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June 16, 2000

U.S. Nuclear Regulatory Commission
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Gentlemen: ULNRC-04268

CALLAWAY PLANT
DOCKET NUMBER 50-483
CORE OPERATING LIMITS REPORT
Reference: ULNRC-04145, dated November 4, 1999

Appendix A, Revision 2 to the Callaway Plant Cycle 11 Core Operating Limits Report (COLR) is attached. The COLR was originally transmitted as an attachment to the letter referenced above. Revision 1 was inadvertently not transmitted to the NRC. Revision 1 updated the COLR to be consistent with the Improved Technical Specifications. Under Section 2.2 "Moderator Temperature Coefficient", subsection 2.2.3 "The MTC 60 ppm surveillance limit is –45.1 pcm/°F (all rods withdrawn, Rated Thermal Power condition)" was added.

In Revision 2, the COLR has been revised in order to provide additional W(z) values. Figures 9 through 12, and Figures 13 through 16, are applicable to measured axial offsets within ±3% of (measured – predicted) axial offset differences of –3.9% and –9.0%, respectively. In addition, the F_Q^{RTP} limit of 2.45 for Cycle 11 is increased to 2.50 for core average burnups of 8000 MWD/MTU and greater. Revision 2 incorporates Revision 1.

The conclusions of the Cycle 11 Final Reload Safety Evaluation remain valid. Revision 2 is hereby submitted per Improved Technical Specification 5.6.5.d. If you have any questions concerning this report, please contact us.

Very truly yours,

Alan C. Passwater
Manager-Corporate Nuclear Services

DJW/jdg
Attachment

A001

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Appendix A

CALLAWAY CYCLE 11

CORE OPERATING LIMITS REPORT

(Revision 2)

May, 2000

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for Callaway Plant Cycle 11 has been prepared in accordance with the requirements of Technical Specification 5.6.5.

The Core Operating Limits affecting the following Technical Specifications are included in this report.

3.1.1, 3.1.4, 3.1.5, 3.1.6, 3.1.8	Shutdown Margin
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
3.2.2	Nuclear Enthalpy Rise Hot Channel Factor
3.2.3	Axial Flux Difference

2.0 OPERATING LIMITS

The cycle-specific parameter limits for the specifications listed in Section 1.0 are presented in the subsections which follow. These limits have been developed using the NRC-approved methodologies specified in Technical Specification 5.6.5.

2.1 Shutdown Margin
(Specifications 3.1.1, 3.1.4, 3.1.5, 3.1.6, and 3.1.8)

2.1.1 The Shutdown Margin in MODES 1-4 shall be greater than or equal to 1.3% Δk/k.

2.1.2 The Shutdown Margin in MODE 5 shall be greater than or equal to 1.0% Δk/k.

2.2 Moderator Temperature Coefficient
(Specification 3.1.3)

2.2.1 The Moderator Temperature Coefficient shall be less positive than the limits shown in Figure 1. These limits shall be referred to as upper limit.

The Moderator Temperature Coefficient shall be less negative than -47.9 pcm/°F. This limit shall be referred to as the lower limit.

2.2.2 The MTC 300 ppm surveillance limit is -40.4 pcm/°F (all rods withdrawn, Rated Thermal Power condition).

2.2.3 The MTC 60 ppm surveillance limit is -45.1 pcm/°F (all rods withdrawn, Rated Thermal Power condition).

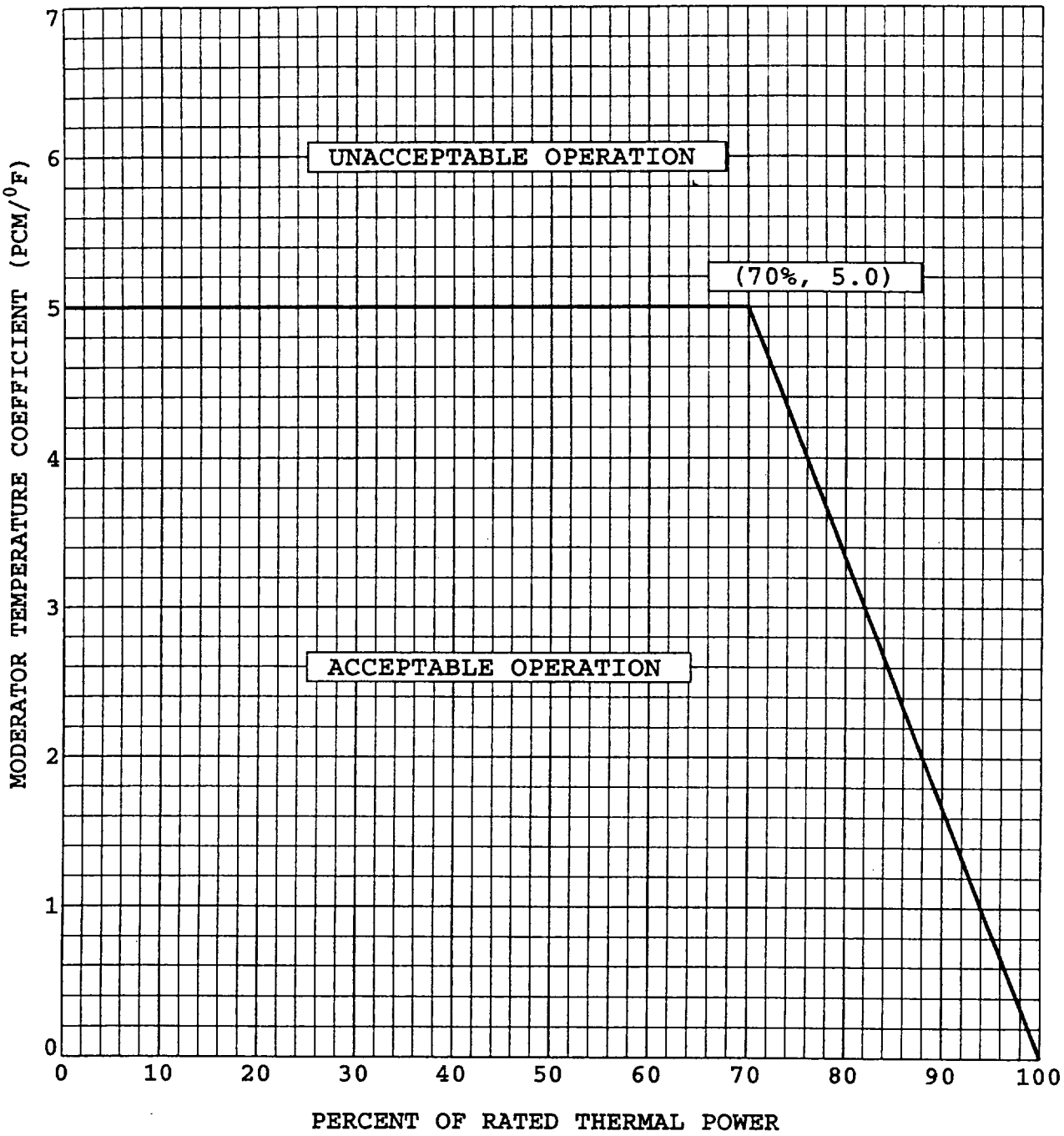


Figure 1

Callaway Cycle 11
Moderator Temperature Coefficient
Versus Power Level

2.3 Shutdown Bank Insertion Limits
(Specification 3.1.5)

The shutdown banks shall be withdrawn to at least 225 steps.

2.4 Control Bank Insertion Limits
(Specification 3.1.6)

2.4.1 Control Bank insertion limits are specified by Figure 2.

2.4.2 Control Bank withdrawal sequence is A-B-C-D. The insertion sequence is the reverse of the withdrawal sequence.

2.4.3 The difference between each sequential Control Bank position is 115 steps when not fully inserted and not fully withdrawn.

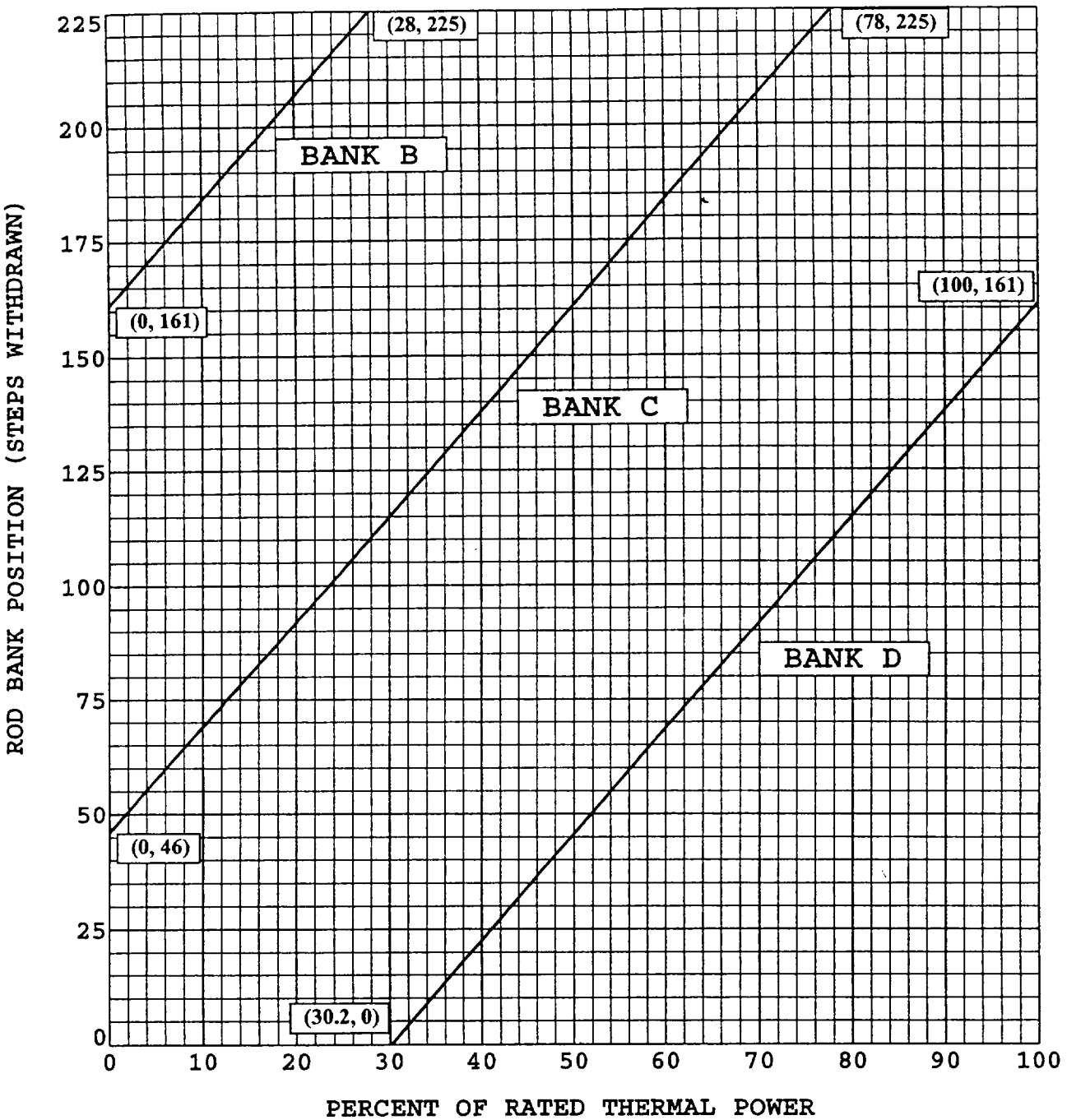


Figure 2

Callaway Cycle 11
Rod Bank Insertion Limits
Versus Rated Thermal Power - Four Loop Operation

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

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

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

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

2.5.1 F_Q^{RTP} = 2.45 for Cycle 11 core average burnups between 0 and 8000 MWD/MTU, and F_Q^{RTP} = 2.50 for Cycle 11 core average burnups between 8000 and 22450 MWD/MTU.

2.5.2 K(Z) is provided in Figure 3.

2.5.3 The W(z) functions that are to be used in Technical Specification 3.2.1 and Surveillance Requirement 3.2.1.2 for determining $F_Q^W(z)$ are shown in Figures 4 through 8.

The W(z) values have been determined for several burnups up to 18000 MWD/MTU in Cycle 11. This permits determination of W(z) at any cycle burnup up to 18000 MWD/MTU through the use of three point interpolation. For cycle burnups greater than 18000 MWD/MTU, use of 18000 MWD/MTU W(z) values without interpolation or extrapolation is conservative. The W(z) values were determined assuming Cycle 11 operates with RAOC strategy. Also included is a W(z) function that bounds the W(z) Curve for all Cycle 11 burnups. Use of the bounding W(z) curve will be conservative for any Cycle 11 burnup; however, additional margin may be gained by using the burnup dependent W(z) values.

W(z) values have also been determined for a range of measured axial offset values for Cycle 11. For measured axial offset values within ±3% of the predicted axial offset value, Figures 4 through 8 are applicable. Additional W(z) values are provided in Figures 9 through 12 applicable to measured axial offsets within ±3% of a [measured – predicted] axial offset difference of –3.9%. Figures 13 through 16 provide W(z) values applicable to measured axial offsets within ±3% of a [measured – predicted] axial offset difference of –9.0%. For purposes of burnup interpolation, a consistent set of W(z) values should be used based on the difference between measured and predicted axial offset. The W(z) set selected could be either the set closest to the actual [measured – predicted] axial offset difference, or a consistent set derived by linear interpolation on the [measured – predicted] axial offset differences between two of the W(z) sets closest to the actual [measured – predicted] axial offset difference.

The W(z) values are provided for 73 axial points within the core height boundaries of 0 and 12 feet at intervals of 0.167 feet.

Table A.1 shows the burnup dependent F_Q penalty factors for Cycle 11. These values shall be used to increase $F_Q{}^W(z)$ when required by Technical Specification Surveillance Requirement 3.2.1.2. A 2% penalty factor should be used at all cycle burnups that are outside the range of Table A.1.

TABLE A.1

F_Q PENALTY FACTORS AS A FUNCTION OF CYCLE BURNUP

Cycle 11 Burnup	$F_Q^W(z)$ Penalty Factor (%)
837 MWD/MTU	3.79
1009 MWD/MTU	3.73
1181 MWD/MTU	3.54
1353 MWD/MTU	3.26
1524 MWD/MTU	2.89
1696 MWD/MTU	2.49
1868 MWD/MTU	2.09

Note: All cycle burnups not in the range of the above table shall use a 2.0% penalty factor for compliance with Surveillance Requirement 3.2.1.2.

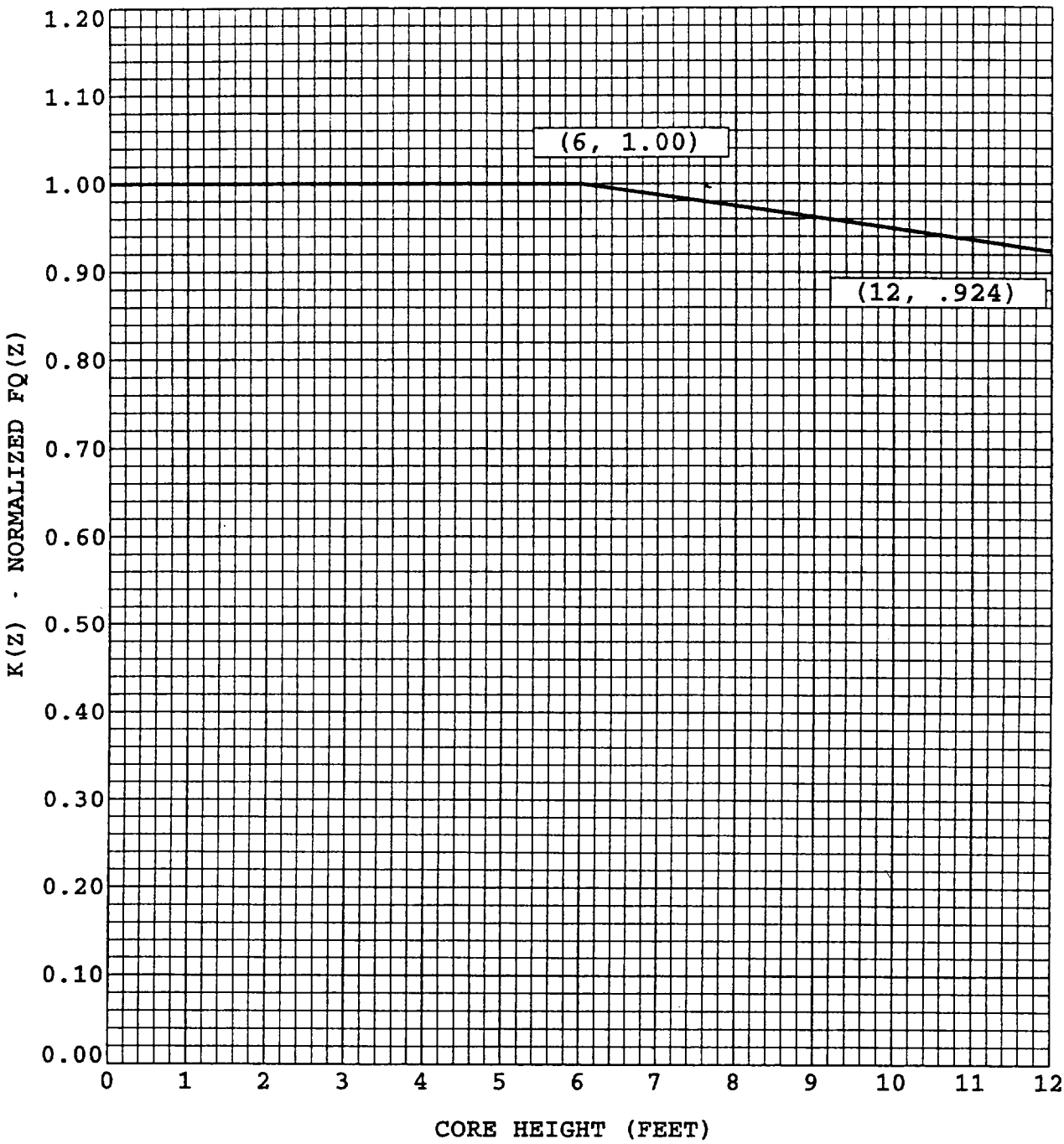
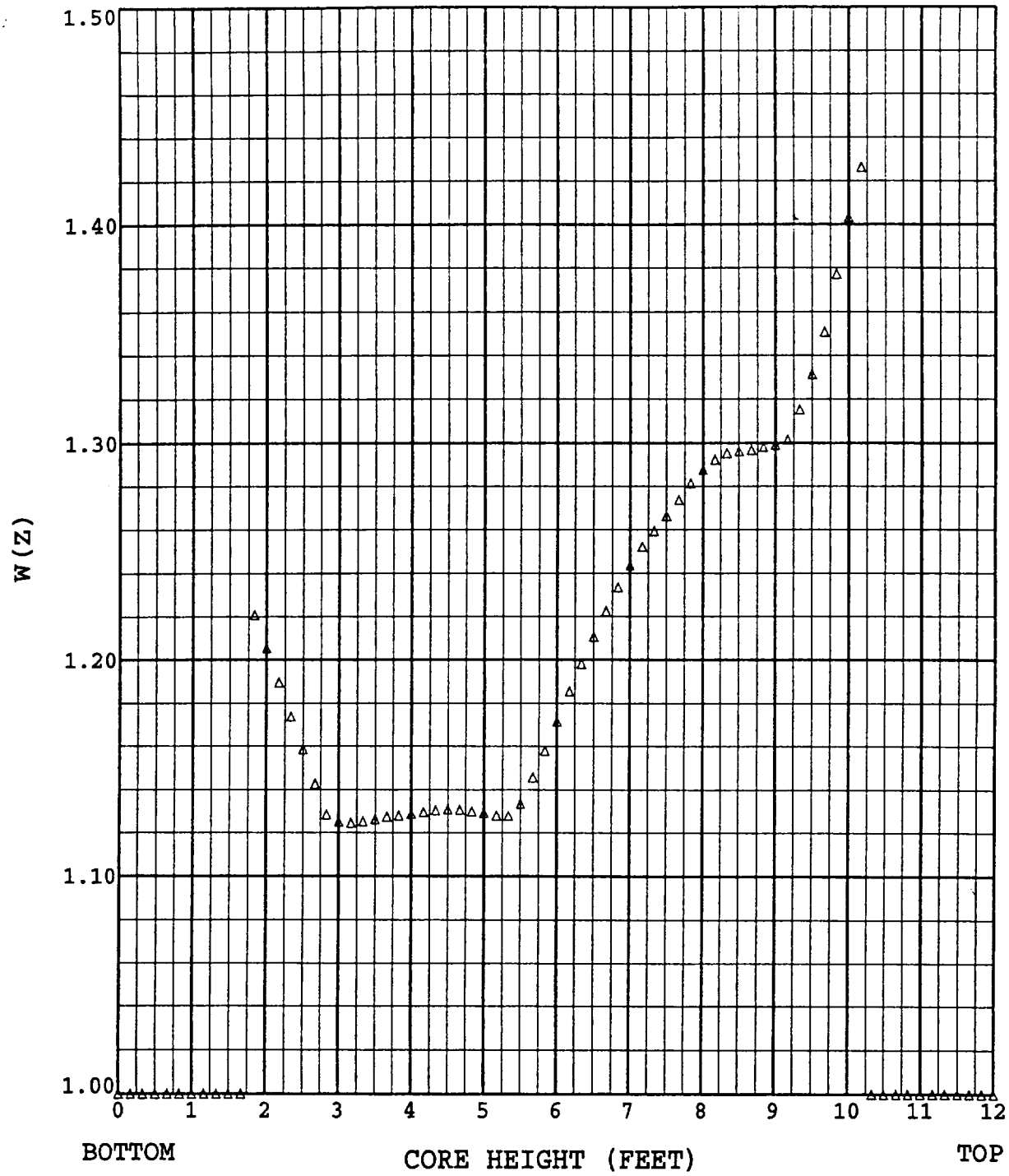


Figure 3

Callaway Cycle 11
K(z) - Normalized $F_Q(z)$
As a Function of Core Height

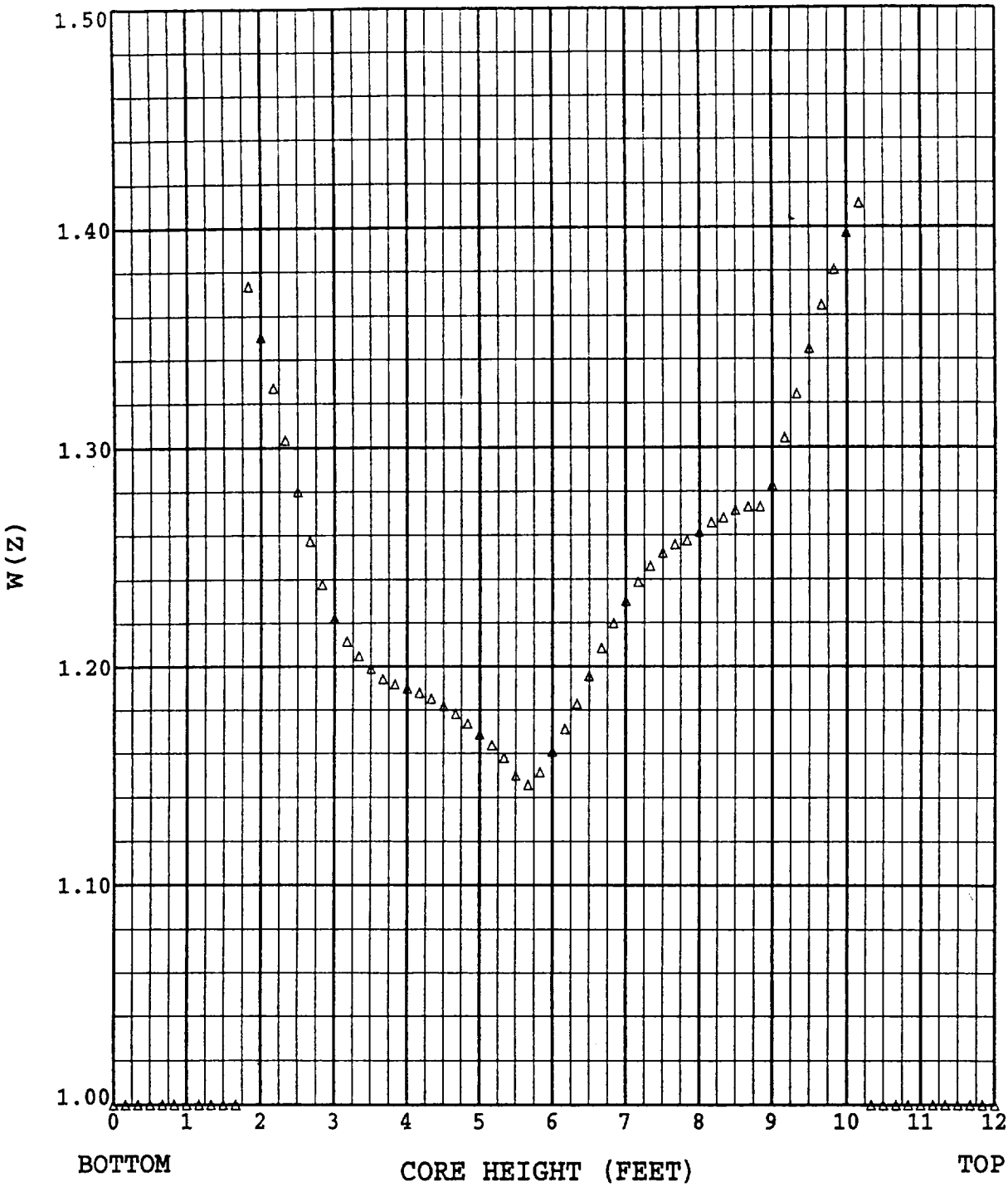


	HEIGHT (FEET)	150. W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.2209
	2.000	1.2054
	2.167	1.1896
	2.333	1.1739
	2.500	1.1585
	2.667	1.1427
	2.833	1.1284
	3.000	1.1252
	3.167	1.1247
	3.333	1.1253
	3.500	1.1263
	3.667	1.1274
	3.833	1.1280
	4.000	1.1288
	4.167	1.1297
	4.333	1.1305
	4.500	1.1309
	4.667	1.1307
	4.833	1.1299
	5.000	1.1293
	5.167	1.1280
	5.333	1.1279
	5.500	1.1335
	5.667	1.1456
	5.833	1.1579
	6.000	1.1716
	6.167	1.1855
	6.333	1.1982
	6.500	1.2105
	6.667	1.2224
	6.833	1.2335
	7.000	1.2436
	7.167	1.2522
	7.333	1.2593
	7.500	1.2663
	7.667	1.2737
	7.833	1.2814
	8.000	1.2877
	8.167	1.2923
	8.333	1.2954
	8.500	1.2963
	8.667	1.2968
	8.833	1.2983
	9.000	1.2992
	9.167	1.3016
	9.333	1.3153
	9.500	1.3314
	9.667	1.3508
	9.833	1.3771
	10.000	1.4032
	10.167	1.4262
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 4

Callaway Cycle 11
W(z) at 150 MWD/MTU

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2

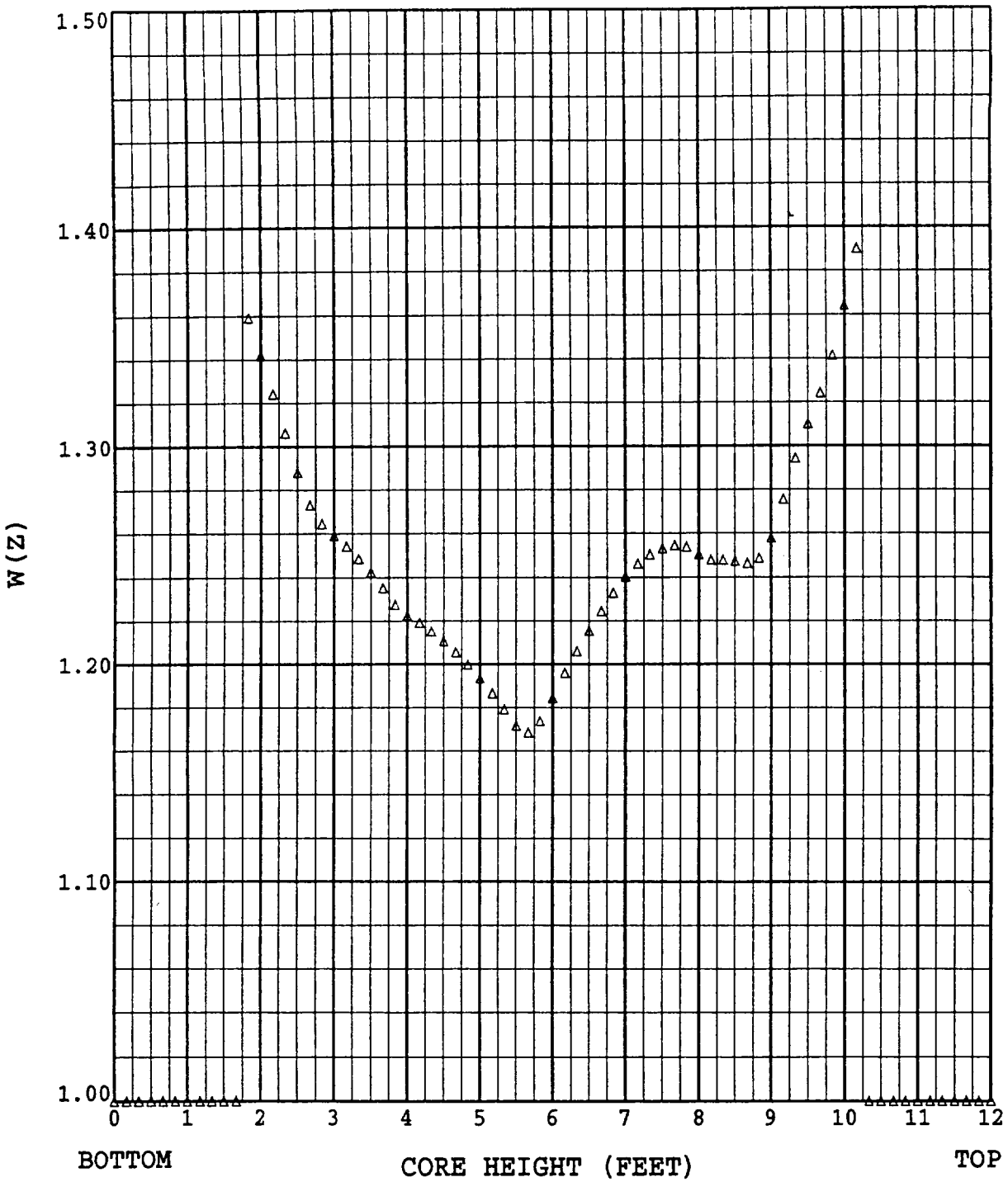


	HEIGHT (FEET)	4000. W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.3734
	2.000	1.3504
	2.167	1.3270
	2.333	1.3036
	2.500	1.2799
	2.667	1.2573
	2.833	1.2377
	3.000	1.2221
	3.167	1.2114
	3.333	1.2047
	3.500	1.1990
	3.667	1.1943
	3.833	1.1918
	4.000	1.1899
	4.167	1.1878
	4.333	1.1852
	4.500	1.1819
	4.667	1.1782
	4.833	1.1739
	5.000	1.1689
	5.167	1.1637
	5.333	1.1580
	5.500	1.1499
	5.667	1.1457
	5.833	1.1515
	6.000	1.1609
	6.167	1.1714
	6.333	1.1828
	6.500	1.1956
	6.667	1.2084
	6.833	1.2197
	7.000	1.2298
	7.167	1.2387
	7.333	1.2460
	7.500	1.2519
	7.667	1.2557
	7.833	1.2575
	8.000	1.2613
	8.167	1.2657
	8.333	1.2679
	8.500	1.2713
	8.667	1.2729
	8.833	1.2728
	9.000	1.2827
	9.167	1.3043
	9.333	1.3240
	9.500	1.3446
	9.667	1.3643
	9.833	1.3805
	10.000	1.3973
	10.167	1.4107
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 5

Callaway Cycle 11
W(z) at 4000 MWD/MTU

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2

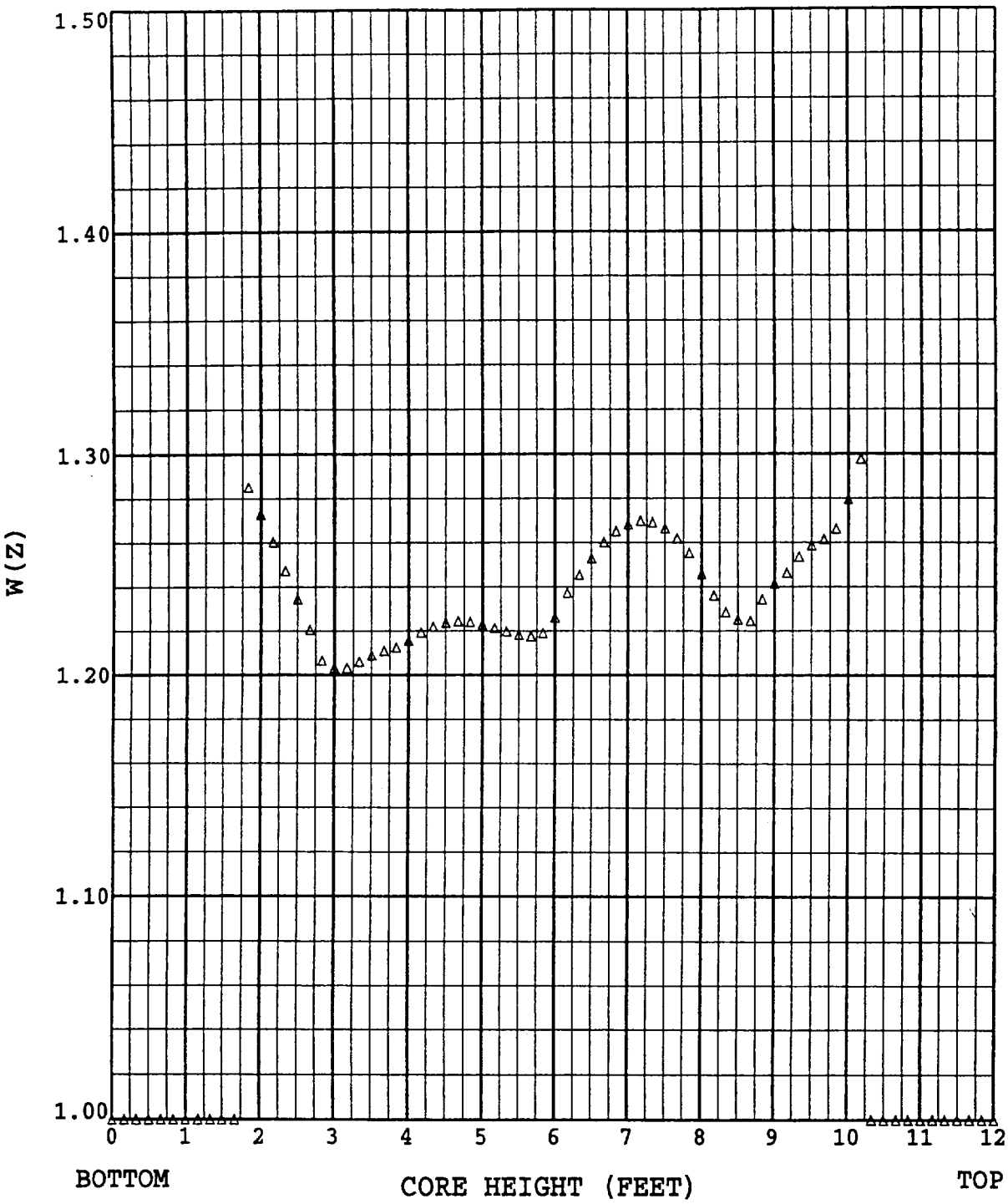


	HEIGHT (FEET)	10000. W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.3592
	2.000	1.3419
	2.167	1.3242
	2.333	1.3063
	2.500	1.2880
	2.667	1.2731
	2.833	1.2644
	3.000	1.2591
	3.167	1.2542
	3.333	1.2486
	3.500	1.2424
	3.667	1.2353
	3.833	1.2275
	4.000	1.2225
	4.167	1.2192
	4.333	1.2152
	4.500	1.2106
	4.667	1.2055
	4.833	1.1998
	5.000	1.1935
	5.167	1.1866
	5.333	1.1792
	5.500	1.1717
	5.667	1.1686
	5.833	1.1739
	6.000	1.1844
	6.167	1.1960
	6.333	1.2060
	6.500	1.2154
	6.667	1.2244
	6.833	1.2329
	7.000	1.2402
	7.167	1.2461
	7.333	1.2504
	7.500	1.2532
	7.667	1.2544
	7.833	1.2539
	8.000	1.2506
	8.167	1.2479
	8.333	1.2479
	8.500	1.2473
	8.667	1.2464
	8.833	1.2488
	9.000	1.2578
	9.167	1.2756
	9.333	1.2944
	9.500	1.3101
	9.667	1.3243
	9.833	1.3414
	10.000	1.3642
	10.167	1.3900
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 6

Callaway Cycle 11
W(z) at 10000 MWD/MTU

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2

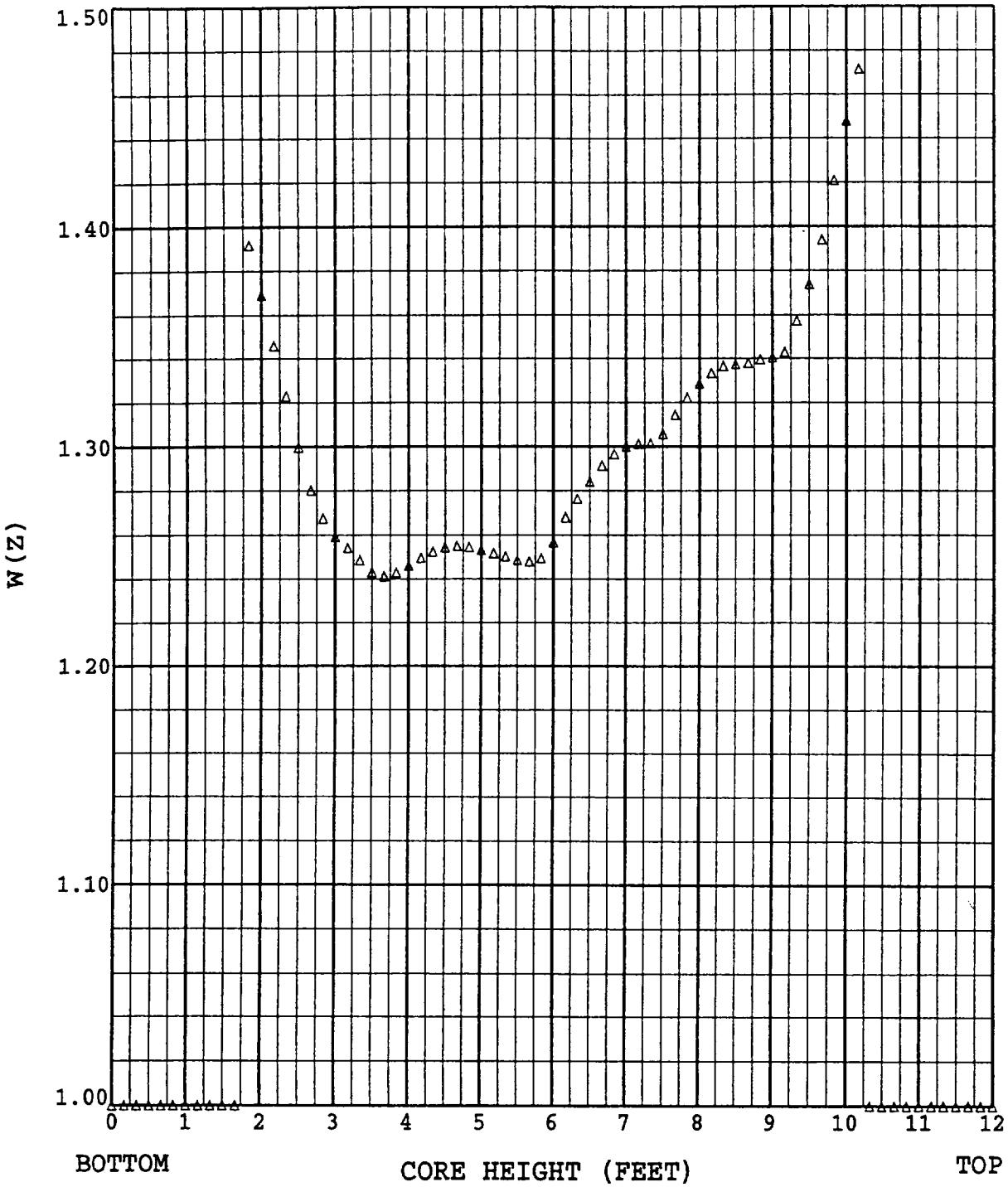


	HEIGHT (FEET)	18000. W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.2851
	2.000	1.2729
	2.167	1.2602
	2.333	1.2473
	2.500	1.2346
	2.667	1.2206
	2.833	1.2065
	3.000	1.2032
	3.167	1.2031
	3.333	1.2061
	3.500	1.2090
	3.667	1.2110
	3.833	1.2125
	4.000	1.2156
	4.167	1.2193
	4.333	1.2220
	4.500	1.2238
	4.667	1.2245
	4.833	1.2242
	5.000	1.2229
	5.167	1.2213
	5.333	1.2199
	5.500	1.2184
	5.667	1.2176
	5.833	1.2191
	6.000	1.2262
	6.167	1.2373
	6.333	1.2454
	6.500	1.2530
	6.667	1.2601
	6.833	1.2651
	7.000	1.2683
	7.167	1.2697
	7.333	1.2691
	7.500	1.2664
	7.667	1.2618
	7.833	1.2553
	8.000	1.2459
	8.167	1.2361
	8.333	1.2286
	8.500	1.2252
	8.667	1.2246
	8.833	1.2344
	9.000	1.2415
	9.167	1.2463
	9.333	1.2536
	9.500	1.2587
	9.667	1.2615
	9.833	1.2662
	10.000	1.2796
	10.167	1.2976
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 7

Callaway Cycle 11
W(z) at 18000 MWD/MTU

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2

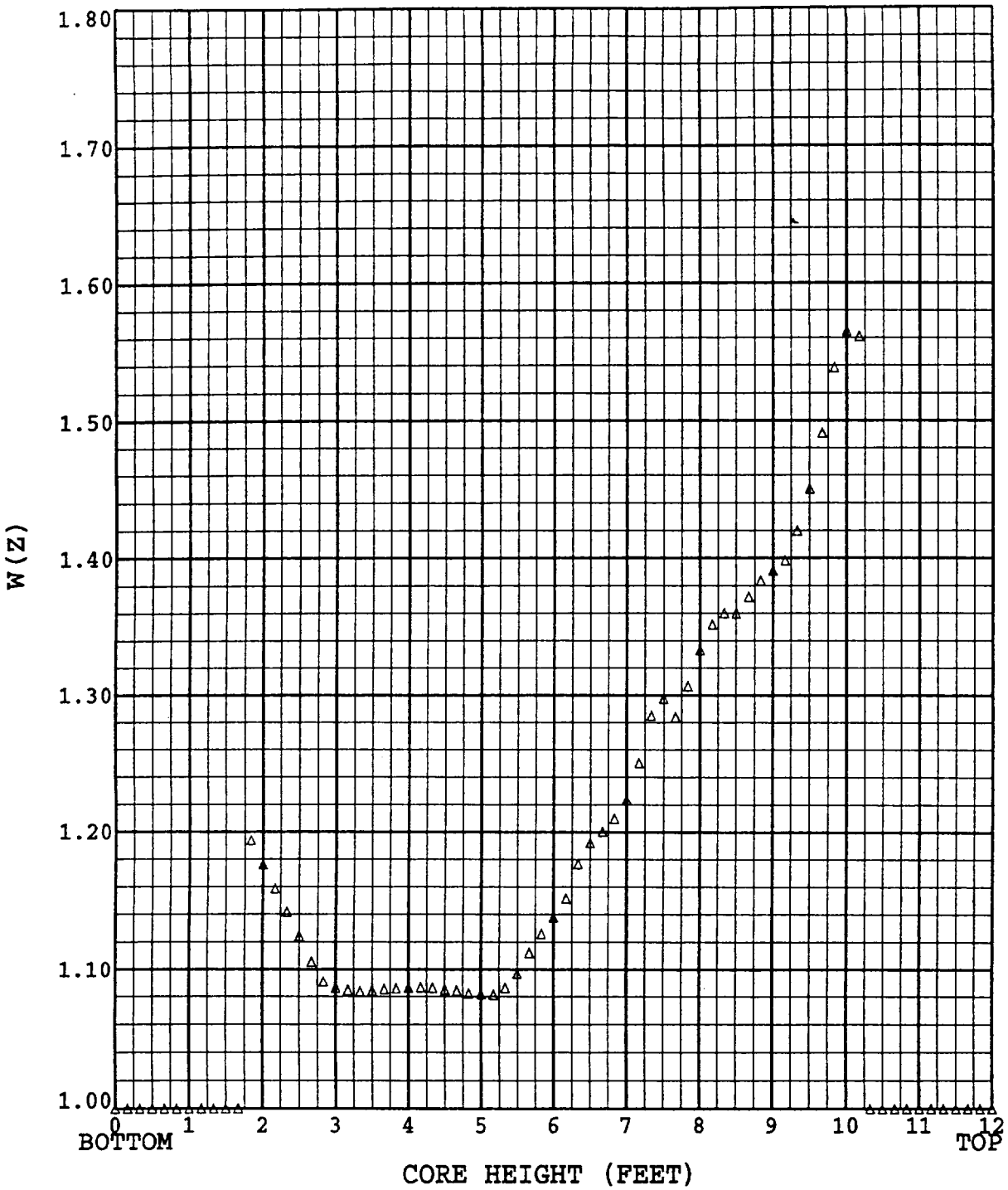


	HEIGHT (FEET)	MAX W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.3915
	2.000	1.3690
	2.167	1.3460
	2.333	1.3230
	2.500	1.2996
	2.667	1.2802
	2.833	1.2675
	3.000	1.2592
	3.167	1.2542
	3.333	1.2486
	3.500	1.2431
	3.667	1.2412
	3.833	1.2429
	4.000	1.2460
	4.167	1.2496
	4.333	1.2524
	4.500	1.2543
	4.667	1.2550
	4.833	1.2546
	5.000	1.2533
	5.167	1.2517
	5.333	1.2503
	5.500	1.2487
	5.667	1.2479
	5.833	1.2495
	6.000	1.2567
	6.167	1.2681
	6.333	1.2764
	6.500	1.2842
	6.667	1.2914
	6.833	1.2966
	7.000	1.3000
	7.167	1.3012
	7.333	1.3015
	7.500	1.3057
	7.667	1.3144
	7.833	1.3222
	8.000	1.3286
	8.167	1.3334
	8.333	1.3366
	8.500	1.3375
	8.667	1.3380
	8.833	1.3396
	9.000	1.3405
	9.167	1.3430
	9.333	1.3572
	9.500	1.3737
	9.667	1.3938
	9.833	1.4208
	10.000	1.4478
	10.167	1.4715
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 8

Callaway Cycle 11
Bounding W(z)

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2

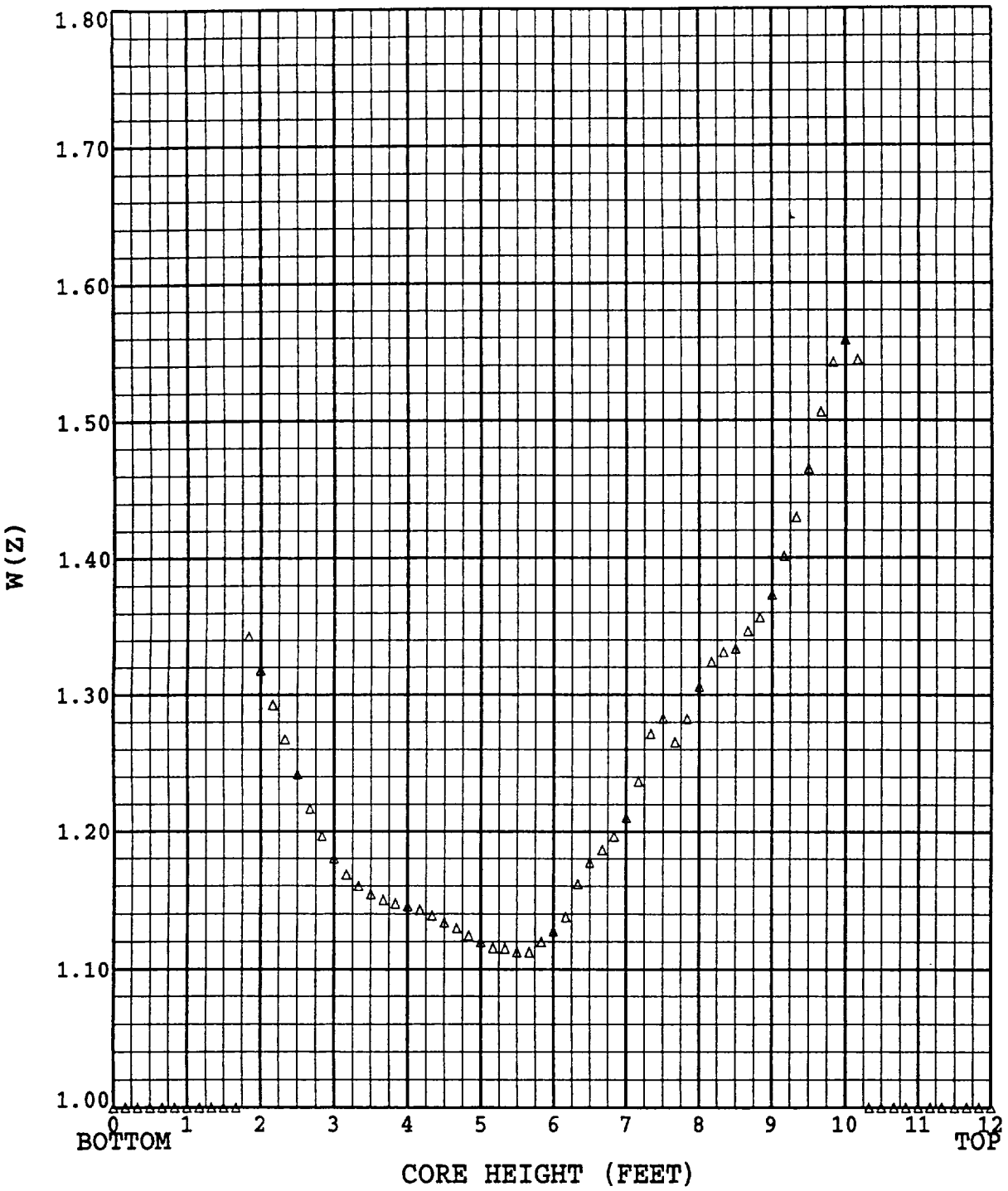


	HEIGHT (FEET)	150. W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.1939
	2.000	1.1762
	2.167	1.1587
	2.333	1.1415
	2.500	1.1241
	2.667	1.1057
	2.833	1.0908
	3.000	1.0863
	3.167	1.0845
	3.333	1.0836
	3.500	1.0842
	3.667	1.0854
	3.833	1.0859
	4.000	1.0865
	4.167	1.0867
	4.333	1.0862
	4.500	1.0850
	4.667	1.0842
	4.833	1.0824
	5.000	1.0817
	5.167	1.0813
	5.333	1.0861
	5.500	1.0969
	5.667	1.1124
	5.833	1.1260
	6.000	1.1380
	6.167	1.1514
	6.333	1.1766
	6.500	1.1920
	6.667	1.2001
	6.833	1.2098
	7.000	1.2237
	7.167	1.2504
	7.333	1.2851
	7.500	1.2973
	7.667	1.2838
	7.833	1.3067
	8.000	1.3332
	8.167	1.3518
	8.333	1.3600
	8.500	1.3599
	8.667	1.3719
	8.833	1.3837
	9.000	1.3908
	9.167	1.3983
	9.333	1.4201
	9.500	1.4503
	9.667	1.4911
	9.833	1.5386
	10.000	1.5649
	10.167	1.5609
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 9

Callaway Cycle 11
W(z) at 150 MWD/MTU (ΔAO= -3.9%)

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2

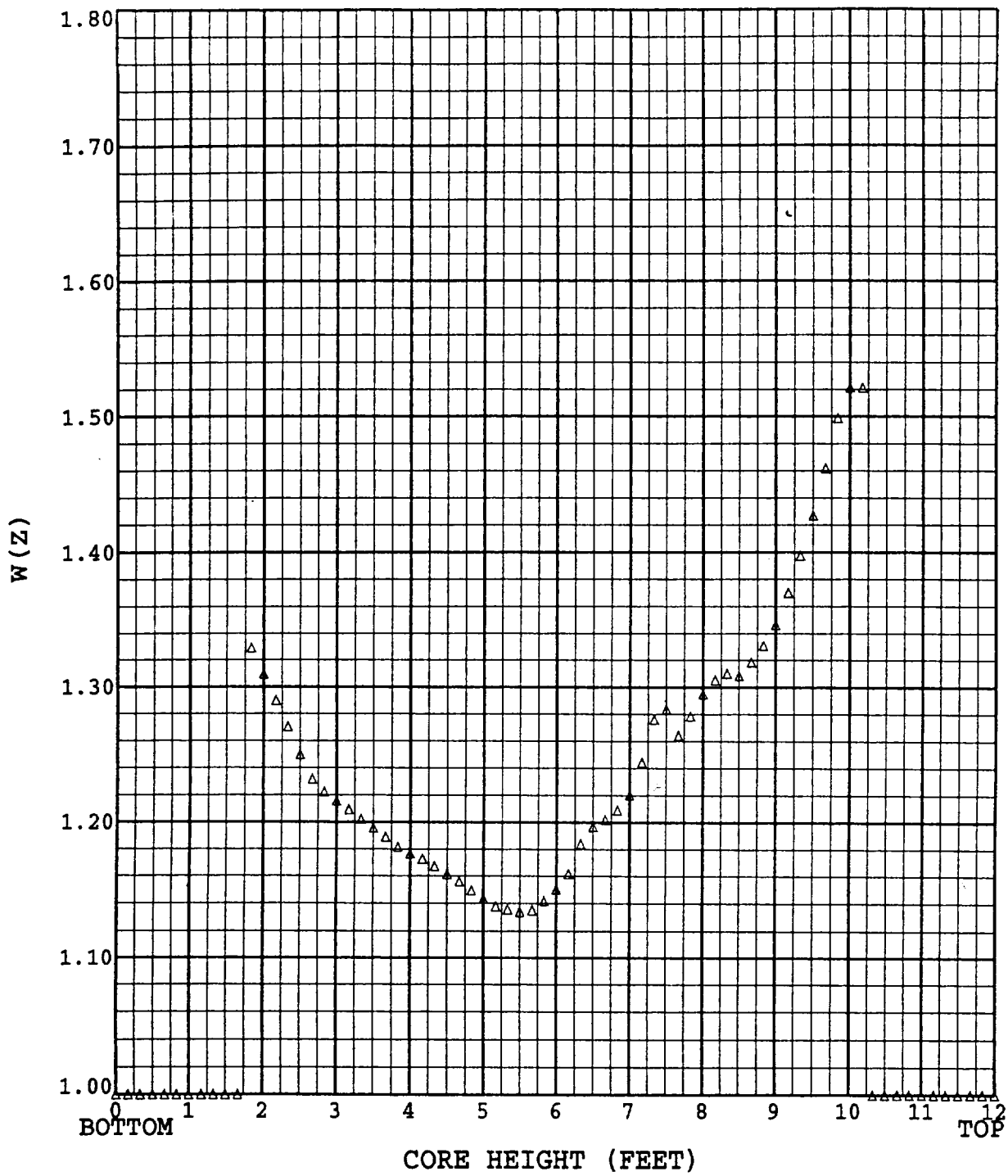


	HEIGHT (FEET)	4000. W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.3430
	2.000	1.3177
	2.167	1.2925
	2.333	1.2676
	2.500	1.2419
	2.667	1.2166
	2.833	1.1965
	3.000	1.1798
	3.167	1.1681
	3.333	1.1600
	3.500	1.1542
	3.667	1.1498
	3.833	1.1474
	4.000	1.1453
	4.167	1.1426
	4.333	1.1387
	4.500	1.1339
	4.667	1.1298
	4.833	1.1245
	5.000	1.1196
	5.167	1.1155
	5.333	1.1151
	5.500	1.1127
	5.667	1.1125
	5.833	1.1198
	6.000	1.1276
	6.167	1.1377
	6.333	1.1615
	6.500	1.1774
	6.667	1.1863
	6.833	1.1963
	7.000	1.2101
	7.167	1.2369
	7.333	1.2716
	7.500	1.2826
	7.667	1.2656
	7.833	1.2823
	8.000	1.3058
	8.167	1.3240
	8.333	1.3312
	8.500	1.3337
	8.667	1.3466
	8.833	1.3565
	9.000	1.3731
	9.167	1.4012
	9.333	1.4295
	9.500	1.4646
	9.667	1.5060
	9.833	1.5424
	10.000	1.5583
	10.167	1.5440
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 10

Callaway Cycle 11
W(z) at 4000 MWD/MTU (ΔAO= -3.9%)

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2

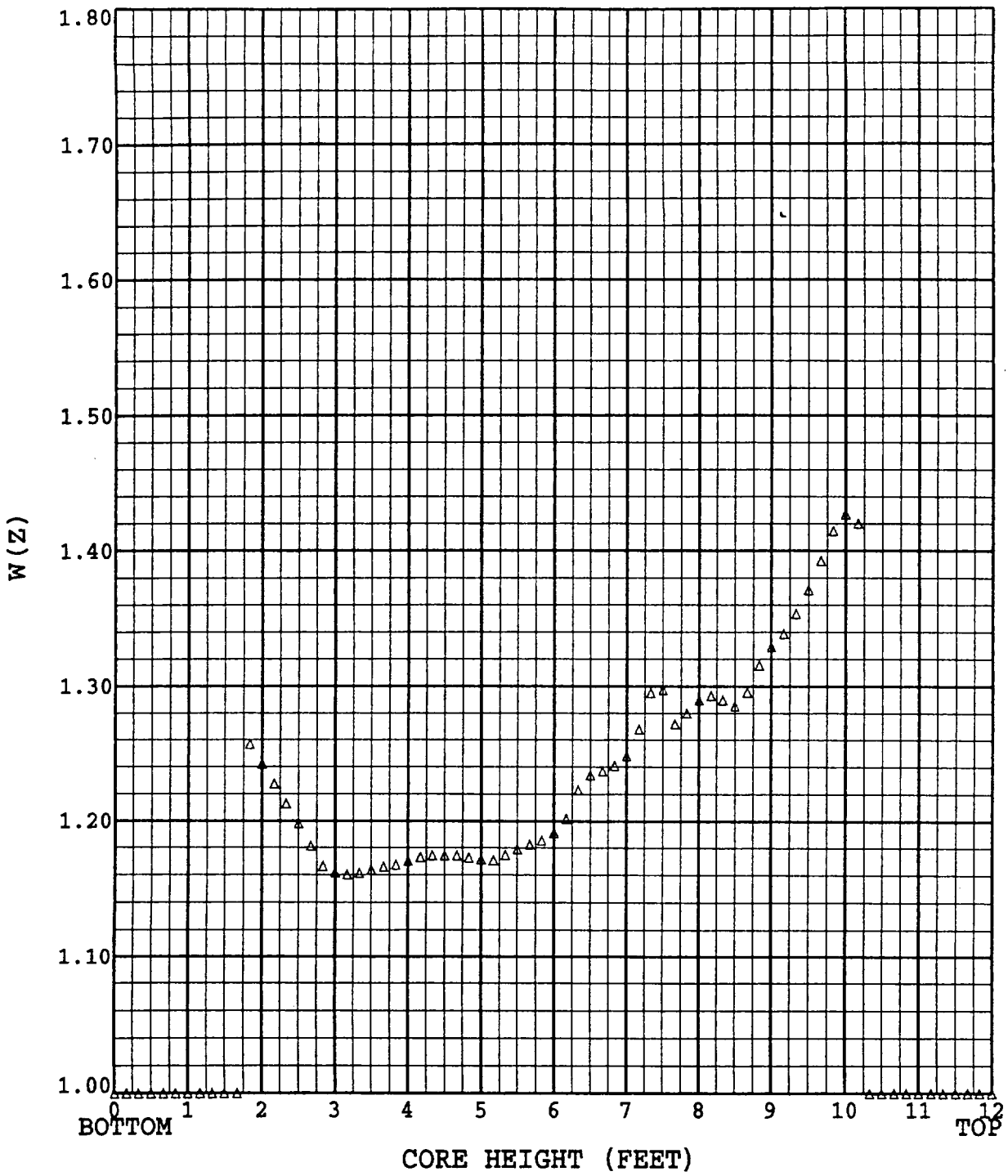


	HEIGHT (FEET)	10000. W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.3291
	2.000	1.3094
	2.167	1.2898
	2.333	1.2703
	2.500	1.2498
	2.667	1.2319
	2.833	1.2223
	3.000	1.2156
	3.167	1.2093
	3.333	1.2023
	3.500	1.1960
	3.667	1.1892
	3.833	1.1817
	4.000	1.1767
	4.167	1.1728
	4.333	1.1675
	4.500	1.1614
	4.667	1.1560
	4.833	1.1493
	5.000	1.1432
	5.167	1.1375
	5.333	1.1355
	5.500	1.1338
	5.667	1.1348
	5.833	1.1415
	6.000	1.1504
	6.167	1.1616
	6.333	1.1842
	6.500	1.1969
	6.667	1.2020
	6.833	1.2092
	7.000	1.2204
	7.167	1.2443
	7.333	1.2761
	7.500	1.2839
	7.667	1.2643
	7.833	1.2786
	8.000	1.2948
	8.167	1.3054
	8.333	1.3102
	8.500	1.3085
	8.667	1.3186
	8.833	1.3309
	9.000	1.3465
	9.167	1.3704
	9.333	1.3976
	9.500	1.4271
	9.667	1.4619
	9.833	1.4988
	10.000	1.5214
	10.167	1.5213
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 11

Callaway Cycle 11
W(z) at 10000 MWD/MTU (ΔAO= -3.9%)

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2

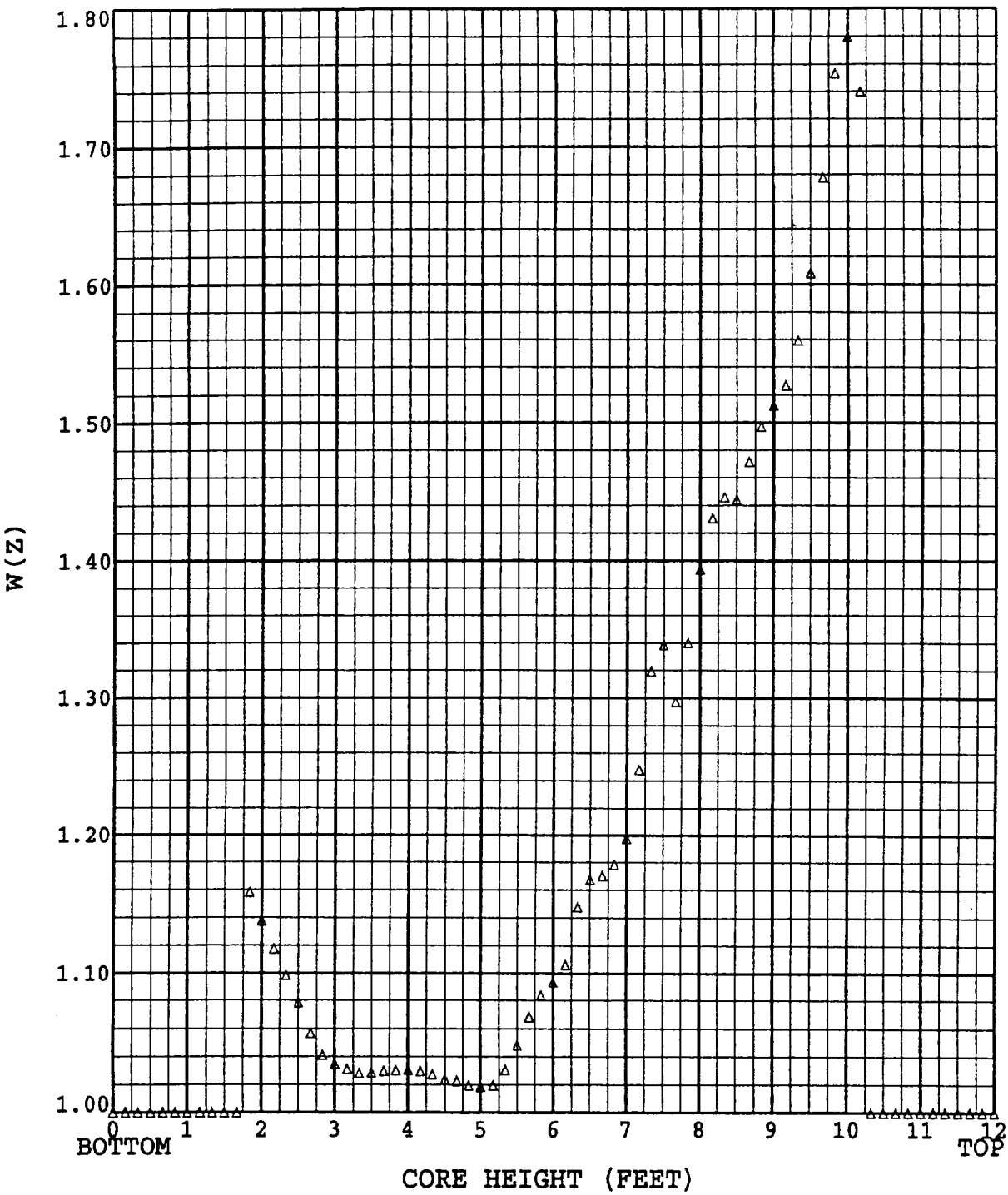


	HEIGHT (FEET)	18000. W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.2567
	2.000	1.2421
	2.167	1.2275
	2.333	1.2129
	2.500	1.1980
	2.667	1.1811
	2.833	1.1663
	3.000	1.1616
	3.167	1.1601
	3.333	1.1614
	3.500	1.1639
	3.667	1.1658
	3.833	1.1673
	4.000	1.1701
	4.167	1.1729
	4.333	1.1741
	4.500	1.1741
	4.667	1.1742
	4.833	1.1727
	5.000	1.1714
	5.167	1.1707
	5.333	1.1747
	5.500	1.1790
	5.667	1.1823
	5.833	1.1855
	6.000	1.1910
	6.167	1.2017
	6.333	1.2229
	6.500	1.2339
	6.667	1.2371
	6.833	1.2408
	7.000	1.2480
	7.167	1.2679
	7.333	1.2951
	7.500	1.2974
	7.667	1.2718
	7.833	1.2800
	8.000	1.2899
	8.167	1.2930
	8.333	1.2899
	8.500	1.2853
	8.667	1.2955
	8.833	1.3156
	9.000	1.3290
	9.167	1.3389
	9.333	1.3535
	9.500	1.3711
	9.667	1.3925
	9.833	1.4147
	10.000	1.4270
	10.167	1.4202
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 12

Callaway Cycle 11
W(z) at 18000 MWD/MTU (ΔAO= -3.9%)

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2

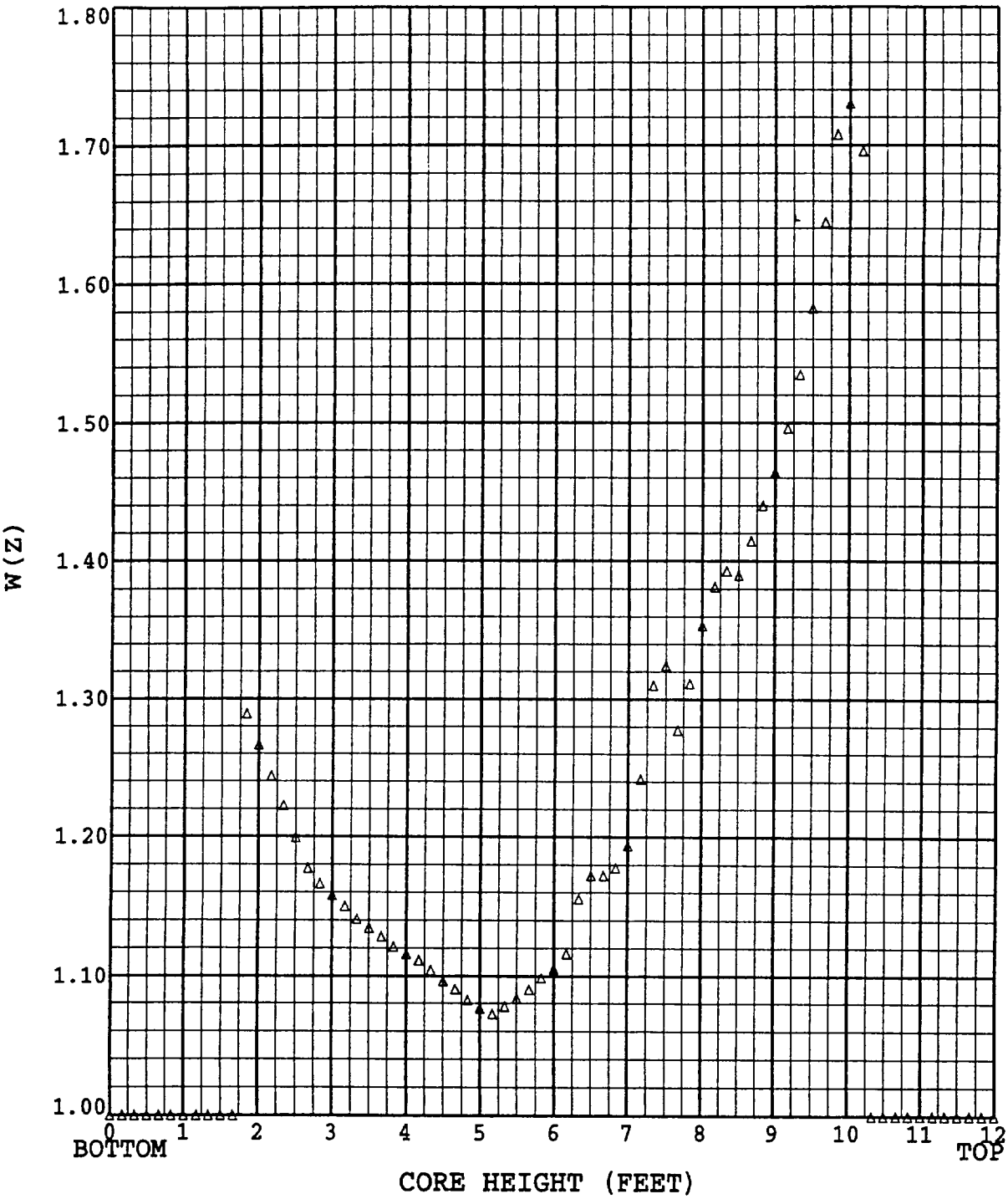


	HEIGHT (FEET)	150. W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.1580
	2.000	1.1375
	2.167	1.1177
	2.333	1.0985
	2.500	1.0785
	2.667	1.0567
	2.833	1.0409
	3.000	1.0346
	3.167	1.0311
	3.333	1.0282
	3.500	1.0284
	3.667	1.0296
	3.833	1.0301
	4.000	1.0304
	4.167	1.0297
	4.333	1.0273
	4.500	1.0240
	4.667	1.0226
	4.833	1.0193
	5.000	1.0185
	5.167	1.0193
	5.333	1.0307
	5.500	1.0482
	5.667	1.0684
	5.833	1.0836
	6.000	1.0934
	6.167	1.1062
	6.333	1.1479
	6.500	1.1675
	6.667	1.1704
	6.833	1.1784
	7.000	1.1973
	7.167	1.2480
	7.333	1.3194
	7.500	1.3385
	7.667	1.2972
	7.833	1.3402
	8.000	1.3935
	8.167	1.4308
	8.333	1.4458
	8.500	1.4443
	8.667	1.4716
	8.833	1.4970
	9.000	1.5124
	9.167	1.5267
	9.333	1.5593
	9.500	1.6080
	9.667	1.6774
	9.833	1.7531
	10.000	1.7795
	10.167	1.7398
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 13

Callaway Cycle 11
W(z) at 150 MWD/MTU (ΔAO= -9.0%)

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2

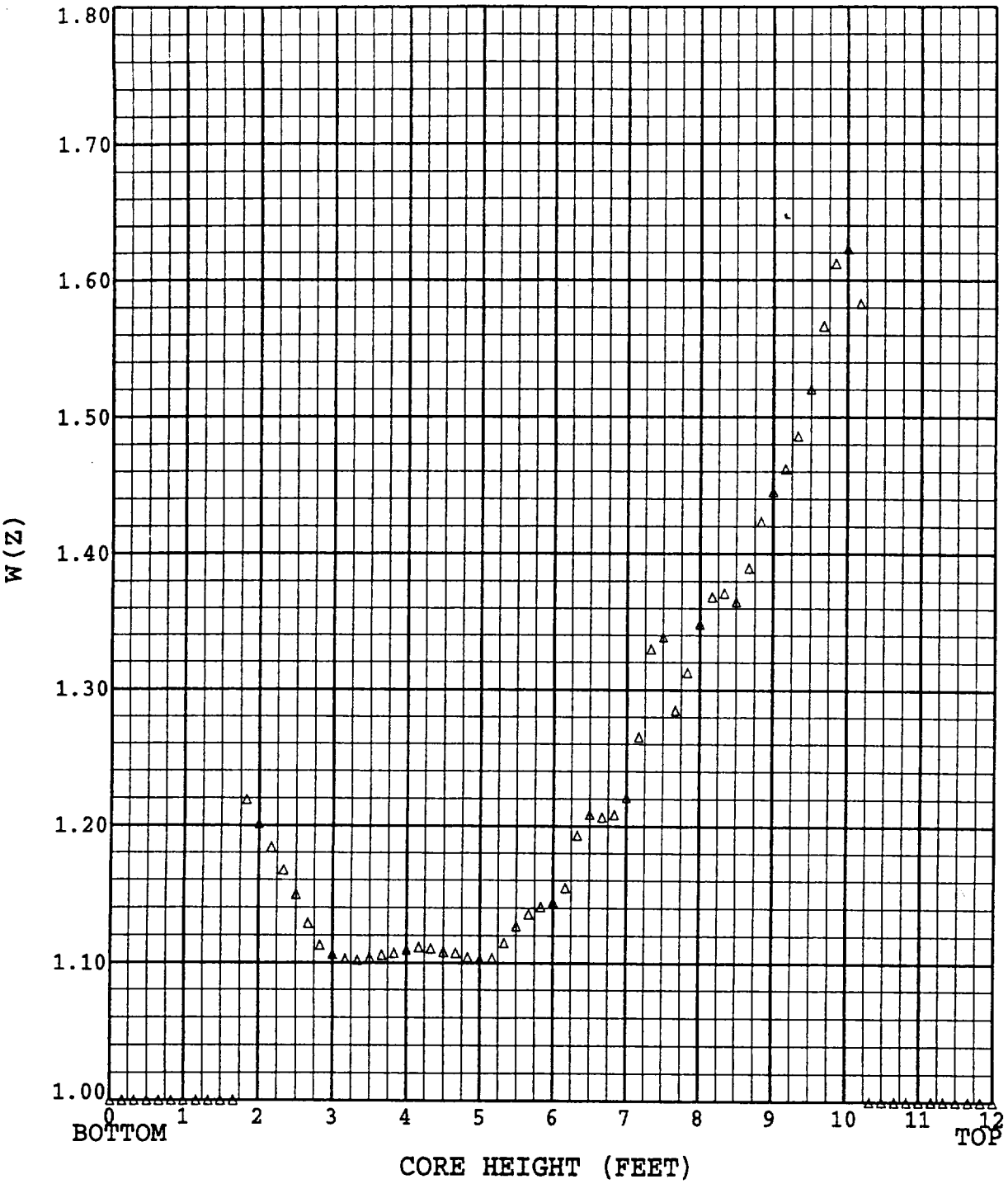


	HEIGHT (FEET)	10000. W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.2892
	2.000	1.2663
	2.167	1.2441
	2.333	1.2224
	2.500	1.1991
	2.667	1.1773
	2.833	1.1663
	3.000	1.1578
	3.167	1.1498
	3.333	1.1408
	3.500	1.1344
	3.667	1.1281
	3.833	1.1210
	4.000	1.1159
	4.167	1.1113
	4.333	1.1043
	4.500	1.0962
	4.667	1.0902
	4.833	1.0823
	5.000	1.0764
	5.167	1.0723
	5.333	1.0776
	5.500	1.0835
	5.667	1.0898
	5.833	1.0986
	6.000	1.1054
	6.167	1.1160
	6.333	1.1554
	6.500	1.1723
	6.667	1.1723
	6.833	1.1778
	7.000	1.1940
	7.167	1.2419
	7.333	1.3101
	7.500	1.3246
	7.667	1.2775
	7.833	1.3114
	8.000	1.3534
	8.167	1.3816
	8.333	1.3928
	8.500	1.3897
	8.667	1.4144
	8.833	1.4400
	9.000	1.4642
	9.167	1.4962
	9.333	1.5345
	9.500	1.5823
	9.667	1.6445
	9.833	1.7076
	10.000	1.7300
	10.167	1.6957
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 15

Callaway Cycle 11
W(z) at 10000 MWD/MTU (ΔAO= -9.0%)

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2



	HEIGHT (FEET)	18000. W(Z)
*	0.000	1.0000
*	0.167	1.0000
*	0.333	1.0000
*	0.500	1.0000
*	0.667	1.0000
*	0.833	1.0000
*	1.000	1.0000
*	1.167	1.0000
*	1.333	1.0000
*	1.500	1.0000
*	1.667	1.0000
	1.833	1.2189
	2.000	1.2012
	2.167	1.1840
	2.333	1.1672
	2.500	1.1494
	2.667	1.1287
	2.833	1.1129
	3.000	1.1064
	3.167	1.1029
	3.333	1.1020
	3.500	1.1039
	3.667	1.1059
	3.833	1.1073
	4.000	1.1096
	4.167	1.1113
	4.333	1.1105
	4.500	1.1081
	4.667	1.1074
	4.833	1.1043
	5.000	1.1030
	5.167	1.1036
	5.333	1.1148
	5.500	1.1267
	5.667	1.1355
	5.833	1.1409
	6.000	1.1444
	6.167	1.1545
	6.333	1.1931
	6.500	1.2085
	6.667	1.2065
	6.833	1.2085
	7.000	1.2211
	7.167	1.2654
	7.333	1.3297
	7.500	1.3386
	7.667	1.2851
	7.833	1.3129
	8.000	1.3483
	8.167	1.3686
	8.333	1.3713
	8.500	1.3651
	8.667	1.3896
	8.833	1.4234
	9.000	1.4452
	9.167	1.4619
	9.333	1.4862
	9.500	1.5202
	9.667	1.5665
	9.833	1.6119
	10.000	1.6227
	10.167	1.5829
*	10.333	1.0000
*	10.500	1.0000
*	10.667	1.0000
*	10.833	1.0000
*	11.000	1.0000
*	11.167	1.0000
*	11.333	1.0000
*	11.500	1.0000
*	11.667	1.0000
*	11.833	1.0000
*	12.000	1.0000

Figure 16

Callaway Cycle 11
W(z) at 18000 MWD/MTU (ΔAO= -9.0%)

* Top and bottom 15% excluded as per Tech Spec SR 3.2.1.2

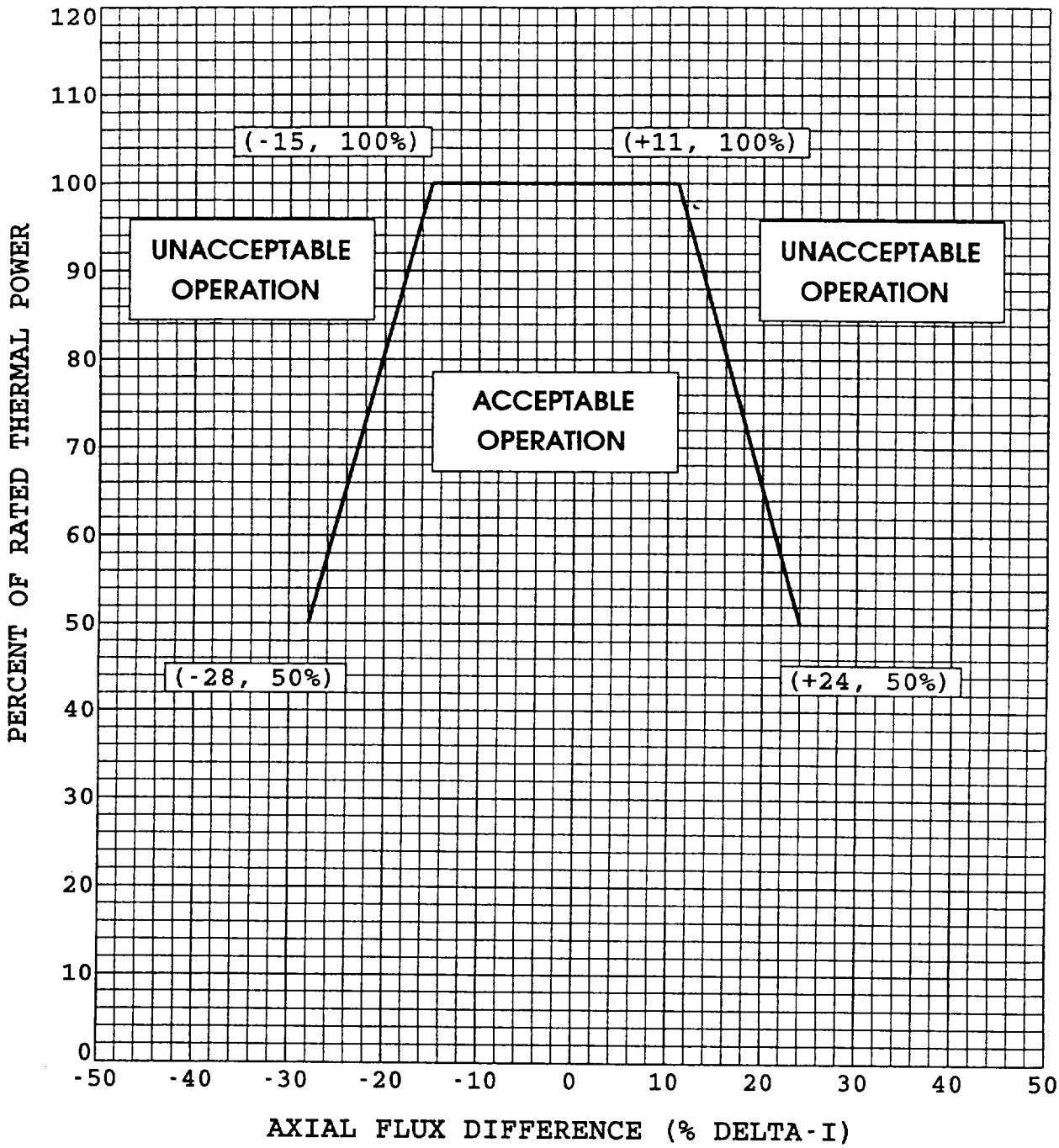


Figure 17

Callaway Cycle 11
Axial Flux Difference Limits as a Function of Rated Thermal Power for RAOC