

Don E. Grissette
Vice President

**Southern Nuclear
Operating Company, Inc.**
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, Alabama 35201

Tel 205.992.6474
Fax 205.992.0341



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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Vogtle Electric Generating Plant
Unit 1 Cycle 13 Core Operating Limits Report

Ladies and Gentlemen:

Pursuant to the reporting requirements of Vogtle Electric Generating Plant (VEGP) Technical Specification 5.6.5 Southern Nuclear Operating Company (SNC) is submitting Revision 3 of the Unit 1 Cycle 13 Core Operating Limits Report (COLR).

This letter contains no NRC commitments. If you have any questions, please advise.

Sincerely,

A handwritten signature in black ink, appearing to read "Don E. Grissette".

Don E. Grissette

DEG/RJF/daj

Enclosure: Unit 1 Cycle 13 Core Operating Limits Report

cc: Southern Nuclear Operating Company
Mr. J. T. Gasser, Executive Vice President
Mr. T. E. Tynan, General Manager – Plant Vogtle
RType: CVC7000

U. S. Nuclear Regulatory Commission
Dr. W. D. Travers, Regional Administrator
Mr. C. Gratton, NRR Project Manager – Vogtle
Mr. G. J. McCoy, Senior Resident Inspector – Vogtle

VOGTLE ELECTRIC GENERATING PLANT (VEGP) UNIT 1 CYCLE 13

CORE OPERATING LIMITS REPORT

REVISION 3

May 2006

COLR for VEGP UNIT 1 CYCLE 13

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for VEGP UNIT 1 CYCLE 13 has been prepared in accordance with the requirements of Technical Specification 5.6.5.

The Technical Requirement affected by this report is listed below:

13.1.1 SHUTDOWN MARGIN - MODES 1 and 2

The Technical Specifications affected by this report are listed below:

3.1.1 SHUTDOWN MARGIN - MODES 3, 4 and 5

3.1.3 Moderator Temperature Coefficient

3.1.5 Shutdown Bank Insertion Limits

3.1.6 Control Bank Insertion Limits

3.2.1 Heat Flux Hot Channel Factor - $F_Q(Z)$

3.2.2 Nuclear Enthalpy Rise Hot Channel Factor - $F_{\Delta H}^N$

3.2.3 Axial Flux Difference

3.9.1 Boron Concentration

2.0 OPERATING LIMITS

The cycle-specific parameter limits for the specifications listed in section 1.0 are presented in the following subsections. These limits have been developed using NRC-approved methodologies, including those specified in Technical Specification 5.6.5.

2.1 SHUTDOWN MARGIN - MODES 1 AND 2 (Technical Requirement 13.1.1)

2.1.1 The SHUTDOWN MARGIN shall be greater than or equal to 1.30 percent $\Delta k/k$.

2.2 SHUTDOWN MARGIN - MODES 3, 4 AND 5 (Specification 3.1.1)

2.2.1 The SHUTDOWN MARGIN shall be greater than or equal to the limits shown in Figures 1 and 2.

2.3 Moderator Temperature Coefficient (Specification 3.1.3)

2.3.1 The Moderator Temperature Coefficient (MTC) limits are:

The BOL/ARO/HZP - MTC shall be less positive than $+0.7 \times 10^{-4} \Delta k/k/^\circ F$ for power levels up to 70 percent RTP with a linear ramp to $0 \Delta k/k/^\circ F$ at 100 percent RTP.

The EOL/ARO/RTP-MTC shall be less negative than $-5.50 \times 10^{-4} \Delta k/k/^\circ F$.¹

2.3.2 The MTC Surveillance limits are:

The 300 ppm/ARO/RTP-MTC should be less negative than or equal to $-4.75 \times 10^{-4} \Delta k/k/^\circ F$.¹

The 60 ppm/ARO/RTP-MTC should be less negative than $-5.35 \times 10^{-4} \Delta k/k/^\circ F$.¹

where: BOL stands for Beginning of Cycle Life
ARO stands for All Rods Out
HZP stands for Hot Zero THERMAL POWER
EOL stands for End of Cycle Life
RTP stands for RATED THERMAL POWER

2.4 Shutdown Bank Insertion Limits (Specification 3.1.5)

2.4.1 The shutdown banks shall be withdrawn to a position greater than or equal to 225 steps.

2.5 Control Bank Insertion Limits (Specification 3.1.6)

2.5.1 The control banks shall be limited in physical insertion as shown in Figure 3.

¹Applicable for full-power T-average of 586.4°F to 587.4°F.

2.6 Heat Flux Hot Channel Factor - $F_Q(Z)$ (Specification 3.2.1)

$$2.6.1 \quad F_Q(Z) \leq \frac{F_Q^{RTP}}{P} * K(Z) \quad \text{for } P > 0.5$$

$$F_Q(Z) \leq \frac{F_Q^{RTP}}{0.5} * K(Z) \quad \text{for } P \leq 0.5$$

$$\text{where: } P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$$

$$2.6.2 \quad F_Q^{RTP} = 2.50$$

2.6.3 $K(Z)$ is provided in Figure 4.

$$2.6.4 \quad F_Q(Z) \leq \frac{F_Q^{RTP} * K(Z)}{P * W(Z)} \quad \text{for } P > 0.5$$

$$F_Q(Z) \leq \frac{F_Q^{RTP} * K(Z)}{0.5 * W(Z)} \quad \text{for } P \leq 0.5$$

2.6.5 $W(Z)$ values are provided in Figures 7 through 9.

The following $W(Z)$ factors will be valid provided that the measured axial offset (i.e., the axial offset measured by an in-core flux map) is within the range as defined by the validity table below.

Axial Offset Validity for W(Z) Factors

Cycle Burnup (MWD/MTU)	Minimum AO (%)	Analysis AO (%)	Maximum AO (%)
16050	-2.39	2.61	7.61
18000	-2.17	2.83	7.83
20000	-3.75	1.25	6.25
21000	-4.48	0.52	5.52
22006	-5.18	-0.18	4.82

It is required that Minimum AO \leq Measured Axial Offset (MAO) \leq Maximum AO.

Linear interpolation should be performed on AO (%) to the burnup of the flux map.

2.6.6 The $F_Q(Z)$ penalty factors are provided in Table 1.

2.7 Nuclear Enthalpy Rise Hot Channel Factor - $F_{\Delta H}^N$ (Specification 3.2.2)

$$2.7.1 \quad F_{\Delta H}^N \leq F_{\Delta H}^{RTP} * (1 + PF_{\Delta H} * (1 - P))$$

$$\text{where: } P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$$

$$2.7.2 \quad F_{\Delta H}^{RTP} = 1.65$$

$$2.7.3 \quad PF_{\Delta H} = 0.3$$

2.8 Axial Flux Difference (Specification 3.2.3)

2.8.1 The Axial Flux Difference (AFD) acceptable operation limits are provided in Figure 5.

2.9 Boron Concentration (Specification 3.9.1)

2.9.1 The boron concentration shall be greater than or equal to 1935 ppm.¹

¹This concentration bounds the condition of $k_{\text{eff}} \leq 0.95$ (all rods in less the most reactive rod) and subcriticality (all rods out) over the entire cycle. This concentration includes additional boron to address uncertainties and B¹⁰ depletion.

TABLE 1

 $F_Q(Z)$ PENALTY FACTOR

Cycle Burnup (MWD/MTU)	$F_Q(Z)$ Penalty Factor
30	1.036
150	1.036
363	1.038
577	1.037
790	1.035
1004	1.031
1217	1.024
1431	1.020

Notes:

1. The Penalty Factor, to be applied to $F_Q(Z)$ in accordance with SR 3.2.1.2, is the maximum factor by which $F_Q(Z)$ is expected to increase over a 39 EFPD interval (surveillance interval of 31 EFPD plus the maximum allowable extension not to exceed 25% of the surveillance interval per SR 3.0.2) starting from the burnup at which the $F_Q(Z)$ was determined.
2. Linear interpolation is adequate for intermediate cycle burnups.
3. For all cycle burnups outside the range of the table, a penalty factor of 1.020 shall be used.

COLR for VEGP UNIT 1 CYCLE 13

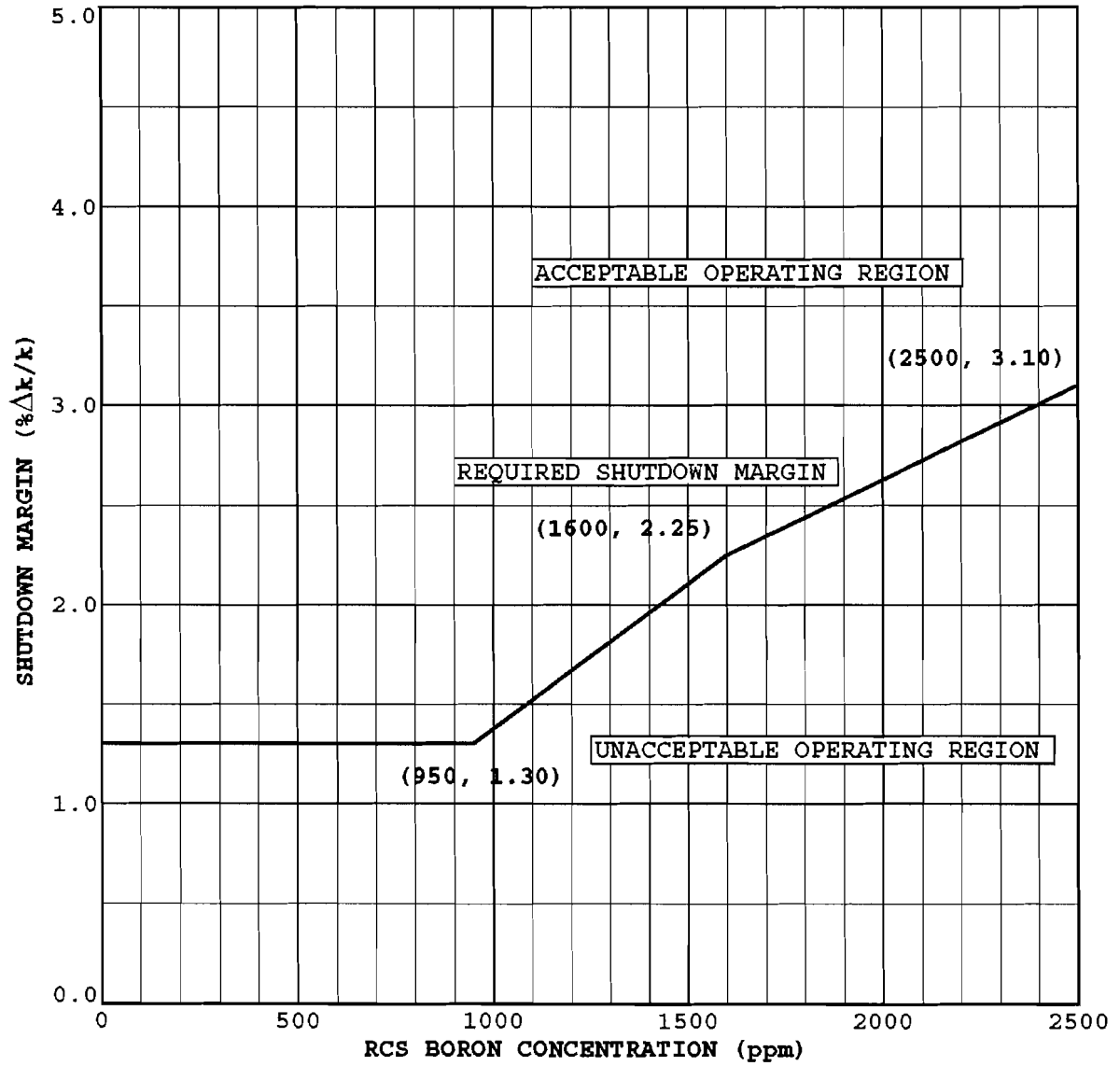


FIGURE 1

REQUIRED SHUTDOWN MARGIN FOR MODES 3 AND 4 (FOUR LOOPS FILLED AND VENTED AND AT LEAST ONE REACTOR COOLANT PUMP RUNNING)

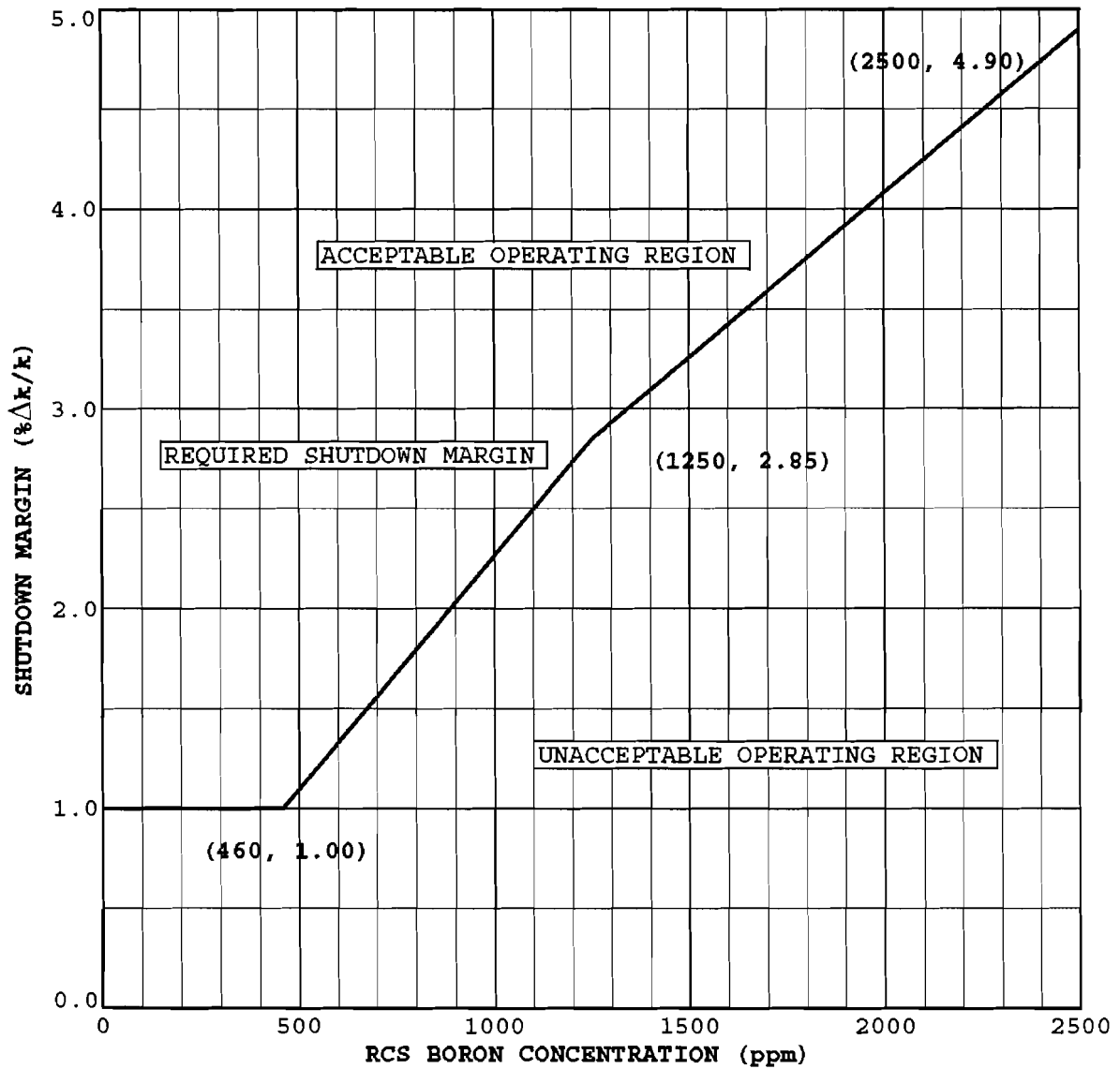
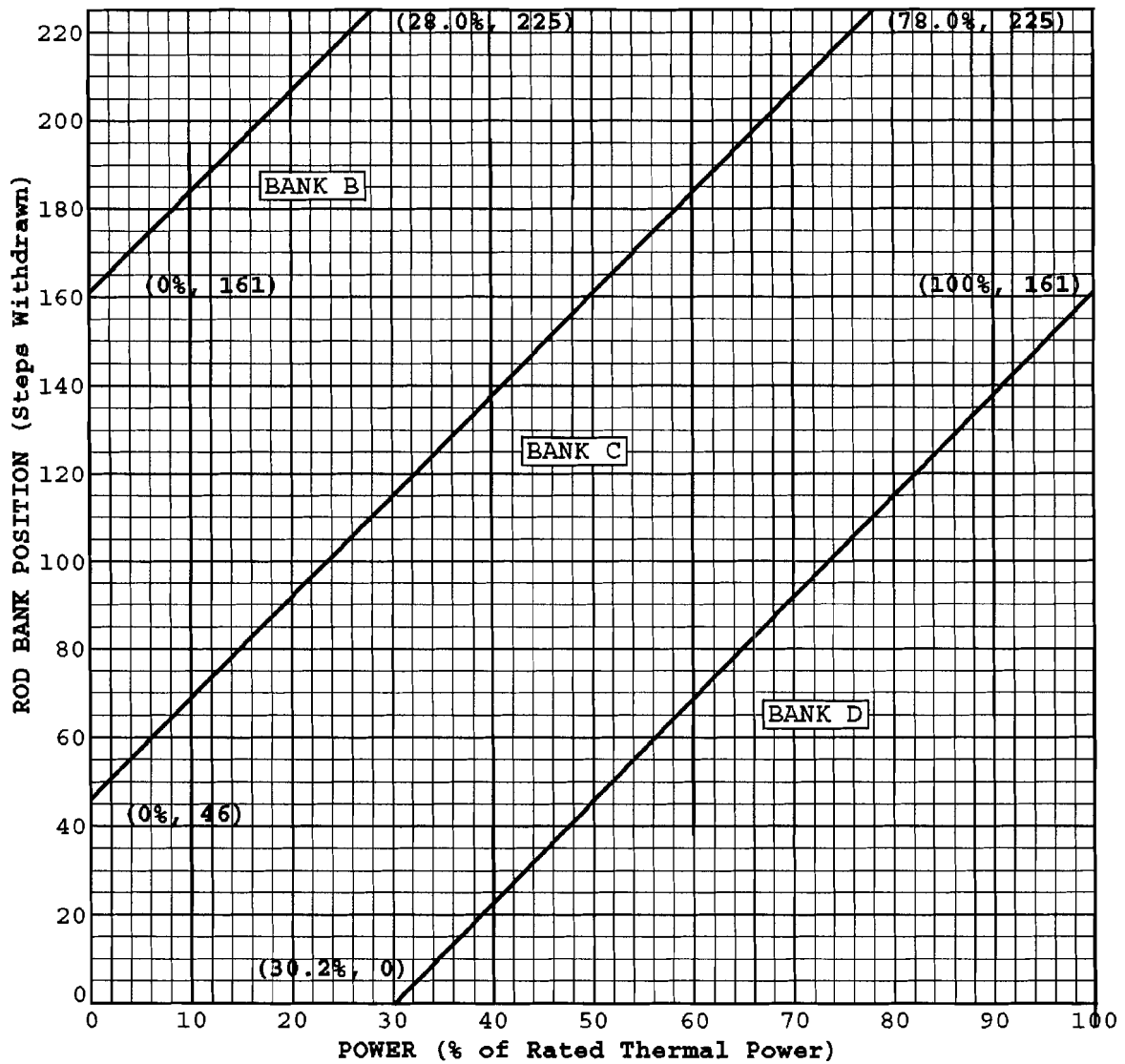


FIGURE 2

REQUIRED SHUTDOWN MARGIN FOR MODES 4 AND 5 (MODE 4 WHEN FIGURE 1 NOT APPLICABLE)

COLR for VEGP UNIT 1 CYCLE 13

(Fully Withdrawn*)



*Fully withdrawn shall be the condition where control rods are at a position within the interval ≥ 225 and ≤ 231 steps withdrawn.

NOTE: The Rod Bank Insertion Limits are based on the control bank withdrawal sequence A, B, C, D and a control bank tip-to-tip distance of 115 steps.

FIGURE 3

ROD BANK INSERTION LIMITS VERSUS % OF RATED THERMAL POWER

COLR for VEGP UNIT 1 CYCLE 13

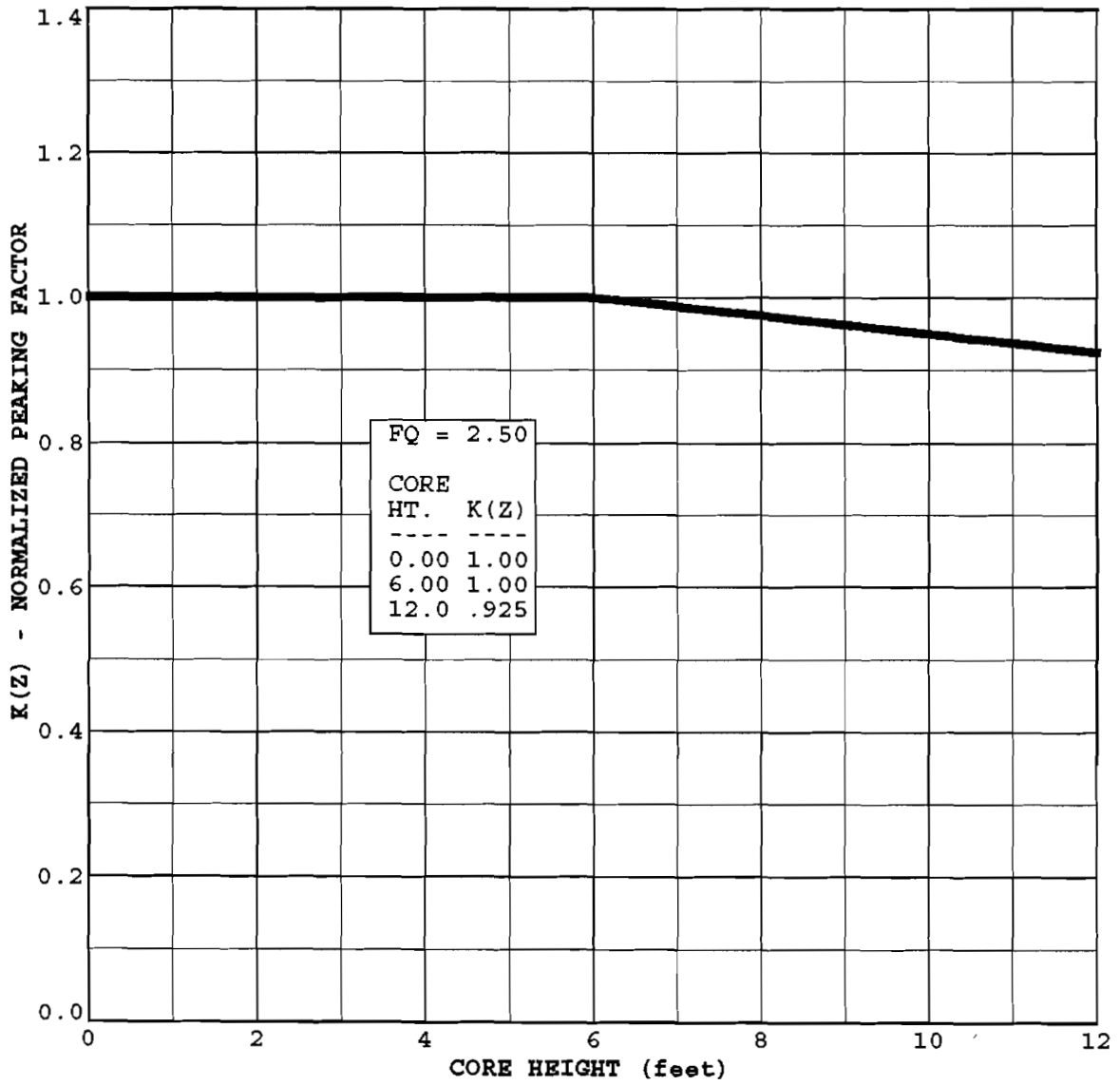


FIGURE 4

$K(Z)$ - NORMALIZED $F_0(Z)$ AS A FUNCTION OF CORE HEIGHT

COLR for VEGP UNIT 1 CYCLE 13

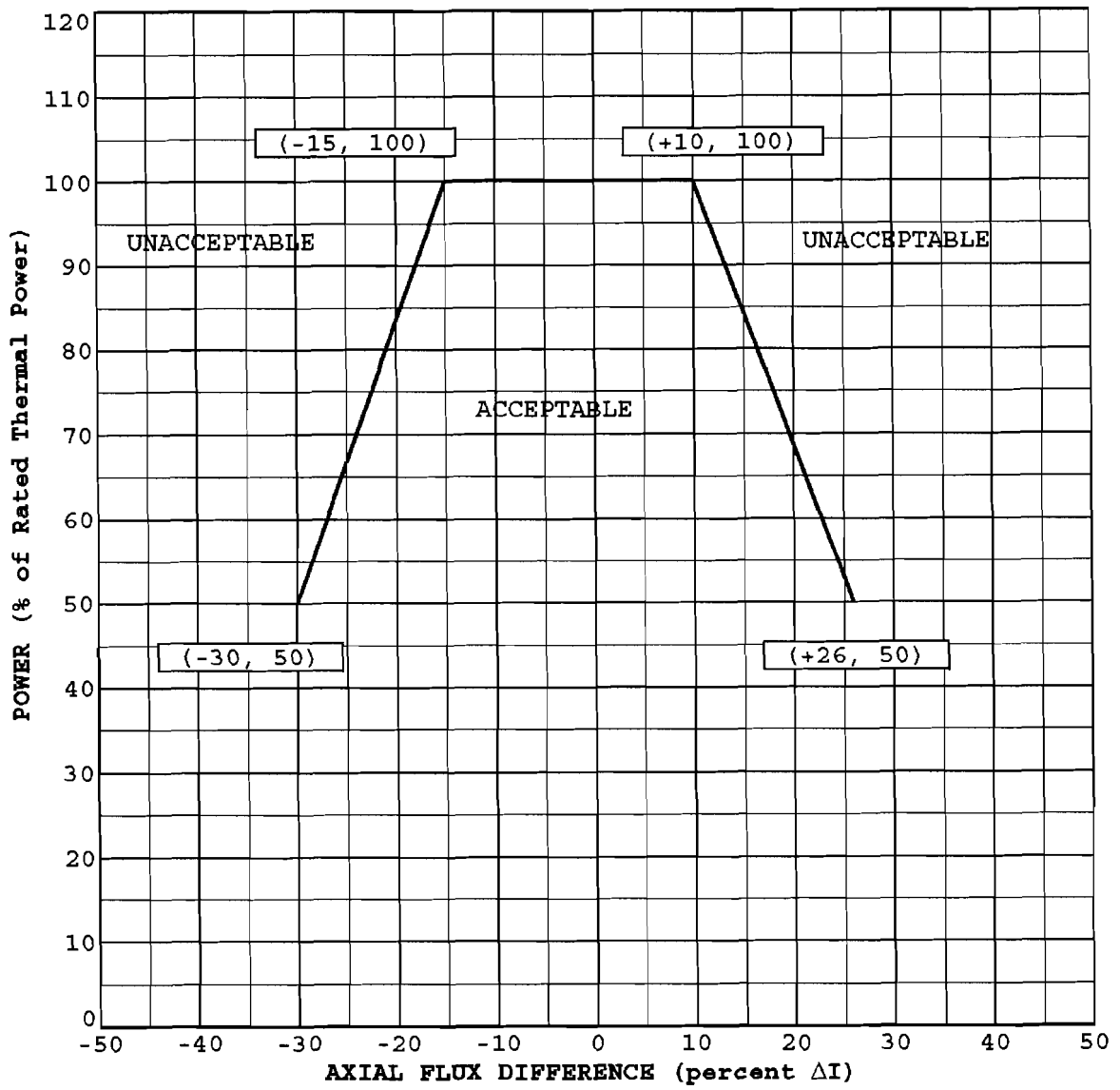


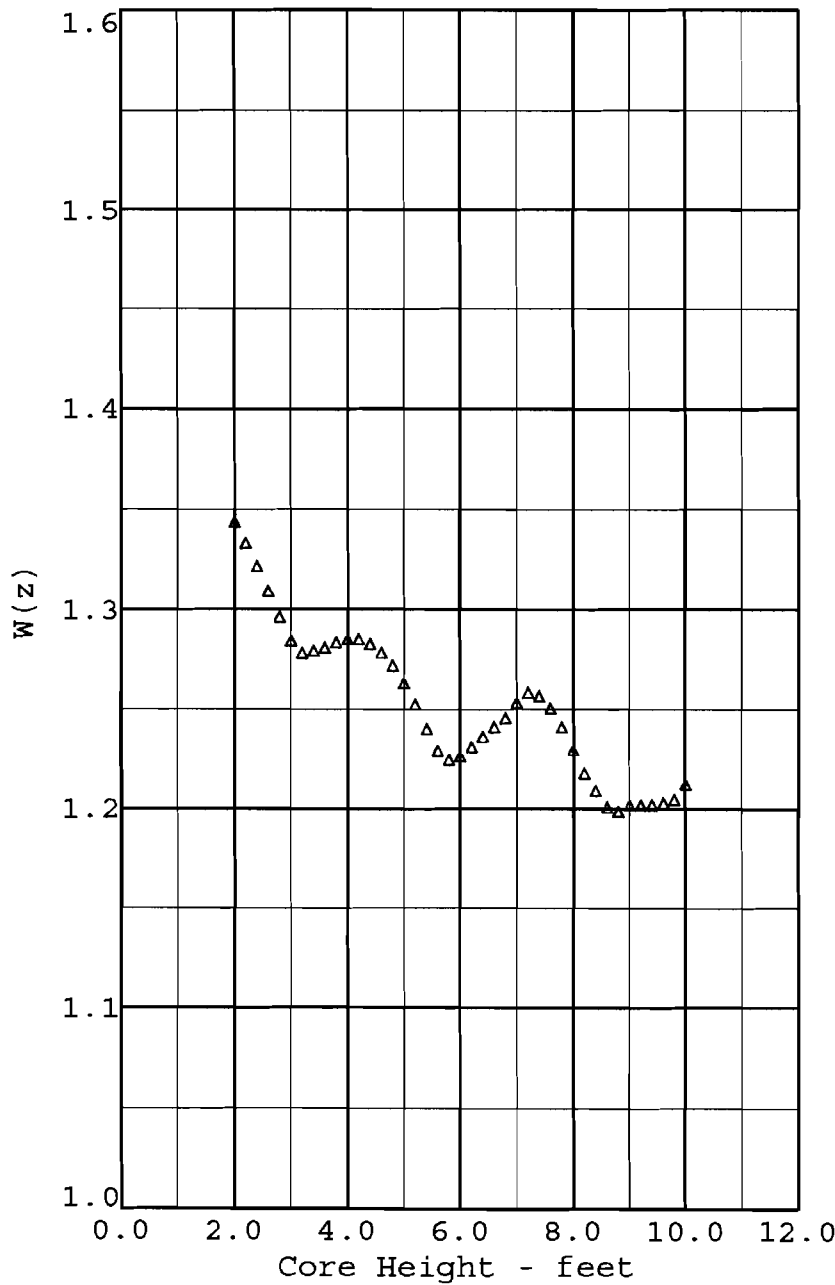
FIGURE 5

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF % OF RATED THERMAL POWER FOR RAOC

This data is intentionally deleted.

FIGURE 6
RAOC W(Z) AT 150 MWD/MTU

COLR for VEGP UNIT 1 CYCLE 13



Axial Point	Elevation (feet)	EOL-1 W(Z)
*	1	12.00 1.0000
*	2	11.80 1.0000
*	3	11.60 1.0000
*	4	11.40 1.0000
*	5	11.20 1.0000
*	6	11.00 1.0000
*	7	10.80 1.0000
*	8	10.60 1.0000
*	9	10.40 1.0000
*	10	10.20 1.0000
	11	10.00 1.2122
	12	9.80 1.2044
	13	9.60 1.2027
	14	9.40 1.2018
	15	9.20 1.2017
	16	9.00 1.2016
	17	8.80 1.1984
	18	8.60 1.2006
	19	8.40 1.2088
	20	8.20 1.2177
	21	8.00 1.2292
	22	7.80 1.2408
	23	7.60 1.2502
	24	7.40 1.2562
	25	7.20 1.2581
	26	7.00 1.2531
	27	6.80 1.2453
	28	6.60 1.2407
	29	6.40 1.2359
	30	6.20 1.2307
	31	6.00 1.2263
	32	5.80 1.2244
	33	5.60 1.2289
	34	5.40 1.2399
	35	5.20 1.2521
	36	5.00 1.2628
	37	4.80 1.2718
	38	4.60 1.2782
	39	4.40 1.2826
	40	4.20 1.2849
	41	4.00 1.2850
	42	3.80 1.2832
	43	3.60 1.2806
	44	3.40 1.2790
	45	3.20 1.2781
	46	3.00 1.2842
	47	2.80 1.2961
	48	2.60 1.3092
	49	2.40 1.3214
	50	2.20 1.3331
	51	2.00 1.3436
*	52	1.80 1.0000
*	53	1.60 1.0000
*	54	1.40 1.0000
*	55	1.20 1.0000
*	56	1.00 1.0000
*	57	0.80 1.0000
*	58	0.60 1.0000
*	59	0.40 1.0000
*	60	0.20 1.0000
*	61	0.00 1.0000

This figure is referred to by Specification B3.2.1

These W(Z) values are consistent with Figure 5, and are valid over the HFP T_{avg} temperature range from 586.4 to 587.4°F.

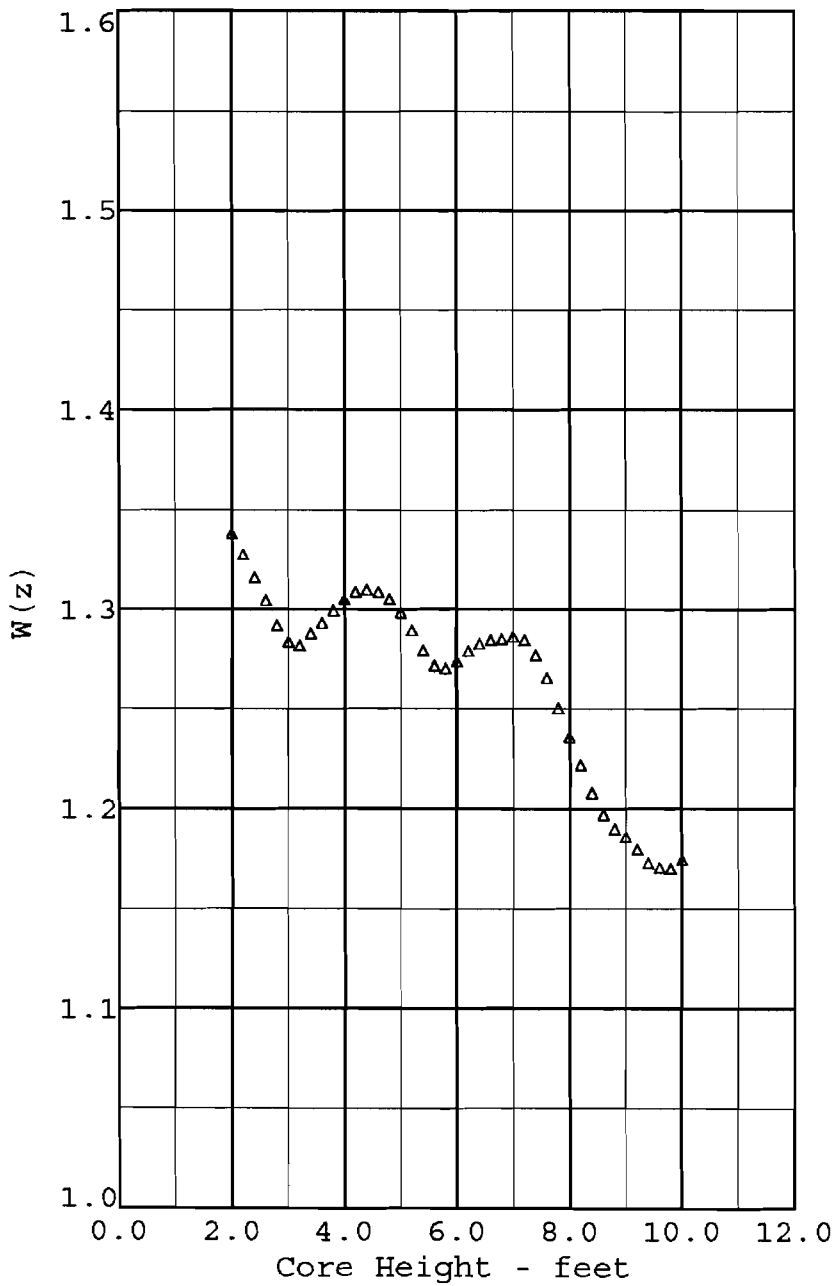
See COLR Section 2.6.5 for AO Validity Rules.

* Top and Bottom 15% Excluded per Technical Specification B3.2.1

FIGURE 7

RAOC W(Z) AT 16,050 MWD/MTU

COLR for VEGP UNIT 1 CYCLE 13



Axial Point	Elevation (feet)	EOL-2 W(Z)
*	1	12.00 1.0000
*	2	11.80 1.0000
*	3	11.60 1.0000
*	4	11.40 1.0000
*	5	11.20 1.0000
*	6	11.00 1.0000
*	7	10.80 1.0000
*	8	10.60 1.0000
*	9	10.40 1.0000
*	10	10.20 1.0000
	11	10.00 1.1746
	12	9.80 1.1702
	13	9.60 1.1707
	14	9.40 1.1730
	15	9.20 1.1799
	16	9.00 1.1860
	17	8.80 1.1900
	18	8.60 1.1971
	19	8.40 1.2081
	20	8.20 1.2219
	21	8.00 1.2358
	22	7.80 1.2503
	23	7.60 1.2653
	24	7.40 1.2768
	25	7.20 1.2844
	26	7.00 1.2861
	27	6.80 1.2849
	28	6.60 1.2844
	29	6.40 1.2825
	30	6.20 1.2789
	31	6.00 1.2738
	32	5.80 1.2702
	33	5.60 1.2715
	34	5.40 1.2791
	35	5.20 1.2893
	36	5.00 1.2982
	37	4.80 1.3049
	38	4.60 1.3085
	39	4.40 1.3097
	40	4.20 1.3085
	41	4.00 1.3048
	42	3.80 1.2991
	43	3.60 1.2929
	44	3.40 1.2877
	45	3.20 1.2817
	46	3.00 1.2836
	47	2.80 1.2916
	48	2.60 1.3043
	49	2.40 1.3160
	50	2.20 1.3274
	51	2.00 1.3382
*	52	1.80 1.0000
*	53	1.60 1.0000
*	54	1.40 1.0000
*	55	1.20 1.0000
*	56	1.00 1.0000
*	57	0.80 1.0000
*	58	0.60 1.0000
*	59	0.40 1.0000
*	60	0.20 1.0000
*	61	0.00 1.0000

This figure is referred to by Specification B3.2.1

These W(Z) values are consistent with Figure 5, and are valid over the HFP T_{avg} temperature range from 586.4 to 587.4°F.

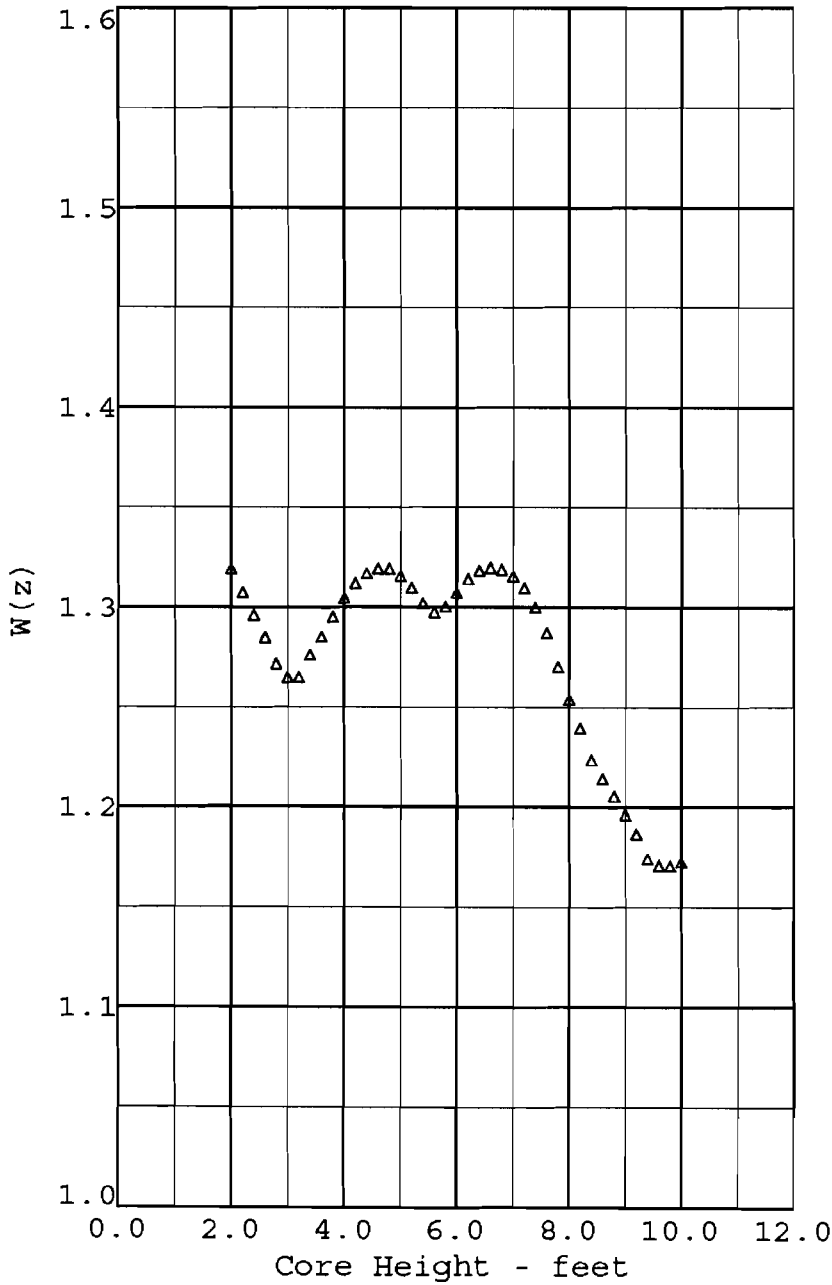
See COLR Section 2.6.5 for AO Validity Rules.

* Top and Bottom 15% Excluded per Technical Specification B3.2.1

FIGURE 8

RAOC W(Z) AT 18,000 MWD/MTU

COLR for VEGP UNIT 1 CYCLE 13



Axial Point	Elevation (feet)	EOL W(Z)
*	1	12.00
*	2	11.80
*	3	11.60
*	4	11.40
*	5	11.20
*	6	11.00
*	7	10.80
*	8	10.60
*	9	10.40
*	10	10.20
	11	10.00
	12	9.80
	13	9.60
	14	9.40
	15	9.20
	16	9.00
	17	8.80
	18	8.60
	19	8.40
	20	8.20
	21	8.00
	22	7.80
	23	7.60
	24	7.40
	25	7.20
	26	7.00
	27	6.80
	28	6.60
	29	6.40
	30	6.20
	31	6.00
	32	5.80
	33	5.60
	34	5.40
	35	5.20
	36	5.00
	37	4.80
	38	4.60
	39	4.40
	40	4.20
	41	4.00
	42	3.80
	43	3.60
	44	3.40
	45	3.20
	46	3.00
	47	2.80
	48	2.60
	49	2.40
	50	2.20
	51	2.00
*	52	1.80
*	53	1.60
*	54	1.40
*	55	1.20
*	56	1.00
*	57	0.80
*	58	0.60
*	59	0.40
*	60	0.20
*	61	0.00

This figure is referred to by Specification B3.2.1

These W(Z) values are consistent with Figure 5, and are valid over the HFP T_{avg} temperature range from 586.4 to 587.4°F.

See COLR Section 2.6.5 for AO Validity Rules.

* Top and Bottom 15% Excluded per Technical Specification B3.2.1

FIGURE 9

RAOC W(Z) AT 20,000 MWD/MTU