Edwin I. Hatch
Nuclear Plant - Unit 2

CORE OPERATING LIMITS REPORT
for
Operating Cycle 9

Revision 0

Interoffice Correspondence Georgia Power

DATE: February 15, 1990

RE: Core Operating Limits Report for
Hatch 2 Cycle 9
File: Fuel Cycle Technical
XREF: X7GJ13-H800 Log: HF-7

FROM: R. D. Baker

TO: ALL UNIT 2 TECHNICAL SPECIFICATIONS HOLDERS

By Amendment 106 to the Unit 2 Technical Specifications, the NRC has authorized relocation of certain fuel related limits out of the Technical Specifications into an adjunct Core Operating Limits Report. This letter transmits to all Unit 2 Technical Specifications holders a copy of Revision 0 of the Core Operating Limits Report for Hatch 2 Cycle 9. This document should be utilized in conjunction with Amendment 106 of the Unit 2 Technical Specifications. If changes to the core operating limits contained in this report are required during the operating cycle, a complete revised document will be issued at that time.

If there are any questions regarding this report, please contact me at extension 8-821-7367, or telephone number (205)-877-7367.

RDB/ RDBaker

c: S. J. Bethay
NORMS

colr

700026A

GEORGIA POWER COMPANY
EDWIN I. HATCH NUCLEAR PLANT

UNIT 2 FUEL CYCLE 9
CORE OPERATING LIMITS REPORT

Prepared by:
SOUTHERN COMPANY SERVICES, INC.
P.O. BOX 1295
BIRMINGHAM, AL 35201

FEBRUARY 27, 1990

REVISION 0

HATCH 2 CYCLE 9
CORE OPERATING LIMITS REPORT
REVISION 0, EFFECTIVE DATE: FEBRUARY 27, 1990

1. INTRODUCTION

This CORE OPERATING LIMITS REPORT for Hatch Unit 2 Cycle 9 is prepared in accordance with the requirements of Hatch Technical Specification 6.9.1.11. The core operating limits presented here were developed using NRC-approved methods (References 1 and 2). Results from the reload analyses for the General Electric fuel in Hatch Unit 2 Cycle 9 are documented in References 3 and 4.

The following cycle-specific core operating limits are included in this report.

a. Control Rod Program Controls - Rod Block Monitor
(Technical Specification 3/4.1.4.3)

b. Average Planar Linear Heat Generation Rate (APLHGR) Limit
(Technical Specification 3/4.2.1)

c. Minimum Critical Power Ratio (MCPR) Operating Limit
(Technical Specification 3/4.2.3)

d. Linear Heat Generation Rate (LHGR) Limit
(Technical Specification 3/4.2.4)

2. ROD BLOCK MONITOR (TECHNICAL SPECIFICATION 3/4.1.4.3)

Both Rod Block Monitor (RBM) channels shall be operable as specified in Technical Specification 3/4.1.4.3 and when:

a. THERMAL POWER is < 90% of RATED THERMAL POWER and the MCPR is less than 1.70, or

b. THERMAL POWER is ≥ 90% of RATED THERMAL POWER and the MCPR is less than 1.40.

3. APLHGR LIMIT (TECHNICAL SPECIFICATION 3/4.2.1)

The APLHGR limit is given by the applicable rated-power, rated-flow limit taken from Figures 3-3 through 3-7, multiplied by the smaller of either:

a. The factor given by Figure 3-1, or

b. The factor given by Figure 3-2.

For the fuel types whose APLHGR limits are shown in Figures 3-3 through 3-7, the APLHGR limit shown shall be applied to each axial location in the fuel assembly.

4. MCPR LIMIT (TECHNICAL SPECIFICATION 3/4.2.3)

The MCPR operating limit (OLMCPR) is a function of fuel design, average scram time, core flow, number of operating recirculation loops, and core power.

4.1 Two Recirculation Loop Operation

For 25% ≤ Power < 30%, the OLMCPR is given in Figure 4-1. For Power ≥ 30%, the OLMCPR is the greater of either:

a. The applicable limit determined from Figure 4-2, or

b. The appropriate K_p given by Figure 4-1, multiplied by the appropriate limit from Figure 4-3, where

$$\tau = 0 \text{ or } \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B}, \text{ whichever is greater}$$

where: τ_A = 1.096 sec (Specification 3.1.3.3, scram time limit to notch 36)

$$\tau_B = \mu + 1.65 \left[\frac{N_1}{\sum_{i=1}^{n} N_i} \right]^{1/2} \sigma$$

where: μ = 0.822 sec (mean scram time used in the transient analysis)

σ = .018 sec (standard deviation of μ)

$$\tau_{ave} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i}$$

where: n = number of surveillance tests performed to date in the cycle

N_i = number of active control rods measured in the ith surveillance test

τ_i = average scram time to notch 36 of rods in the ith surveillance test

N_1 = total number of active rods measured in Specification 4.1.3.2.a

Note that $\tau = 1.0$ prior to the initial scram time measurements for the cycle performed in accordance with Specification 4.1.3.2.a, because τ_{ave} is assumed equal to τ_A (Specification 4.2.3.1.a).

4.2 Single Recirculation Loop Operation

For single-loop operation, the MCPR operating limit shall be 0.01 greater than the two-loop value which is determined as specified in Section 4.1.

5. LHGR LIMIT (TECHNICAL SPECIFICATION 3/4.2.4)

The LHGR limit shall be 13.4 kw/ft for all 8x8 fuel. There is no corresponding limit for 9x9 fuel.

6. REFERENCES

1. "General Electric Standard Application for Reactor Fuel," NEDE-24011-P-A-9 (September 1988).

2. Letter, L. P. Crocker (NRC) to J. P. O'Reilly (GPC), "Issuance of Amendment Nos. 151 and 89 to Facility Operating Licenses DPR-57 and NPF-5 - Edwin I. Hatch Nuclear Plant Units 1 and 2 (TACS 66524/66525)," January 22, 1988.

3. "Supplemental Reload Licensing Submittal for Edwin I. Hatch Nuclear Plant Unit 2, Reload 8, Cycle 9," GE Document 23A6470, Rev. 0 (November 1989).

4. Letter, CJP:90-006, "Hatch 2 Cycle 9 Operating Limit MCPR Modification," C. J. Paone to K. S. Folk, January 8, 1990.

5. NEDC-31376P, "Edwin I. Hatch Nuclear Plant Units 1 and 2 SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis," December 1986.

6. Technical Specifications Bases for Sections 3/4.1.4.3, 3/4.2.1, 3/4.2.3, and 3/4.2.4.

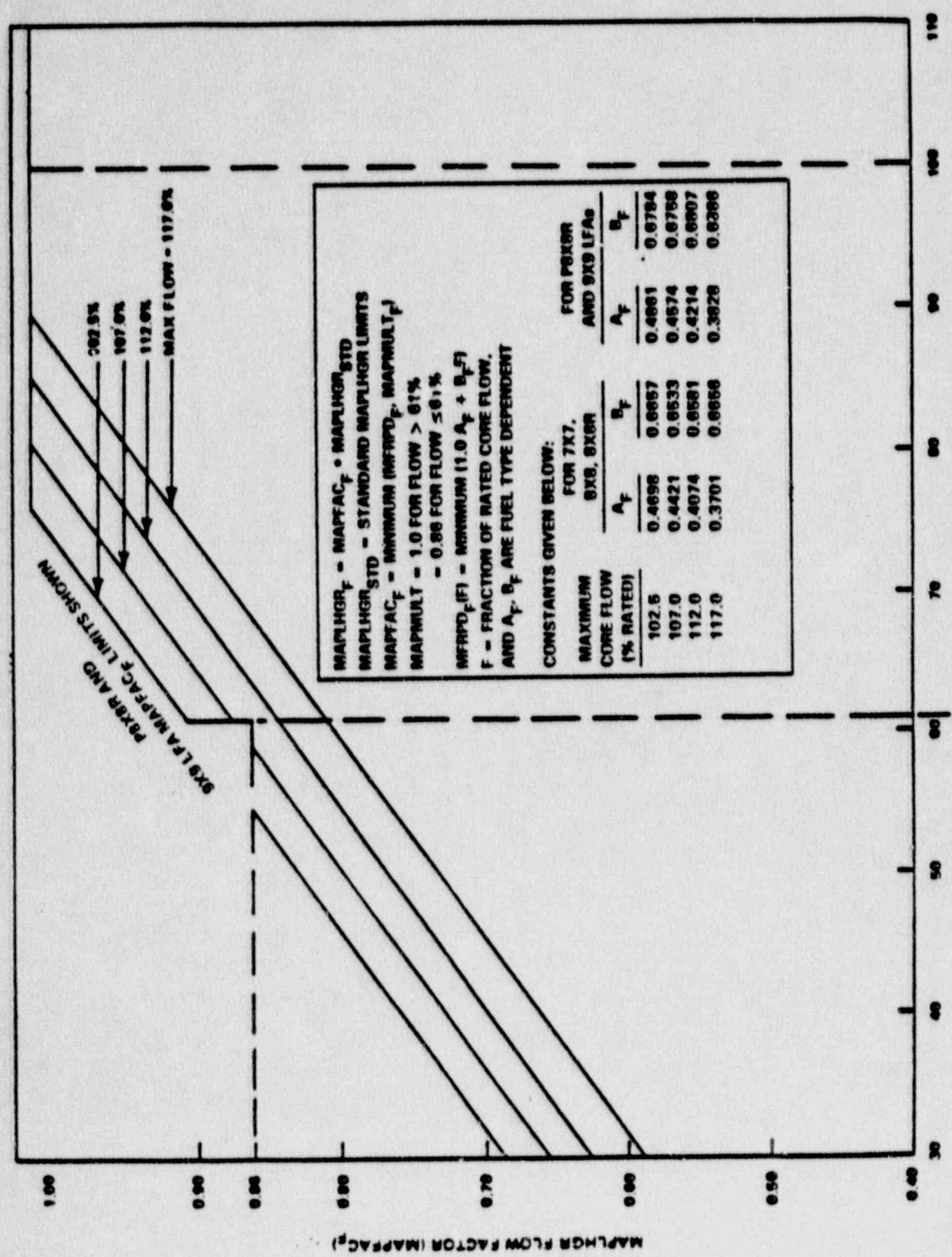


FIGURE 3-1 MAPFAC$_F$

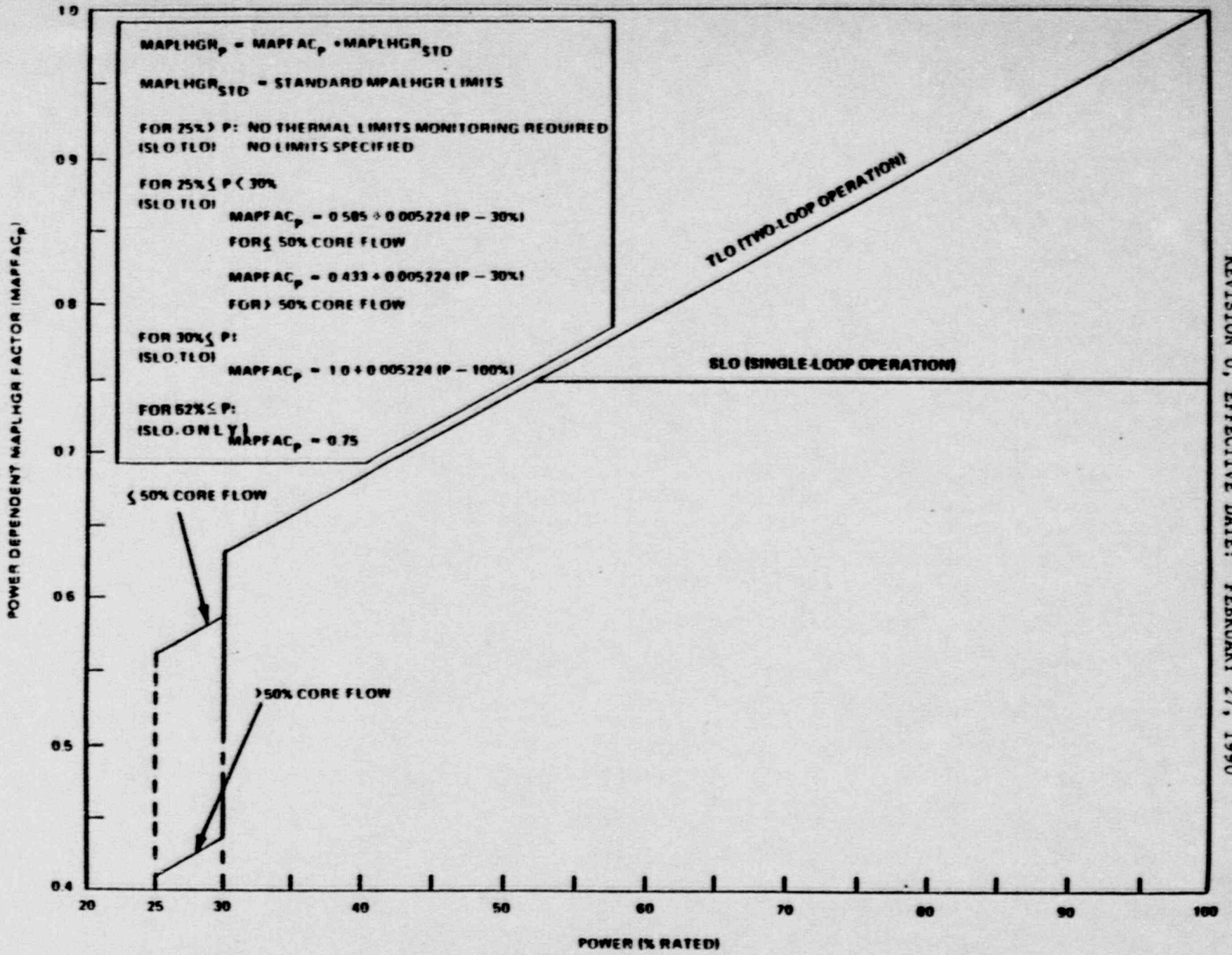


FIGURE 3-2 MAPFAC$_P$

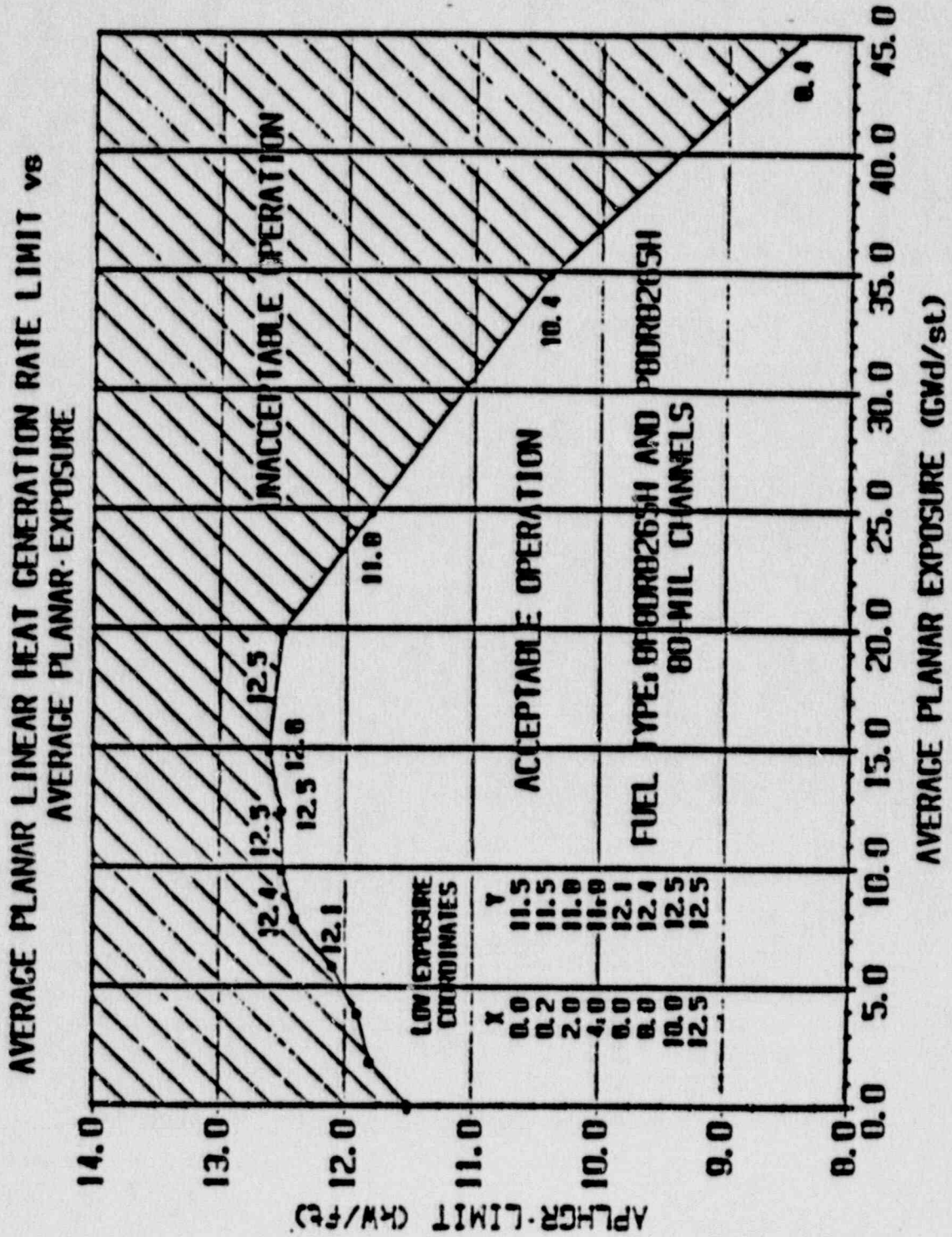
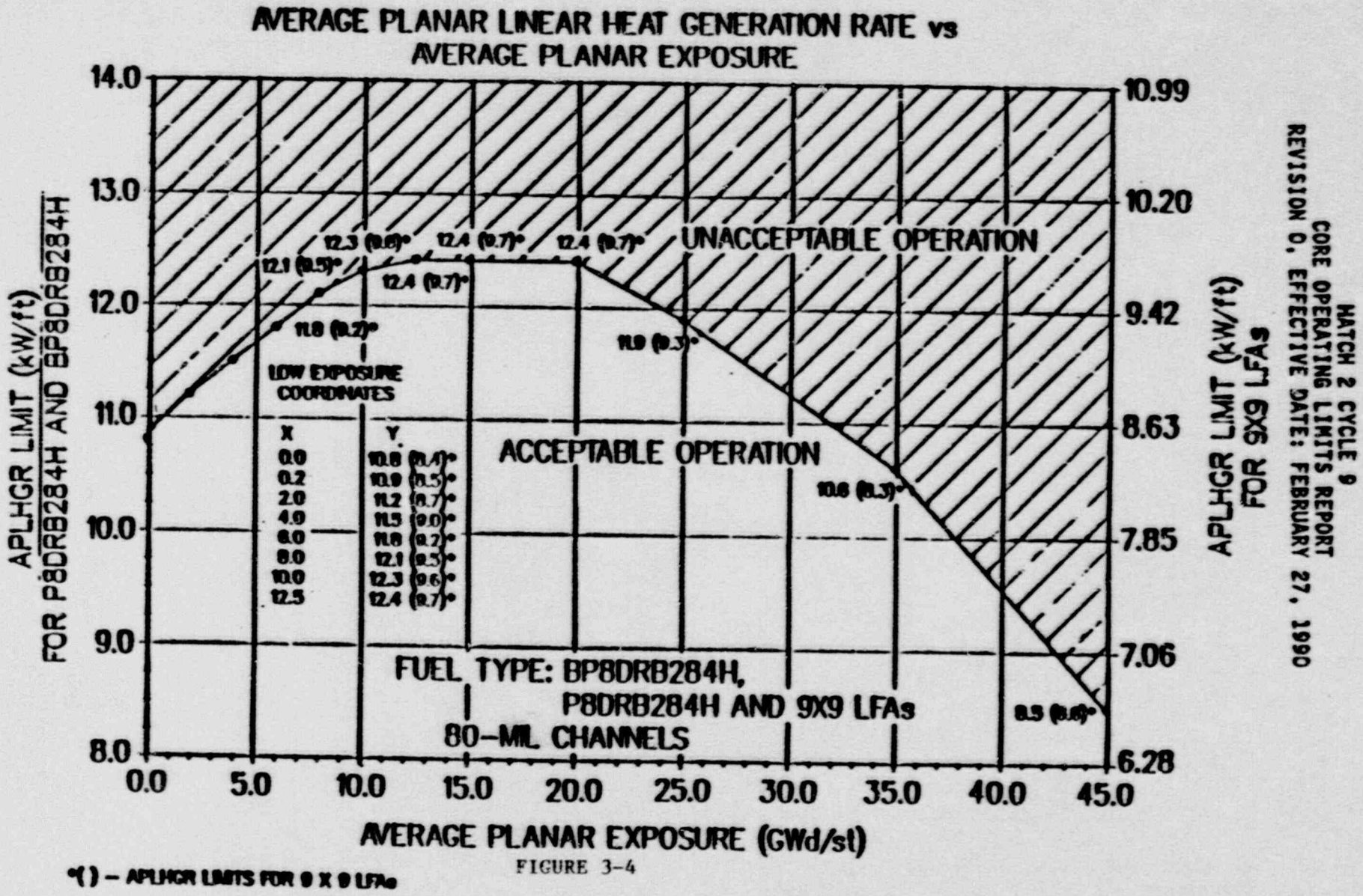

AVERAGE PLANAR LINEAR HEAT GENERATION RATE LIMIT vs
AVERAGE PLANAR-EXPOSURE
APLHGR-LIMIT (KW/ft)
AVERAGE PLANAR EXPOSURE (GWd/st)
14.0
13.0
12.0
11.0
10.0
9.0
8.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
UNACCEPTABLE OPERATION
ACCEPTABLE OPERATION
FUEL TYPE: BP80DR8265H AND BP80DR8265H
80 MIL CHANNELS
LOW EXPOSURE COORDINATES
X
0.0
0.2
2.0
4.0
8.0
8.0
10.0
12.5
Y
11.5
11.5
11.0
11.0
12.1
12.4
12.5
12.5
12.4
12.1
12.5
12.5
12.5
12.5
11.0
10.4

FIGURE 3-3



*( ) – APLHGR LIMITS FOR 9 X 9 LFAs

FIGURE 3-4

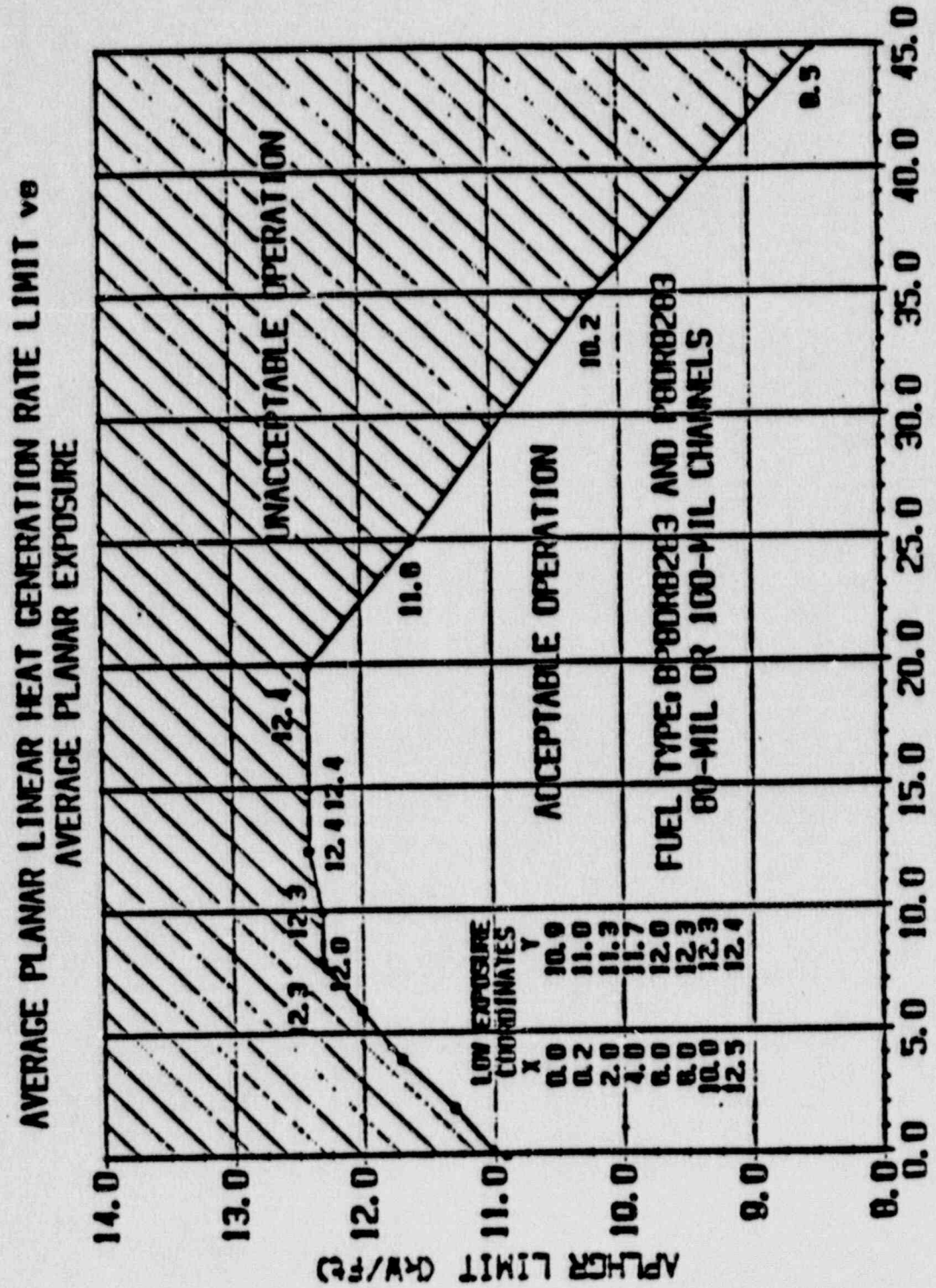

AVERAGE PLANAR LINEAR HEAT GENERATION RATE LIMIT vs
AVERAGE PLANAR EXPOSURE
APLHGR LIMIT (KW/FT)
AVERAGE PLANAR EXPOSURE (GWd/st)
UNACCEPTABLE OPERATION
ACCEPTABLE OPERATION
FUEL TYPE: BP8DR8283 AND P8DR8283
80-MIL OR 100-MIL CHANNELS
LOW EXPOSURE COORDINATES
X
Y
0.0 10.9
0.2 11.0
2.0 11.3
4.0 11.7
8.0 12.0
8.0 12.3
10.0 12.3
12.5 12.4
11.0
10.2
0.5
14.0
13.0
12.0
11.0
10.0
9.0
8.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0

FIGURE 3-5

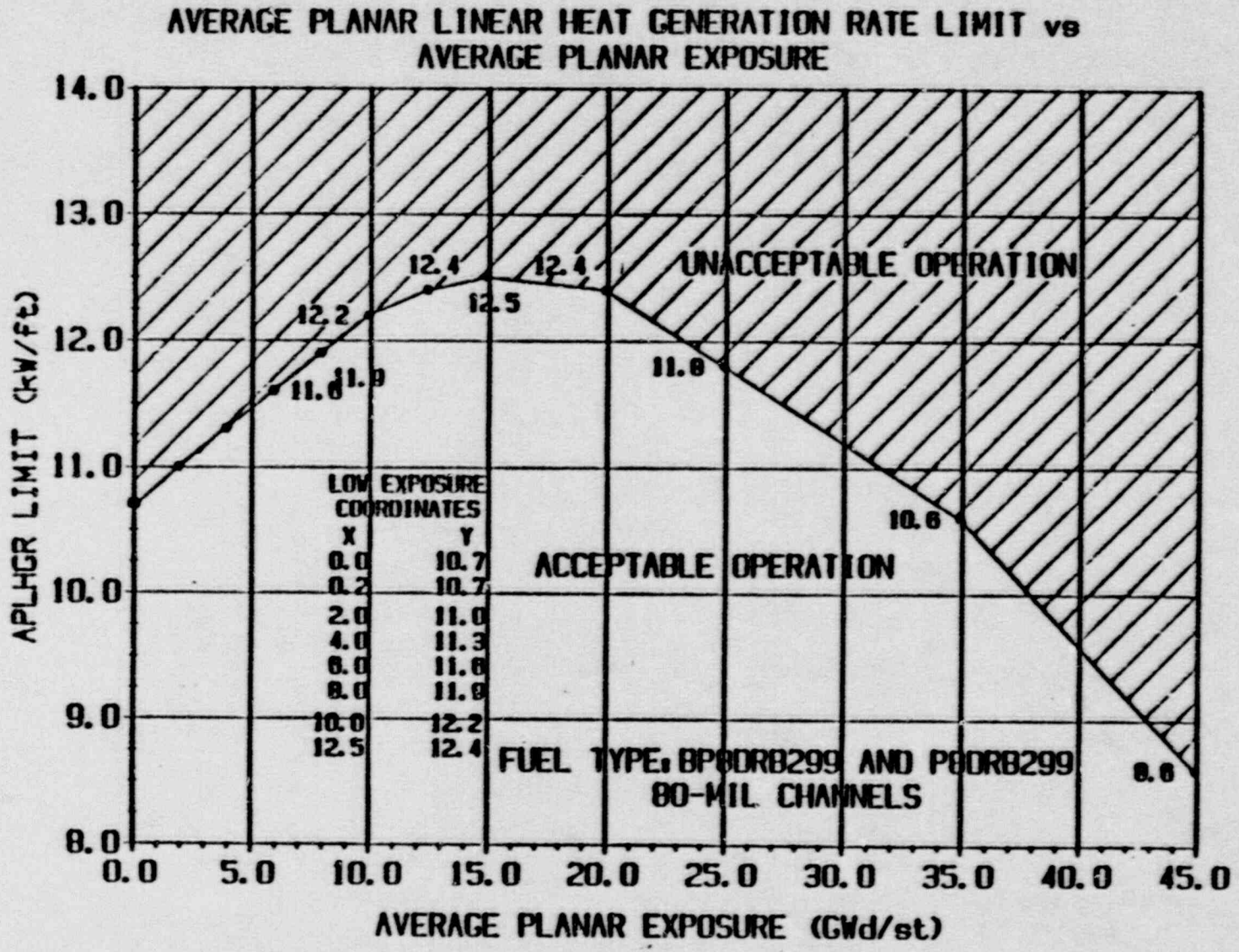

AVERAGE PLANAR LINEAR HEAT GENERATION RATE LIMIT vs
AVERAGE PLANAR EXPOSURE
APLHGR LIMIT (kW/ft)
AVERAGE PLANAR EXPOSURE (GWd/st)
14.0
13.0
12.0
11.0
10.0
9.0
8.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
UNACCEPTABLE OPERATION
ACCEPTABLE OPERATION
12.4
12.4
12.5
12.2
11.8
11.9
11.8
10.6
8.6
LOW EXPOSURE COORDINATES
X
Y
0.0 10.7
0.2 10.7
2.0 11.0
4.0 11.3
6.0 11.6
8.0 11.8
10.0 12.2
12.5 12.4
FUEL TYPE: BP8DRB299 AND P8DRB299
80-MIL CHANNELS

FIGURE 3-6

AVERAGE PLANAR LINEAR HEAT GENERATION RATE LIMIT vs
AVERAGE PLANAR EXPOSURE

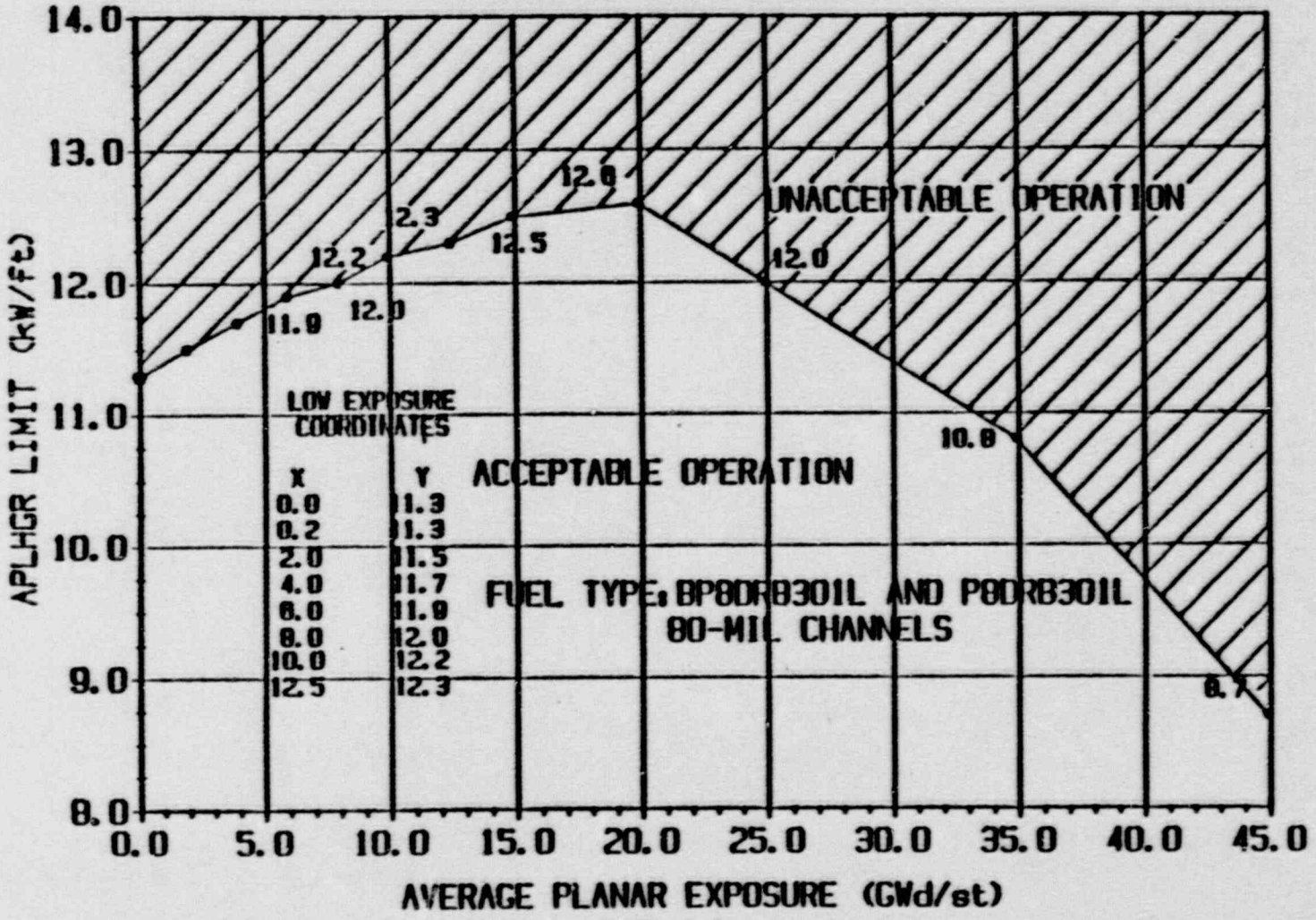


FIGURE 3-7

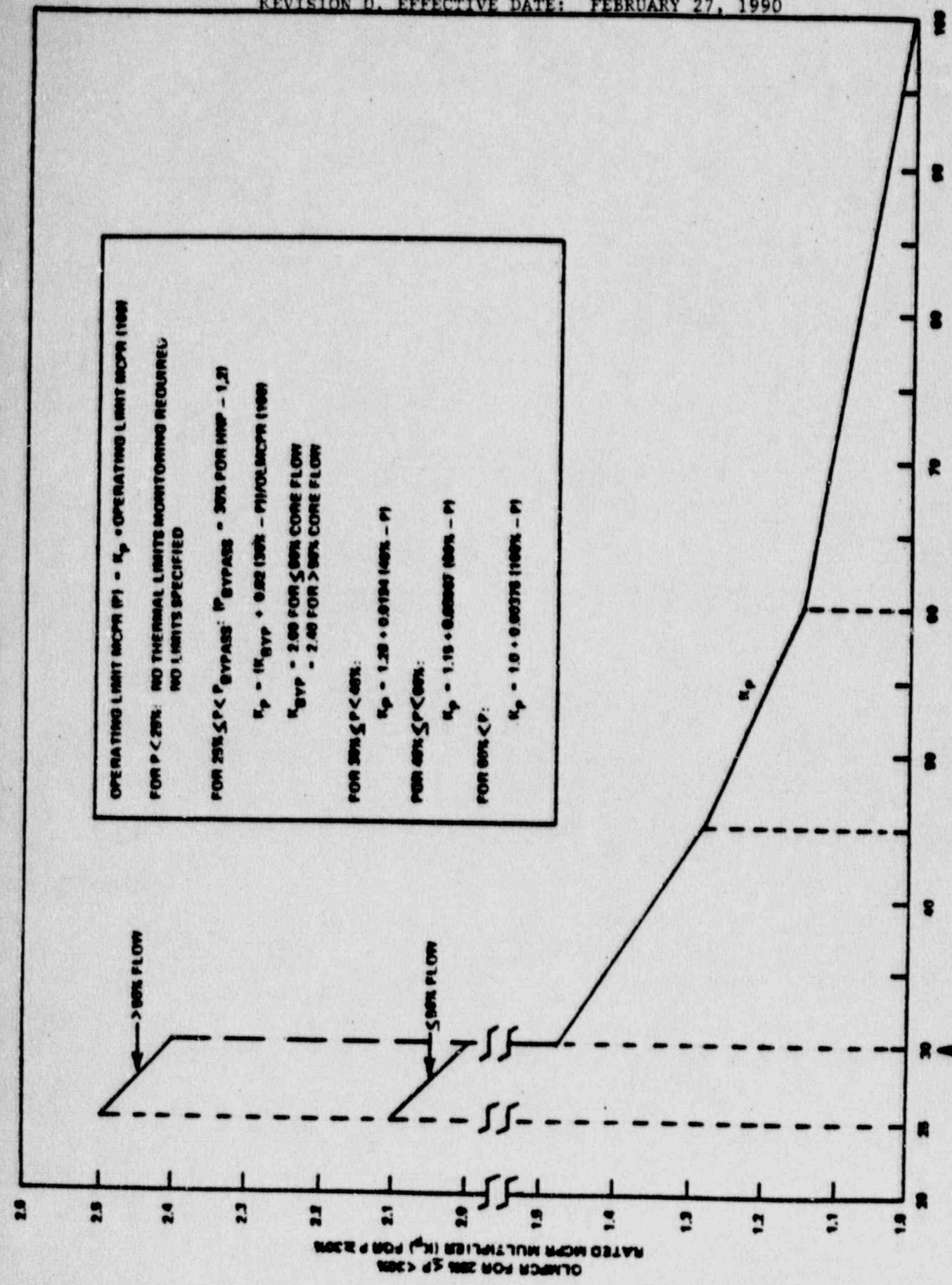

OPERATING LIMIT MCPR (P) = K_p • OPERATING LIMIT MCPR (100)
FOR P < 25%: NO THERMAL LIMITS MONITORING REQUIRED
NO LIMITS SPECIFIED
FOR 25% ≤ P < P_{BYPASS}: P_{BYPASS} = 30% FOR HNP – 1,2)
K_p = (K_{BYP} + 0.02 (30% – P))/MCPR (100)
K_{BYP} = 2.00 FOR ≤ 50% CORE FLOW
= 2.40 FOR > 50% CORE FLOW
FOR 30% ≤ P < 40%:
K_p = 1.20 + 0.0150 (40% – P)
FOR 40% ≤ P < 60%:
K_p = 1.15 + 0.0050 (60% – P)
FOR 60% < P:
K_p = 1.0 + 0.00375 (100% – P)
K_p
>50% FLOW
≤50% FLOW
P_{BYPASS}
POWER (% RATED)
OLMCPR FOR 25% ≤ P < 30%
RATED MCPR MULTIPLIER (K_p) FOR P ≥ 30%
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.0
20
25
30
40
50
60
70
80
90
100

FIGURE 4-1 K_p

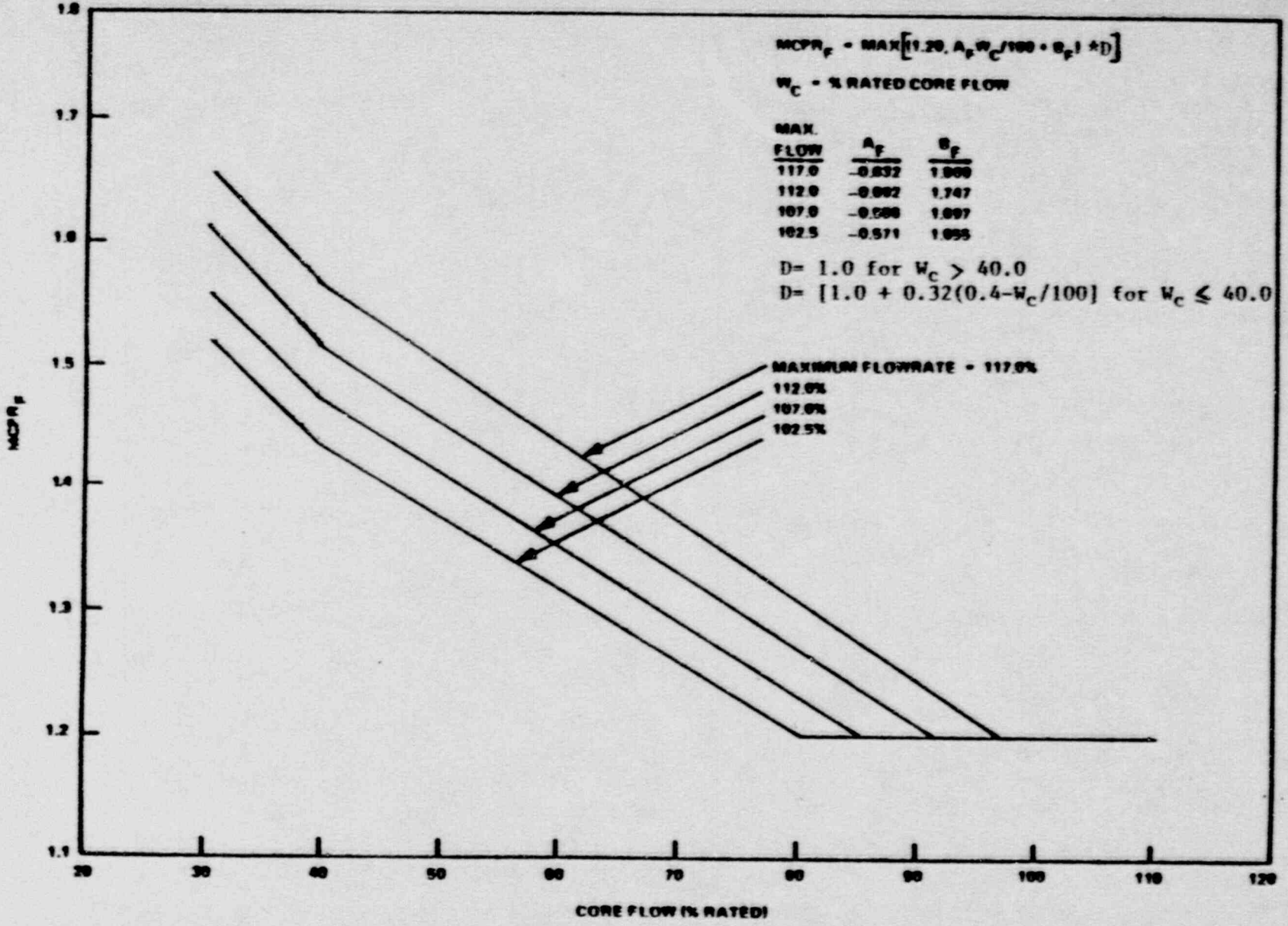


FIGURE 4-2 $MCPR_F$

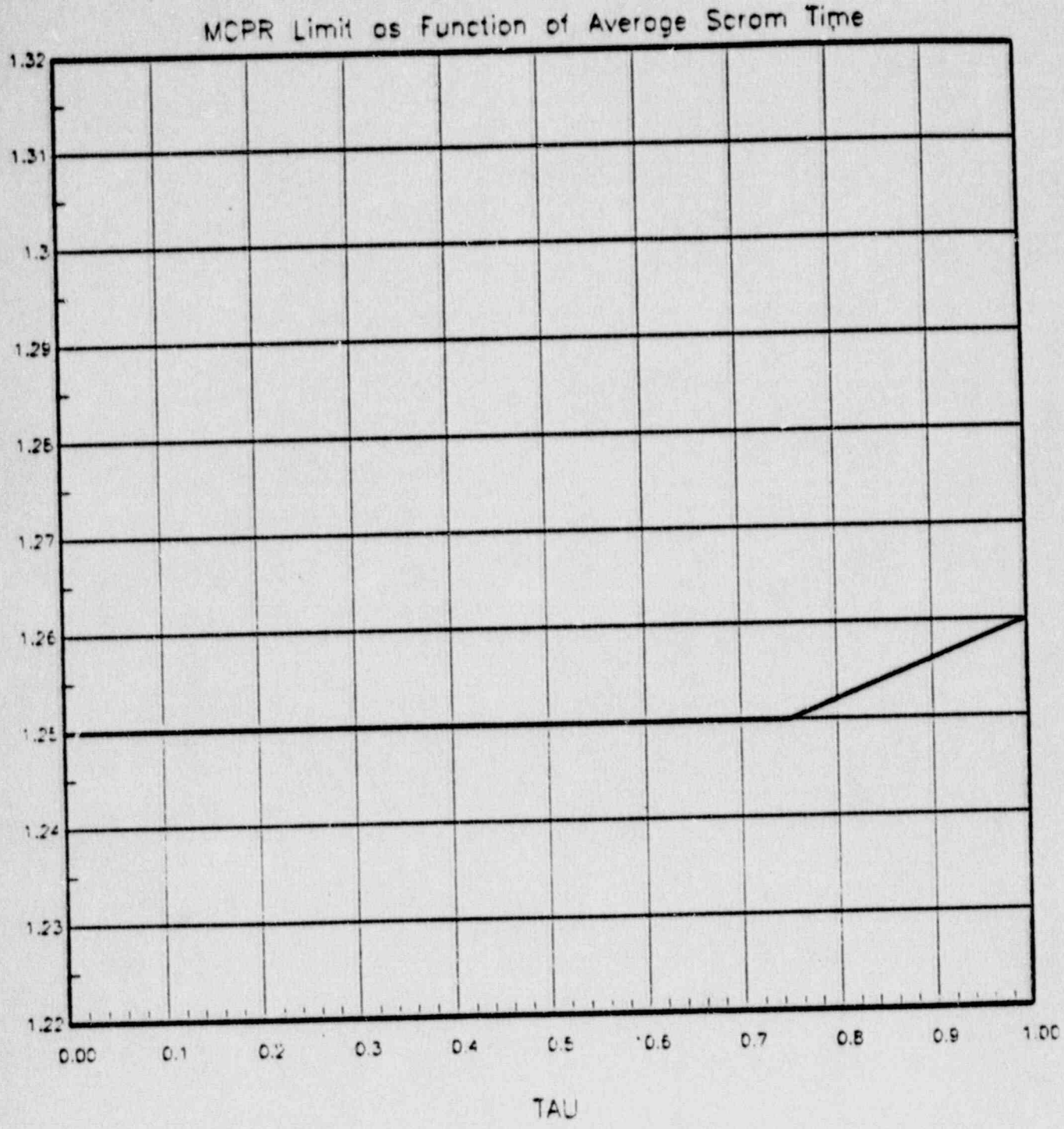

MCPR Limit as Function of Average Scram Time
MCPR LIMIT at RATED FLOW and RATED POWER
1.32
1.31
1.3
1.29
1.28
1.27
1.26
1.25
1.24
1.23
1.22
0.00
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.00
TAU

FIGURE 4-3