FPL Energy
Seabrook Station

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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
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Seabrook Station
Cycle 11 Core Operating Limits Report

FPL Energy Seabrook, LLC is enclosing Revision 0 of the Cycle 11 Core Operating Limits Report (COLR) for Seabrook Station pursuant to Technical Specification 6.8.1.6.c. Cycle 11 commenced on April 12, 2005.

Should you require further information regarding this report, please contact Mr. Paul V. Gurney, Reactor Engineering Supervisor, at (603) 773-7776.

Very truly yours,

FPL ENERGY SEABROOK, LLC

Mark E. Warner
Site Vice President

cc: S. J. Collins, NRC Region I Administrator
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G. T. Dentel, NRC Senior Resident Inspector

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ENCLOSURE TO SBK-L-05122

CORE OPERATING LIMITS REPORT

SEABROOK CYCLE 11

COLR

Revision 0
April 2005

RE Supervisor	Paul V. [signature]	4/7/05
Operations Manager	[signature]	4/7/05
	Signature	Date

1.0 Core Operating Limits Report

This Core Operating Limits Report for Seabrook Station Unit 1, Cycle 11 has been prepared in accordance with the requirements of Technical Specification 6.8.1.6.

The Technical Specifications affected by this report are:

1) 2.2.1 Limiting Safety System Settings
2) 2.1 Safety Limits
3) 3.1.1.1 Shutdown Margin Limit for MODES 1, 2, 3, 4
4) 3.1.1.2 Shutdown Margin Limit for MODE 5
5) 3.1.1.3 Moderator Temperature Coefficient
6) 3.1.2.7 Minimum Boron Concentration for MODES 4, 5, 6
7) 3.1.3.5 Shutdown Rod Insertion Limit
8) 3.1.3.6 Control Rod Insertion Limits
9) 3.2.1 Axial Flux Difference
10) 3.2.2 Heat Flux Hot Channel Factor
11) 3.2.3 Nuclear Enthalpy Rise Hot Channel Factor
12) 3.2.5 DNB Parameters
13) 3.5.1.1 Boron Concentration Limits for MODES 1, 2, 3
14) 3.5.4 Boron Concentration Limits for MODES 1, 2, 3, 4
15) 3.9.1 Boron Concentration Limits for MODE 6

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 Limiting Safety System Settings: (Specification 2.2.1)

2.1.1 Cycle Dependent Overtemperature ΔT Trip Setpoint Parameters and Function Modifier:

2.1.1.1 K_1 = 1.210

2.1.1.2 K_2 = 0.021 / °F

2.1.1.3 K_3 = 0.0011 / psig

T = Measured RCS T_{avg} (°F), and

T^1 = Indicated RCS T_{avg} at RATED THERMAL POWER (Calibration temperature for ΔT instrumentation, $\leq$ 589.1°F).

P^1 = Nominal RCS operating pressure, 2235 psig

2.1.1.4 Channel Total Allowance (TA) = N.A.

2.1.1.5 Channel Z = N.A.

2.1.1.6 Channel Sensor Error (S) = N.A.

2.1.1.7 Allowable Value – The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 0.5% of ΔT span. Note that 0.5% of ΔT span is applicable to OTΔT input channels ΔT, Tavg and Pressurizer Pressure; 0.25% of ΔT span is applicable to ΔI.

2.1.1.8 $f_1(\Delta I)$ is a function of the indicated difference between top and bottom detectors of the power-range neutron ion chambers; with nominal gains to be selected based on measured instrument response during plant startup tests calibrations such that:

(1) For $q_t - q_b$ between –20% and +8%, $f_1(\Delta I) \geq 0$; where q_t and q_b are percent RATED THERMAL POWER in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total THERMAL POWER in percent RATED THERMAL POWER;

(2) For each percent that the magnitude of $q_t - q_b$ exceeds –20%, the ΔT Trip Setpoint shall be automatically reduced by $\geq$ 2.87% of its value at RATED THERMAL POWER.

(3) For each percent that the magnitude of $q_t - q_b$ exceeds +8%, the ΔT Trip Setpoint shall be automatically reduced by $\geq$ 1.71% of its value at RATED THERMAL POWER.

See Figure 5.

2.1.1.9 $\tau_1 = 0$ seconds

2.1.1.10 $\tau_2 = 0$ seconds

2.1.1.11 $\tau_3 \leq 2$ seconds

2.1.1.12 $\tau_4 \geq 28$ seconds

2.1.1.13 $\tau_5 \leq 4$ seconds

2.1.1.14 $\tau_6 \leq 2$ seconds

2.1.2 Cycle Dependent Overpower ΔT Trip Setpoint Parameters and Function Modifier:

2.1.2.1 K_4 = 1.116

2.1.2.2 K_5 = 0.020 / °F for increasing average temperature and $K_5 = 0.0$ for decreasing average temperature.

2.1.2.3 K_6 = 0.00175 / °F for $T > T^{11}$ and $K_6 = 0.0$ for $T \leq T^{11}$,

where:

T = Measured T_{avg} (°F), and

T^{11} = Indicated T_{avg} at RATED THERMAL POWER (Calibration temperature for ΔT instrumentation, ≤ 589.1 °F).

2.1.2.4 Channel Total Allowance (TA) = N.A.

2.1.2.5 Channel Z = N.A.

2.1.2.6 Channel Sensor Error (S) = N.A.

2.1.2.7 Allowable Value – The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 0.5% of ΔT span. Note that 0.5% of ΔT span is applicable to OPΔT input channels ΔT and T_{avg}.

2.1.2.8 $f_2(\Delta I)$ is disabled.

2.1.2.9 τ_1 as defined in 2.1.1.9, above.

2.1.2.10 τ_2 as defined in 2.1.1.10, above.

2.1.2.11 τ_3 as defined in 2.1.1.11, above.

2.1.2.12 τ_6 as defined in 2.1.1.14, above.

2.1.2.13 $\tau_7 \geq 10$ seconds. It is recognized that exactly equal values cannot always be dialed into the numerator and denominator in the protection system hardware, even if the nominal values are the same (10 seconds). Thus given the inequality sign in the COLR (greater than or equal to) the intent of the definition of this time constant applies primarily to the rate time constant (i.e. the Tau value in the numerator). The lag time constant (denominator Tau value) may be less than 10 seconds or less than the value of the numerator Tau value (e.g., if the numerator is set at 10.5, the denominator may be set to 10 or 9.5) and still satisfy the intent of the anticipatory protective feature.

2.2 Safety Limits: (Specification 2.1.1)

2.2.1 In Modes 1 and 2, the combination of Thermal Power, reactor coolant system highest loop average temperature and pressurizer pressure shall not exceed the limits in Figure 6.

2.3 Shutdown Margin Limit for MODES 1, 2, 3, and 4: (Specification 3.1.1.1)

2.3.1 The Shutdown Margin shall be greater than or equal to 1.3% ΔK/K, in MODES 1, 2 and 3.

2.3.2 The Shutdown Margin shall be greater than or equal to 2.3% ΔK/K, in MODE 4.

2.3.3 The Boric Acid Storage System boron concentration shall be greater than or equal to 7000 ppm.

2.4 Shutdown Margin Limit for MODE 5: (Specification 3.1.1.2)

2.4.1 The Shutdown Margin shall be greater than or equal to 2.3% ΔK/K.

2.4.2 The RCS boron concentration shall be greater than or equal to 2000 ppm when the reactor coolant loops are in a drained condition.

2.4.3 The Boric Acid Storage System boron concentration shall be greater than or equal to 7000 ppm.

2.5 Moderator Temperature Coefficient: (Specification 3.1.1.3)

2.5.1 The Moderator Temperature Coefficient (MTC) shall be less positive than $+3.024 \times 10^{-5}$ $\Delta K/K/°F$ for Beginning of Cycle Life (BOL), All Rods Out (ARO), Hot Zero Thermal Power conditions.

2.5.2 MTC shall be less negative than -5.5×10^{-4} $\Delta K/K/°F$ for End of Cycle Life (EOL), ARO, Rated Thermal Power conditions.

2.5.3 The 300 ppm ARO, Rated Thermal Power MTC shall be less negative than -4.6×10^{-4} $\Delta K/K/°F$ (300 ppm Surveillance Limit).

2.6 Minimum Boron Concentration for MODES 4, 5, 6 (Specification 3.1.2.7)

2.6.1 The Boric Acid Storage System boron concentration shall be greater than or equal to 7000 ppm.

2.7 Shutdown Rod Insertion Limit: (Specification 3.1.3.5)

2.7.1 The shutdown rods shall be fully withdrawn. The fully withdrawn position is defined as the interval within 225 steps withdrawn to the mechanical fully withdrawn position inclusive.

2.8 Control Rod Insertion Limits: (Specification 3.1.3.6)

2.8.1 The control rod banks shall be limited in physical insertion as specified in Figure 1. Control Bank A shall be at least 225 steps withdrawn.

2.9 Axial Flux Difference: (Specification 3.2.1)

2.9.1 The indicated AFD must be within the Acceptable Operation Limits specified in Figure 2.

2.10 Heat Flux Hot Channel Factor : (Specification 3.2.2)

2.10.1 $F^{RTP}_{Q} = 2.50$

2.10.2 K(Z) is specified in Figure 3.

2.10.3 W(Z) is specified in Figures 4.1 to 4.4 and in Table 1.

The W(Z) data is applied over the cycle as follows:

BU < 150 MWD/MTU,	linear extrapolation of 150 and 3000 MWD/MTU W(Z) data
150 ≤ BU < 6500 MWD/MTU,	quadratic interpolation of 150, 3000, and 10000 MWD/MTU data
6500 ≤ BU <19000 MWD/MTU,	quadratic interpolation of 3000, 10000, and 19000 MWD/MTU W(Z) data
BU > 19000 MWD/MTU,	linear extrapolation of 10000 and 19000 MWD/MTU W(Z) data

Note: The FQ(Z) surveillance exclusion zone is specified by Technical Specification 4.2.2.2.g

2.10.4 The $F^M_Q(Z)$ penalty factor is 1.02

2.11 Nuclear Enthalpy Rise Hot Channel Factor: (Specification 3.2.3)

2.11.1 $F^N_{\Delta H} \leq F^N_{\Delta H}(RTP) \times (1 + PF \times (1 - P))$
where P = THERMAL POWER / RATED THERMAL POWER.

2.11.2.a For $F^N_{\Delta H}$ measured by the fixed incore detectors:
$F^N_{\Delta H}(RTP) = 1.585$.

2.11.2.b For $F^N_{\Delta H}$ measured by the movable incore detectors:
$F^N_{\Delta H}(RTP) = 1.587$.

2.11.3 Power Factor Multiplier for $F^N_{\Delta H}$ = PF = 0.3.

2.12 DNB Parameters (Specification 3.2.5)

2.12.1 The Reactor Coolant System Tavg shall be less than or equal to 595.1 degrees F.

2.12.2 The Pressurizer Pressure shall be greater than or equal to 2185 PSIG.

Note: Technical Specification Bases 3/4.2.5, "DNB Parameters" indicates that the limits on DNB-related parameters assure consistency with the normal steady-state envelope of operation assumed in the transient and accident analyses. Operating procedures include allowances for measurement and indication uncertainty so that the limits in the COLR for T_{avg} and pressurizer pressure are not exceeded. Consistent with the Bases, the values of these DNB parameters are the limiting T_{avg} and pressurizer pressure assumed in the transient and accident analyses.

2.13 Accumulator Boron Concentration Limits for MODES 1,2,3 (Specification 3.5.1.1)

2.13.1 Each Accumulator shall have a boron concentration between 2300 and 2600 ppm.

2.14 Refueling Water Storage Tank Boron Concentration Limits for MODES 1, 2, 3, 4 (Specification 3.5.4)

2.14.1 The RWST shall have a boron concentration between 2400 and 2600 ppm.

2.15 Refueling Boron Concentration Limits for MODE 6 (Specification 3.9.1)

2.15.1 The Refueling Boron Concentration during OR10 and Cycle11 shall be greater than or equal to 2140 ppm.

2.15.2 The Boric Acid Storage System boron concentration shall be greater than or equal to 7000 ppm.

Figure 1
Control Bank Insertion Limits
Versus Thermal Power

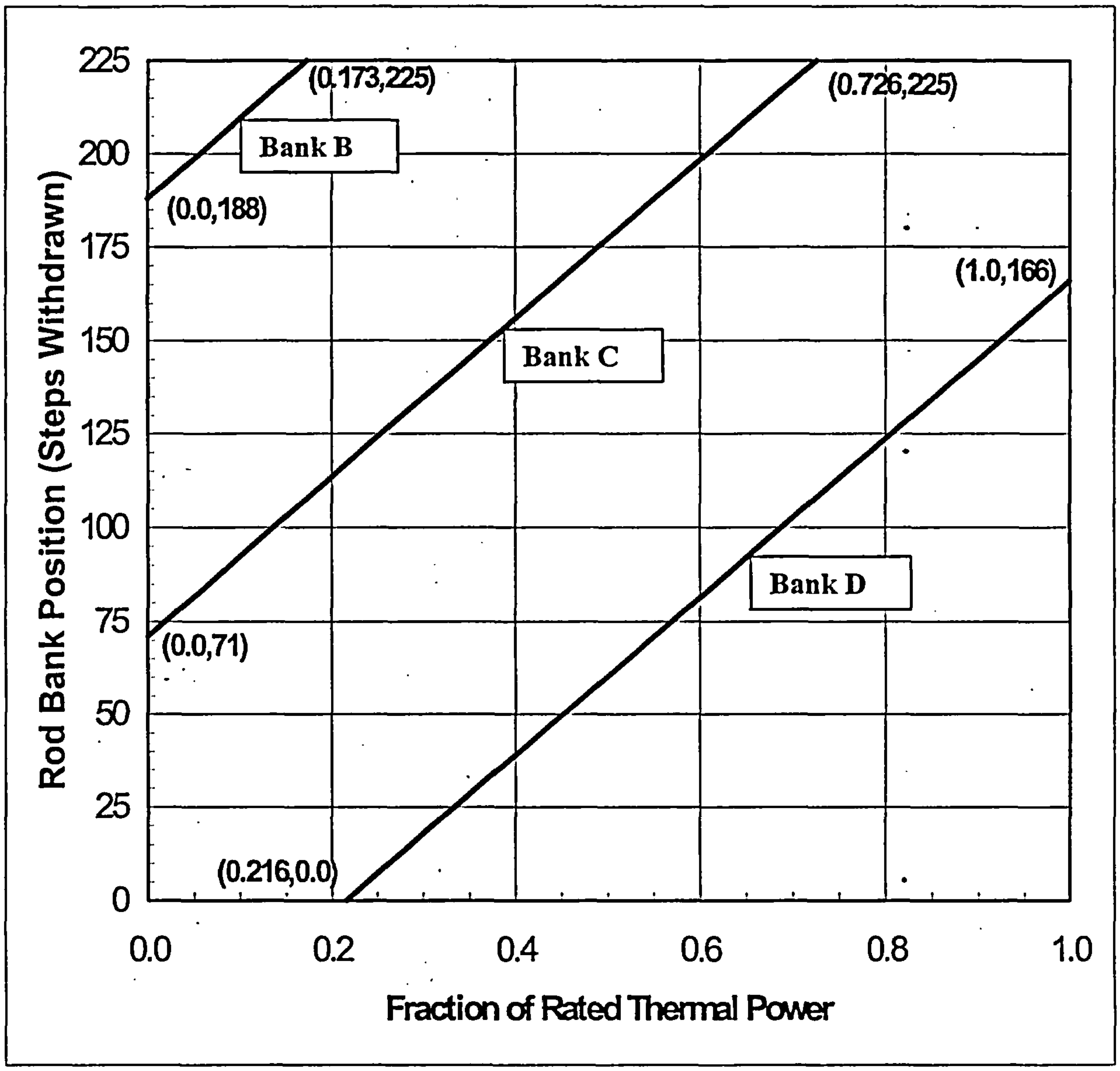
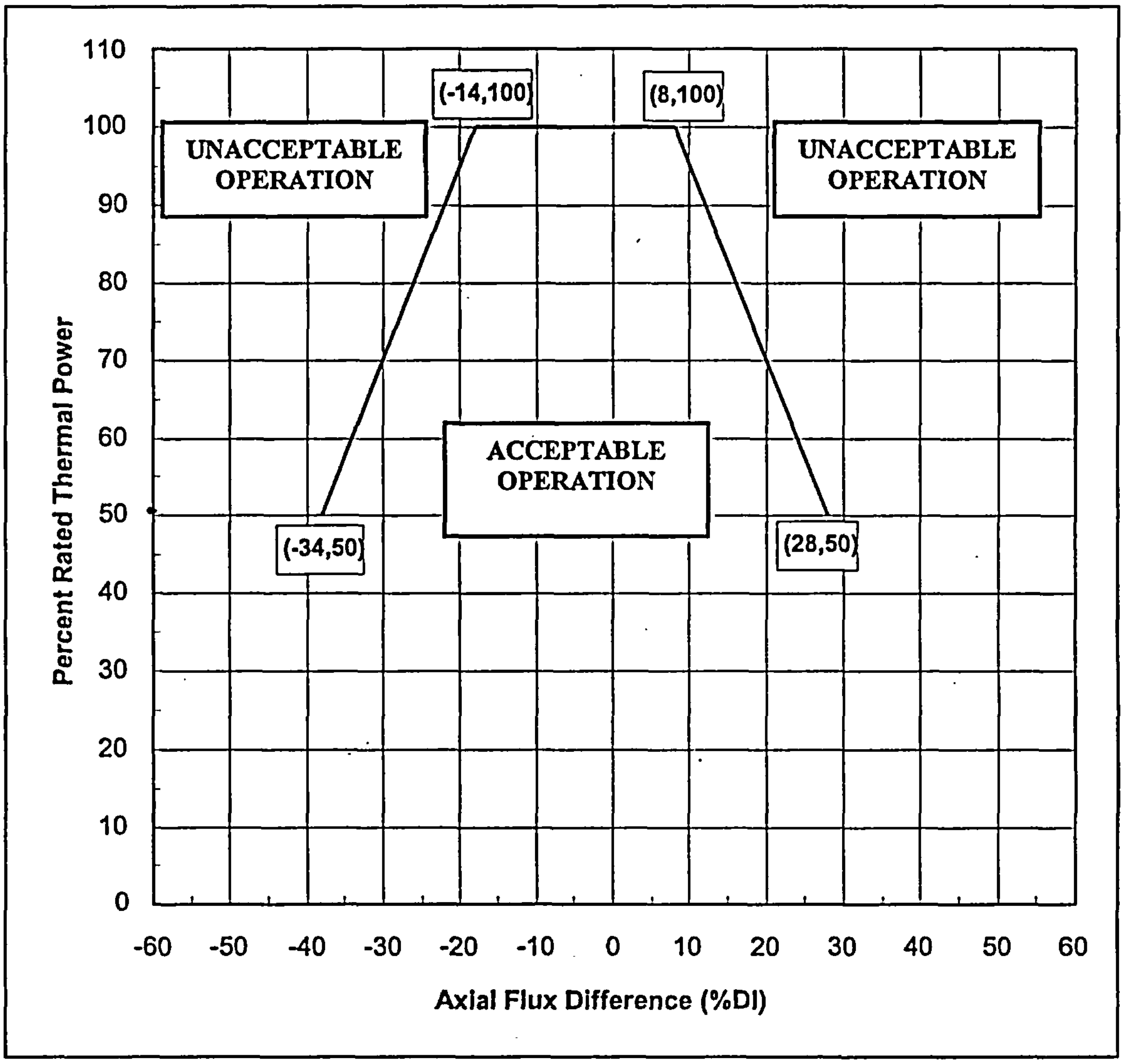


Figure 2
Axial Flux Difference Operating Limits Versus Thermal Power



Note: %DI = %ΔI

Figure 3
K(Z) Versus Core Height

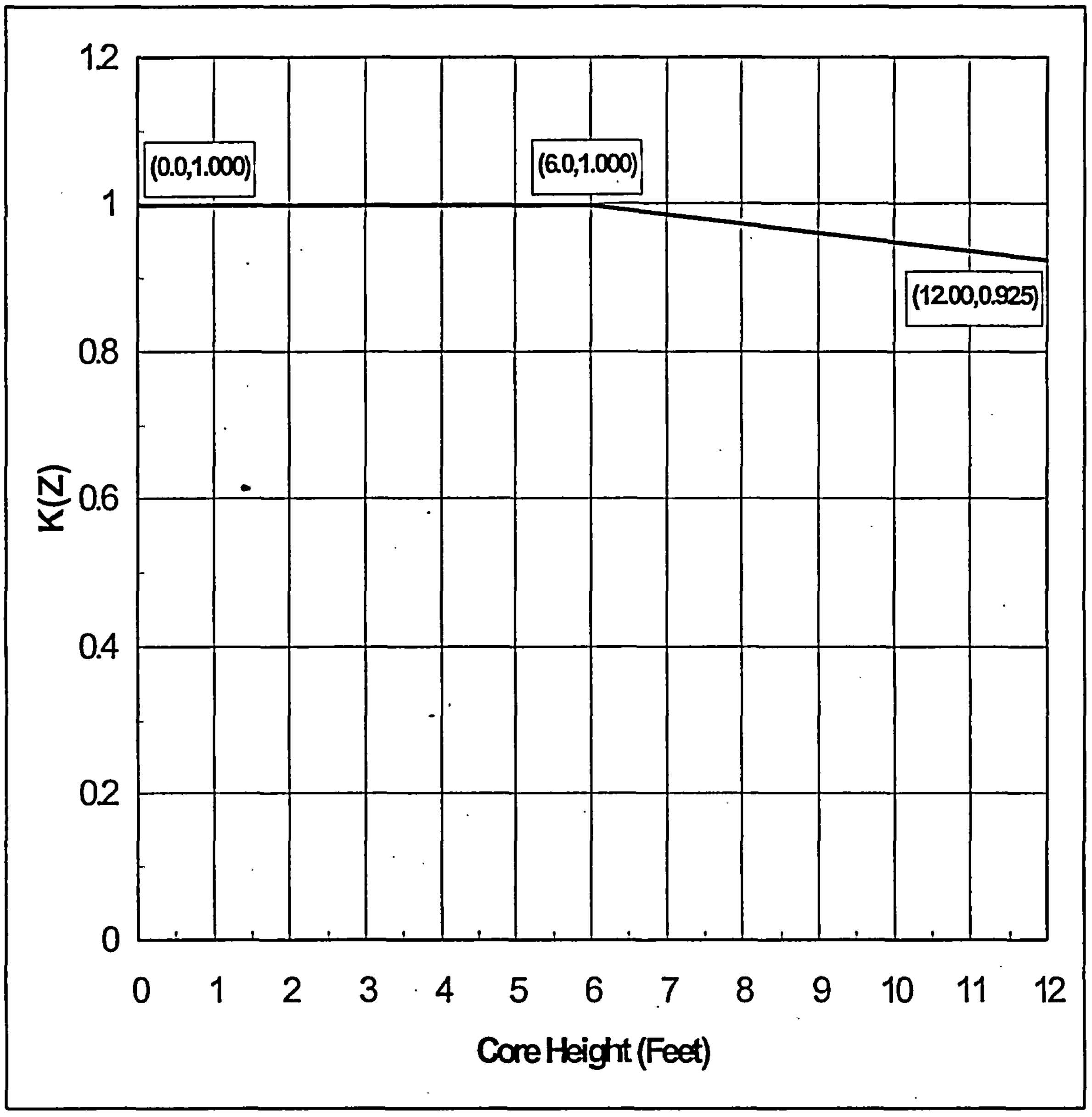


Figure 4.1
W(Z) Versus Core Height
150 MWD/MTU

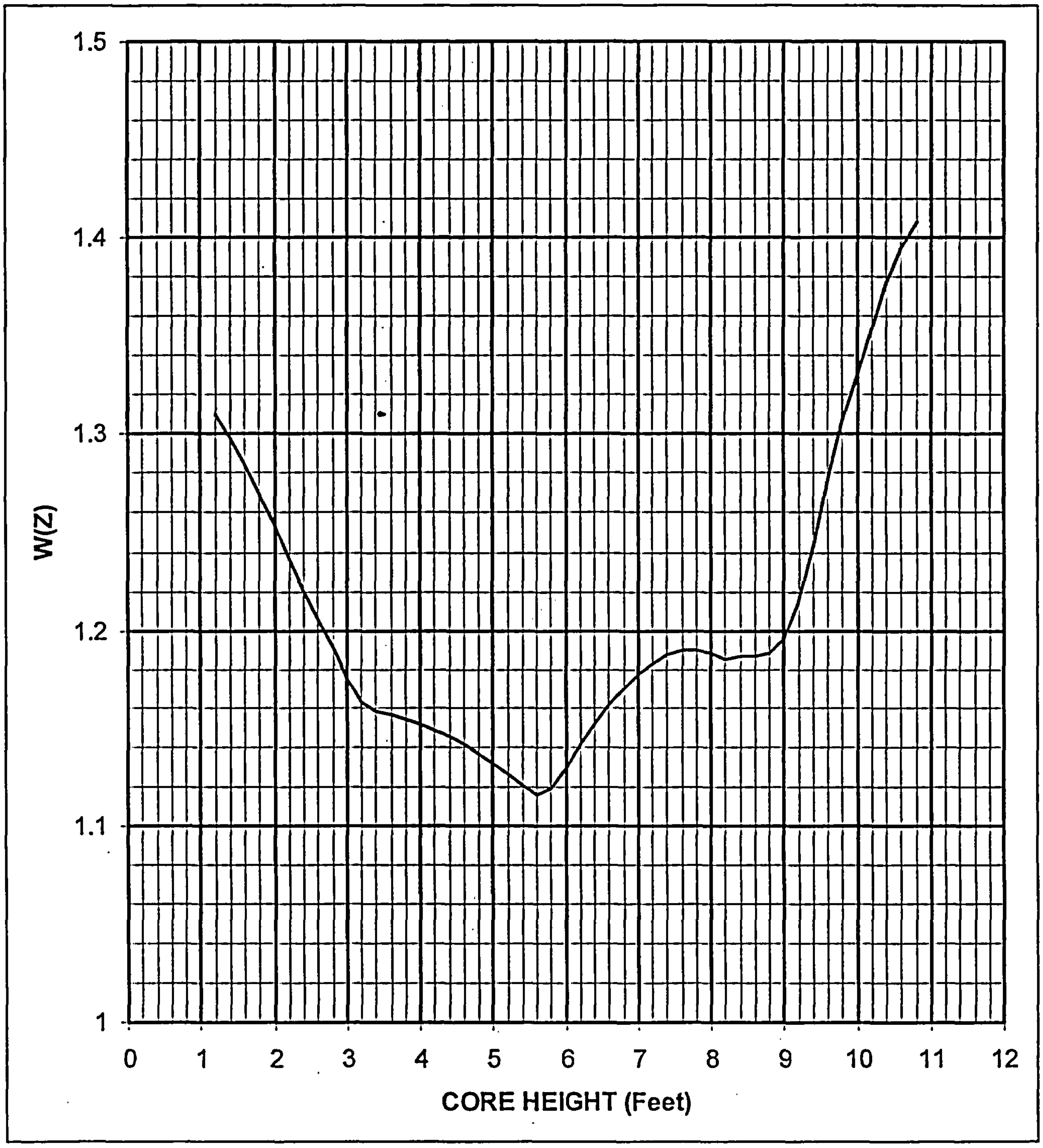


Figure 4.2
W(Z) Versus Core Height
3000 MWD/MTU

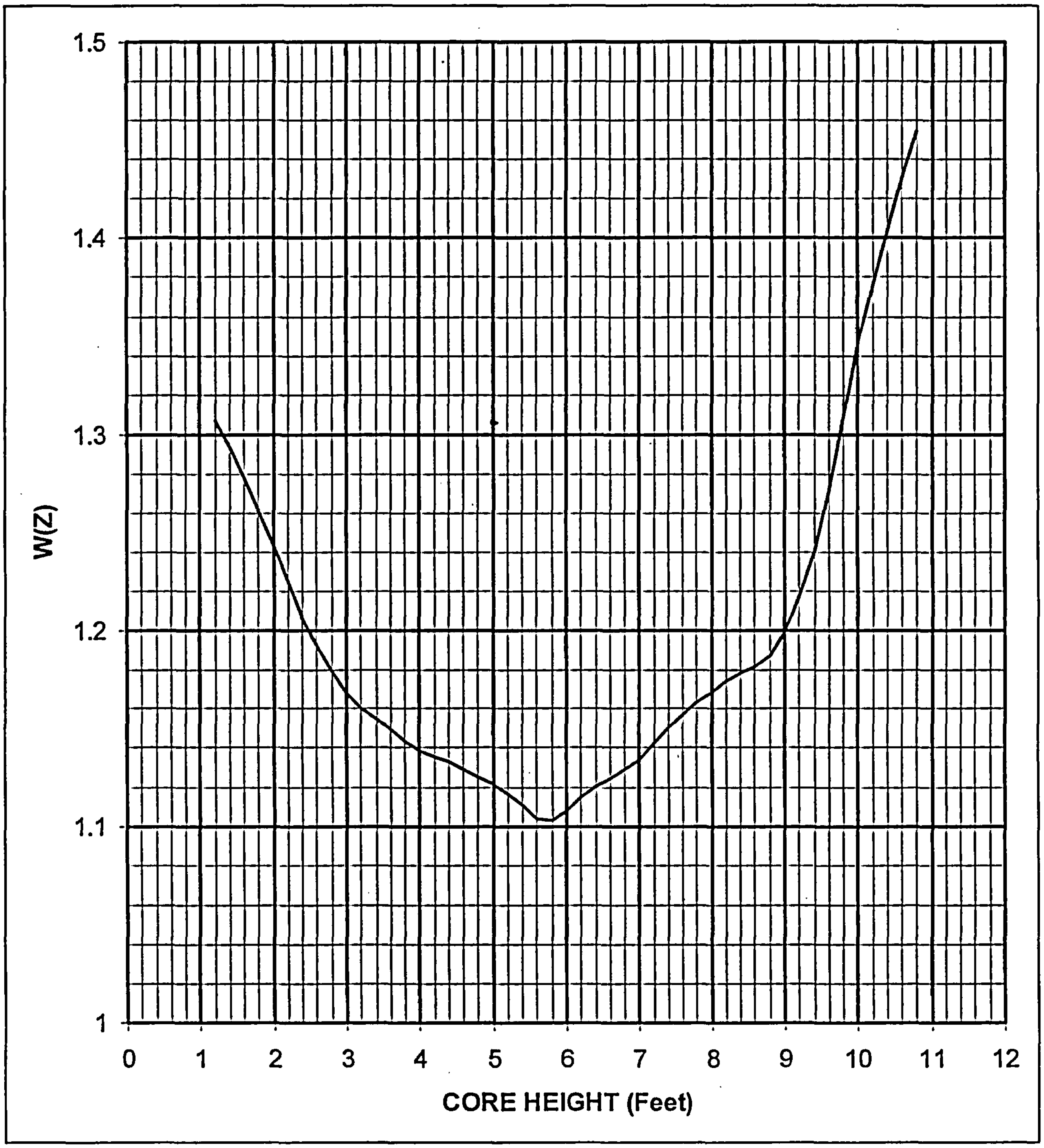


Figure 4.3
W(Z) Versus Core Height
10,000 MWD/MTU

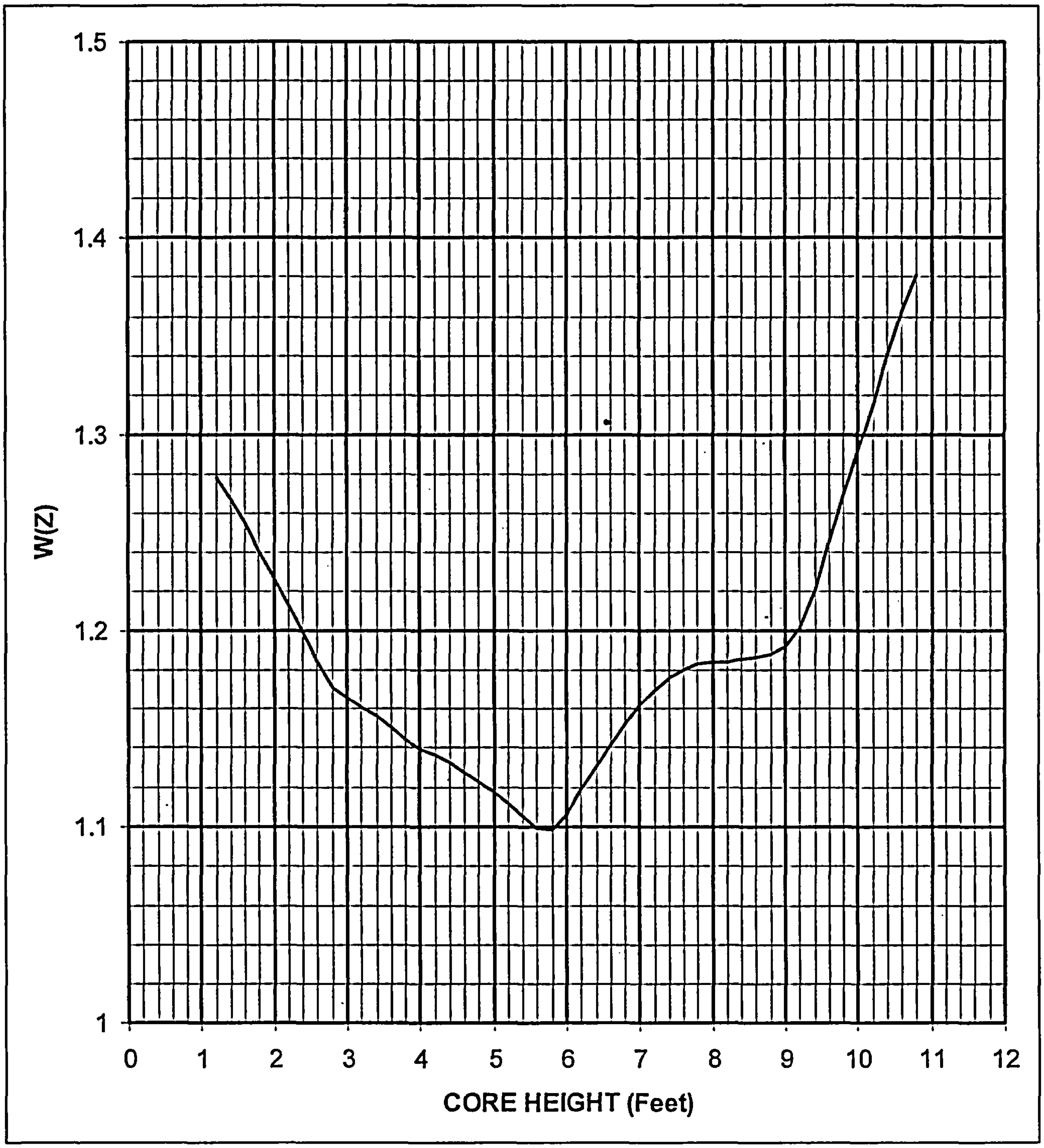


Figure 4.4
W(Z) Versus Core Height
19,000 MWD/MTU

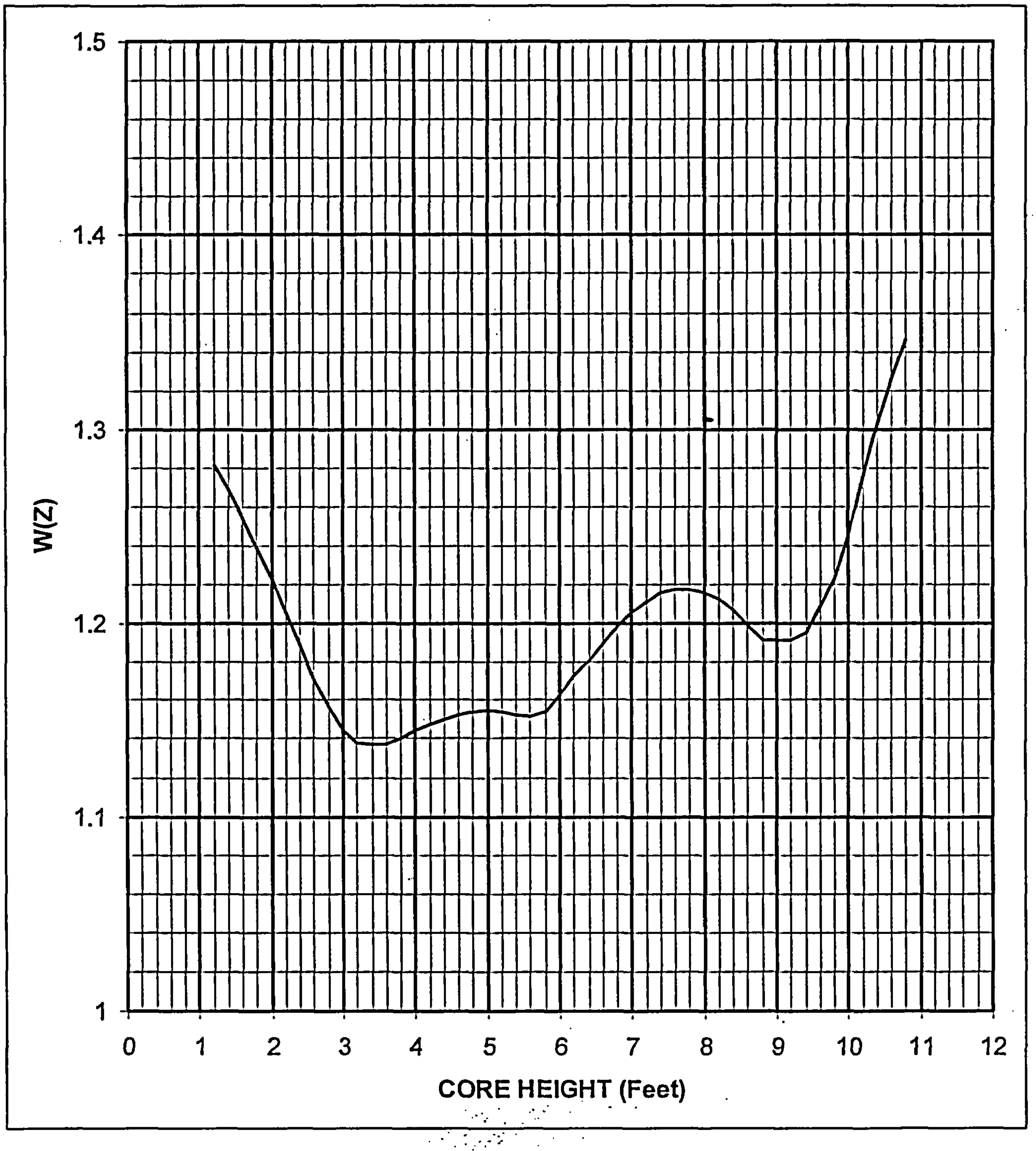


Figure 5

$f_1(\Delta I)$ Function

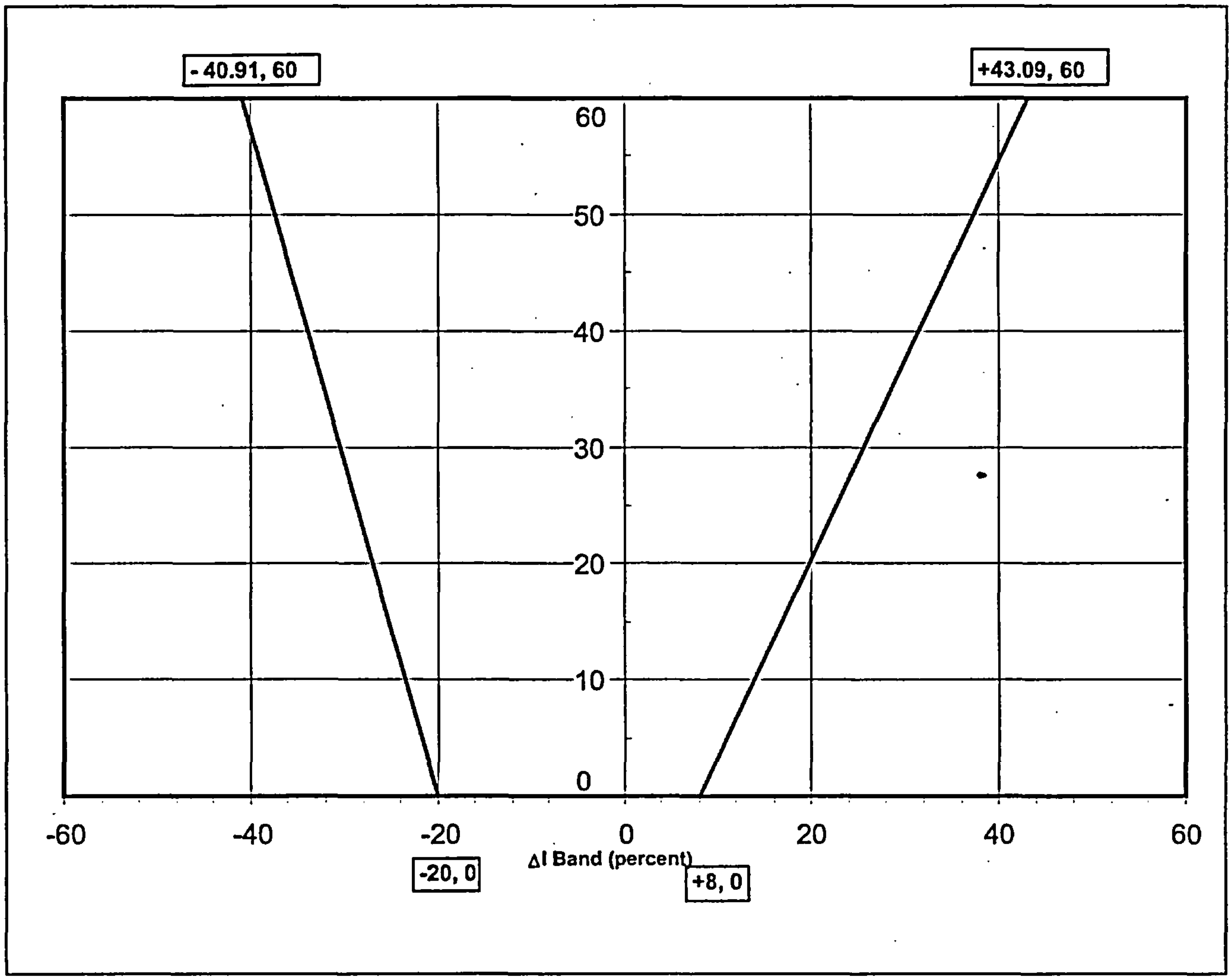


Figure 6
Safety Limits

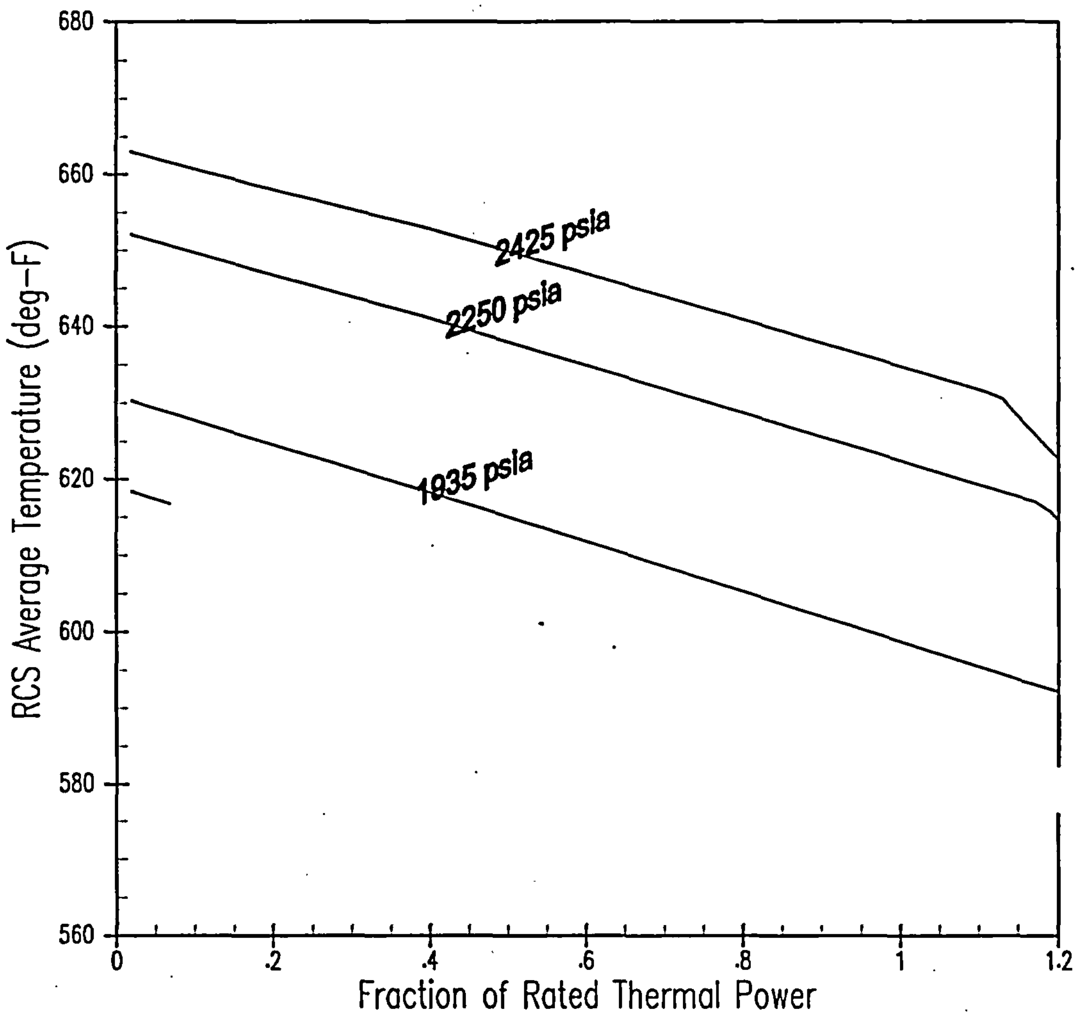


Table 1
W(Z,BU) versus Axial Height

HEIGHT (Z) (Feet)	W(Z,BU) 150 MWD/MTU	W(Z,BU) 3000 MWD/MTU	W(Z,BU) 10000 MWD/MTU	W(Z,BU) 19000 MWD/MTU
≤1.0	1.0000	1.0000	1.0000	1.0000
1.2	1.3103	1.3068	1.2786	1.2817
1.4	1.2980	1.2933	1.2675	1.2690
1.6	1.2844	1.2780	1.2548	1.2547
1.8	1.2695	1.2613	1.2405	1.2392
2.0	1.2534	1.2433	1.2262	1.2227
2.2	1.2368	1.2246	1.2126	1.2058
2.4	1.2208	1.2069	1.1991	1.1886
2.6	1.2057	1.1928	1.1853	1.1714
2.8	1.1911	1.1798	1.1714	1.1564
3.0	1.1753	1.1683	1.1657	1.1441
3.2	1.1628	1.1601	1.1610	1.1376
3.4	1.1581	1.1551	1.1560	1.1375
3.6	1.1562	1.1499	1.1506	1.1374
3.8	1.1541	1.1438	1.1444	1.1401
4.0	1.1515	1.1388	1.1397	1.1443
4.2	1.1486	1.1356	1.1363	1.1473
4.4	1.1452	1.1328	1.1322	1.1497
4.6	1.1413	1.1294	1.1277	1.1521
4.8	1.1369	1.1255	1.1227	1.1537
5.0	1.1320	1.1210	1.1173	1.1544
5.2	1.1263	1.1161	1.1113	1.1539
5.4	1.1208	1.1106	1.1049	1.1524
5.6	1.1159	1.1037	1.0989	1.1517
5.8	1.1190	1.1028	1.0984	1.1542
6.0	1.1297	1.1080	1.1060	1.1624
6.2	1.1413	1.1147	1.1185	1.1727
6.4	1.1517	1.1201	1.1306	1.1813
6.6	1.1613	1.1247	1.1421	1.1895
6.8	1.1700	1.1289	1.1526	1.1982
7.0	1.1773	1.1336	1.1618	1.2059
7.2	1.1832	1.1426	1.1697	1.2117
7.4	1.1874	1.1507	1.1760	1.2158
7.6	1.1897	1.1574	1.1806	1.2179
7.8	1.1904	1.1634	1.1837	1.2181
8.0	1.1882	1.1692	1.1844	1.2164
8.2	1.1856	1.1747	1.1842	1.2127
8.4	1.1868	1.1789	1.1862	1.2071
8.6	1.1872	1.1821	1.1869	1.1991
8.8	1.1887	1.1874	1.1879	1.1917
9.0	1.1956	1.1991	1.1922	1.1914
9.2	1.2129	1.2177	1.2016	1.1916
9.4	1.2439	1.2407	1.2212	1.1952
9.6	1.2769	1.2719	1.2463	1.2092
9.8	1.3067	1.3084	1.2693	1.2233
10.0	1.3317	1.3450	1.2908	1.2449
10.2	1.3538	1.3772	1.3146	1.2760
10.4	1.3770	1.4037	1.3402	1.3033
10.6	1.3944	1.4318	1.3630	1.3265
10.8	1.4084	1.4542	1.3814	1.3458
≥11.0	1.0000	1.0000	1.0000	1.0000

Note: The FQ(Z) surveillance exclusion zone is specified by Technical Specification 4.2.2.2.g