

VOGTLE ELECTRIC GENERATING PLANT (VEGP) UNIT 2 CYCLE 3
CORE OPERATING LIMITS REPORT
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COLR for VEGP UNIT 2 CYCLE 3

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for VEGP UNIT 2 CYCLE 3 has been prepared in accordance with the requirements of Technical Specification 6.8.1.6.

The Technical Specifications affected by this report are listed below:

- | | |
|-----------|---|
| 3/4.1.1.1 | SHUTDOWN MARGIN - MODES 1 and 2 |
| 3/4.1.1.2 | SHUTDOWN MARGIN - MODES 3, 4 and 5 |
| 3/4.1.1.3 | Moderator Temperature Coefficient |
| 3/4.1.3.5 | Shutdown Rod Insertion Limit |
| 3/4.1.3.6 | Control Rod Insertion Limits |
| 3/4.2.1 | Axial Flux Difference |
| 3/4.2.2 | Heat Flux Hot Channel Factor - $f_0(Z)$ |
| 3/4.2.3 | Nuclear Enthalpy Rise Hot Channel Factor - F_{RH}^N |

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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 the NRC-approved methodologies specified in Technical Specification 6.8.1.6.

2.1 SHUTDOWN MARGIN - MODES 1 AND 2 (Specification 3/4.1.1.1)

2.1.1 The SHUTDOWN MARGIN shall be greater than or equal to 1.3% $\Delta k/k$.

2.2 SHUTDOWN MARGIN - MODES 3, 4 AND 5 (Specification 3/4.1.1.2)

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 3/4.1.1.3)

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% RTP with a linear ramp to 0 $\Delta k/k/^{\circ}F$ at 100% RTP.

The EOL/ARO/RTP-MTC shall be less negative than $-5.6 \times 10^{-4} \Delta k/k/^{\circ}F$.*

2.3.2 The MTC Surveillance limit is:

The 300 ppm/ARO/RTP-MTC should be less negative than or equal to $-4.85 \times 10^{-4} \Delta k/k/^{\circ}F$.*

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 Rod Insertion Limit (Specification 3/4.1.3.5)

2.4.1 The shutdown rods shall be withdrawn to a position greater than or equal to 225 steps.

2.5 Control Rod Insertion Limits (Specification 3/4.1.3.6)

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

* Based on full-power T-average of 586.4°F.

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2.6 Axial Flux Difference (Specification 3/4.2.1)
{RAOC methodology}

2.6.1 The Axial Flux Difference (AFD) Acceptable Operation Limits are provided in Figure 4.

2.7 Heat Flux Hot Channel Factor - $F_o(Z)$ (Specification 3/4.2.2)
{ F_o methodology}

$$2.7.1 \quad F_o(Z) \leq \frac{F_o^{RTP}}{P} * K(Z) \quad \text{for } P > 0.5$$

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

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

$$2.7.2 \quad F_o^{RTP} = 2.50$$

2.7.3 $K(Z)$ is provided in Figure 5.

$$2.7.4 \quad F_o^C(Z) \leq \frac{F_o^{RTP} * K(Z)}{P * W(Z)} \quad \text{for } P > 0.5$$

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

2.7.5 $W(Z)$ values are provided in Figures 6 through 8.

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2.8 Nuclear Enthalpy Rise Hot Channel Factor - $F_{\Delta H}^N$ (Specification 3/4.2.3)

$$2.8.1 \quad F_{\Delta H}^N \leq F_{\Delta H}^{RTP} * (1 + PF_{\Delta H} * (1-P))$$

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

$$2.8.2a \quad F_{\Delta H}^{RTP} = 1.57 \text{ for LOPAR fuel, and}$$

$$2.8.2b \quad F_{\Delta H}^{RTP} = 1.65 \text{ for VANTAGE 5 fuel}$$

$$2.8.3 \quad PF_{\Delta H} = 0.3 \text{ for LOPAR and VANTAGE 5 fuel}$$

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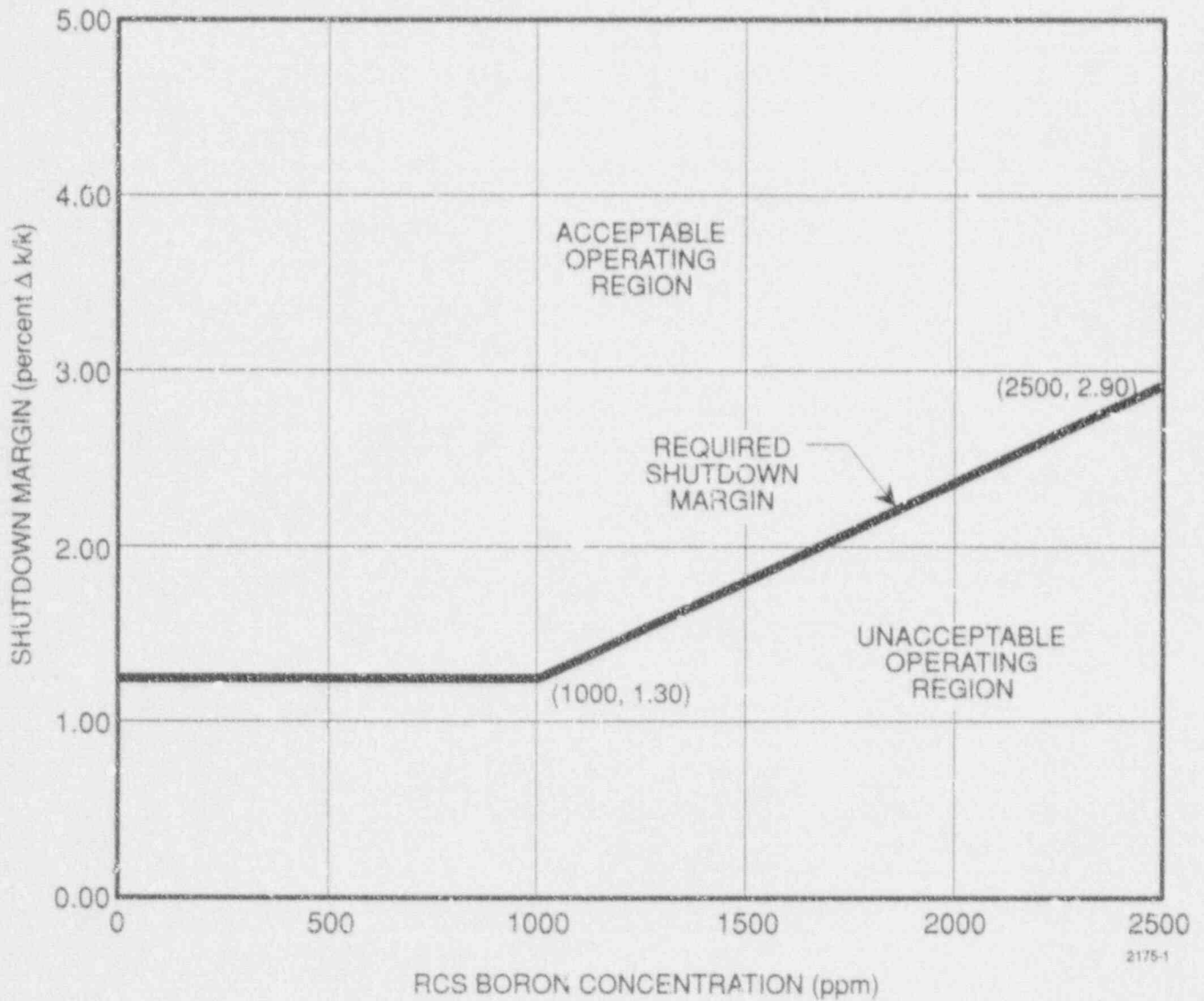


FIGURE 1

REQUIRED SHUTDOWN MARGIN FOR MODES 3 AND 4 (MODE 4 WITH AT LEAST ONE REACTOR COOLANT PUMP RUNNING)

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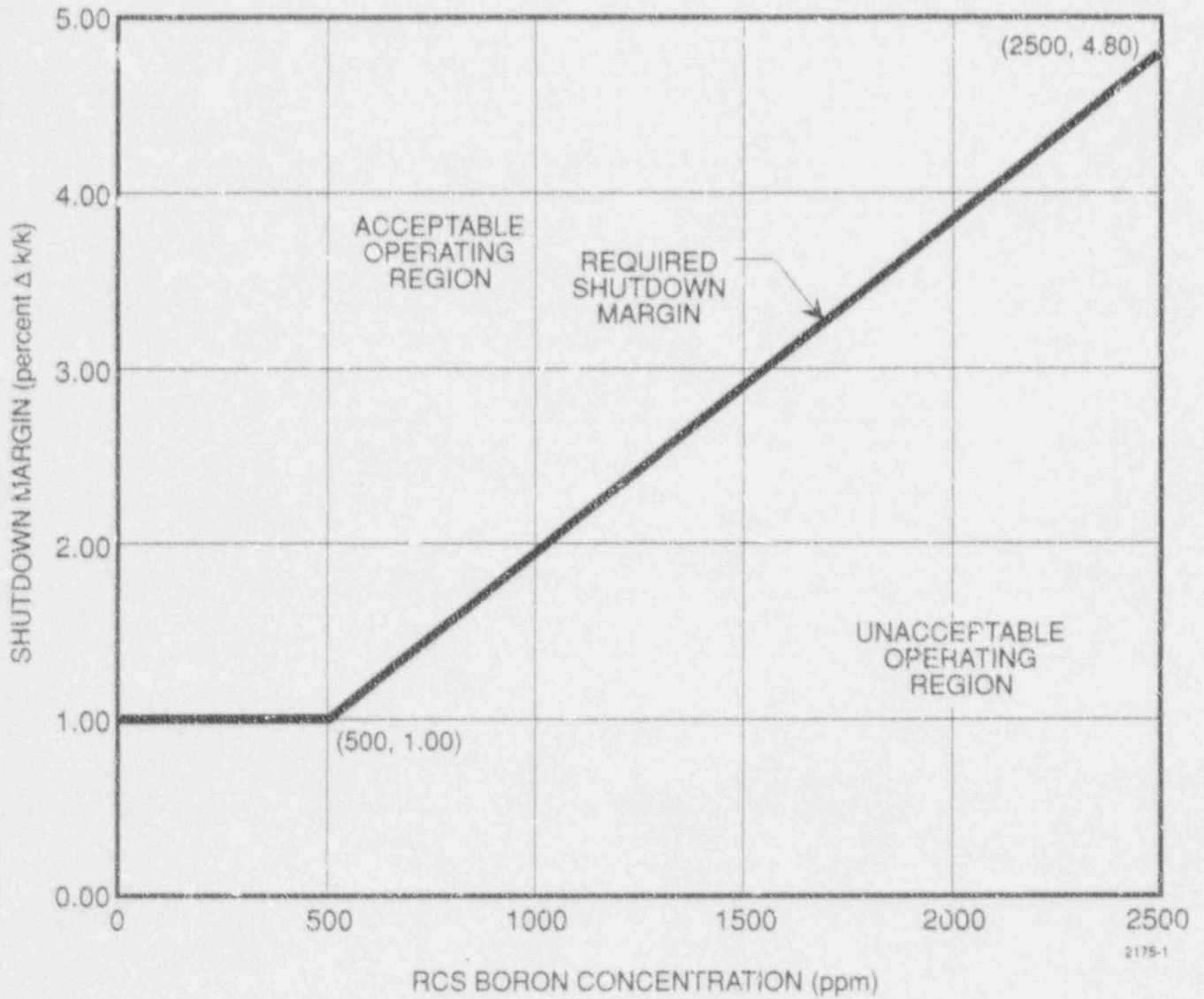
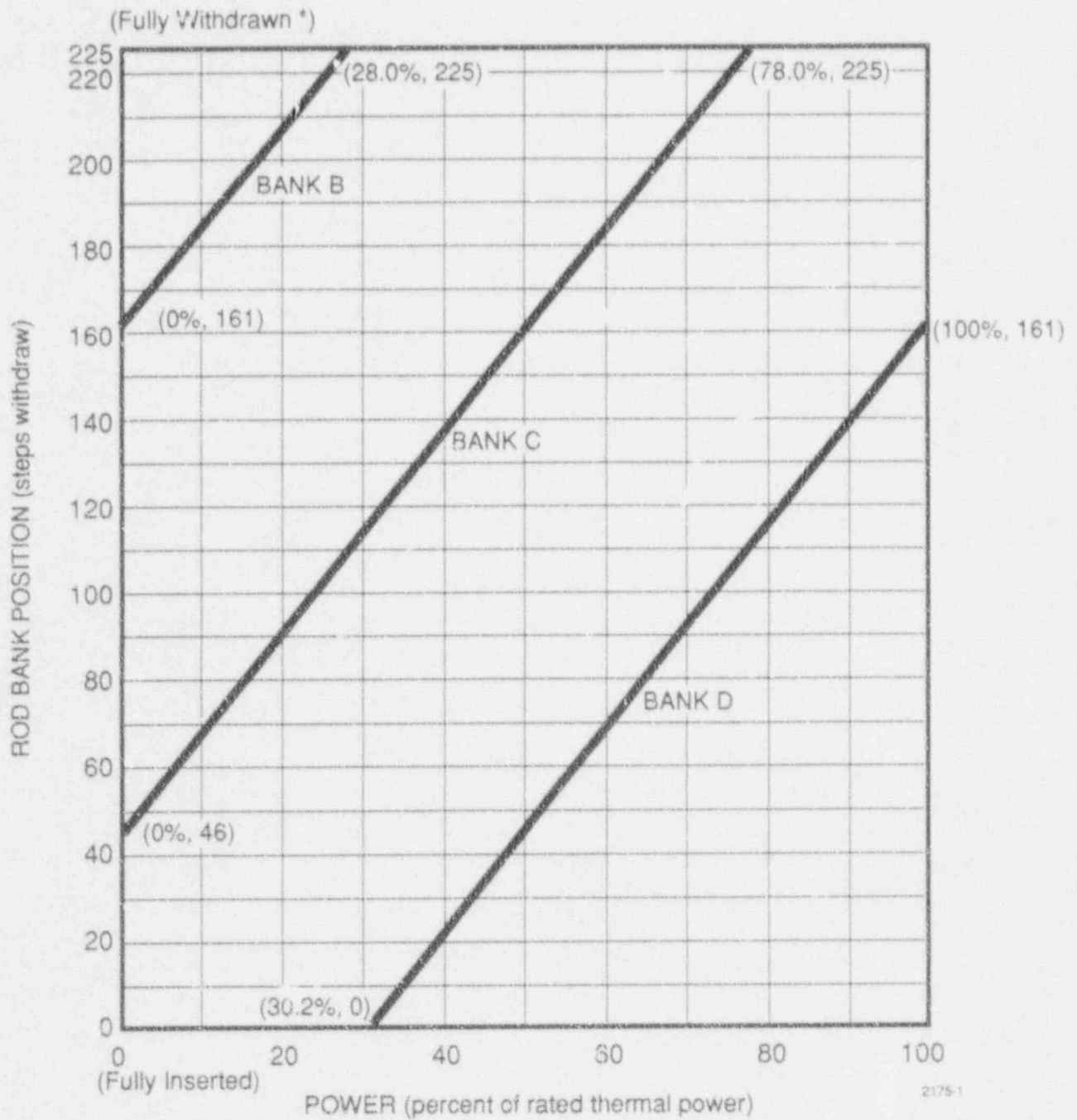


FIGURE 2

REQUIRED SHUTDOWN MARGIN FOR MODES 4 AND 5 (MODE 4 WITH NO REACTOR COOLANT PUMPS RUNNING)

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

FIGURE 3
ROD BANK INSERTION LIMITS VERSUS THERMAL POWER

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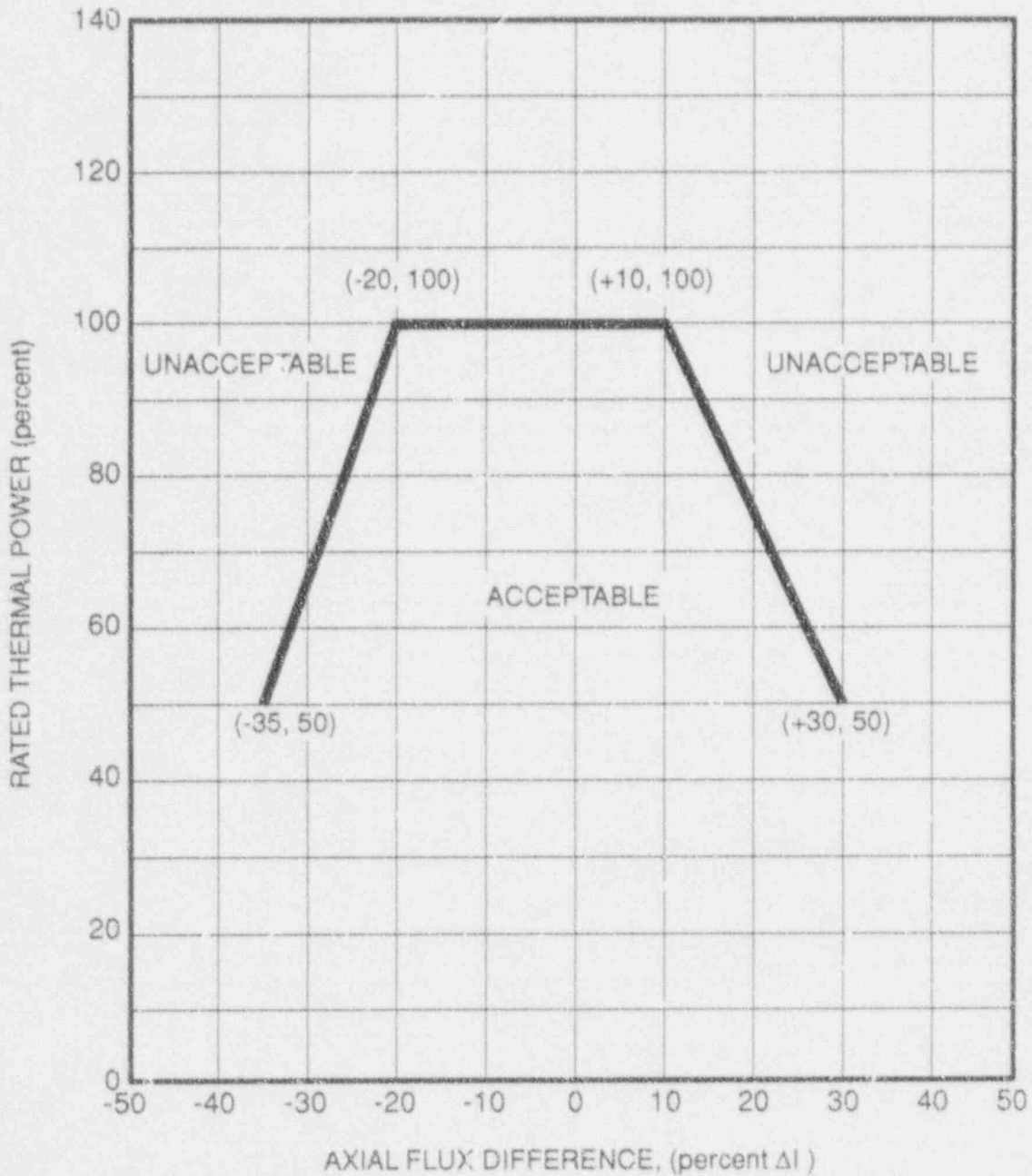


FIGURE 4

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

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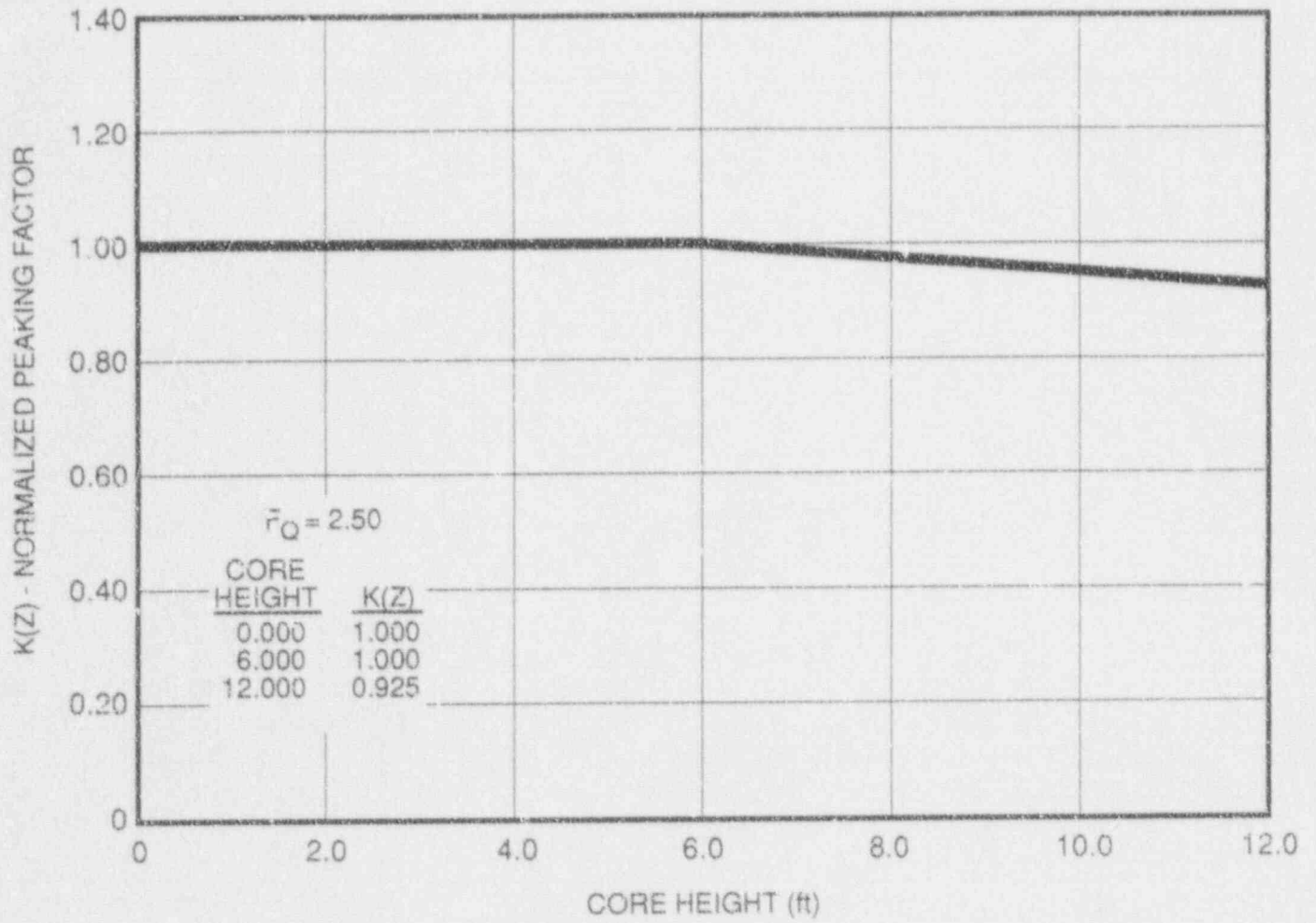


FIGURE 5

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

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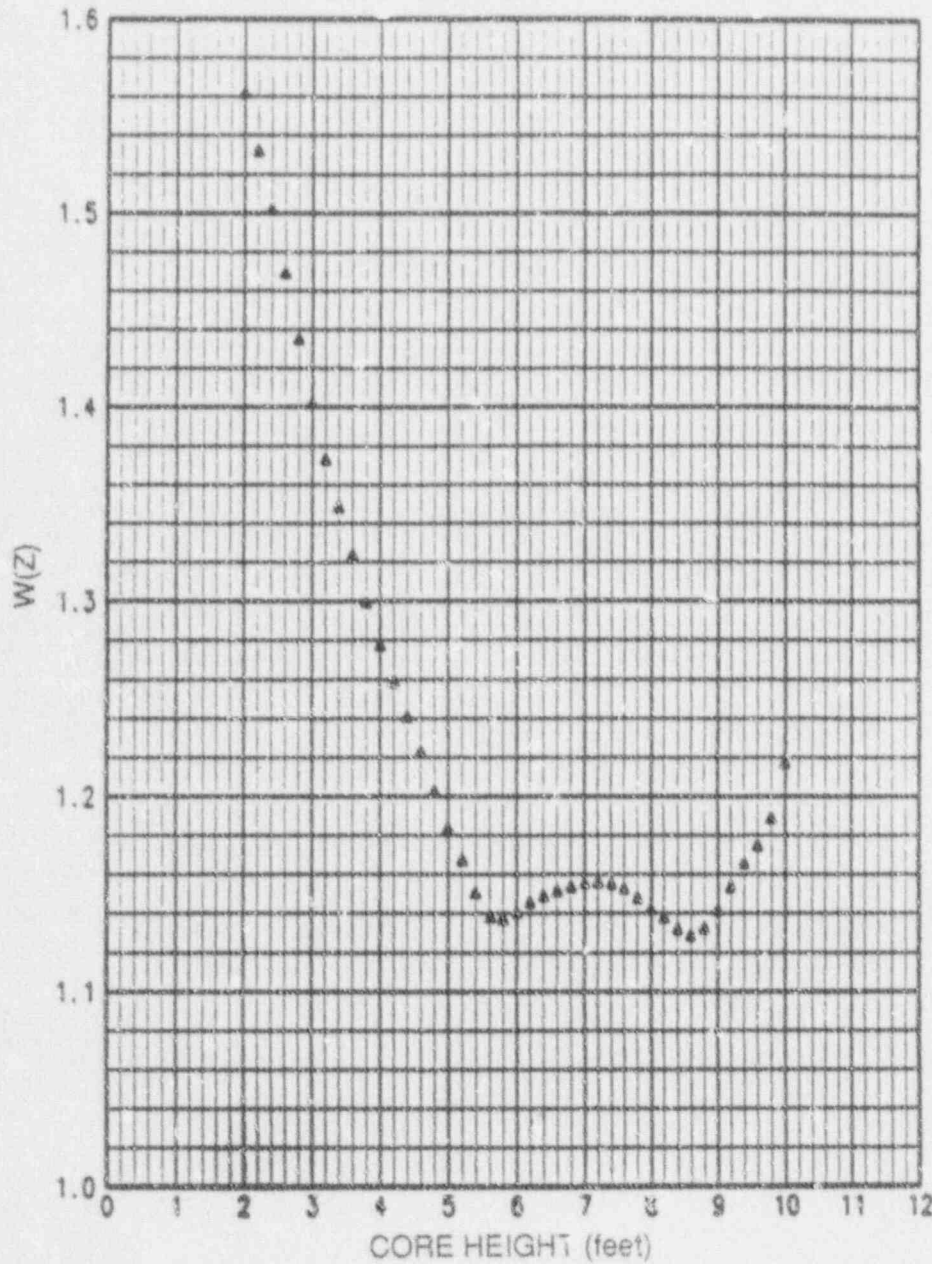


FIGURE 6
RAOC W(Z) AT 150 MWD/MTU

Axial Point	Elevation (feet)	COL 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	1.2177
*	12	9.80	1.1892
*	13	9.60	1.1750
*	14	9.40	1.1660
*	15	9.20	1.1540
*	16	9.00	1.1421
*	17	8.80	1.1329
*	18	8.60	1.1289
*	19	8.40	1.1324
*	20	8.20	1.1382
*	21	8.00	1.1428
*	22	7.80	1.1483
*	23	7.60	1.1531
*	24	7.40	1.1556
*	25	7.20	1.1566
*	26	7.00	1.1559
*	27	6.80	1.1540
*	28	6.60	1.1520
*	29	6.40	1.1496
*	30	6.20	1.1461
*	31	6.00	1.1412
*	32	5.80	1.1373
*	33	5.60	1.1388
*	34	5.40	1.1510
*	35	5.20	1.1677
*	36	5.00	1.1841
*	37	4.80	1.2031
*	38	4.60	1.2230
*	39	4.40	1.2414
*	40	4.20	1.2591
*	41	4.00	1.2779
*	42	3.80	1.2997
*	43	3.60	1.3240
*	44	3.40	1.3487
*	45	3.20	1.3734
*	46	3.00	1.4026
*	47	2.80	1.4355
*	48	2.60	1.4696
*	49	2.40	1.5019
*	50	2.20	1.5326
*	51	2.00	1.5625
*	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 Technical Specifications 4.2.2.2d, B3/4.2.2

* Top and Bottom 15% Excluded per Technical Specification 4.2.2.2

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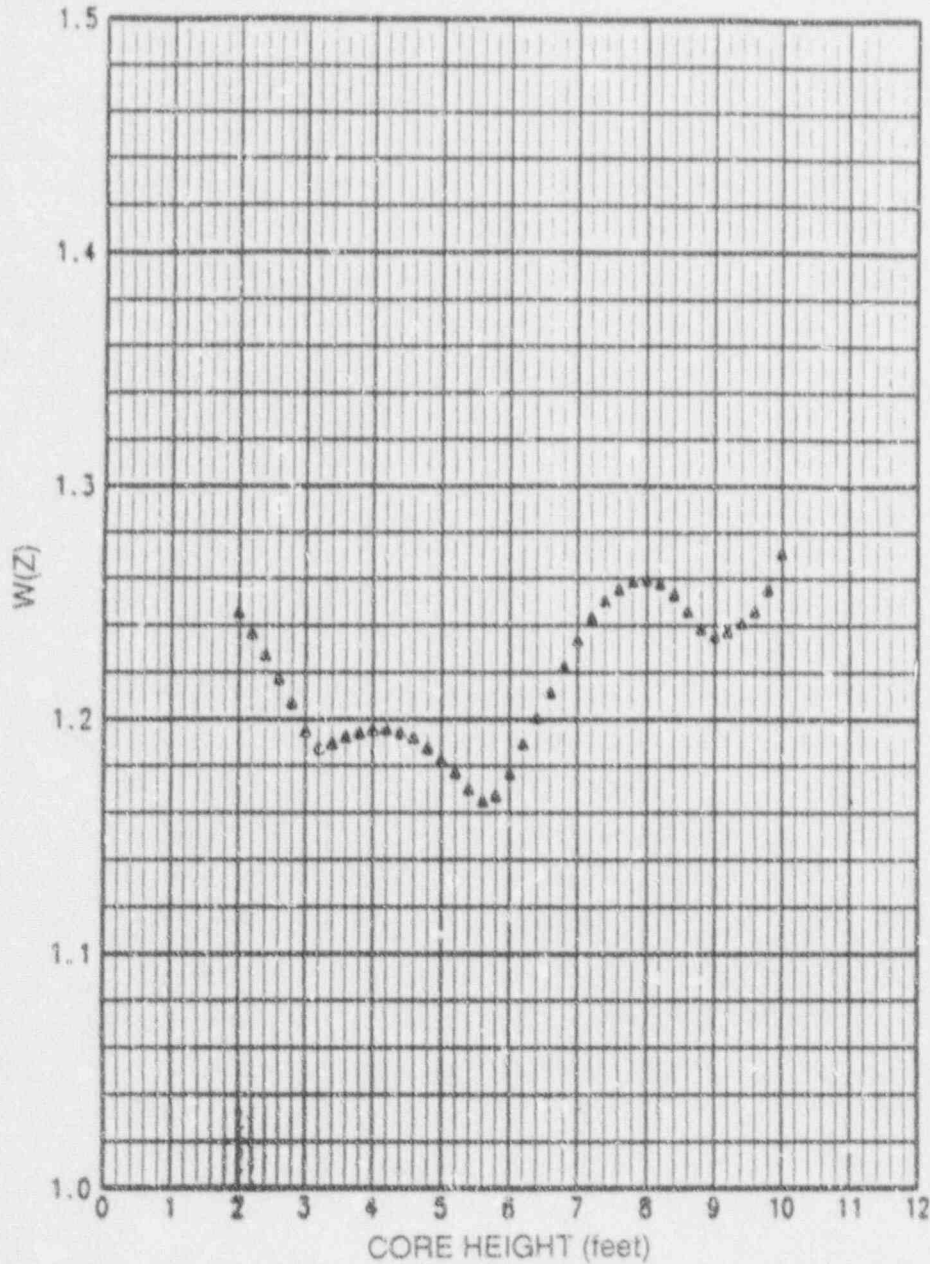


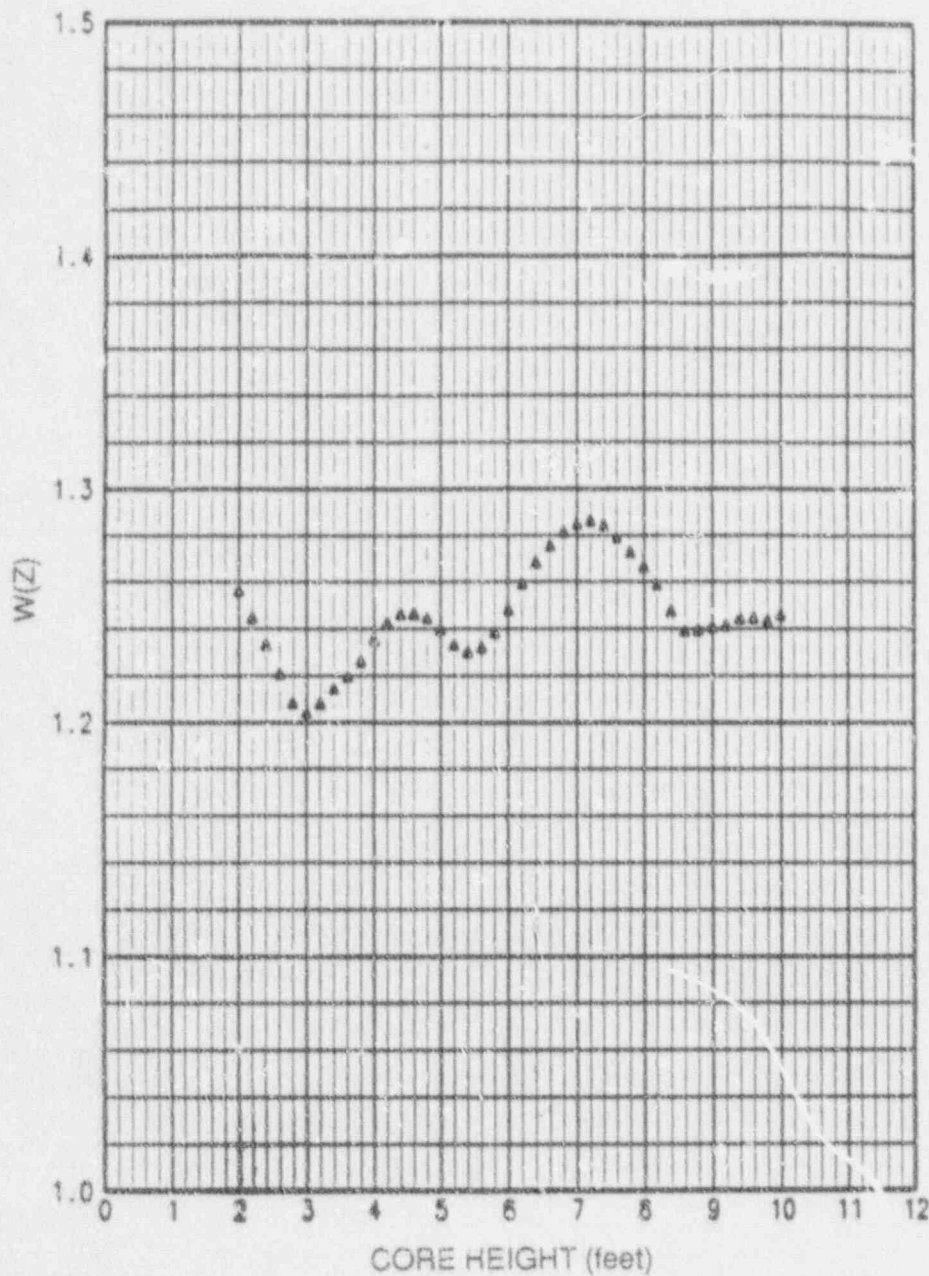
FIGURE 7
RAOC W(Z) AT 8000 MWD/MTU

Axial Point	Elevation (feet)	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	1.2713
12	9.80	1.2557
13	9.60	1.2464
14	9.40	1.2414
15	9.20	1.2377
16	9.00	1.2358
17	8.80	1.2386
18	8.60	1.2462
19	8.40	1.2534
20	8.20	1.2580
21	8.00	1.2597
22	7.80	1.2589
23	7.60	1.2558
24	7.40	1.2507
25	7.20	1.2436
26	7.00	1.2341
27	6.80	1.2228
28	6.60	1.2116
29	6.40	1.2009
30	6.20	1.1899
31	6.00	1.1773
32	5.80	1.1677
33	5.60	1.1654
34	5.40	1.1705
35	5.20	1.1776
36	5.00	1.1829
37	4.80	1.1880
38	4.60	1.1923
39	4.40	1.1946
40	4.20	1.1960
41	4.00	1.1959
42	3.80	1.1945
43	3.60	1.1928
44	3.40	1.1900
45	3.20	1.1880
46	3.00	1.1952
47	2.80	1.2071
48	2.60	1.2176
49	2.40	1.2275
50	2.20	1.2369
51	2.00	1.2459
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 Technical Specifications 4.2.2.2d, B3/4.2.2

* Top and Bottom 15% Excluded per Technical Specification 4.2.2.2

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Axial Point	Elevation (feet)	COL #12	
*	1	12.00	1.0000
*	2	11.80	1.0000
*	3	11.60	1.0070
*	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	1.2464
	12	9.80	1.2436
	13	9.60	1.2449
	14	9.40	1.2446
	15	9.20	1.2470
	16	9.00	1.2412
	17	8.80	1.2399
	18	8.60	1.2394
	19	8.40	1.2479
	20	8.20	1.2590
	21	8.00	1.2668
	22	7.80	1.2731
	23	7.60	1.2792
	24	7.40	1.2845
	25	7.20	1.2865
	26	7.00	1.2853
	27	6.80	1.2817
	28	6.60	1.2759
	29	6.40	1.2685
	30	6.20	1.2595
	31	6.00	1.2486
	32	5.80	1.2388
	33	5.60	1.2326
	34	5.40	1.2304
	35	5.20	1.2334
	36	5.00	1.2402
	37	4.80	1.2449
	38	4.60	1.2468
	39	4.40	1.2466
	40	4.20	1.2430
	41	4.00	1.2356
	42	3.80	1.2262
	43	3.60	1.2200
	44	3.40	1.2147
	45	3.20	1.2084
	46	3.00	1.2046
	47	2.80	1.2086
	48	2.60	1.2211
	49	2.40	1.2335
	50	2.20	1.2449
	51	2.00	1.2568
*	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

FIGURE 8
RAOC W(Z) AT 16000 MWD/MTU

This figure is referred to by Technical Specifications 4.2.2.2d, B3/4.2.2

* Top and Bottom 15% Excluded per Technical Specification 4.2.2.2