DONALD C. COOK NUCLEAR PLANT UNIT 1 CYCLE 12

CORE OPERATING LIMITS REPORT

Revision 1

December 1990

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report for Donald C. Cook Nuclear Plant Unit 1 Cycle 12 has been prepared in accordance with the requirements of Technical Specification 6.9.1.11.

The Technical Specifications affected by this report are listed below:

3/4.1.1.4	Moderator Temperature Coefficient
3/4.1.3.1	Movable Control Assemblies Group Height
3/4.1.3.3	Rod Drop Time
3/4.1.3.4	Shutdown Rod Insertion Limits
3/4.1.3.5	Control Rod Insertion Limits
3/4.2.1	Axial Flux Difference
3/4.2.2	Heat Flux Hot Channel Factor
3/4.2.3	Nuclear Enthalpy Hot Channel Factor
3/4.2.6	Allowable Power Level

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 6.9.1.11.

2.1 Moderator Temperature Coefficient (Specification 3/4.1.1.4)

2.1.1 The Moderator Temperature Coefficient (MTC) Limits are:

The BOL/ARO -MTC shall be less positive than the value given in Figure 1.

The EOL/ARO/RTP-MTC shall be less negative than -3.35E-4 $\Delta k/k/^{o}F$.

This limit is based on a T_{avg} program with HFP T_{avg} of $550^{o}F$

where: ARO stands for All Rods Out
BOL stands for Beginning of Cycle Life
EOL stands for End of Cycle Life
RTP stands for Rated Thermal Power
HFP stands for Hot Full Thermal Power

2.1.2 The MTC Surveillance limit is:

The 300 ppm/ARO/RTP-MTC should be less negative than or equal to -2.70E-4 $\Delta k/k/^{\circ}F$ at a vessel average temperature of $550^{o}F$.

2.2 Rod Drop Time Drop Height (Specification 3/4.1.3.3)

2.2.1 All rods shall be dropped from 228 steps.

2.3 Shutdown Rod Insertion Limit (Specification 3/4.1.3.4)

2.3.1 The shutdown rods shall be withdrawn to 228 steps.

2.4 Control Rod Insertion Limits (Specification 3/4.1.3.5, and 3/4.1.3.1)

2.4.1 The control banks shall be limited in physical insertion as shown in Figure 2.

2.4.2 Successive Control Banks shall overlap by 100 steps. The sequence for Control Bank withdrawal shall be Control Bank A, Control Bank B, Control Bank C, and Control Bank D.

2.5 Axial Flux Difference (Specification 3/4.2.1)

2.5.1 The Allowable Operation Limits are provided in Figure 3.

2.5.2 The AXIAL FLUX DIFFERENCE (AFD) target band during base load operations is +3%, -3% (not applicable for this cycle).

2.5.3 The AFD target band is +5%, -5% for core average accumulated burnup $\geq$ 0.0 MWD/MTU

2.6 Heat Flux Hot Channel Factor - $F_Q(Z)$ (Specifications 3.2.2)

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

$$F_Q(Z) \leq 2 * CFQ * K(Z) \qquad \text{for } P \leq 0.5$$

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

2.6.1 CFQ= 2.15 for Westinghouse fuel

2.6.2 K(Z) is provided in Figure 4 for Westinghouse fuel

2.7 Nuclear Enthalpy Hot Channel Factor - $F^N_{\Delta H}$ (Specification 3/4.2.3)

$$F^N_{\Delta H} \leq CFDH * (1 + PFDH * (1-P))$$

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

2.7.1 CFDH = 1.49 for Westinghouse fuel

2.7.2 PFDH = 0.3

2.8 Allowable Power Level - APL (Specification 3.2.6)

$$\text{APL} = \min \text{ over } Z \text{ for } \frac{CFQ * K(Z)}{F_Q(Z) * V(Z) * F_P}$$

2.8.1 V(Z) is provided in Table 1 for ±5% AFD target band

2.8.2 CFQ and K(Z) are provided in COLR Sections 2.6.1 and 2.6.2, respectively

2.8.3 F_P is provided in Technical Specification 3.2.6

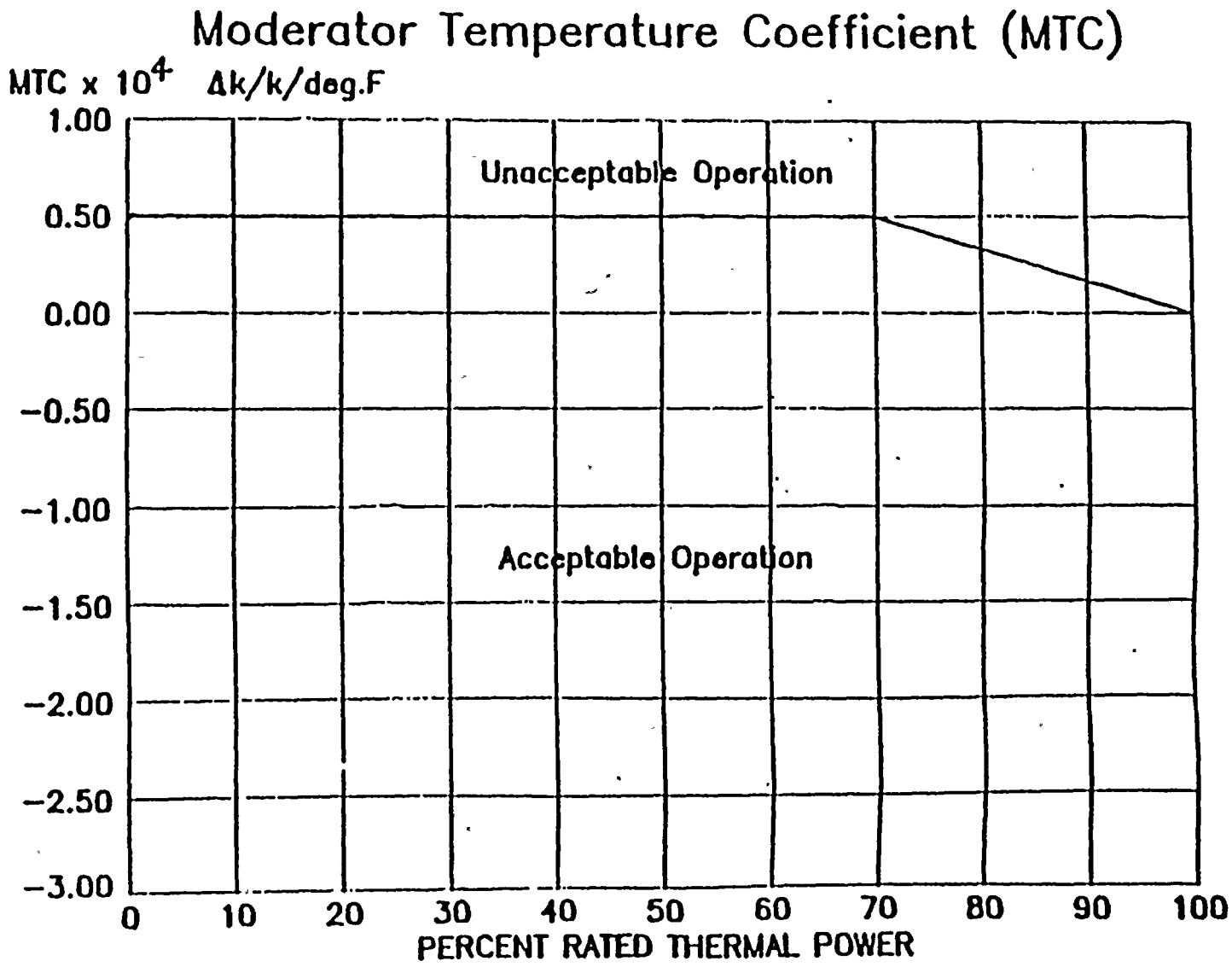
Moderator Temperature Coefficient (MTC)
MTC x 10^4 Δk/k/deg.F
1.00
0.50
0.00
−0.50
−1.00
−1.50
−2.00
−2.50
−3.00
Unacceptable Operation
Acceptable Operation
0
10
20
30
40
50
60
70
80
90
100
PERCENT RATED THERMAL POWER

FIGURE 1

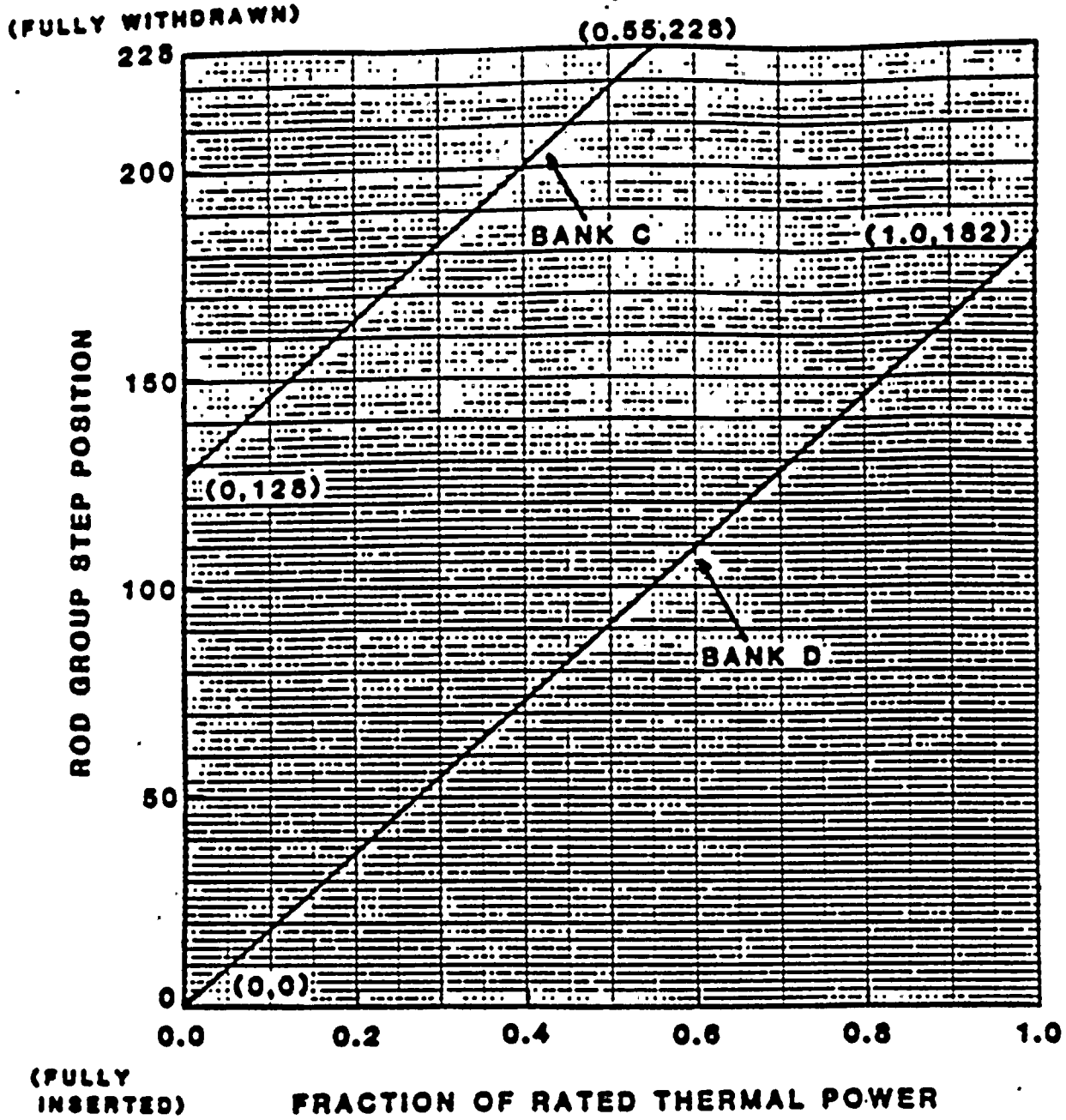

FIGURE 2

ROD INSERTION LIMITS VERSUS

THERMAL POWER 4 LOOP OPERATION

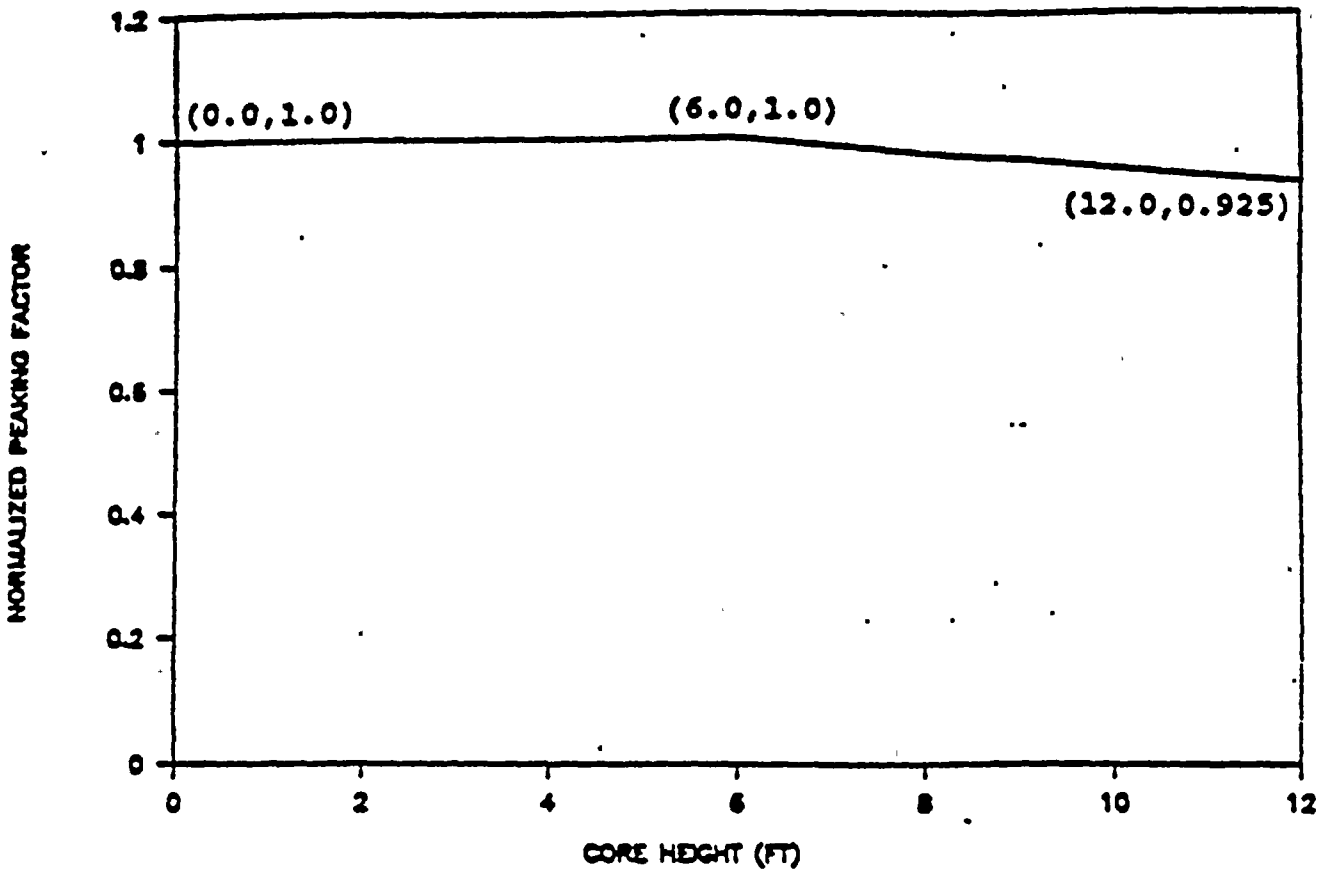

FIGURE 4

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