+30	85, 77, 78	136
	C 1/2 T	+30	82, 55, 91	119
Bottom Shell Forging	C 1/5 T[1]	+20	49, 83, 43	155
	C 1/4 T	+40	39, 50, 66	152
	C 1/2 T	+20	24, 34, 14	154
Oconee 3				
Top Weld Deposit (WF 200)	1/4 T	Not Available	36, 35, 26	Not Available
Outer Weld Deposit (WF 67)	1/4 T	Not Available	29, 35, 30	Not Available
Bottom Weld Deposit (WF 169-1)	1/4 T	Not Available	42, 29, 46	Not Available

Note:

1. Circumferential, 2 inches from surface.
2. In addition to the impact tests required by the ASME Code, the Nil-Ductility Temperature and Charpy V-notch energy levels at several temperatures were obtained for the two

	Specimen Description	Drop Weight NDT (F)	Cv Energy at +10°F (ft - lb)	Approximate Upper Shelf Cv Energy (ft-lb)

forgings that comprise the core region of the reactor vessels. The forging material is ASTM A508-64 Class 2 as modified by Code Case 1332-4. The impact tests were taken at 2 inches from surface, 1/4 and 1/2 of the forging thickness, and oriented in the circumferential direction with the length of the notch of the Charpy V-notch perpendicular to the surface of the material. The weld deposits of the core region (circumferential welds) were impact tested at plus 10°F using Charpy V-notch specimens oriented perpendicular to the direction of welding with the notch normal to the surface. No upper shelf fracture energy levels were obtained for the weld deposits.

Table 5-15. Reactor Coolant Flow Distribution with Less than Four Pumps Operating

	Oconee 1 (10^6 lb/hr)	Oconee 2 or 3 (10^6 lb/hr)
"HISTORICAL INFORMATION NOT REQUIRED TO BE REVISED"		
3 Pumps		
Flow in loop with two pumps	68.92	71.1
Flow in loop with one pump	29.95	29.5
Flow of pump in one pump loop	43.50	43.6
Idle pump reverse flow	13.55	14.1
2 Pumps - 2 Loops		
Pump flow each loop	44.49	44.5
Steam generator flow each loop	32.67	32.6
Reverse flow each idle pump	11.82	11.9
2 Pumps - 1 Loop		
Operating loop flow	71.22	73.6
Idle loop reverse flow	10.82	11.9
1 Pump		
Operating pump flow	45.06	45.0
Operating loop idle pump reverse flow	10.65	10.6
Idle loop reverse flow	5.23	5.5

Note:

1. For the configurations with both loops in operation the temperature in the cold legs will be the core inlet temperature (about 554°F). The hot leg fluid will be at about 604°F.
2. The reactor will not be operated at power in the 2 pump - single loop configuration.

Table 5-16. Reactor Coolant Pump - Design Data (Oconee 1)

Design Pressure/Operating Pressure, psig	2500/2185
Hydrostatic Test Pressure (cold), psig	4100
Design Temperature (casing), °F	650
Operating Speed, rpm	1190
Suction Temperature, °F	554
Developed Head, ft	350
Capacity, gal/min	88,000
Seal Water Injection, gal/min	8
Seal Return, gal/min	2.2 (1A1, 1B2), 2.0 (1A2, 1B1)
Pump Discharge Nozzle i.d., in.	28
Pump Suction Nozzle i.d., in.	31
Overall Unit Height, ft-in. (Pump - Motor)	29' 9"
Weight (dry), lb (without motor)	99,600
Coolant Volume, ft^3	56
Pump-motor moment of inertia, $lb\text{-}ft^2$	70,000
Injection Water Temperature, °F	125
Cooling Water Temperature, °F	105
Motor Data	
Type	Squirrel Cage Induction Single Speed, Water Cooled
Voltage	6600
Phase	3
Frequency, Hz	60
Insulation Class	F
Starting Current, amp	4350
Power, HP (Nameplate)	9000

Table 5-17. Reactor Coolant Pump - Design Data (Oconee 2, 3) (Data per Pump)

Design Pressure/Temperature, psig/°F	2500/650
Hydrotest Pressure, psig	3750
RPM at Nameplate Rating	1190
Developed Head, ft	362
Capacity, gal/min	92,200
Seal Water Injection, gal/min	10
Seal Water Return, gal/min	1.5
Injection Water Temperature, °F	120°F ± 10°F
Cooling Water Temperature, °F	105
Pump Discharge Nozzle i.d., in.	28
Pump Suction Nozzle i.d., in.	28
Overall Height, (Pump-Motor), ft-in.	29-4
Dry Weight Without Motor, lb	100,000
Coolant Volume, ft^3	98
Pump-motor Moment of Inertia, $lb\text{-}ft^2$	70,000
Motor Data	
Type	Squirrel Cage Induction Single Speed, Water Cooled
Voltage	6600
Phase	3
Frequency, Hz	60
Insulation Class	F
Starting Current, amp	4350
Power, HP (Nameplate)	9000

Table 5-18. Reactor Coolant Pump Casings – Code Allowables (Applies to Oconee 2 and 3)

Component	Material	Area	Governing Code III Para.	Condition (See Note 1)	Allowable Stress or Stress Intensity (psi)	Maximum Stress or Stress Intensity (psi)
Discharge/ Suction Nozzle (Outside Reinforcement)	ASTM A351 CF8M	Extreme Fibers	N414.3	D	1.5 S_m = 28,050	9,176
		Extreme Fibers	N414.3	A + [(B + C)/2] + P	1.5 S_m = 28,050	18,164
		Extreme Fibers	N414.4	A + [(B + C)/2] + D + P	3.0 S_m = 56,100	18,908
		Extreme Fibers	N414.3	P	1.5 S_m = 28,050	18,426
		Extreme Fibers	Note 1	A + B + C + P	1.2 x 1.5 S_m = 33,660	18,214
		Extreme Fibers	Note 1	A + B + C + D + P	1.2 x 3.0 S_m = 67,320	23,072
		Centerline Fibers	N417.9	D	1.5 S_m = 28,050	8,420
		Centerline Fibers	N417.9	A + [(B + C)/2]+ P	1.0 S_m = 18,700	16,202
		Centerline Fibers	N414.4	A + [(B + C)/2] + D + P	3.0 S_m = 56,100	18,791
		Centerline Fibers	N414.1	P	1.0 S_m = 18,700	16,380
		Centerline Fibers	Note 1	A + B + C + P	1.2 S_m = 22,440	16,490

Component	Material	Area	Governing Code III Para.	Condition (See Note 1)	Allowable Stress or Stress Intensity (psi)	Maximum Stress or Stress Intensity (psi)
		Centerline Fibers	Note 1	A + B + C + D + P	1.2 x 3.0 S_m = 67,320	22,621
Discharge/ Suction Nozzle (Inside Reinforcement)	ASTM A351 CF8M	Extreme Fibers	N414.3	A + [(B + C)/2] + D + P	1.5 S_m = 28,050	18,440
		Extreme Fibers	See Note 2	A + B + C + D + P	1.2 x 1.5 S_m = 33,660	18,362
		Centerline Fibers	N417.8	A + [(B + C)/2] + D + P	1.0 S_m = 18,700	15,970
		Centerline Fibers	See Note 2	A + B + C + D + P	1.2 S_m = 22,440	16,139
Bowl Section	ASTM A351 CF8M	Extreme Fibers	N414.3	P	1.5 S_m = 28,050	14,750
		Centerline Fibers	N414.1	P	1.0 S_m = 18,700	10,000
Cover	ASTM A182 Grade F316	Extreme Fibers	N712.1	Hydrostatic Test Pressure	0.9 S_y = 17,160	See Note 3
		Extreme Fibers	N414.3	Operating Pressure	1.5 S_m = 25,780	20,807 Note 4
		Centerline Fibers	N712.1	Hydrostatic Test Pressure	1.35 S_y = 25,740	See Note 3
		Centerline Fibers	N414.1	Operating Pressure	1.0 S_m = 17,190	14,527

Component	Material	Area	Governing Code III Para.	Condition (See Note 1)	Allowable Stress or Stress Intensity (psi)	Maximum Stress or Stress Intensity (psi)
		All Fibers	N412(m)(1)	Operating Thermal	2.0 S_y = 38,140	62,469 Note 5
		All Fibers	N414.4	Operating Pressure & Thermal	3.0 S_m = 51,570	48,440 Note 6

Notes:

1. A = Dead Load Reactions
   B = Vertical Seismic Reactions (SSE)
   C = Horizontal Seismic Reactions (SSE)
   D = Thermal Expansion Reactions
   P = 2500 psia (operating design pressure)
2. Allowable Stress specified by B & W for Reactor Coolant Piping reactions on Pump.
3. No maximum stress associated with this case, this requirement determines the hydrostatic test pressure necessary to produce the allowable stress.
4. Element 18 has maximum stress $P_m + P_b$ = 29,102, which is acceptable versus allowable $1.5S_m$ = 30,000 psi @ 225^o F.
5. All thermal stresses for wet and dry cooling jackets meet the provisions of paragraph N414(m)(1) vs. the allowable of 2.0 x Y.S. At several locations at the lower inside radius the localized thermal stresses exceed 2.0 x Y.S. These stresses are deemed to be peak stresses and as such are required only to be considered from a fatigue standpoint, per paragraph N412(m)(2), N412(k) and N4i4.5.
6. Three elements have maximum stress $P_m + P_b + Q$ qualified versus allowable at lower temperature, $3.0S_m$ = 60,000. One element has maximum stress $P_m + P_b + Q$ that exceeds allowable at lower temperature, $3.0S_m$ = 60,000 but this stress is considered a peaking stress, and thus the requirements of N414.4 don't apply.

Table 5-19. Deleted Per 2000 Update.

Table 5-20. Steam Generator Design Data (Data per Steam Generator)

Original Steam Generator		
Deleted row(s) per 2004 update		
Replacement Steam Generator		
Steam Conditions at Full Load, Outlet Nozzles		
	Steam Flow, lbm/hr	$5.4*10^6$
	Steam Temperature, °F	597 (BOL) / 591 (EOL), 570 (Design)
	Steam Pressure, psig	910
Feedwater Temperature, °F		460
Reactor Coolant Flow, lbm/hr		$65.66 * 10^6$ (Thermal Design Flow)
Reactor Coolant Side		
	Design Pressure, psig	2500
	Design Temperature, °F	650
	Hydrotest Pressure, psig	3125
	Coolant Volume (Hot), ft^3	2001.45 (Note 1)
	Full Load Temperature, °F	604 (inlet) / 554 (outlet) @ TDF
Secondary Side		
	Design Pressure, psig	1150 Secondary Side 1200 Feedwater
	Design Temperature, °F	630
	Hydrotest Pressure, psig	1500
	Net Volume, ft^3	3486.3
	Mass of Steam and Water at Full Load, lbm	54,696
	Energy Content of Steam and Water at Full Load, (BTU)	29.8 (BOL) / 34.0 (EOL) $* 10^6$
Dimensions		
	Tube, Nom. OD/Min Wall, in.	0.625/0.034
	Overall Height (Including stool), ft-in.	73-3 1/16
	Shell OD, in.	148-1/8
	Shell Minimum Thickness, in.	3

Shell Minimum Thickness at Tubesheets and F.W. Connections, in.	5
Tube Sheet Minimum Thickness, in.	22 1/16
Dry Weight, lbm	929600
Tube Length Between Tubesheets ft-in.	52-5

Function	No.	ID, in.	Material
Nozzles - Reactor Coolant Side			
Inlet	1	36	Carbon Steel - SS Clad
Outlet	2	28	Carbon Steel - SS Clad
Drain	N/A	N/A	N/A
Manways	2	16	Carbon Steel - SS Clad
Handholes	1	6	Carbon Steel - SS Clad
Nozzles - Secondary Side			
Steam	2	24	Carbon Steel
Vent	1	1-1/2 Sch 80	E7018-A1 SFA5.5 buildup
Drains	6	1-1/2 Sch 80	E7018-A1 SFA5.5 buildup
Level Sensing	8	1 Sch 80	E7018-A1 SFA5.5 buildup
Temperature Well	3	1-1/2" NPT	Alloy 690 buildup
Manways	2	16	Carbon Steel
Feedwater Connections	32	3 Sch 80	2 ¼ Cr-Mo piping & nozzles, Alloy 600 spargers
Emergency Feedwater Connections	6	3 Sch 80	2 ¼ Cr-Mo piping & nozzles, Alloy 600 sleeves
Handholes	5	6	Alloy 690
Inspection Ports	30	3	Carbon Steel

Note:

1. OSC-2729 Oconee Nuclear Station RETRAN Transient Analysis Model, Rev. 9, App K

Table 5-21. Reactor Coolant Piping Design Data

Reactor Inlet Piping			
	Pipe i.d., in.		28
	Design Pressure/Temperature, psig/°F		2500/650
	Hydrotest Pressure, psig		3125
	Minimum Thickness, in.		2-1/4
	Coolant Volume (Hot - System Total), ft^3		1085
	Dry weight, System Total, lb		214,000
Reactor Outlet Piping			
	Pipe i.d. in.		36
	Design Pressure/Temperature, psig/°F		2500/650
	Hydrotest Pressure, psig		3125
	Minimum Thickness, in.		2-7/8
	Coolant Volume (Hot - System Total), ft^3		979
	Dry Weight, System Total, lb		200,000
Pressurizer Surge Piping			
	Pipe Size, in.		10, Schd 140
	Design Pressure/Temperature, psig/°F		2500/670
	Hydrotest Pressure, psig		3125
	Coolant Volume, hot, ft^3		20
	Dry Weight, lb		5000
Pressurizer Spray Piping			
	Pipe Size, in.		2-1/2, Sch 160
	Design Pressure/Temperature, psig/°F		2500/650 & 670
	Hydrotest Pressure, psig		3125
	Coolant Volume, hot, ft^3		2
	Dry Weight, lb		650

Nozzles:

Function	**No.**	**ID, in.**	**Material**
On Reactor Inlet Piping			
High Pressure Injection	4	2-1/2 Sch 160	[1]
Pressurizer Spray	1	2-1/2 Sch 160	Stainless Steel
Drain/Letdown	1	2-1/2 Sch 160	[2]

Nozzles:			
Function	**No.**	**ID, in.**	**Material**
Drain	3	1-1/2 Sch 160	[3]
Pressure Sensing	4	1 Sch 160	
Temperature Well	4	0.375	Inconel
Temperature Sensing	4	0.613	Inconel
On Reactor Outlet Piping			
Decay Heat	1	12 Sch 140	[2]
Vent	2	1 Sch 160	[3]
Conn. on Flow Meters	4	1 Sch 160	[3]
Pressure Sensing	4	1 Sch 160	[3]
Temperature Well	2	3/8	Inconel
Temperature Sensing	6	0.613	Inconel
Surge Line	1	10 Sch 140	[2]
On Pressurizer Surge Piping			
Drain	1	1 Sch 160	Stainless Steel
On Pressurizer Spray Piping			
Auxiliary Spray	1	1-1/2 Sch 160	Stainless Steel
Spray Valve Bypass	2	1/2 Sch 160	Stainless

Note:

1. Carbon Steel - SS Clad - With Stainless Steel Safe End Added after Stress Relief
2. Carbon Steel - SS Clad - with Inconel Safe End
3. SS pipe with Alloy 690 nozzles
4. Deleted per 2004 update

Table 5-22. Pressurizer Design Data

Design/Operating Pressure, psig			2500/2166
Design/Operating Temperature, °F			670/648
Steam Volume, ft^3			700
Water Volume, ft^3			800
Hydrotest Pressure, psig [3]			3125
Electric Heater Capacity, kW			1638[4]
Dimensions			
Overall Height, ft-in.			44-11-3/4
Shell o.d., in.			96-3/8
Shell Minimum Thickness, in.			6.188
Dry Weight, lb.			291,000

Nozzles

Function	**No.**	**ID, in.**	**Material**
Surge Line	1	10 Sch 140	Carbon Steel - SS Clad[1]
Spray Line	1	4 Sch 120	Carbon Steel - SS Clad[2]
Relief Valve	3	2-1/2	Carbon Steel - SS Clad[1]
Vent	1	1 Sch 160	Inconel[7]
Sample	1	1 Sch 160	Carbon Steel - SS Clad[6]
Temperature Well	1	3/8	Inconel
Level Sensing	6	1 Sch 160	Carbon Steel - SS Clad[6]
Heater Bundle	3	19-1/8	Carbon Steel - SS Clad
Manway	1	16	Carbon Steel - SS Clad

Note:

1. With stainless steel safe end added after stress relief.
2. With Inconel safe end.
3. Pressure retaining part (inlet bushing) of pressurizer relief valves shop hydrotested at 3750 psig.
4. Total kw could be less depending on operational status of some heater elements.
5. Operating pressure is nominal steam space pressure based on 2155 psig at the hot leg nozzle for the pressure transmitter.
6. With Inconel or stainless steel (SA-479 Type 316) safe end.
7. With Inconel or stainless steel (SA-479 Type 316) vent nozzle.

Table 5-23. Operating Design Transient Cycles for Pressurizer Surge Line

Transient Number	Transient Description - (ASME Category)	Design Cycles		
		Oconee - 1/	-2/	-3
1A	Heatup from 70°F to 8% Full Power (Normal)			
	1A1	11	13	10
	1A2	12	14	6
	1A3	64	70	33
	1A4	45	43	51
	1A5	228	220	260
	Total Heatup Events	360	360	360
1B	Cooldown from 8% Full Power (Normal)			
	1B1	60	60	60
	1B2	300	300	300
	Total Cooldown Events	360	360	360
2	Power Change 0 to 15% and 15 to 0% (Normal)			
	2A		1,400	
	2B		1,440	
3	Power Loading 8% to 100% Power (Normal)		18,000	
4	Power Unloading 100% to 8% Power (Normal)		18,000	
5	10% Step Load Increase (Normal)		8,000	
6	10% Step Load Decrease (Normal)		8,000	
7	Step Load Reduction (100% to 8% Power) (Upset)		310	
8	Reactor Trip (Upset)			
	Type A		80	
	Type B		172	
	Type C		90	
	Type D		70	
	Total Reactor Trips		412	
9	Rapid Depressurization (Upset)		40	

Transient Number	Transient Description - (ASME Category)	Design Cycles		
		Oconee - 1/	-2/	-3
10	Change of Flow (Upset)		412	
11	Rod Withdrawal Accident (Upset)		[(1)]	
12	Hydrotests (Test)		[2]	
13	Steady-State Power Operations		1.4E5	
14	Control Rod Drop (Upset)		60	
15	Loss of Station Power (Upset)		[1]	
16	Steam Line Failure (Faulted)		[2]	
17A	Loss of Feedwater to One Steam Generator (Upset)		[1]	
17B	Stuck Open Turbine Bypass Valve (Emergency)		[1]	
18	Loss of Feedwater Heater (Upset)		-	
19	Feed and Bleed Operations (Normal)		4,000	
20	Miscellaneous (Normal)			
	A - Change in Makeup Flow Rate		30,000	
	B - Miscellaneous Spray Actuation		20,000	
	C - Change in Makeup Flow Rate		4.0E6	
	D1 - Pzr Boron Equilibration (on/off valve)		2.55E4	
	D2 - Pzr Boron Equilibration (modulating valve)		8.5E3	
21	Loss of Coolant (Faulted)		[2]	
22	Test Transients (Test)			
	A1 - High Pressure Injection System Test		5	
	B1 - High Pressure Injection System Test		15	
	C1 - High Pressure Injection System Test		10	
	D1 - High Pressure Injection System Test		10	
	Total Safety Injection Tests		40	
	A2 - HPI Check Valve Tests	8	8	8
	B2 - HPI Check Valve Tests	48	48	48

Transient Number	Transient Description - (ASME Category)	Design Cycles		
		Oconee - 1/	-2/	-3
	C2 - HPI Check Valve Tests	15	12	9
	D2 - HPI Check Valve Tests	80	84	88
	Total Safety Injection Tests	151	152	153
23	Steam Generator Filling, Draining, Flushing and Cleaning (Normal)		-	
24	Hot Functional Testing (Test)		[3]	

Note:

1. Included in Transient 8, Reactor Trip.
2. Refer to the appropriate RCS Functional Specification for number of transient event cycles.
3. Included in Transient 1, Plant Heatup and Cooldown

Table 5-24. Evaluation of Reactor Vessel Pressurized Thermal Shock Toughness Properties at 48 EFPY - Oconee Unit 1

Material Description				Chemical Composition								
Reactor Vessel Beltline Region Location	**Matl. Ident.**	**Heat Number**	**Type**	**Cu wt%**	**NI wt%**	**Initial RT_{NDT}**	**Chemistry Factor**	**Fluence, n/cm^2 Inside Surface**	**ΔRT_{NDT}, F at 48 EFPY**	**Margin**	**RT_{PTS}, F at 48 EFPY**	**Screening Criteria**
10 CFR 50.61 (Tables)												
Lower Nozzle Belt Forging	AHR 54	ZV-2861	A 508 Cl. 2	0.16	0.65	+3	119.3	1.11E+18	52.2	70.7	126.0	270
Intermediate Shell Plate	C2197-2	C2197-2	SA-302 Gr. BM[1]	0.15	0.50	+1	104.5	1.18E+19	109.3	63.6	174.0	270
Upper Shell Plate	C3265-1	C3265-1	SA-302 Gr. BM[1]	0.10	0.50	+1	65.0	1.31E+19	69.9	63.6	134.5	270
Upper Shell Plate	C3278-1	C3278-1	SA-302 Gr. BM[1]	0.12	0.60	+1	83.0	1.31E+19	89.2	63.6	153.9	270
Lower Shell Plate	C2800-1	C2800-1	SA-302 Gr. BM	0.11	0.63	+1	74.5	1.31E+19	80.0	63.6	144.7	270
Lower Shell Plate	C2800-2	C2800-2	SA-302 Gr. BM[1]	0.11	0.63	+1	74.5	1.31E+19	80.0	63.6	144.7	270
LNB to IS Circ. Weld (100%)	SA-1135	61782	ASA/Linde 80	0.23	0.52	-5	157.4	1.11E+18	69.0	68.5	132.4	300
IS Longit. Weld (Both 100%)	SA-1073	1P0962	ASA/Linde 80	0.21	0.64	-5	170.6	9.24E+18	166.8	68.5	230.3[2]	270
IS to US Circ. Weld (ID 61%)	SA-1229	71249	ASA/Linde 80	0.23	0.59	+10	167.6	1.19E+19	175.7	56.0	241.7	300

Material Description				Chemical Composition								
Reactor Vessel Beltline Region Location	**Matl. Ident.**	**Heat Number**	**Type**	**Cu wt%**	**NI wt%**	**Initial RT_{NDT}**	**Chemistry Factor**	**Fluence, n/cm^2 Inside Surface**	**ΔRT_{NDT}, F at 48 EFPY**	**Margin**	**RT_{PTS}, F at 48 EFPY**	**Screening Criteria**
US Longit. Weld (Both 100%)	SA-1493	8T1762	ASA/Linde 80	0.19	0.57	-5	152.4	1.12E+19	157.3	68.5	220.8	270
US to LS Circ. Weld (100%)	SA-1585	72445	ASA/Linde 80	0.22	0.54	-5	158.0	1.27E+19	168.5	68.5	232.0	300
LS Longit. Weld (100%)	SA-1426	8T1762	ASA/Linde 80	0.19	0.57	-5	152.4	1.08E+19	155.8	68.5	219.3	270
LS Longit. Weld (100%)	SA-1430	8T1762	ASA/Linde 80	0.19	0.57	-5	152.4	1.08E+19	155.8	68.5	219.3	270
10 CFR 50.61 (Surveillance Data)												
LNB to IS Circ. Weld (100%)	SA-1135	61782	ASA/Linde 80	0.23	0.52	-5	141.1	1.11E+18	61.8	48.3	105.1	300
US to LS Circ. Weld (100%)	SA-1585	72445	ASA/Linde 80	0.22	0.54	-5	145.2	1.27E+19	155.8	48.3	199.1	300

Note:

1. SA-302 Grade B modified by ASME Code Case 1339
2. Controlling value of RT_{PTS} reference temperature

Table 5-25. Evaluation of Reactor Vessel Pressurized Thermal Shock Toughness Properties at 48 EFPY - Oconee Unit 2

Material Description				Chemical Composition								
Reactor Vessel Beltline Region Location	Matl. Ident.	Heat Number	Type	Cu wt%	NI wt%	Initial RT_{NDT}	Chemistry Factor	Fluence, n/cm^2 Inside Surface	ΔRT_{NDT}, F at 48 EFPY	Margin	RT_{PTS}, F at 48 EFPY	Screening Criteria
10 CFR 50.61 (Tables)												
Lower Nozzle Belt Forging	AMX77	123T382	A 508 Cl. 2	0.13	0.76	+3	95.0	1.19E+19	99.6	70.7	173.3	270
Upper Shell Forging	AAW 163	3P2359	A 508 Cl. 2	0.04	0.75	+20	26.0	1.28E+19	27.8	27.8	75.6	270
Lower Shell Forging	AWG 164	4P1885	A 508 Cl. 2	0.02	0.80	+20	20.0	1.27E+19	21.3	21.3	62.7	270
LNB to US Circ. Weld (100%)	WF-154	406L44	ASA/Linde 80	0.27	0.59	-5	182.6	1.19E+19	191.5	68.5	255.0	300
US to LS Circ. Weld (100%)	WF-25	299L44	ASA/Linde 80	0.34	0.68	-5	220.6	1.23E+19	233.3	68.5	296.8[1]	300
10 CFR 50.61 (Surveillance Data)												
None												

Note:

1. Controlling value of RT_{PTS} refereence temperature

Table 5-26. Evaluation of Reactor Vessel Pressurized Thermal Shock Toughness Properties at 48 EFPY - Oconee Unit 3

Material Description				Chemical Composition								
Reactor Vessel Beltline Region Location	Matl. Ident.	Heat Number	Type	Cu wt%	NI wt%	Initial RT_{NDT}	Chemistry Factor	Fluence, n/cm^2 Inside Surface	ΔRT_{NDT}, F at 48 EFPY	Margin	RT_{PTS}, F at 48 EFPY	Screening Criteria
10 CFR 50.61 (Tables)												
Lower Nozzle Belt Forging	4680	4680	A 508 Cl. 2	0.13	0.91	+3	96.0	1.14E+19	99.5	70.7	173.2	270
Upper Shell Forging	AWS 192	522314	A 508 Cl. 2	0.01	0.73	+40	20.0	1.26E+19	21.3	21.3	82.6	270
Lower Shell Forging	ANK 191	522194	A 508 Cl. 2	0.02	0.76	+40	20.0	1.26E+19	21.3	21.3	82.6	270
LNB to US Circ. Weld (100%)	WF-200	821T44	ASA/ Linde 80	0.24	0.63	-5	178.0	1.14E+19	184.6	68.5	248.1	300
US to LS Circ. Weld (ID 75%)	WF-67	72442	ASA/ Linde 80	0.26	0.60	-5	180.0	1.22E+19	190.0	68.5	253.5(1)	300
10 CFR 50.61 (Surveillance Data)												
Upper Shell Forging	AWS 192	522314	A 508 Cl. 2	0.01	0.73	+40	36.0	1.26E+19	38.3	34.0	75.5	270
Lower Shell Forging	ANK 191	522194	A 508 Cl. 2	0.02	0.76	+40	17.4	1.26E+19	18.5	17.0	112.3	270
LNB to US Circ. Weld (100%)	WF-200	821T44	ASA/ Linde 80	0.24	0.63	-5	158.3	1.14E+19	159.5	48.3	202.8	300

Material Description				**Chemical Composition**								
Reactor Vessel Beltline Region Location	**Matl. Ident.**	**Heat Number**	**Type**	**Cu wt%**	**NI wt%**	**Initial RT_{NDT}**	**Chemistry Factor**	**Fluence, n/cm^2 Inside Surface**	**ΔRT_{NDT}, F at 48 EFPY**	**Margin**	**RT_{PTS}, F at 48 EFPY**	**Screening Criteria**

Note:

1. Controlling value of RT_{PTS} reference temperature

Table 5-27. Evaluation of Reactor Vessel Extended Life (48EFPY) Charpy V-Notch Upper-Shelf Energy - Oconee Unit 1

Material Description								
Reactor Vessel Beltline Region Location	**Matl. Ident.**	**Heat Number**	**Type**	**Copper Composition w/o**	**Initial CvUSE, ft-lbs**	**48 EFPY Fluence T/4 Location n/cm^2**	**Estimated 48 EFPY CvUSE at T/4**	**48 EFPY % Drop at T/4**
Regulatory Guide 1.99, Revision 2, Position 1								
Lower Nozzle Belt Forging	AHR-54	ZV-2861	A508 Cl.2	0.16	109	6.64E+17	95	13
Intermediate Shell Plate	C2197-2	C2197-2	SA-302 Gr. B M	0.15	81	7.06E+18	63	22
Upper Shell Plate	C3265-1	C3265-1	SA-302 Gr. B M	0.10	81	7.84E+18	66	18
Upper Shell Plate	C3278-1	C3278-1	SA-302 Gr. B M	0.12	81	7.84E+18	65	20
Lower Shell Plate	C2800-1	C2800-1	SA-302 Gr. B M	0.11	81	7.84E+18	66	19
Lower Shell Plate	C2800-2	C2800-2	SA-302 Gr. B M	0.11	81	7.84E+18	66	19
LNB to IS Circ. Weld (100%)	SA-1135	61782	ASA/Linde 80	0.23	70	6.64E+17	56	19
IS Longit. Weld (Both 100%)	SA-1073	1P0962	ASA/Linde 80	021	70	5.53E+18	49	30
IS to US Circ. Weld (61%ID)	SA-1229	71249	ASA/Linde 80	0.23	70	7.12E+18	46	34
IS to US Circ. Weld (39%OD)	WF-25	299L44	ASA/Linde 80	0.34	70	--	--	--
US Longit. Weld (Both 100%)	SA-1493	8T1762	ASA/Linde 80	0.19	70	6.70E+18	49	30
US to LS Circ. Weld (100%)	SA-1585	72445	ASA/Linde 80	0.22	70	7.60E+18	46	34
LS Longit. Weld (100%)	SA-1430	8T1762	ASA/Linde 80	0.19	70	6.46E+18	49	30
LS Longit. Weld (100%)	SA-1426	8T1762	ASA/Linde 80	0.19	70	6.46E+18	49	30
Regulatory Guide 1.99, Revision 2, Position 2								
Upper Shell Plate	C3265-1	C3265-1	SA-302 Gr. B M	--	108	7.84E+18	91	16

Material Description								
Reactor Vessel Beltline Region Location	**Matl. Ident.**	**Heat Number**	**Type**	**Copper Compositio n w/o**	**Initial CvUSE, ft-lbs**	**48 EFPY Fluence T/4 Location n/cm^2**	**Estimated 48 EFPY CvUSE at T/4**	**48 EFPY % Drop at T/4**
LNB to IS Circ. Weld (100%)	SA-1135	61782	ASA/Linde 80	--	70	6.64E+17	55	22
IS to US Circ. Weld (61%ID)	SA-1229	71249	ASA/Linde 80	--	70	7.12E+18	46	34
IS to US Circ. Weld (39%OD)	WF-25	299L44	ASA/Linde 80	--	70	--	--	--
US to LS Circ. Weld (100%)	SA-1585	72445	ASA/Linde 80	--	70	7.60E+18	48	32

Table 5-28. Evaluation of Reactor Vessel Extended Life (48 EFPY) Charpy V-Notch Upper-Shelf Energy - Oconee Unit 2

Material Description								
Reactor Vessel Beltline Region Location	**Matl. Ident.**	**Heat Number**	**Type**	**Copper Composition w/o**	**Initial CvUSE, ft-lbs**	**48 EFPY Fluence T/4 Location n/cm^2**	**Estimated 48 EFPY CvUSE at T/4**	**48 EFPY % Drop at T/4**
Regulatory Guide 1.99, Revision 2, Position 1								
Lower Nozzle Belt Forging	AMX-77	123T382	A508 C1.2	0.13	109	7.12E+18	87	20
Upper Shell Forging	AAW-163	3P2359	A508 C1.2	0.04	128	7.66E+18	113	12
Lower Shell Forging	AWG-164	4P1885	A508 C1.2	0.02	140	7.60E+18	126	10
LNB to US Circ. Weld (100%)	WF-154	406L44	ASA/Linde 80	0.27	70	7.12E+18	43	38
US to LS Circ. Weld (100%)	WF-25	299L44	ASA/Linde 80	0.34	70	7.36E+18	39	40
Regulatory Guide 1.99, Revision 2, Position 2								
Upper Shell Forging	AAW-163	3P2359	A508 C1.2	--	128	7.66E+18	101	21
NB to US Circ. Weld (100%)	WF-154	406L44	ASA/Linde 80	--	70	7.12E+18	45	36
US to LS Circ. Weld (100%)	WF-25	299L44	ASA/Linde 80	--	70	7.60E+18	44	37

Table 5-29. Evaluation of Reactor Vessel Extended Life (48 EFPY) Charpy V-Notch Upper-Shelf Energy - Oconee Unit 3

Material Description								
Reactor Vessel Beltline Region Location	**Matl. Ident.**	**Heat Number**	**Type**	**Copper Composition w/o**	**Initial CvUSE, ft-lbs**	**48 EFPY Fluence T/4 Location n/cm^2**	**Estimated 48 EFPY CvUSE at T/4**	**48 EFPY % Drop at T/4**
Regulatory Guide 1.99, Revision 2, Position 1								
Lower Nozzle Belt Forging	4680	4680	A508 C1.2	0.13	109	6.82E+18	87	20
Upper Shell Forging	AWS-192	522314	A508 C1.2	0.01	90	7.54E+18	82	9
Lower Shell Forging	ANK-191	522194	A508 C1.2	0.02	110	7.54E+18	99	10
LNB to US Circ. Weld (100%)	WF-200	821T44	ASA/Linde 80	0.24	70	6.82E+18	46	35
US to LS Circ. Weld (75%ID)	WF-67	72442	ASA/Linde 80	0.26	70	7.30E+18	44	37
US to LS Circ. Weld (25%OD)	WF-70	72105	ASA/Linde 80	0.32	70	-----	-----	-----
Regulatory Guide 1.99, Revision 2, Position 2								
Upper Shell Forging	AWS-192	522314	A508 C1.2	-----	90	7.54E+18	77	15
Lower Shell Forging	ANK-191	522194	A508 C1.2	-----	110	7.30E+18	85	23
NB to US Circ. Weld (100%)	WF-200	821T44	ASA/Linde 80	-----	70	6.82E+18	55	21
US to LS Circ. Weld (25%OD)	WF-70	72105	ASA/Linde 80	-----	70	-----	--	--