TITLE: COLR FOR DIABLO CANYON UNIT 1 CYCLE 7

APPROVED: D Miklush 4/28/94 DATE 4/28/94 EFFECTIVE DATE

PROCEDURE CLASSIFICATION: QUALITY RELATED

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for Diablo Canyon Unit 1 Cycle 7 has been prepared in accordance with the requirements of Technical Specification (TS) 6.9.1.8.

The Technical Specifications affected by this report are listed below:

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 - $F_Q(z)$
3/4.2.3 - RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor

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 6.9.1.8.

2.1 Shutdown Rod Insertion Limit (TS 3/4.1.3.5)

2.1.1 The shutdown rods shall be withdrawn to at least 225 steps.

2.2 Control Rod Insertion Limits (TS 3/4.1.3.6)

2.2.1 The control rod banks shall be limited in physical insertion as shown in Figure 1.

2.3 Axial Flux Difference (TS 3/4.2.1)

2.3.1 The AXIAL FLUX DIFFERENCE (AFD) Limits are provided in Figure 2.

2.4 Heat Flux Hot Channel Factor - $F_Q(z)$ (TS 3/4.2.2)

2.4.1

$$F_Q(z) < \frac{F_Q^{RTP}}{P} * K(z) \qquad \text{for } P > 0.5$$

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

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

$F_Q^{RTP} = 2.45$

K(z) is provided in Figure 6.

2.4.2 The W(z) curves for Specification 4.2.2.2.c Relaxed Axial Offset Control (RAOC) operation, provided in Figures 3 through 5, are sufficient to determine the RAOC W(z) versus core height for Cycle 7 burnups through the end of full power reactivity plus a power coastdown of up to 1000 MWD/MTU.

2.5 RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor (Specification 3/4.2.3)

$$R = \frac{F_{\Delta H}^{N}}{F_{\Delta H}^{RTP} * [1 + PF_{\Delta H} * (1-P)]}$$

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

$F_{\Delta H}^{RTP} = 1.59$

$PF_{\Delta H} = 0.3$

3.0 FIGURES

3.1 Figure 1, Rod Bank Insertion Limits Versus Rated Thermal Power

3.2 Figure 2, AFD Limits as a Function of Rated Thermal Power

3.3 Figure 3, W(z) at 150 MWD/MTU

3.4 Figure 4, W(z) at 10,000 MWD/MTU

3.5 Figure 5, W(z) at 18,000 MWD/MTU

3.6 Figure 6, K(z) - Normalized $F_Q(z)$ as a Function of Core Height

4.0 RECORDS

None

5.0 REFERENCES

Westinghouse Reload Safety Evaluation for Diablo Canyon Power Plant Unit 1 Cycle 7, Revision 1, dated April 1994.

6.0 SPONSOR

P.T. Nugent

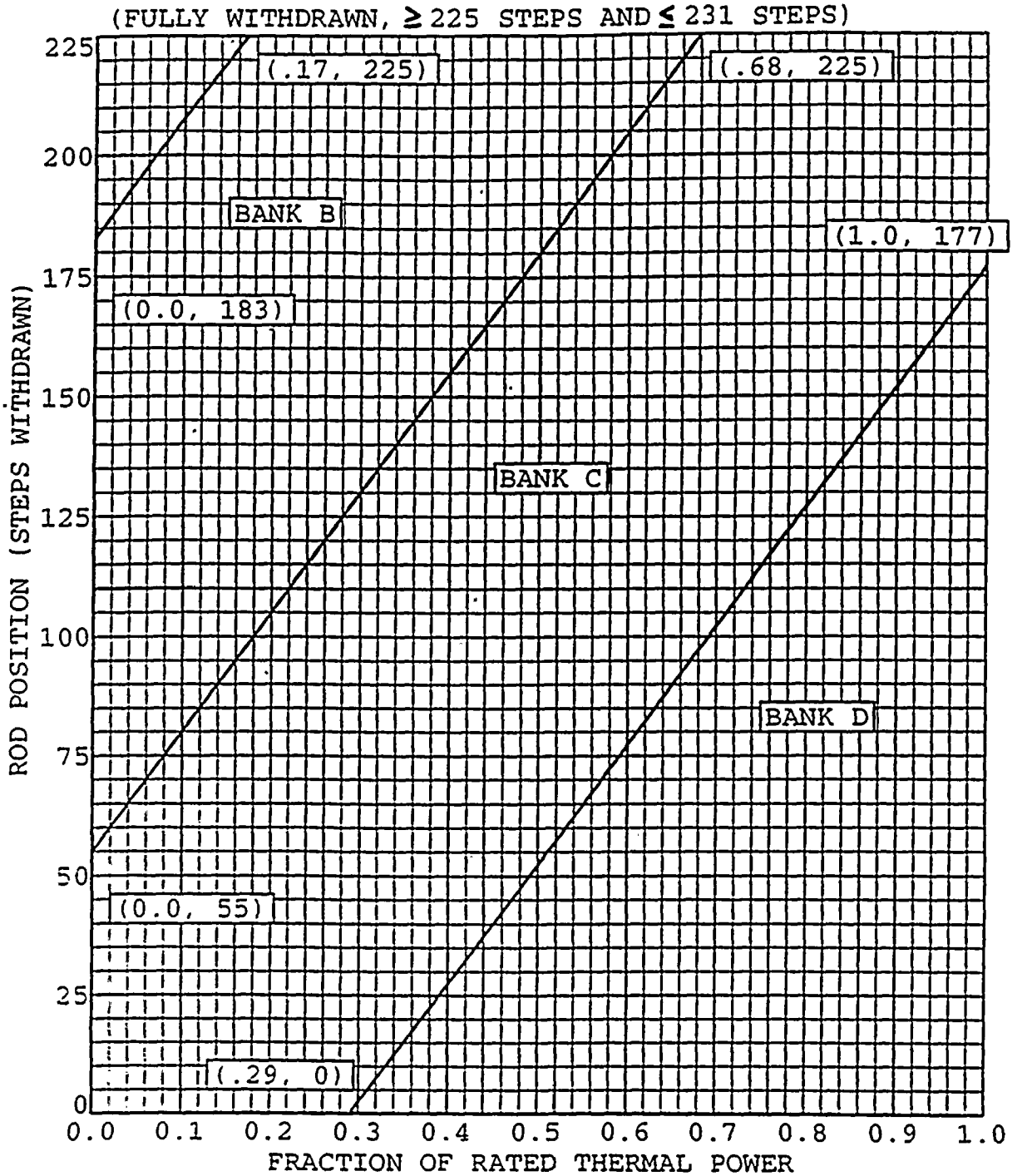


Figure 1

Rod Bank Insertion Limits Versus Rated Thermal Power

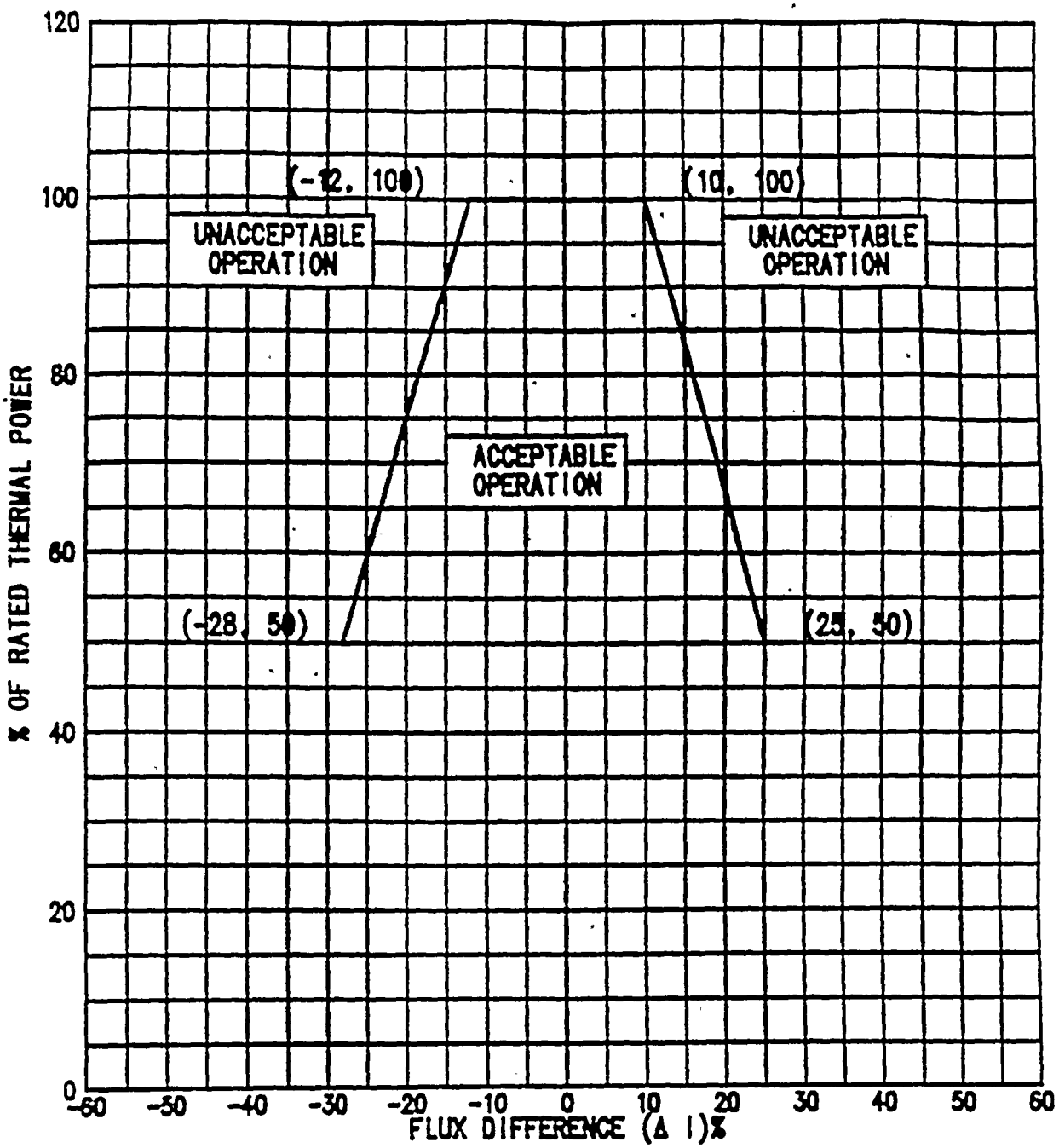
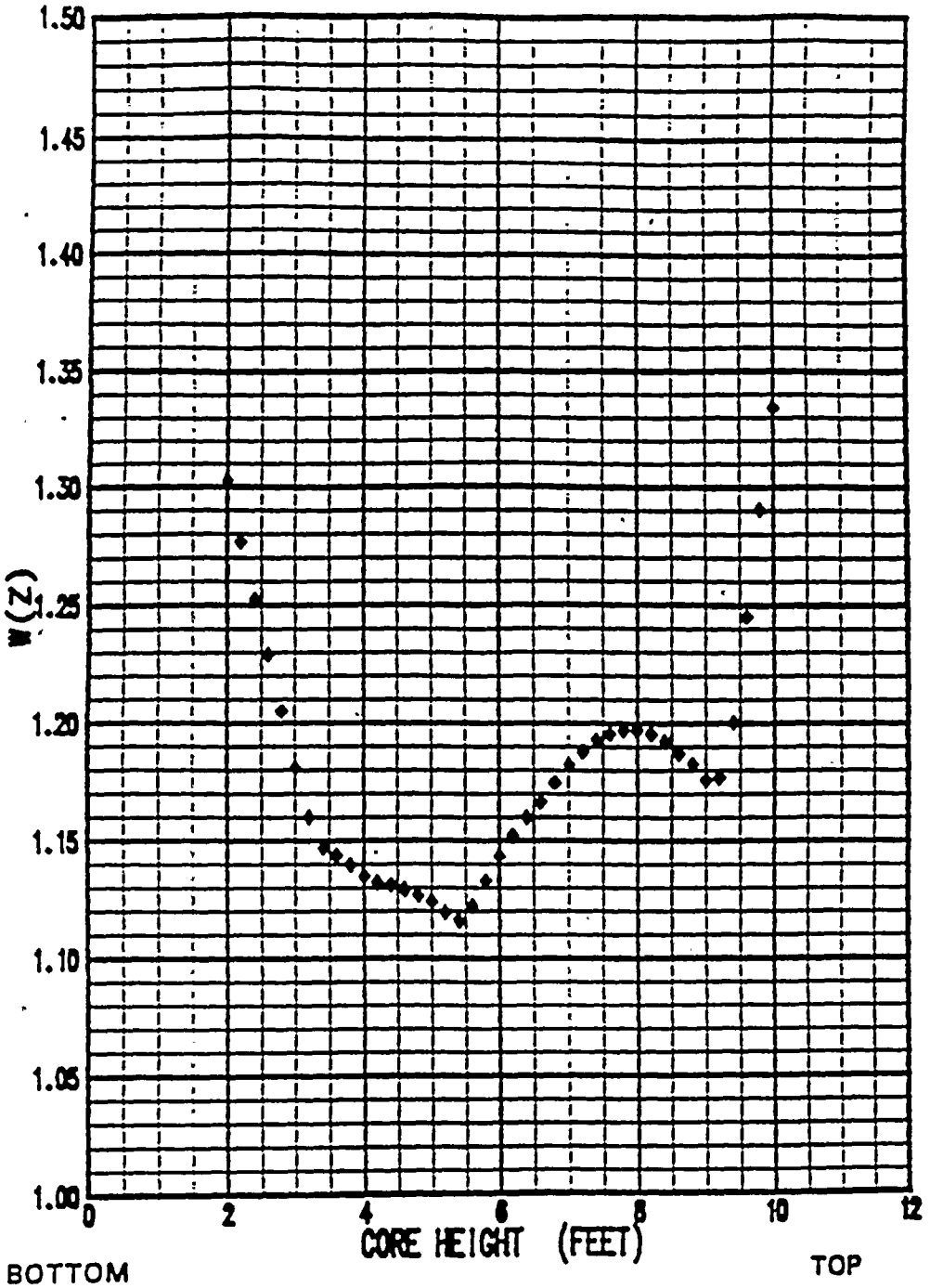


Figure 2

AFD Limits as a Function of Rated Thermal Power

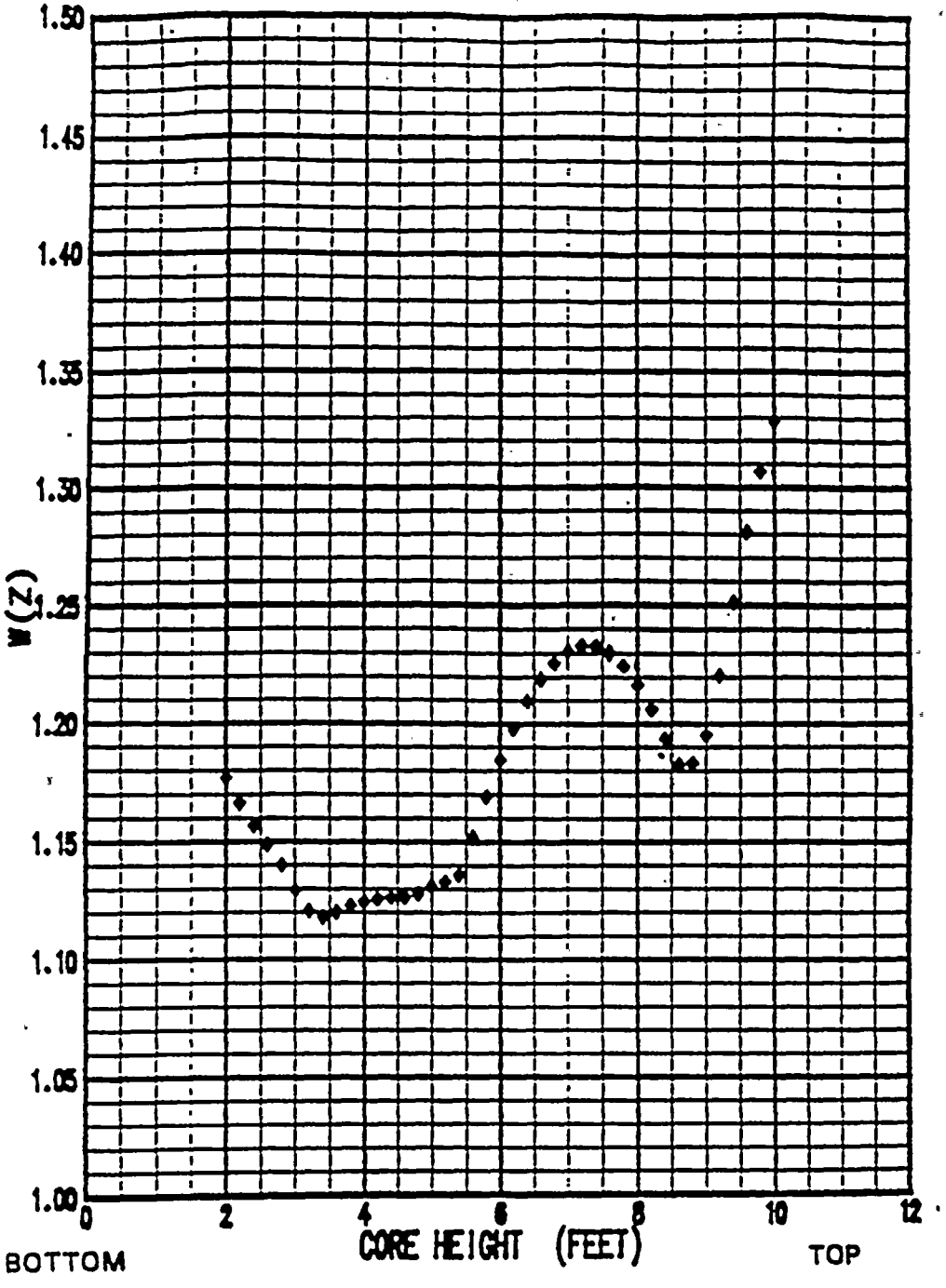


HEIGHT (FEET)	BOL W(Z)
*0.0000	*.0000
*0.2000	*.0000
*0.4000	*.0000
*0.6000	*.0000
*0.8000	1.0000
*1.0000	1.0000
*1.2000	1.0000
*1.4000	1.0000
*1.6000	1.0000
*1.8000	1.0000
2.0000	1.3026
2.2000	1.2768
2.4000	1.2523
2.6000	1.2291
2.8000	1.2050
3.0000	1.1810
3.2000	1.1600
3.4000	1.1470
3.6000	1.1437
3.8000	1.1397
4.0000	1.1350
4.2000	1.1322
4.4000	1.1310
4.6000	1.1292
4.8000	1.1267
5.0000	1.1239
5.2000	1.1194
5.4000	1.1160
5.6000	1.1221
5.8000	1.1328
6.0000	1.1433
6.2000	1.1522
6.4000	1.1599
6.6000	1.1666
6.8000	1.1747
7.0000	1.1823
7.2000	1.1882
7.4000	1.1928
7.6000	1.1958
7.8000	1.1973
8.0000	1.1972
8.2000	1.1956
8.4000	1.1922
8.6000	1.1873
8.8000	1.1825
9.0000	1.1761
9.2000	1.1772
9.4000	1.2004
9.6000	1.2451
9.8000	1.2906
10.0000	1.3340
*10.2000	1.0000
*10.4000	1.0000
*10.6000	1.0000
*10.8000	1.0000
*11.0000	1.0000
*11.2000	1.0000
*11.4000	1.0000
*11.6000	1.0000
*11.8000	1.0000
*12.0000	1.0000

Figure 3

W(z) at 150 MWD/MTU

* Top and Bottom 15% excluded as per TS 4.2.2.2.g

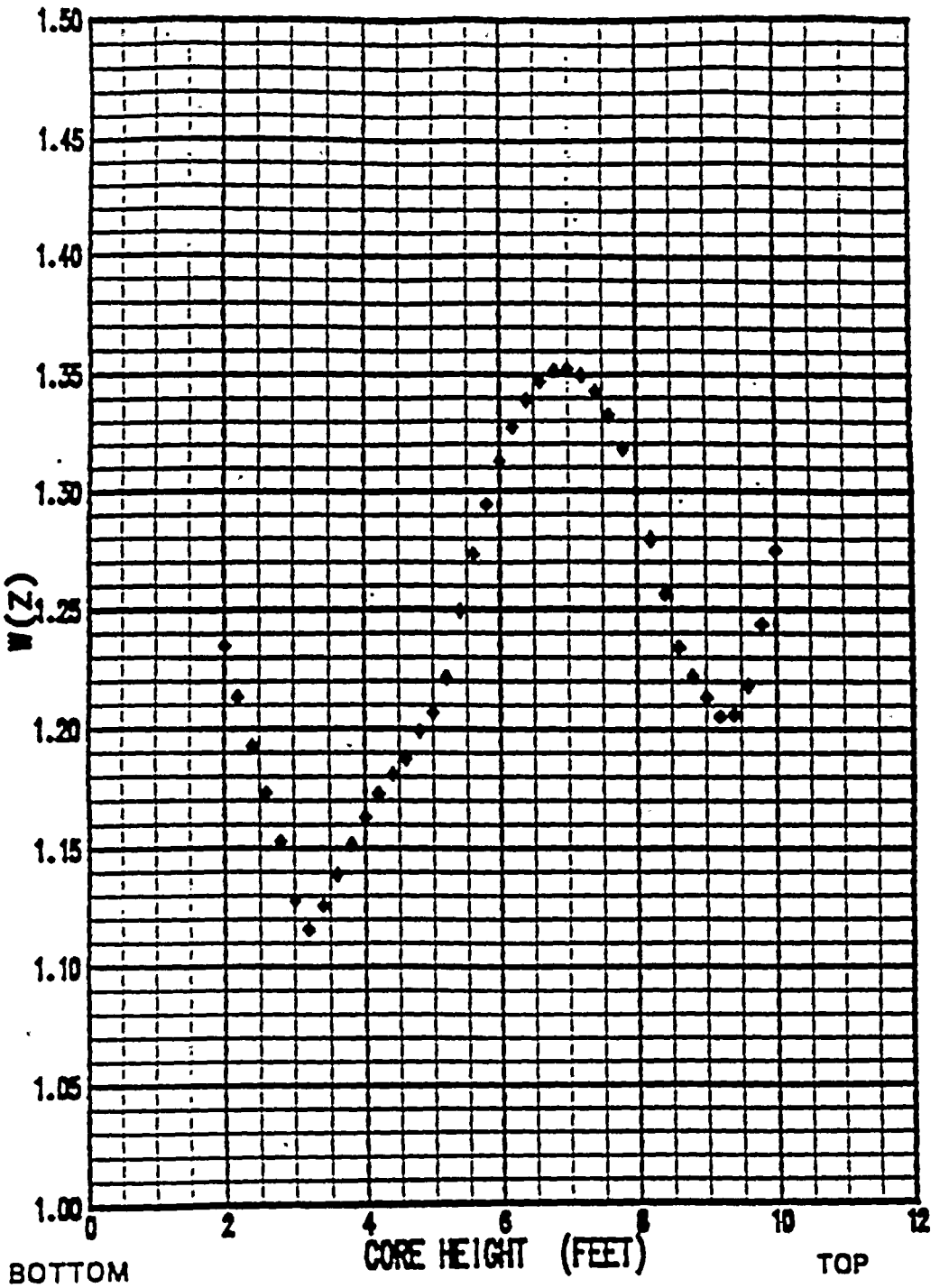


HEIGHT (FEET)	MOL W(Z)
*0.0000	1.0000
*0.2000	1.0000
*0.4000	1.0000
*0.6000	1.0000
*0.8000	1.0000
*1.0000	1.0000
*1.2000	1.0000
*1.4000	1.0000
*1.6000	1.0000
*1.8000	1.0000
2.0000	1.1771
2.2000	1.1666
2.4000	1.1571
2.6000	1.1489
2.8000	1.1401
3.0000	1.1295
3.2000	1.1206
3.4000	1.1178
3.6000	1.1202
3.8000	1.1229
4.0000	1.1247
4.2000	1.1259
4.4000	1.1265
4.6000	1.1267
4.8000	1.1280
5.0000	1.1314
5.2000	1.1332
5.4000	1.1364
5.6000	1.1519
5.8000	1.1691
6.0000	1.1845
6.2000	1.1981
6.4000	1.2096
6.6000	1.2190
6.8000	1.2260
7.0000	1.2308
7.2000	1.2331
7.4000	1.2329
7.6000	1.2301
7.8000	1.2247
8.0000	1.2168
8.2000	1.2063
8.4000	1.1936
8.6000	1.1823
8.8000	1.1832
9.0000	1.1954
9.2000	1.2206
9.4000	1.2513
9.6000	1.2809
9.8000	1.3069
10.0000	1.3287
*10.2000	1.0000
*10.4000	1.0000
*10.6000	1.0000
*10.8000	1.0000
*11.0000	1.0000
*11.2000	1.0000
*11.4000	1.0000
*11.6000	1.0000
*11.8000	1.0000
*12.0000	1.0000

Figure 4

W(z) at 10,000 MWD/MTU

* Top and Bottom 15% excluded as per TS 4.2.2.2.g



HEIGHT (FEET)	EOL W(Z)
*0.0000	1.0000
*0.2000	1.0000
*0.4000	1.0000
*0.6000	1.0000
*0.8000	1.0000
*1.0000	1.0000
*1.2000	1.0000
*1.4000	1.0000
*1.6000	1.0000
*1.8000	1.0000
2.0000	1.2349
2.2000	1.2132
2.4000	1.1927
2.6000	1.1729
2.8000	1.1526
3.0000	1.1280
3.2000	1.1158
3.4000	1.1260
3.6000	1.1391
3.8000	1.1516
4.0000	1.1627
4.2000	1.1726
4.4000	1.1810
4.6000	1.1879
4.8000	1.1991
5.0000	1.2070
5.2000	1.2213
5.4000	1.2496
5.6000	1.2734
5.8000	1.2943
6.0000	1.3125
6.2000	1.3275
6.4000	1.3392
6.6000	1.3473
6.8000	1.3518
7.0000	1.3526
7.2000	1.3496
7.4000	1.3428
7.6000	1.3323
7.8000	1.3181
8.0000	1.3001
8.2000	1.2795
8.4000	1.2566
8.6000	1.2339
8.8000	1.2219
9.0000	1.2130
9.2000	1.2053
9.4000	1.2065
9.6000	1.2183
9.8000	1.2438
10.0000	1.2751
*10.2000	1.0000
*10.4000	1.0000
*10.6000	1.0000
*10.8000	1.0000
*11.0000	1.0000
*11.2000	1.0000
*11.4000	1.0000
*11.6000	1.0000
*11.8000	1.0000
*12.0000	1.0000

Figure 5

W(z) at 18,000 MWD/MTU

* Top and Bottom 15% excluded as per TS 4.2.2.2.g

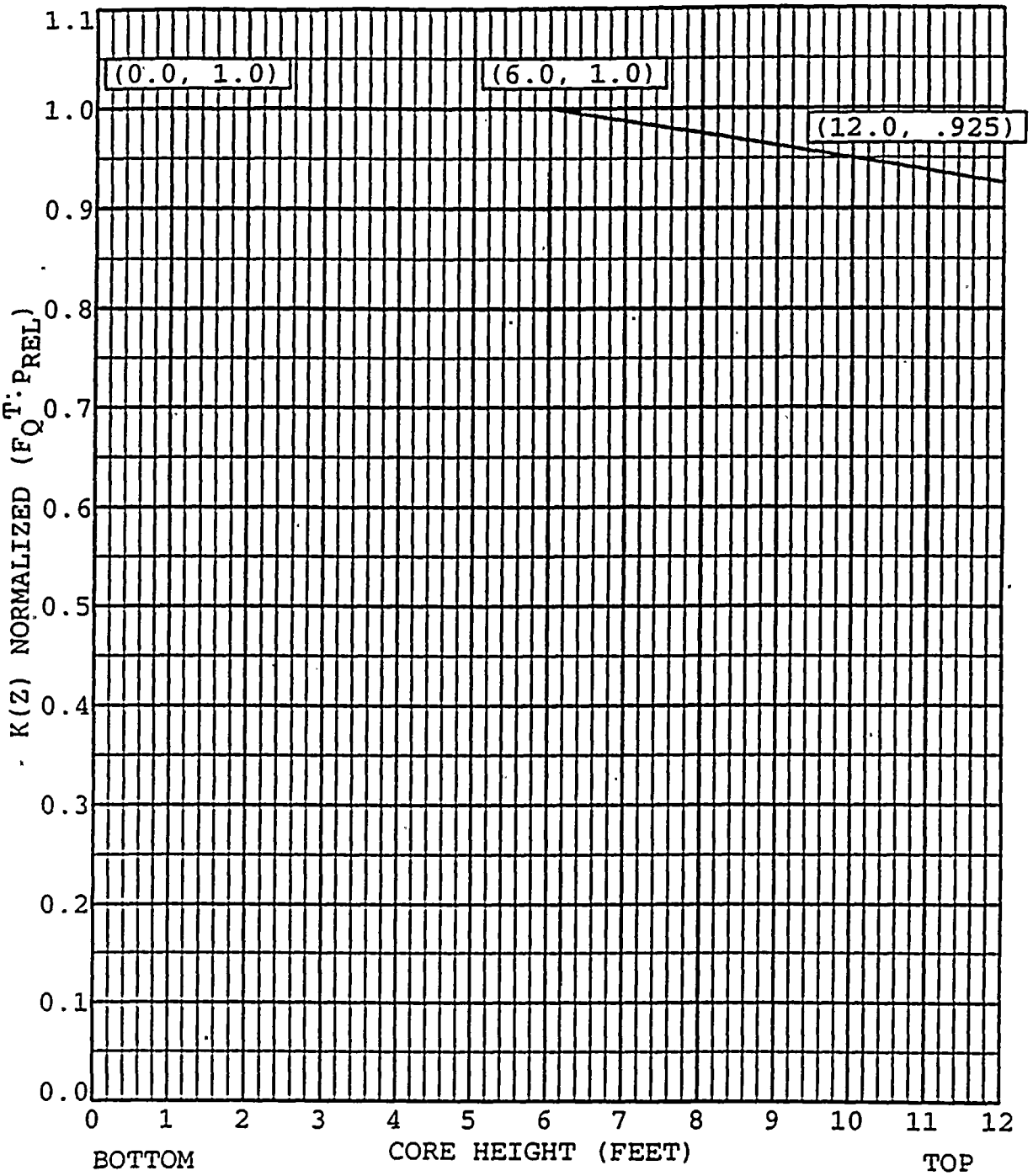


Figure 6

K(z) - Normalized $F_Q(z)$ as a Function of Core Height