



THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

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MURRAY R. EDELMAN

VICE PRESIDENT
NUCLEAR

August 9, 1985
PY-CEI/NRR-0313 L

Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Perry Nuclear Power Plant
Docket Nos. 50-440; 50-441
Fracture Toughness
RCPB Materials
SER Confirmatory Issue 17

Dear Mr. Youngblood:

Attached are proposed revisions to the FSAR associated with fracture toughness of the Reactor Coolant Pressure Boundary (RCPB) materials as requested by your staff. These will be incorporated in a future FSAR amendment. A Technical Specification bases page associated with this revision is also attached.

We believe this information is sufficient to resolve SER Confirmatory Issue Number 17 in the next SER Supplement.

Very truly yours,

Murray R. Edelman
Vice President
Nuclear Group

MRE:njc

Attachment

cc: Jay Silberg, Esq.
John Stefano (2)
J. Grobe

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5.3.2.1.2 Temperature Limits for Preoperational System Hydrostatic Tests and ISI Hydrostatic or Leak Pressure Tests

Based on 10 CFR 50 Appendix G, if there is no fuel in the reactor during system hydrostatic pressure tests or leak tests, the minimum permissible test temperature is 100°F at 1563 psig for Perry Units 1 and 2.

The fracture toughness analysis for system pressure tests resulted in the curves labeled A shown in Figures 5.3-2 (Perry 1) and 5.3-3 (Perry 2). The curves labeled "core beltline" are based on an initial RT_{NDT} of 10°F for the plate material for Perry 1, and an initial RT_{NDT} of -20°F for the plate material for Perry 2.

The predicted shift in the RT_{NDT} from Figure 5.3-5 (based on neutron fluence at 1/4 T of the vessel wall) must be added to the beltline curve to account for the effect of fast neutrons.

5.3.2.1.3 Operating Limits During Heatup, Cooldown and Core Operation

The fracture toughness analysis was done for the normal heatup or cooldown rate of 100°F/hour. The temperature gradients and thermal stress effects corresponding to this rate were included. The results of the analyses are a set of operating limits for non-nuclear heatup or cooldown shown as curves labeled B on Figures 5.3-2 and 3. Curves labeled C on Figures 5.3-2 and 5.3-3 apply whenever the core is critical.

5.3.2.1.4 Reactor Vessel Annealing

In place annealing of the reactor vessel because of radiation embrittlement is unnecessary because the predicted value in transition of adjusted reference temperature does not exceed 200°F.

TABLE 5.3-1

CHARPY TEST RESULTS AND CHEMICAL COMPOSITION

A. PERRY UNIT 1

I. VESSEL BELTLINE MATERIAL IDENTIFICATION

A. Number 2 Shell Ring

Plates - Pc. 22-1-1, Heat C2557, Slab 1
 Pc. 22-1-2, Heat B6270, Slab 1
 Pc. 22-1-3, Heat A1155, Slab 1

B. Welds in No. 2 Shell Ring Vertical Seams

Seam BD - Type E8018NM, Heat 627260, Lot B322A27AE
 Type E8018NM, Heat 626677, Lot C301A27AF
 Type RACO-1NMM, Heat 5P6214B, Lot 0331

Seam BE - Type E8018NM, Heat 624063, Lot C228A27A
 Type E8018NM, Heat 626677, Lot C301A27AF
 Type E8018NM, Heat 627069, Lot C312A27A
 Type RACO-1NMM, Heat 5P6214B, Lot 0331

Seam BF - Type E8018NM, Heat 627260, Lot B322A27AE
 Type E8018NM, Heat 626677, Lot C301A27AF
 Type RACO-1NMM, Heat 5P6214B, Lot 0331

II. CHEMICAL ANALYSES FOR BELTLINE MATERIAL

A. Plates	C	Mn	P	S	Cu	Si	Ni	Mo	V	Al
Pc. 22-1-1, Ht C2557	.23	1.32	.010	.025	.06	.27	.61	.54	.001	.039
Pc. 22-1-2, Ht B6270	.20	1.28	.012	.015	.06	.23	.63	.53	0	.039
Pc. 22-1-3, Ht A1155	.20	1.33	.010	.013	.06	.28	.63	.54	.002	.031
B. Welds	C	Mn	Ni	Si	Mo	Cu	P	S	V	
Ht. 627260 Lot B322A27AE	.04	1.25	1.08	.56	.64	.06	.020	.022	.02	
Ht. 626677 Lot C301A27AF	.048	1.10	.85	.56	.45	.010	.015	.022	.009	
Ht. 5P6214B Lot 0331	.051	1.39	.82	.53	.52	.02	.013	.017	.004	
Ht. 624063 Lot D228A27A	.041	1.12	1.00	.41	.54	.03	.009	.018	.01	
Ht. 627069 Lot C312A27A	.037	1.07	.94	.60	.52	.010	.013	.019	.012	

TABLE 5.3-2

UNIRRADIATED FRACTURE TOUGHNESS PROPERTIES

A. PERRY UNIT 1

Plates Ht.No.	Drop Wt. NDT(°F)	Transverse CVN			Reference Temp.(°F)	Upper Shelf (Ft-lb)
		Ft-lbs	MLE	Temp.		
C2557-1						
Top	-20	52,50,52	42,46,42	+70F	10	84
Bottom	-20	54,64,76	63,53,46	+60F		
B6270-1						
Top	-40	53,78,56	43,58,44	+20F		
Bottom	-30	63,63,64	51,51,52	+30F	-30	94
A1155-1						
Top	-20	65,63,67	54,60,52	+50F	-10	114
Bottom	-20	54,66,85	68,55,44	+40F		

Weld Metal	Drop Wt. NDT(°F)	CVN			Reference Temp.(°F)	Upper Shelf (Ft-lb)
		Ft-lbs	MLE	Temp.		
Ht. 627260	-40	52,56,51	36,37,35	+30F	-30	104
Lot B322A27AE						
Ht. 626677	-40	53,51,54	36,37,35	+40	-20	90
Lot C301A27AF						
Ht. 5P6214B	-50	56,50,54	45,41,46	+10	-50	88
Lot 0331	-40	50,61,64	46,50,52	+10	-40	96
Ht. 624063	-60	57,59,68	37,38,46	+10	-50	105
Lot 228A27A						
Ht. 627069	-60	72,64,78	52,48,56	0	-60	112
Lot C312A27A						

TABLE 5.3-2 (Continued)

B. PERRY UNIT 2

<u>Plates</u> <u>Ht.No.</u>	<u>Drop Wt.</u> <u>NDT(°F)</u>	<u>Transverse CVN</u>			<u>Reference</u> <u>Temp.(°F)</u>	<u>Upper</u> <u>Shelf (Ft-lb)</u>
		<u>Ft-lbs</u>	<u>MLE</u>	<u>Temp.</u>		
C3474-1						
Top	-30	54,54,53	44,44,44	+40F	-20	95
Bottom	-40	51,63,69	41,45,51	+20F		
C3560-1						
Top	-30	92,86,68	71,56,62	+30F		
Bottom	-30	54,74,64	58,62,46	+40F	-20	125
C3560-2						
Top	-30	70,52,61	44,54,49	+30F		
Bottom	-30	60,66,76	62,52,48	+40F	-20	107
<u>Weld</u> <u>Metal</u>	<u>Drop Wt.</u> <u>NDT(°F)</u>	<u>Transverse CVN</u>			<u>Reference</u> <u>Temp.(°F)</u>	<u>Upper</u> <u>Shelf (Ft-lb)</u>
		<u>Ft-lbs</u>	<u>MLE</u>	<u>Temp.</u>		
Ht. 422K8511	-80	65,74,127	44,48,76	-20F	-80	143
Lot G313A27AD						
Ht. 492L4871	-90	50,51,57	36,38,40	0F	-60	151
Lot A421B27AE						
Ht. 04T931	-90	65,69,72	52,48,50	0F	-60	148
Lot A423B27AG						
Ht. 5P6756	-60	55,66,63	54,51,57	0F	-60	89
Lot 0342						
(Single Wire)						
Ht. 5P6756	-50	64,79,77	35,72,55	+10F	-50	95
Lot 0342		80,72	69,60			
(Tandem Wire)						

TABLE 5.3-3

EOL BELTLINE PLATE RT_{NDT} & WELDS

UNIT 1

A. Beltline Plates

Heat	WT %Cu	WT %P	ASME NB-2300 Start RT _{NDT}	Reg. Guide 1.99 Extrap. Δ RT _{NDT} (°F)	Estimated EOL RT _{NDT} (°F)
C2557-1(2)	.06	.010	10	34	+44 (Limiting Plate)
B6270-1	.06	.012	-30	40	+10
A1155-1	.06	.010	-20	34	+14

B. Beltline Welds

Weld Seam	Heat/Lot	WT %Cu	WT %P	ASME NB-2300 Start RT _{NDT}	Reg. Guide 1.99 Extrap. Δ RT _{NDT} (°F)	Estimated EOL RT _{NDT} (°F)	Weld Wire Type	Flux Type
BD, BF	627260/B322A27AE(3)	.06	.02	-30	67	+37	E8018NM	--
BD, BE, BF	626677/C301A27AF(3)	.01	.015	-20	50	+30	E8018NM	--
BE	624063/D228A27A	.03	.009	-50	30	-20	E8018NM	--
BE	627069/C312A27A	.01	.013	-60	43	-17	E8018NM	--
BD, BE, BF	5P6214B/0331(1), (3)	.02	.013	-40	43	+3	RACO INMM (Single Wire)	Linde 124

C. Test Plate Weld Material

Heat/Lot	WT %Cu	WT %P	ASME NB-2300 Start RT _{NDT}	Reg. Guide 1.99 Extrap. Δ RT _{NDT} (°F)	Estimated EOL RT _{NDT} (°F)
624039/D205A27A(3)	.028	.015	-90	50	-40
07R458/S403B27AG(3)	.04	.02	-60	67	+7
401P2871/H430B27AF(3)	.03	.013	-50	43	-7

TABLE 5.3-3 (Cont'd)

UNIT 2

A. Beltline Plates

Heat	WT ICu	WT IP	ASME NB-2300 Start RT _{NDT}	Reg. Guide 1.99 Extrap. ΔRT_{NDT} (°F)	Estimated EOL RT _{NDT} (°F)
C3474-1 ⁽²⁾	.09	.011	-20	44	+24 (Limiting Plate)
C3560-1	.07	.010	-20	34	+14
C3560-2	.07	.010	-20	34	+14

B. Beltline Welds

Weld Seam	Heat/Lot	WT ICu	WT IP	ASME NB-2300 Start RT _{NDT}	Reg. Guide 1.99 Extrap. ΔRT_{NDT} (°F)	Estimated EOL RT _{NDT} (°F)	Weld Wire Type	Flux Type
BD, BE, BF	422K8511/G313A27AD ⁽²⁾	.01	.016	-80	54	-26	E8018NM	--
BD, BE, BF	492L4871/A421B27AE ⁽³⁾	.04	.018	-60	60	0	E8018NM	--
BD, BF	04T931/A423B27AC ⁽³⁾	.03	.020	-60	67	+7	E8018NM	--
BD, BE, BF	5P6756/0342 ^{(1),(3)}	.08	.010	-60	34	-26	RACO INMM (Single Wire)	Linde 124
BD, BE, BF	5P6756/0342 ^{(1),(3)}	.09	.010	-50	40	-10	RACO INMM (Tandem Wire)	Linde 124

C. Test Plate Weld Material

Heat/Lot	WT ICu	WT IP	ASME NB-2300 Start RT _{NDT}	Reg. Guide 1.99 Extrap. ΔRT_{NDT} (°F)	Estimated EOL RT _{NDT} (°F)
05T776/L314A27AH ⁽³⁾	.06	.015	-70	50	-20

All materials in (B.) were also used in the surveillance test plate fabrication.

NOTES:

1. Submerged ARC welding
2. Surveillance Test Plate
3. Surveillance Weld Material

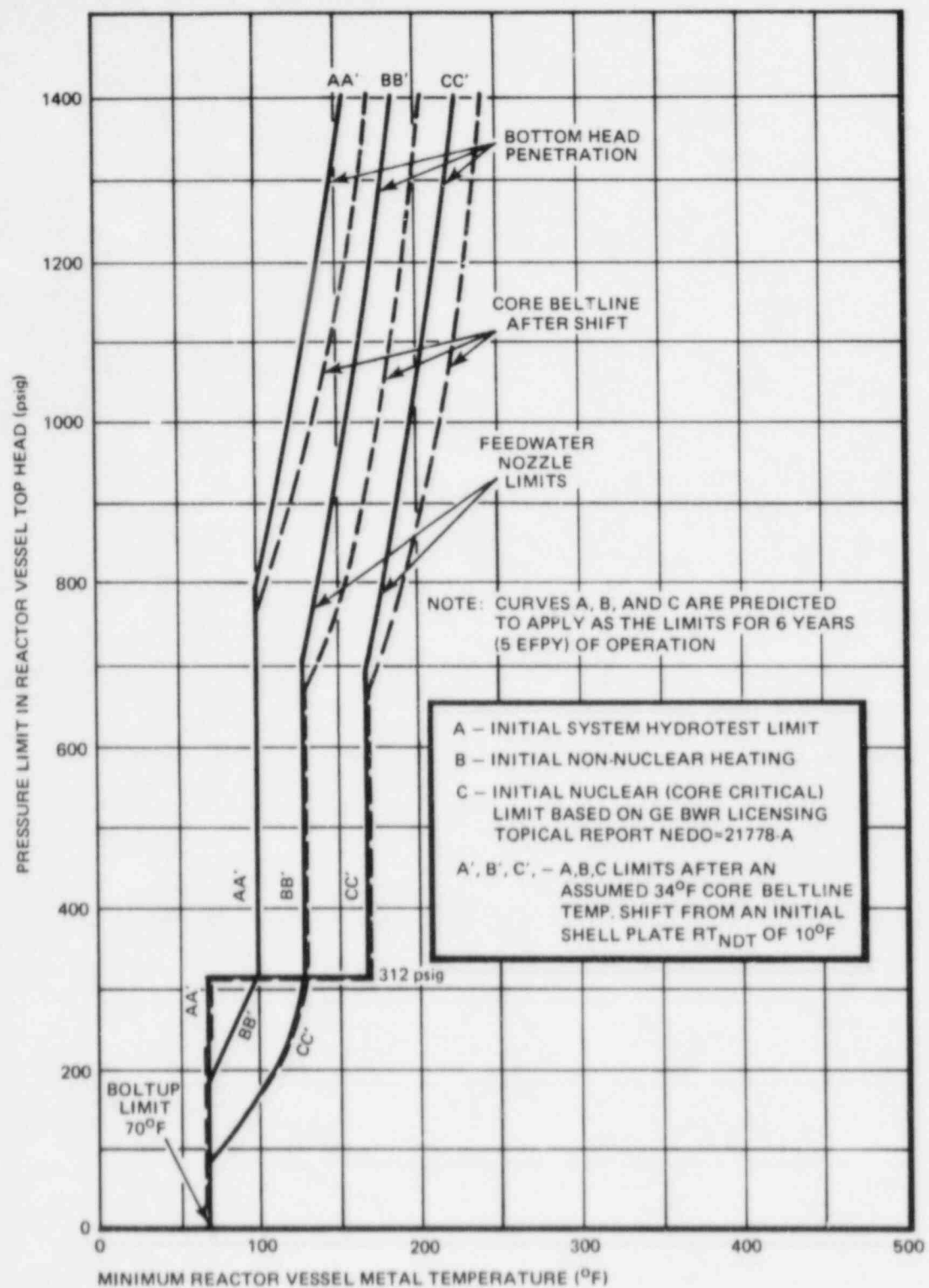
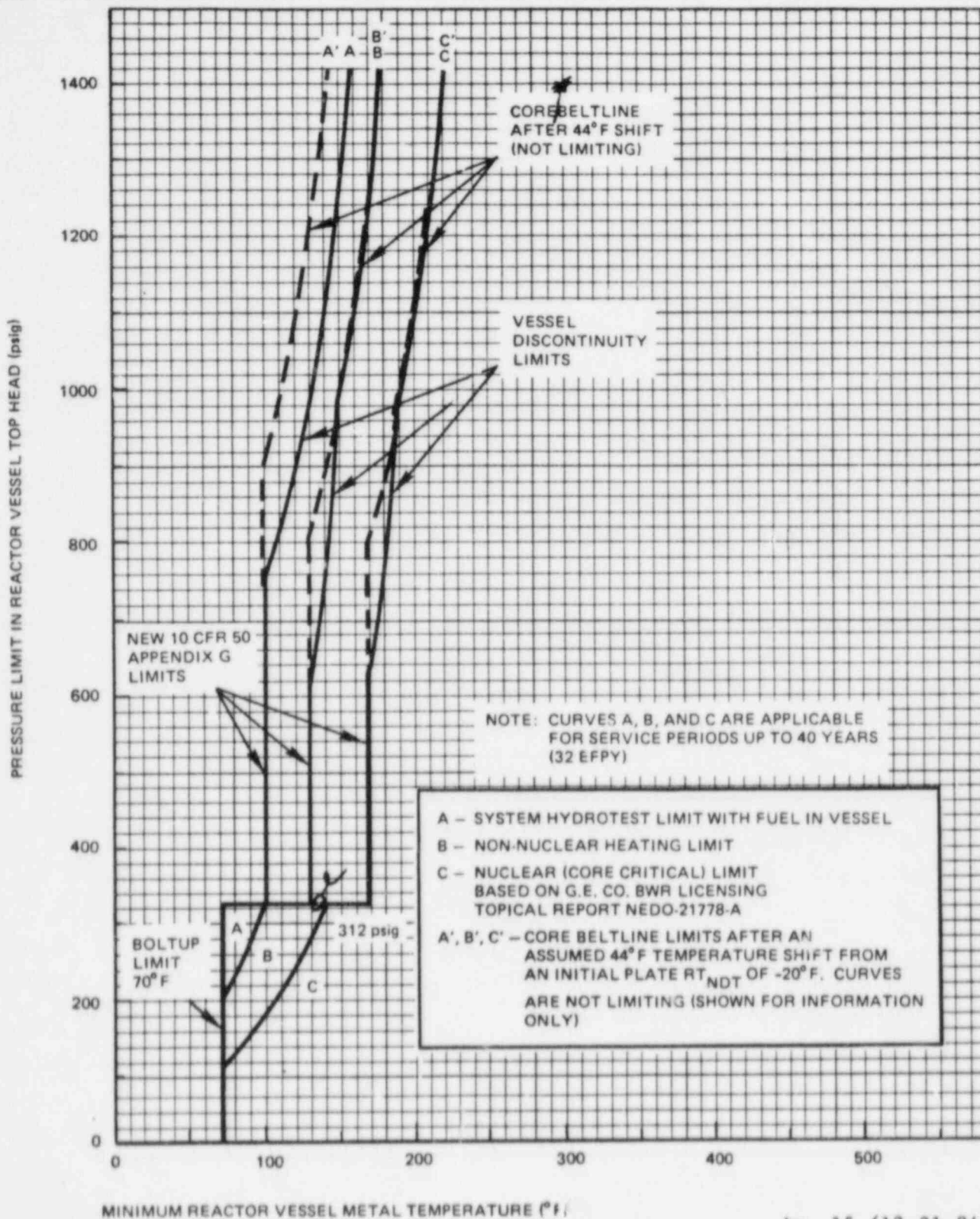


Figure 5.3-2



Am. 15 (12-31-84)



PERRY NUCLEAR POWER PLANT
THE CLEVELAND ELECTRIC
ILLUMINATING COMPANY

Minimum Temperatures Required vs.
Reactor Pressure, Perry Unit 2

Figure 5.3-3

FIGURE 5.3-4
HAS BEEN DELETED

BASES TABLE B 3/4.4.6-1REACTOR VESSEL TOUGHNESS

I. BELTLINE COMPONENT	MATERIAL	HEAT#/LOT#	CU(%)	P(%)	HIGHEST STARTING RT _{NDT} (°F)	MINIMUM UPPER SHELF ENERGY (Ft-Lb)	END OF LIFE RT _{NDT} (°F)
Plate	SA533 GrB Class 1	C2557-1	.06	.010	+10	75	+ 44
Weld	BD,BF	627260/B322A27AE	.06	.020	-30	75	+37

II. NON-BELTLINE COMPONENT	MATERIAL	HIGHEST STARTING RT _{NDT} (°F)
Shell Ring	SA 533 Gr.B, C1.1	+10
Bottom Head	SA 533 Gr.B, C1.1	+10
Top Head	SA 533 Gr.B, C1.1	+10
Top Head Flange	SA 508, C1.2	+10
Vessel Flange	SA 508, C1.2	+10
Feedwater Nozzle	SA 508, C1.2	-20
Weld	Low alloy steel per GE purchase specification	-20
Closure Studs	SA 540 Gr.B23	

45 ft-lb & 25 mils lat. exp
requirement met at +10(°F)

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