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,

A. Kaplan for

Murray R. Edelman
Vice President
Nuclear Group

MRE:njc

Attachment

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

B001
1/1

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 PROPERITES

A. PERRY UNIT 1

Plates Ht.No.	Drop Wt. NDT(°F)	Transverse CVN Ft-lbs	MLE	Temp.	Reference Temp.(°F)	Upper Shelf (Ft-lb)
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 Ft-lbs	MLE	Temp.	Reference Temp.(°F)	Upper Shelf (Ft-lb)
Ht. 627260 Lot B322A27AE	-40	52,56,51	36,37,35	+30F	-30	104
Ht. 626677 Lot C301A27AF	-40	53,51,54	36,37,35	+40	-20	90
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 Lot 228A27A	-60	57,59,68	37,38,46	+10	-50	105
Ht. 627069 Lot C312A27A	-60	72,64,78	52,48,56	0	-60	112

TABLE 5.3-2 (Continued)

B. PERRY UNIT 2

Plates Ht.No.	Drop Wt. NDT(°F)	Transverse CVN Ft-lbs	MLE	Temp.	Reference Temp.(°F)	Upper Shelf (Ft-lb
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

Weld Metal	Drop Wt. NDT(°F)	Transverse CVN Ft-lbs	MLE	Temp.	Reference Temp.(°F)	Upper Shelf (Ft-lb
Ht. 422K8511 Lot G313A27AD	-80	65,74,127	44,48,76	-20F	-80	143
Ht. 492L4871 Lot A421B27AE	-90	50,51,57	36,38,40	0F	-60	151
Ht. 04T931 Lot A423B27AG	-90	65,69,72	52,48,50	0F	-60	148
Ht. 5P6756 Lot 0342 (Single Wire)	-60	55,66,63	54,51,57	0F	-60	89
Ht. 5P6756 Lot 0342 (Tandem Wire)	-50	64,79,77 80,72	35,72,55 69,60	+10F	-50	95

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. ΔRT_{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. ΔRT_{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. ΔRT_{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 %Cu	WT %P	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 %Cu	WT %P	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/A423B27AG(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 %Cu	WT %P	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

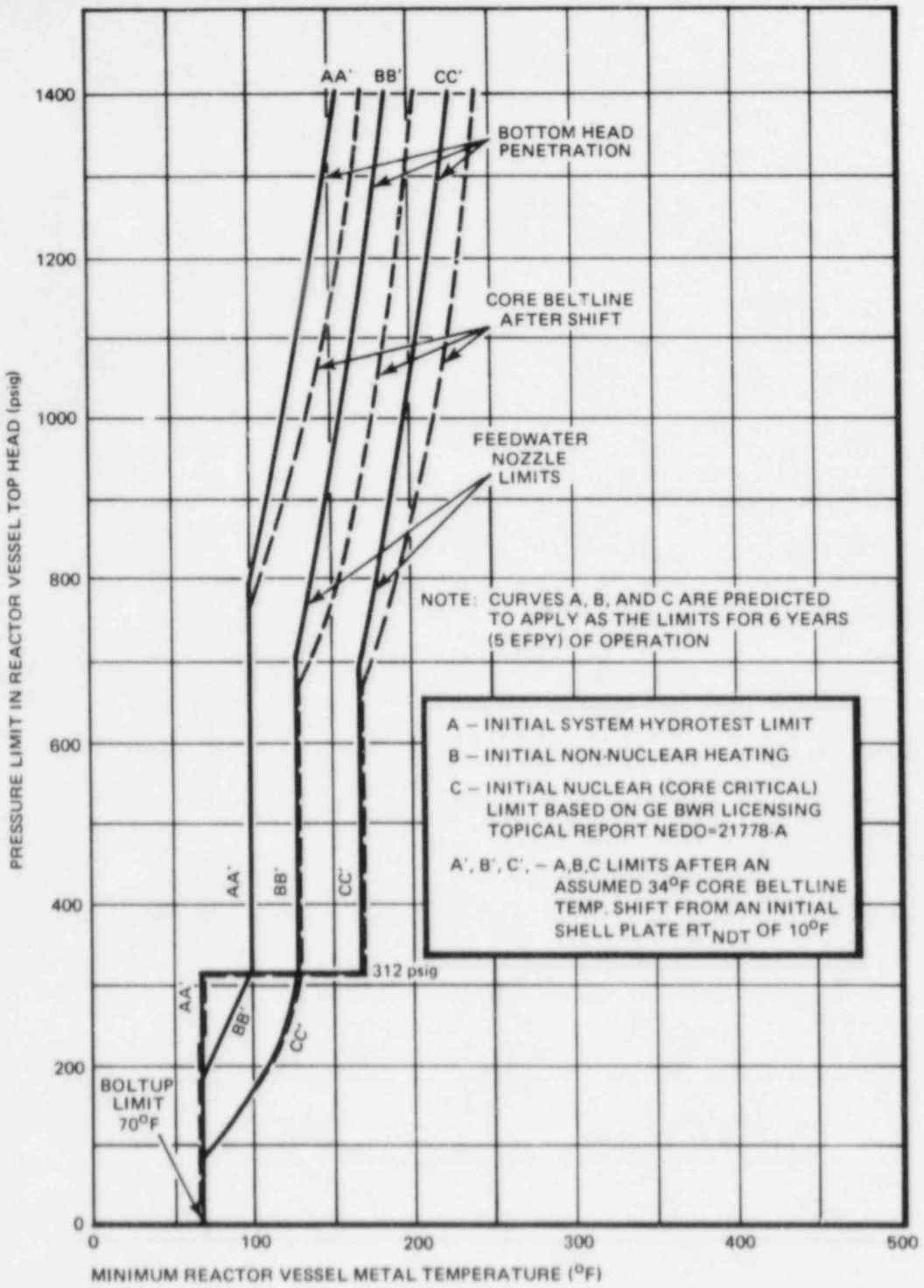

Figure 5.3-2

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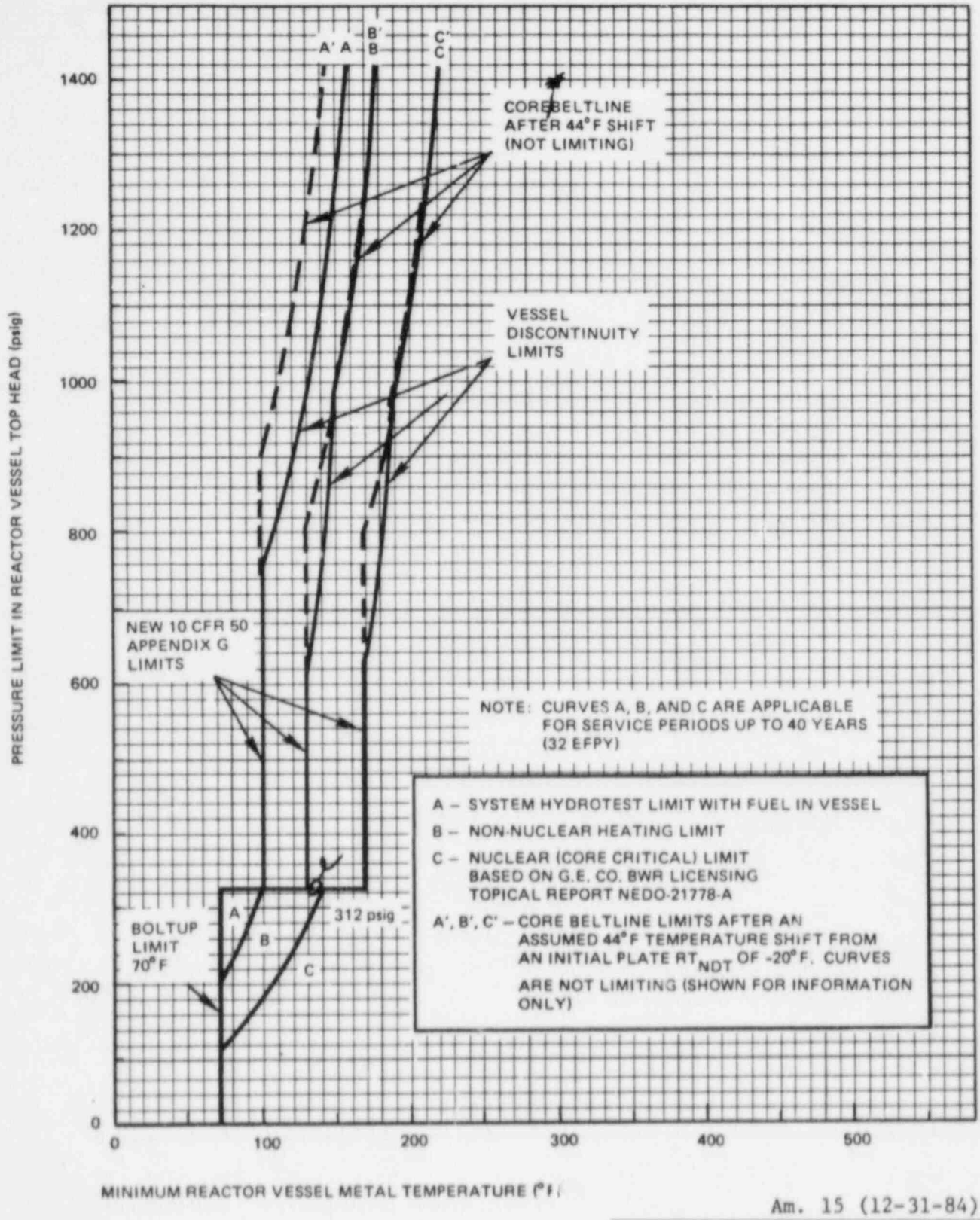

Am. 15 (12-31-84)

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 3/4.4.6-1

REACTOR 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/B322A2/AE	.06	.020	-30	75	+37

II. NON-BELTLINE

COMPONENT	MATERIAL	HIGHEST STARTING RT_{NDT}(°F)
Shell Ring	SA 533 Gr.B, Cl.1	+10
Bottom Head	SA 533 Gr.B, Cl.1	+10
Top Head	SA 533 Gr.B, Cl.1	+10
Top Head Flange	SA 508, Cl.2	+10
Vessel Flange	SA 508, Cl.2	+10
Feedwater Nozzle	SA 508, Cl.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)