NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
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Reference: Facility Operating License No. NPF-49
Docket No. 50-423

Gentlemen:

Millstone Nuclear Power Station Unit 3
Transmittal of CORE OPERATING LIMITS REPORT (COLR)

Amendment 50 to the Millstone 3 Technical Specifications issued June 13, 1990 allowed implementation of a CORE OPERATING LIMITS REPORT within 90 days.

In accordance with Millstone No. 3 Technical Specification 6.9.1.6.d, the Northeast Nuclear Energy Company hereby submits the CORE OPERATING LIMITS REPORT for the remainder of Cycle 3 operation. This information addresses both four and three loop operation. The information provided represents no changes from the previously issued Technical Specifications, or Radial Peaking Factor Limit Report for Millstone 3, Cycle 3.

If you have any questions please contact David McDaniel at (203) 444-4389 directly.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

S. E. Scace

Stephen E. Scace
Director, Millstone Station

SES/DTM:clc

cc: T. T. Martin, Region I Administrator
W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2 and 3
D. H. Jaffe, NRC Project Manager, Millstone Unit No. 3

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Docket 50-423

Attachment I

Millstone Unit No. 3

Core Operating Limits Report

August 1990

MILLSTONE UNIT NO. 3
CYCLE 3
CORE OPERATING LIMITS REPORT

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for Millstone Unit No. 3, Cycle 3, has been prepared in accordance with the requirements of Technical Specification 6.9.1.6.

The Technical Specifications affected by this report are listed below:

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 (Four Loop and Three Loop)
3/4.2.1.1	Axial Flux Difference--Four Loop
3/4.2.1.2	Axial Flux Difference--Three Loop
3/4/2.2.1	Heat Flux Hot Channel Factor--Four Loop
3/4.2.2.2	Heat Flux Hot Channel Factor--Three Loop
3/4.2.3.1	RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor--Four Loop
3/4.2.3.2	RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor--Three Loop

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 6.9.1.6.

2.1 Moderator Temperature Coefficient (Specification 3/4.1.1.3)

2.1.1 The moderator temperature coefficient (MTC) limits are:

The BOL/ARO/0%-70% RTP--MTC shall be less positive than $+0.5 \times 10^{-4}$ $\Delta k/k/°F$. Above 70% RTP the MTC limit is a linear ramp to 0 $\Delta k/k/°F$ at 100% RTP.

The EOL/ARO/RTP--MTC shall be less negative than -4.75×10^{-4} $\Delta k/k/°F$.

2.1.2 The MTC surveillance limit is:

The 300 ppm/ARO/RTP--MTC should be less negative than or equal to -4.0×10^{-4} $\Delta k/k/°F$.

Where: BOL stands for beginning of cycle life
ARO stands for all rods out
HZP stands for hot zero power
EOL stands for end of cycle life
RTP stands for rated thermal power

2.2 Shutdown Rod Insertion Limit (Specification 3/4.1.3.5)

The shutdown rods shall be fully withdrawn.

2.3 Control Rod Insertion Limits (Specification 3/4.1.3.6)

The control rod banks shall be limited in physical insertion as shown in Figure 1 for four-loop operation and Figure 2 for three-loop operation.

2.4 Axial Flux Difference--Four-Loop Operation (Specification 3/4.2.1.1)

2.4.1 The axial flux difference (AFD) target band is +5%, -5% for core average accumulated burnup $\leq$ 3000 MWD/MTU.

2.4.2 The AFD target band is +3%, -12% for core average accumulated burnup $\geq$ 3000 MWD/MTU.

Where: MWD/MTU stands for megawatt days/metric ton of initial uranium metal.

2.4.3 The AFD acceptable operation limits are provided in Figure 3.

2.5 Axial Flux Difference--Three-Loop Operation (Specification 3/4.2.1.2)

2.5.1 The AFD target band is +5%, -5%.

2.5.2 The AFD acceptable operation limits are provided in Figure 4.

2.6 Heat Flux Hot Channel Factor (Four Loops Operating)--$F_Q(Z)$ (Specification 3/4.2.2.1)

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

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

$$\text{Where:} \quad P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$$

2.6.1 $F_Q^{RTP} = 2.32$

2.6.2 K(Z) is provided in Figure 5.

2.6.3 See Figure 6 for a plot of $[F_Q^T \cdot P_{Rel}]$ versus axial core height.

$$F_{xy}^{L} = F_{xy}^{RTP} * (1 + PF_{xy} * [1-P])$$

2.6.4 Where: F_{xy}^{RTP} = 1.67 for unrodded core planes
1.79 for core planes containing Bank D control rods

2.6.5 $PF_{xy} = 0.2$

2.7 Heat Flux Hot Channel Factor (Three Loops Operating)--$F_Q(Z)$ (Specification 3/4.2.2.2)

$$F_Q(Z) \le \frac{F_Q^{RTP}}{P} * K(Z) \qquad \text{for } P > 0.325$$

$$F_Q(Z) \le \frac{F_Q^{RTP}}{0.325} * K(Z) \qquad \text{for } P \le 0.325$$

$$\text{Where:} \quad P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$$

2.7.1 $F_Q^{RTP} = 1.69$

Note: Since maximum power in three-loop operation is 65%, F_Q^{RTP} represents the theoretical F_Q limit if power were at 100%.

2.7.2 K(Z) is provided in Figure 7.

2.7.3 See Figure 8 for a plot of $[F_Q^T \cdot P_{Rel}]$ versus axial core height.

$$F_{xy}{}^L = F_{xy}^{0.65\ RTP} * (1 + M_{F_{xy}} * [0.65 - P])$$

2.7.4 Where: F_{xy}^{RTP} = 1.69 for unrodded core planes
1.81 for core planes containing Bank D control rods

2.7.5 $M_{F_{xy}} = 0.281$

2.8 Nuclear Enthalpy Rise Hot Channel Factor (Four Loops Operating)--$F_{\Delta H}^N$ (Specification 3/4.2.3.1)

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

Where: $P = \dfrac{\text{Thermal Power}}{\text{Rated Thermal Power}}$

2.8.1 $F_{\Delta H}^{RTP} = 1.49$

2.8.2 $PF_{\Delta H} = 0.3$

2.9 Nuclear Enthalpy Rise Hot Channel Factor (Three Loops Operating)--$F^N_{\Delta H}$(Specification 3/4.2.3.2)

$$F^N_{\Delta H} \leq F^{RTP}_{\Delta H} * (1 + PF_{\Delta H} * [1-P])$$

Where: $P = \dfrac{\text{Thermal Power}}{\text{Rated Thermal Power}}$

2.9.1 $F^{RTP}_{\Delta H} = 1.351$

2.9.2 $PF_{\Delta H} = 0.43$

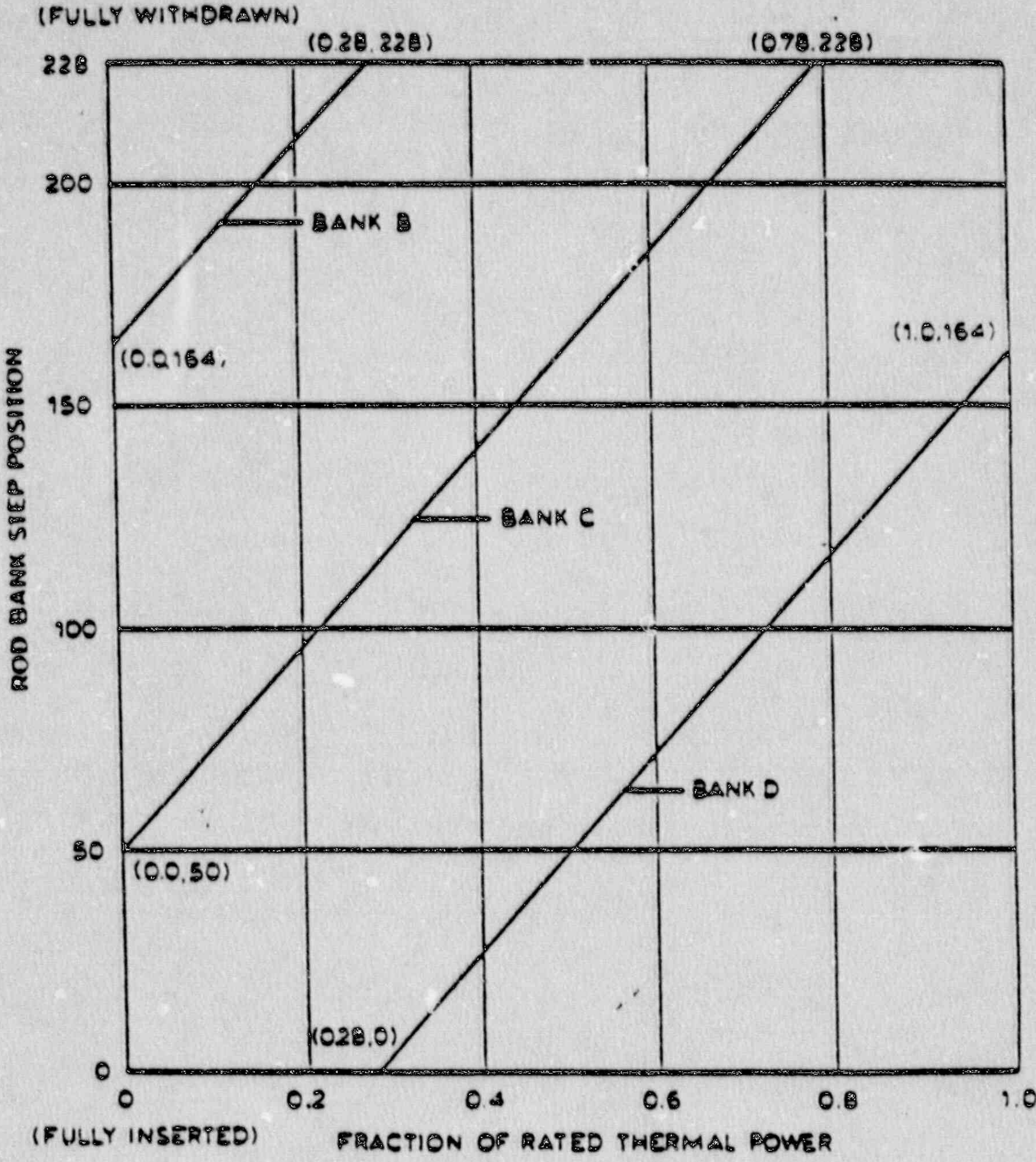

FIGURE 1

ROD BANK INSERTION LIMITS VERSUS THERMAL POWER
FOUR LOOP OPERATION

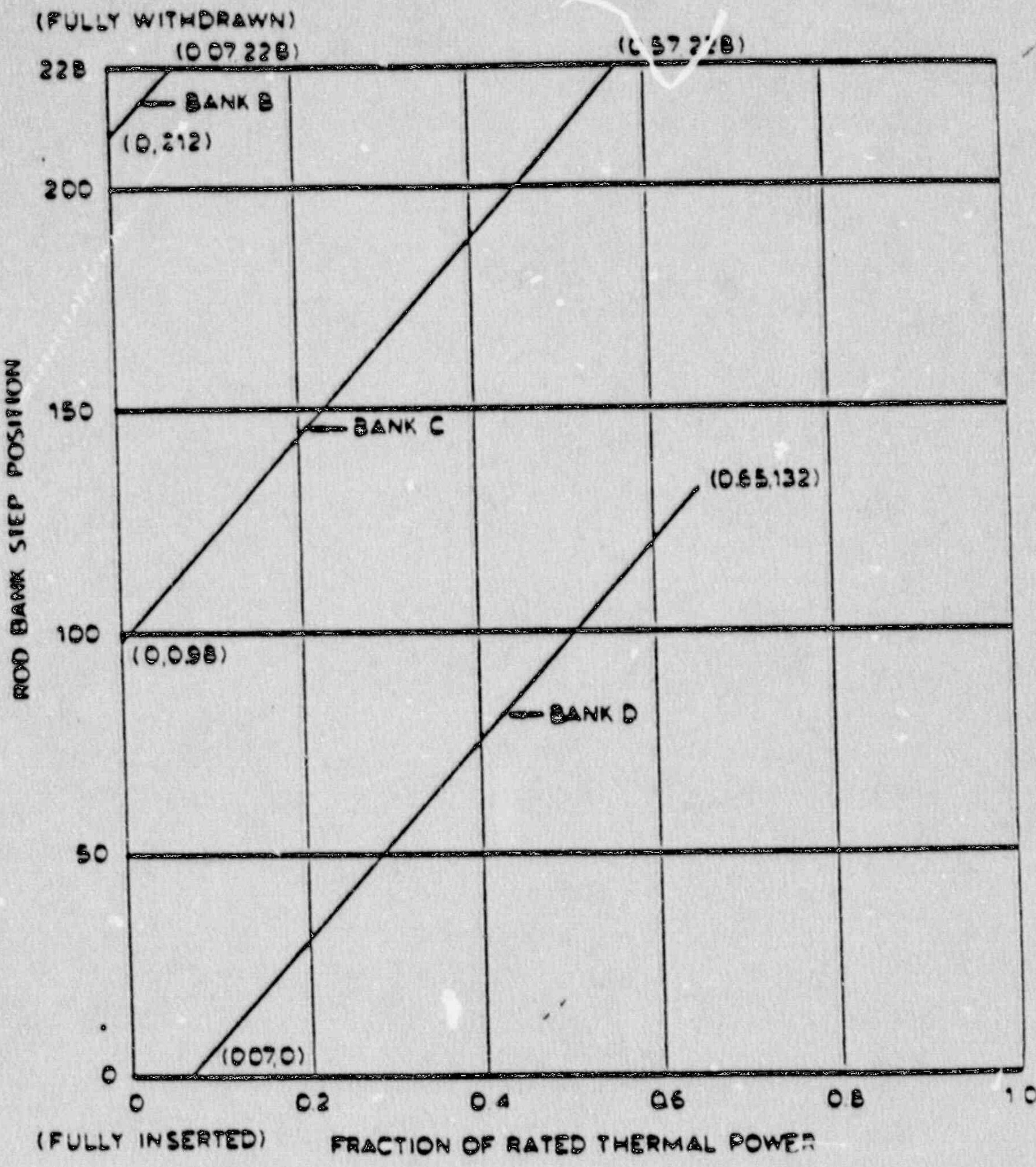

FIGURE 2

ROD BANK INSERTION LIMITS VERSUS THERMAL POWER
THREE LOOP OPERATION

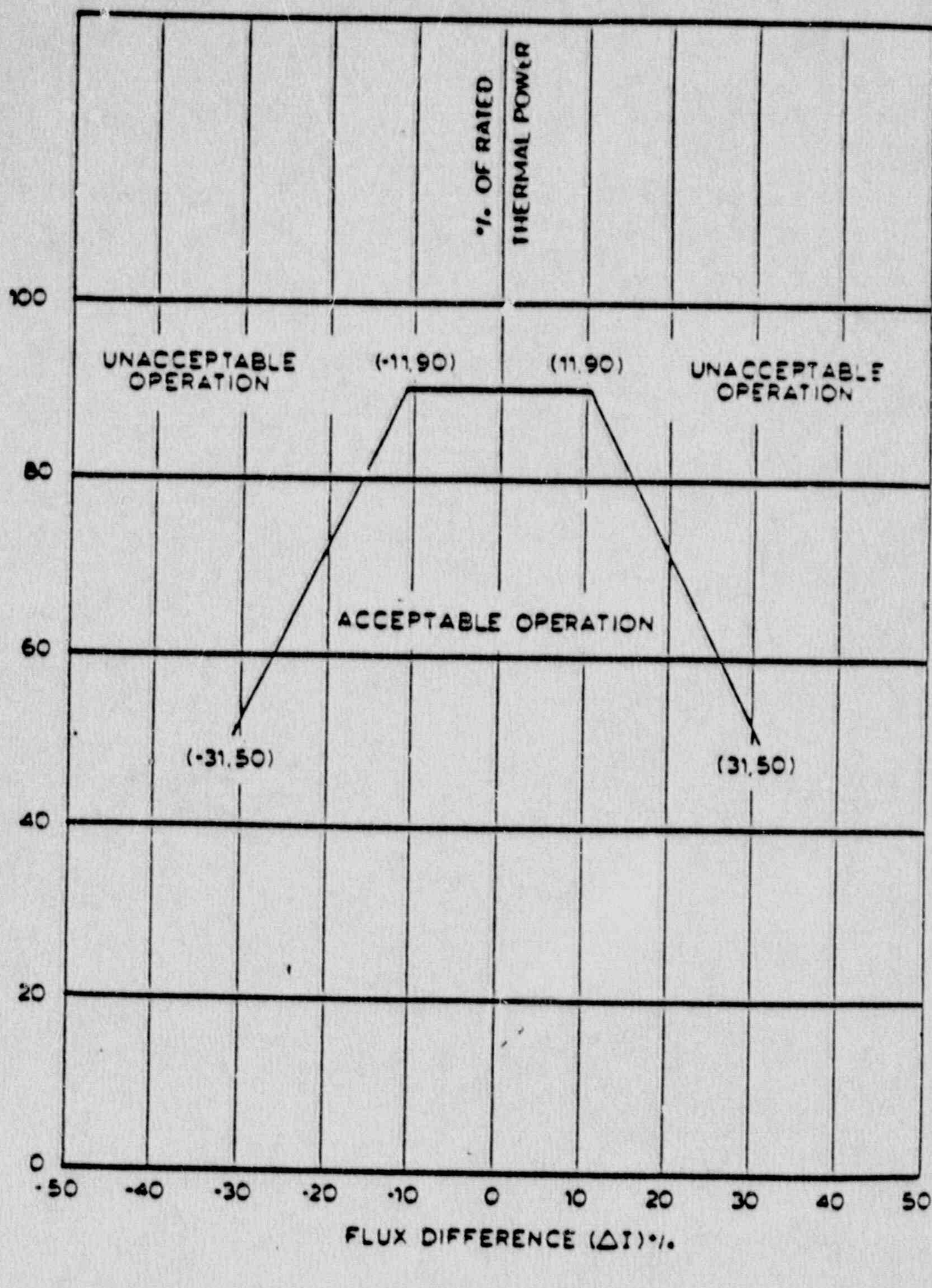

FIGURE 3

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF
RATED THERMAL POWER
(FOUR LOOPS OPERATING)

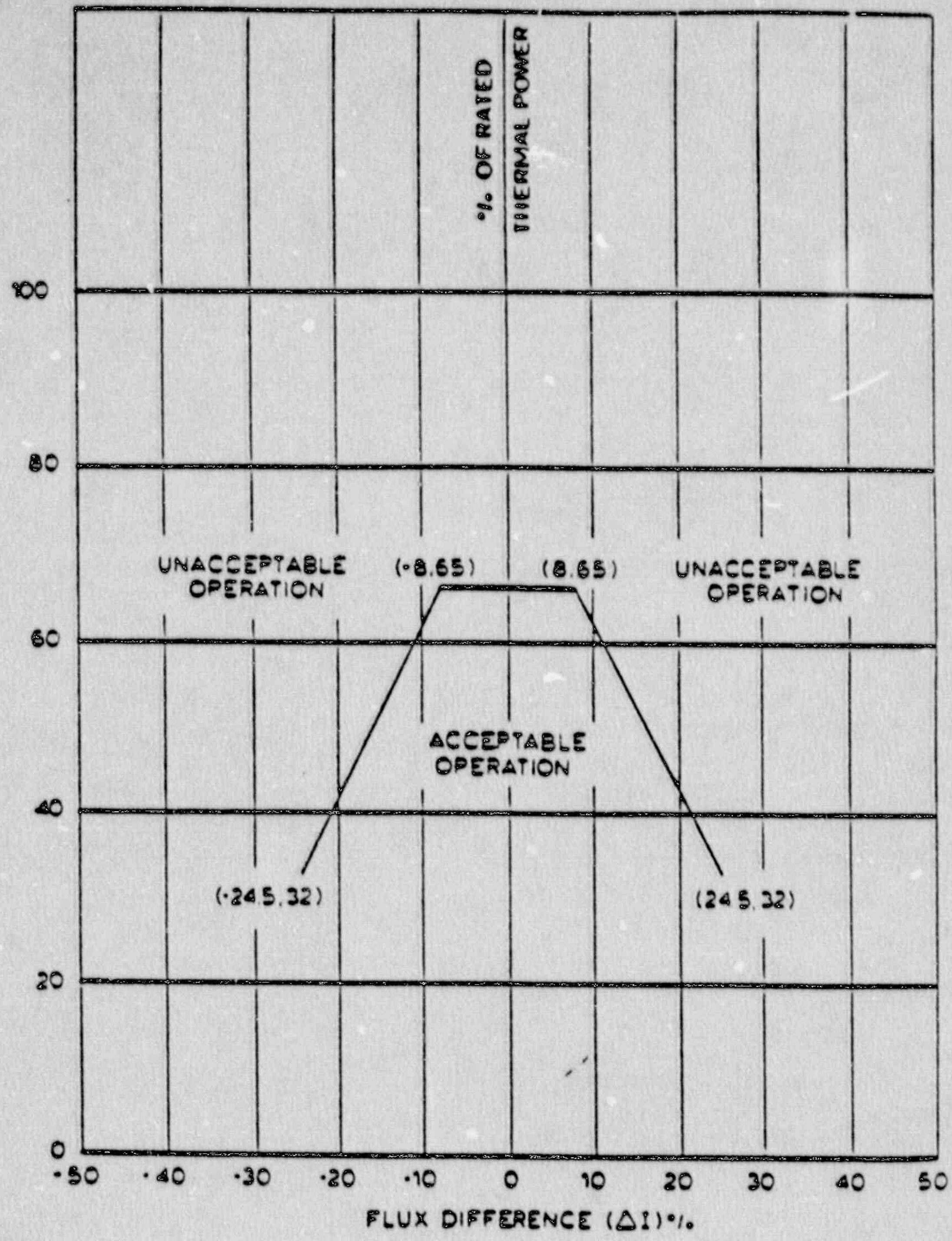

FIGURE 4

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF
RATED THERMAL POWER
(THREE LOOPS OPERATING)

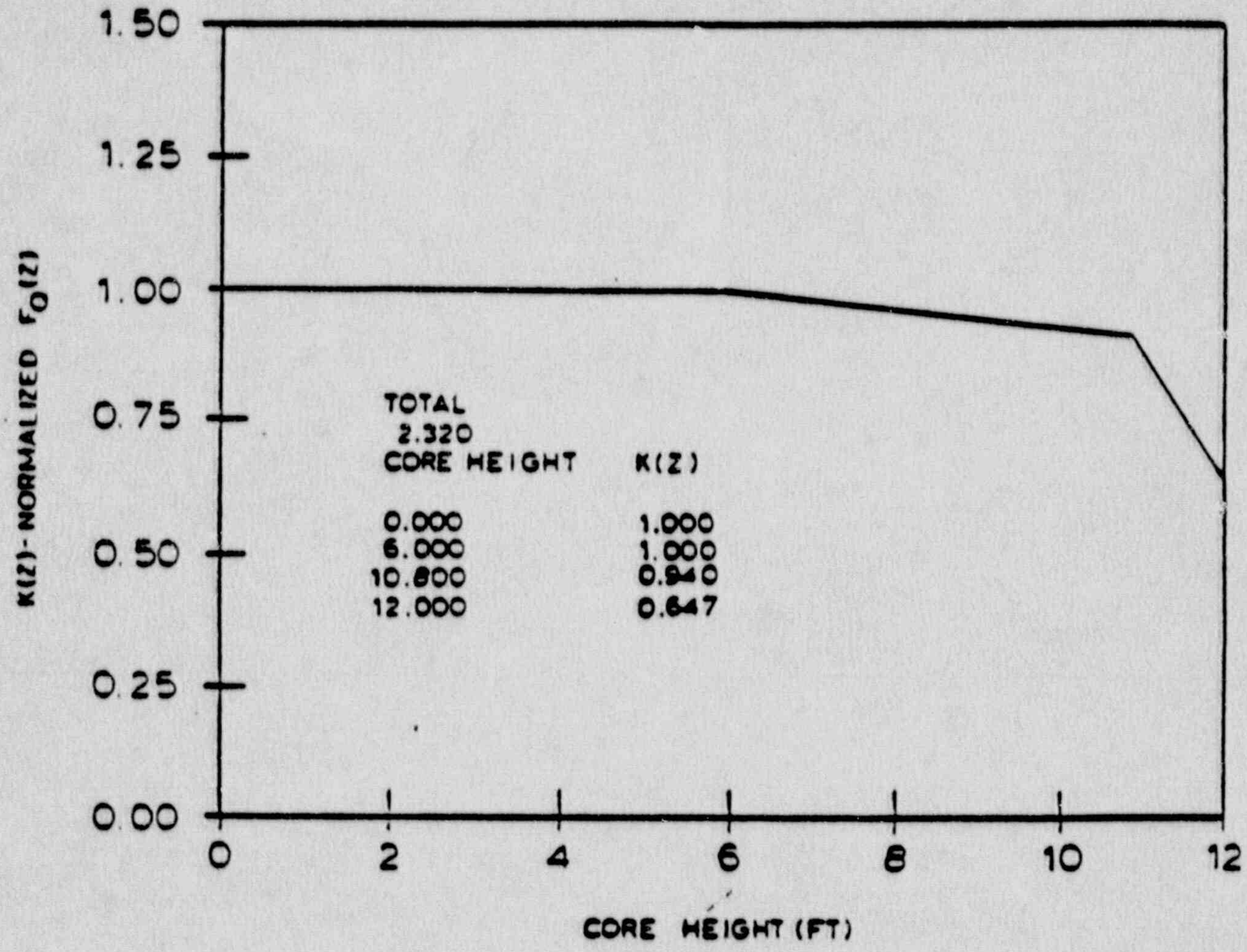

FIGURE 5

K(Z) - NORMALIZED $F_Q(Z)$ AS A FUNCTION OF CORE HEIGHT
FOR FOUR LOOP OPERATION

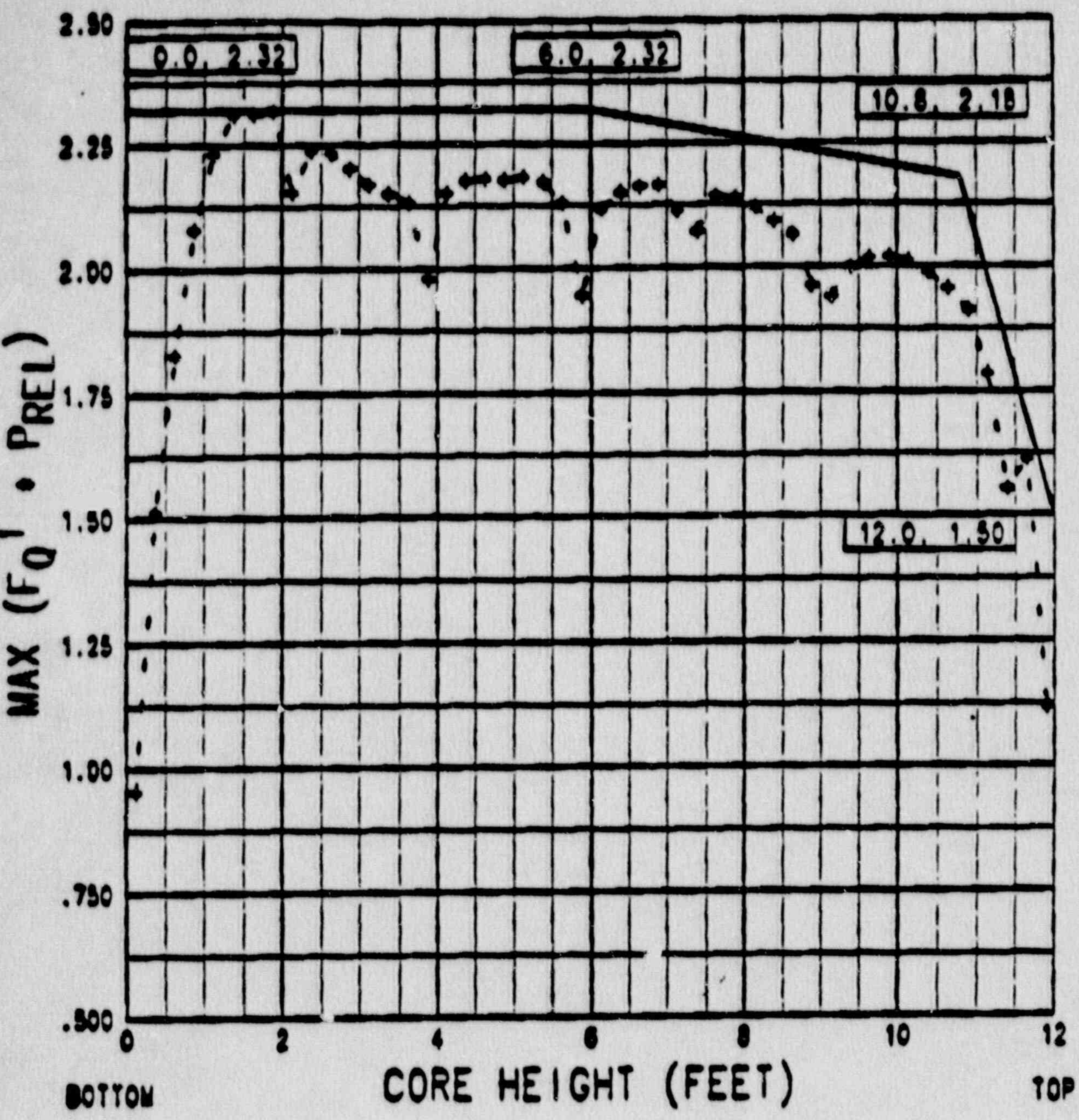

FIGURE 6

MAXIMUM $F_Q^T \cdot P_{REL}$ VERSUS AXIAL CORE HEIGHT DURING NORMAL CORE FOUR-LOOP OPERATION

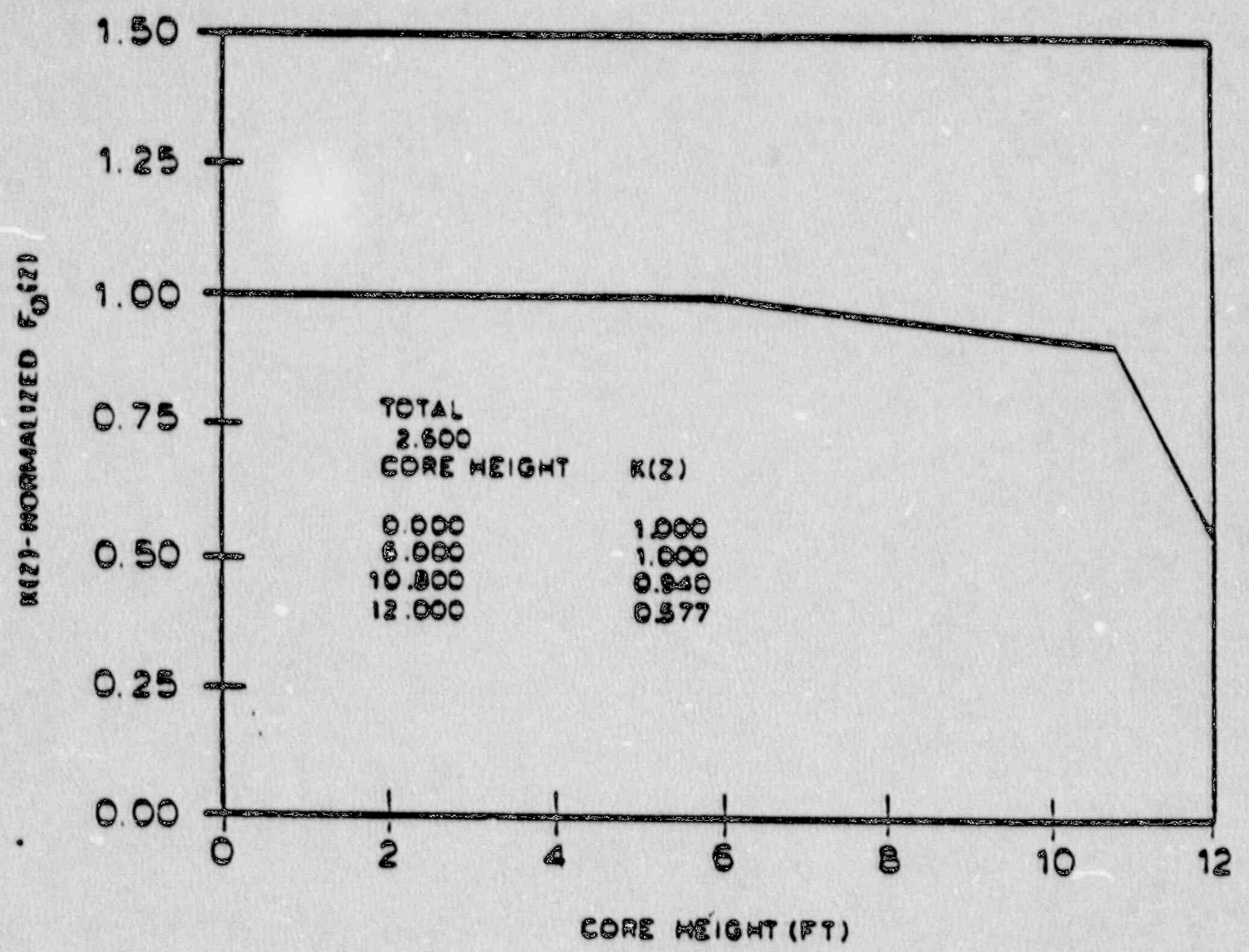

FIGURE 7

K(Z) - NORMALIZED $F_Q(Z)$ AS A FUNCTION OF CORE HEIGHT
FOR THREE-LOOP OPERATION

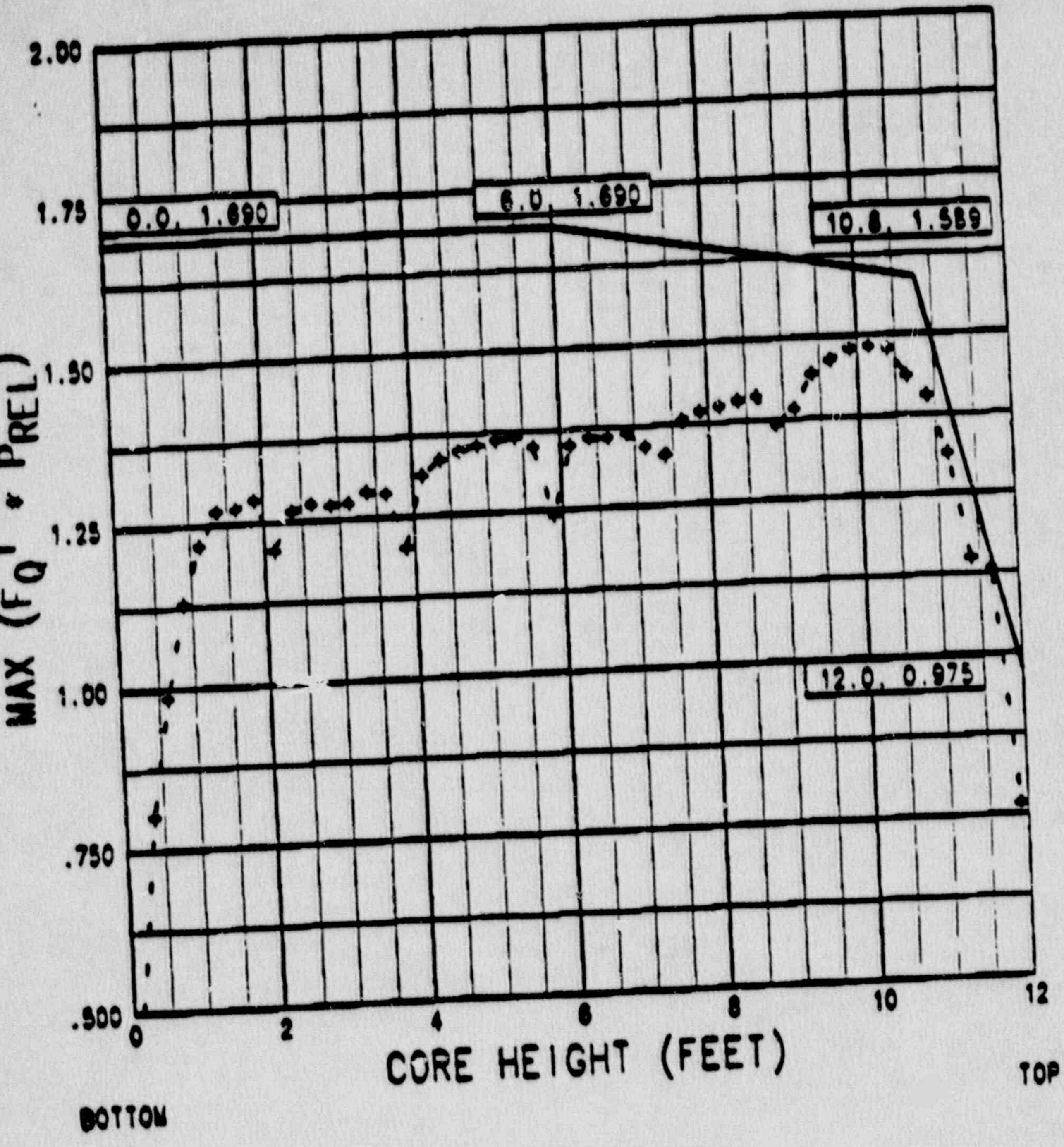

FIGURE 8

MAXIMUM $F_Q^T \cdot P_{REL}$ VERSUS AXIAL CORE HEIGHT
DURING NORMAL CORE THREE-LOOP OPERATION

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