

BRUNSWICK UNIT 2, CYCLE 11
CORE OPERATING LIMITS REPORT
AUGUST 1995

Controlled Copy 1

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INTRODUCTION AND SUMMARY

This report provides the values of the power distribution limits and control rod withdrawal block instrumentation setpoints for Brunswick Unit 2, Cycle 11 as required by Technical Specification 6.9.3.1. The values of the Average Planar Linear Heat Generation Rate (APLHGR) limits, along with associated core flow and core power adjustment factors are provided as required by Technical Specification 6.9.3.1.a. The values of the Minimum Critical Power Ratio (MCPR) limits, along with associated core flow and core power adjustment factors are provided as required by Technical Specifications 6.9.3.1.b and 6.9.3.1.c. The control rod block upscale trip setpoints and allowable values are provided as required by Technical Specification 6.9.3.1.d.

Per Technical Specification 6.9.3.2 and 6.9.3.3, these values have been determined using NRC-approved methodology and are established such that all applicable limits of the plant safety analysis are met.

Preparation of this report was performed in accordance with CP&L Nuclear Fuels Management & Safety Analysis Quality Assurance requirements as documented in Reference 1.

APLHGR LIMITS

The limiting APLHGR value for the most limiting lattice (excluding natural uranium) of each fuel type as a function of planar average exposure is given in Figures 1 through 9. These values were determined with the SAFER/GESTR LOCA methodology described in GESTAR-II (Reference 2). Figures 1 through 9 are to be used when hand calculations are required as specified in Technical Specification 3.2.1.

The core flow and core power adjustments factors for use in Technical Specification 3.2.1 are presented in Figures 10 and 11. For any given flow/power state, the minimum of MAPLHGR(F) determined from Figure 10 and MAPLHGR(P) determined from Figure 11 is used to determine the governing limit.

MCPR LIMITS

The ODYN OPTION A, ODYN OPTION B, and non-pressurization transient MCPR limits for use in Technical Specification 3.2.2.1 and 3.2.2.2 for each fuel type as a function of cycle average exposure are given in Table 1. These values were determined with the GEMINI methodology and GEXL-PLUS critical power correlation described in GESTAR-II (Reference 2) and are consistent with the Safety Limit MCPR of 1.07 specified by Technical Specification 2.1.2. The analysis was performed without End of Cycle-Recirculation Pump Trip (EOC-RPT) operable.

The core flow and core power adjustments factors for use in Technical Specification 3.2.2.1 are presented in Figures 12 and 13. For any given flow/power state, the maximum of MCPR(F) determined from Figure 12 and MCPR(P) determined from Figure 13 is used to determine the governing limit.

ROD BLOCK INSTRUMENTATION SETPOINTS

The nominal trip setpoints and allowable values of the control rod withdrawal block instrumentation for use in Technical Specification 3.3.4 (Table 3.3.4-2) are presented in Table 2. These values were determined consistent with the bases of the ARTS program and the determination of MCPR limits with the GEMINI methodology and GEXL-PLUS critical power correlation described in GESTAR-II (Reference 2).

REFERENCE(s)

- 1) CP&L Nuclear Fuels Management & Safety Analysis Quality Assurance File NF-2494.0026.1, "Preparation of the Brunswick Unit 2, Cycle 11 (B2C11) Core Operating Limits Report (COLR), Revision 1," (August 1995).
- 2) NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," (latest approved version).

Figure 1

FUEL TYPE BP8DRB299 (BP8X8R)
AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (APLHGR) LIMIT
VERSUS AVERAGE PLANAR EXPOSURE

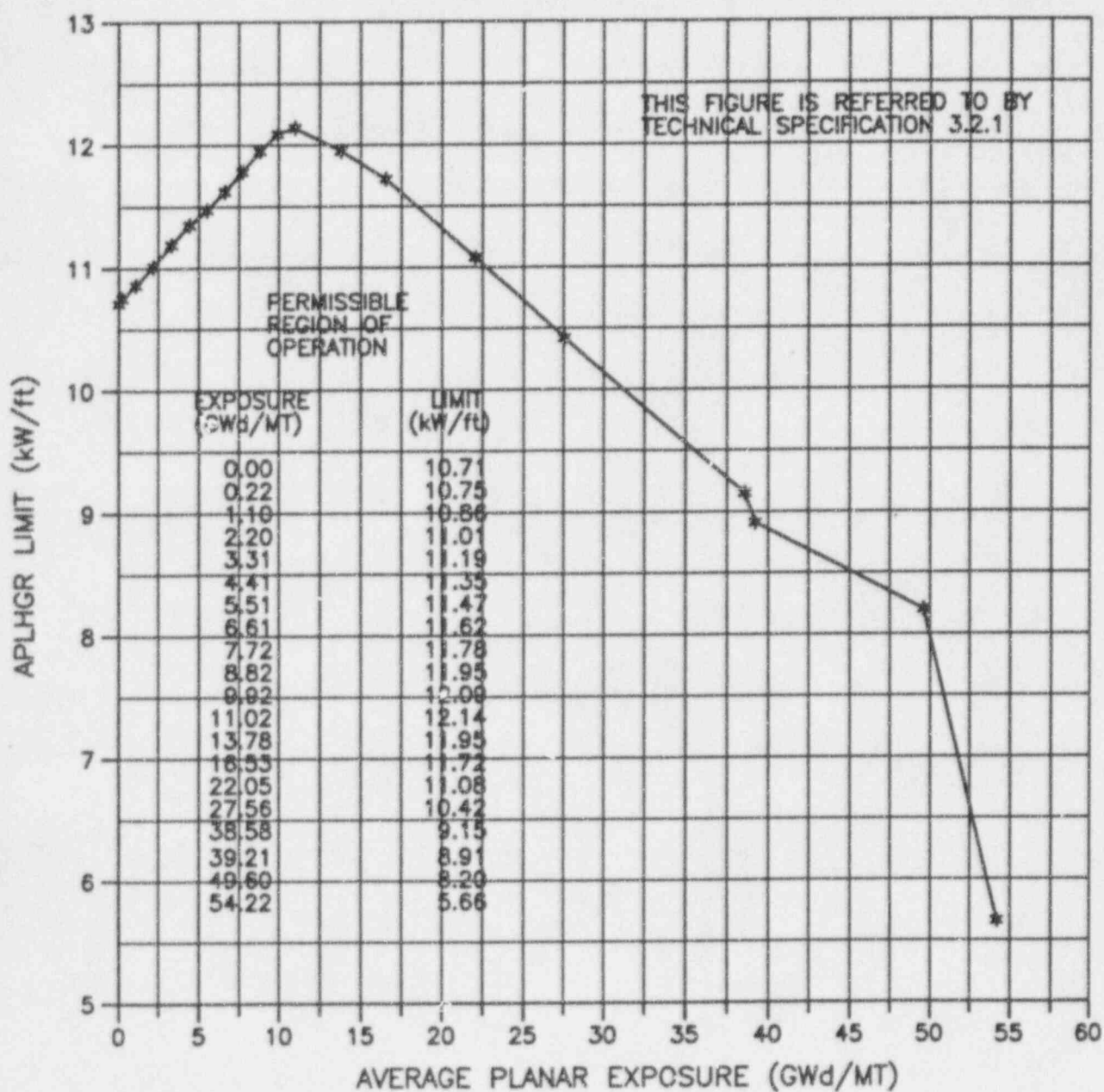


Figure 2

FUEL TYPE BD323A (GE8X8EB)
AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (APLHGR) LIMIT
VERSUS AVERAGE PLANAR EXPOSURE

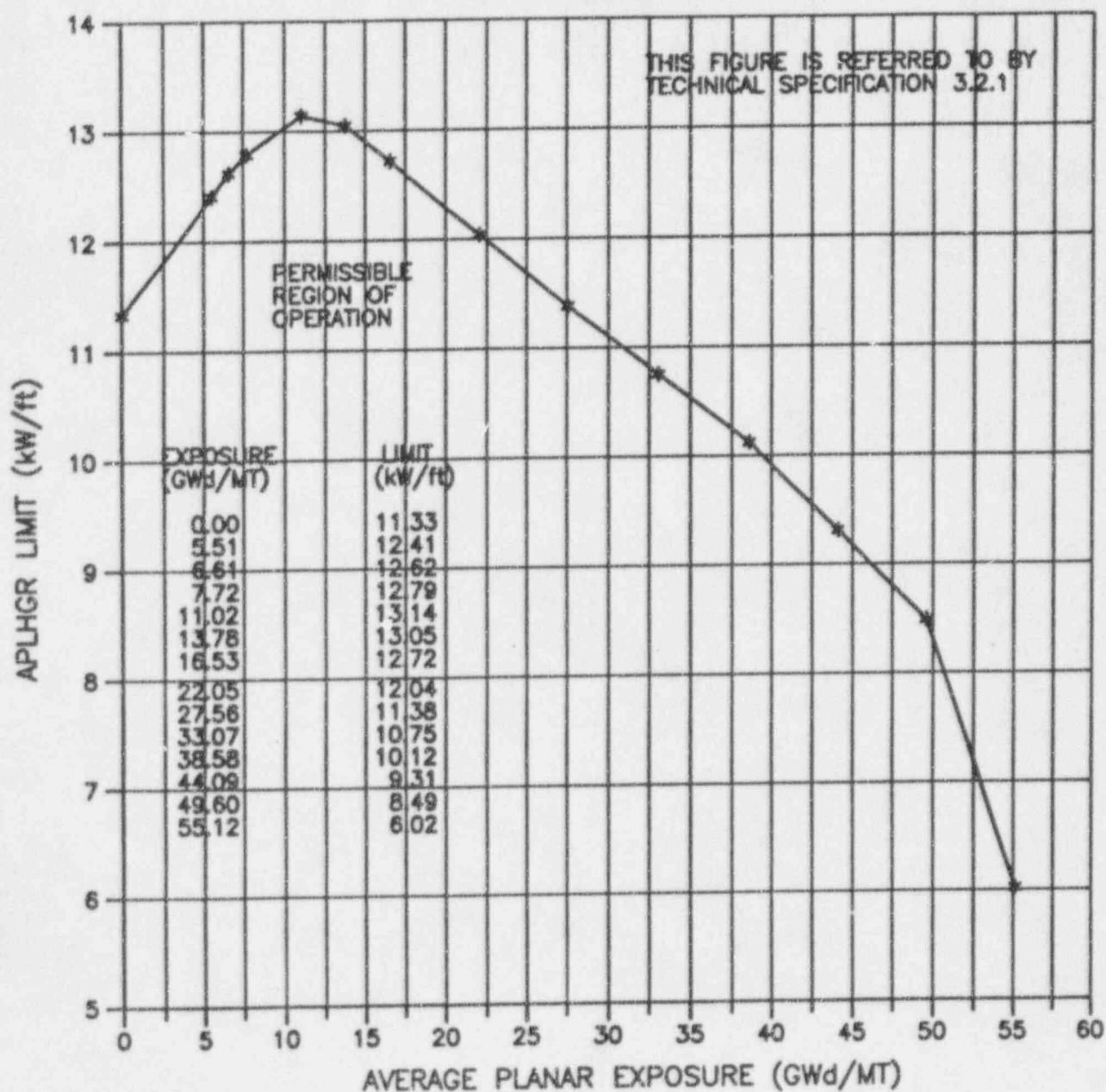


Figure 3

FUEL TYPE BD317A (GE8X8EB)
AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (APLHGR) LIMIT
VERSUS AVERAGE PLANAR EXPOSURE

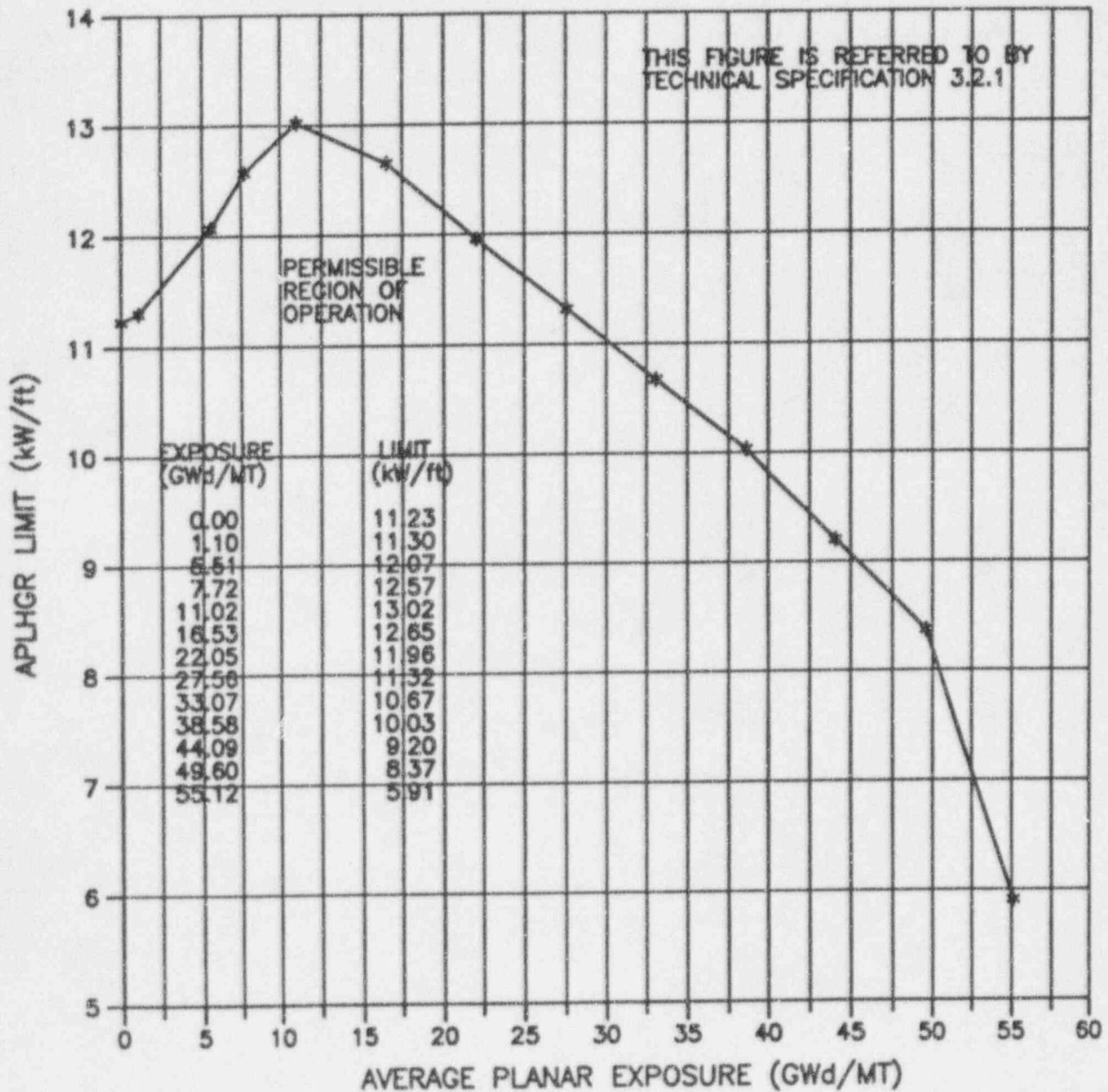


Figure 4

FUEL TYPE NBD330A (GE8X8NB)
AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (APLHGR) LIMIT
VERSUS AVERAGE PLANAR EXPOSURE

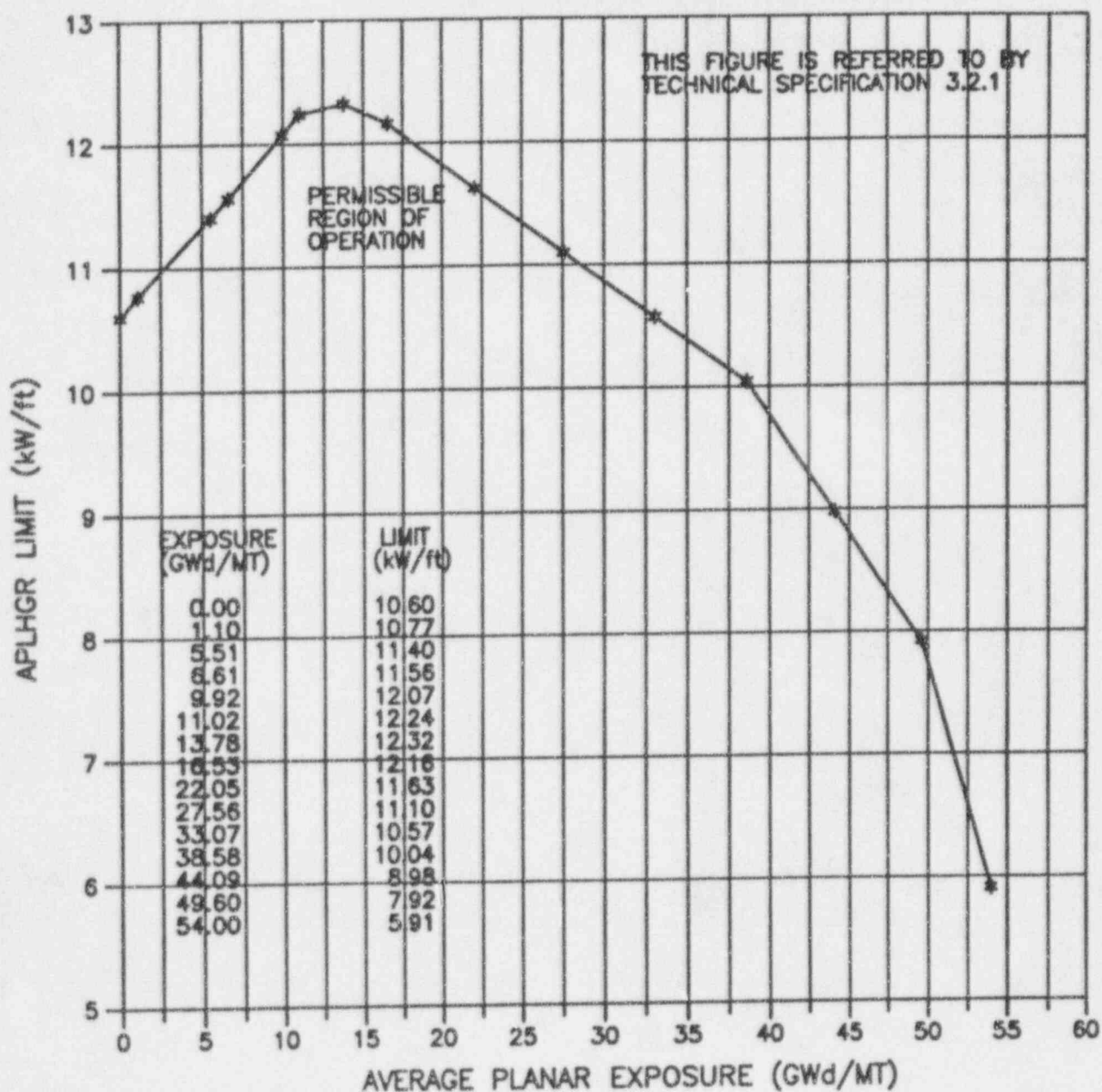


Figure 5

FUEL TYPE NBD329A (GE8X8NB)
AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (APLHGR) LIMIT
VERSUS AVERAGE PLANAR EXPOSURE

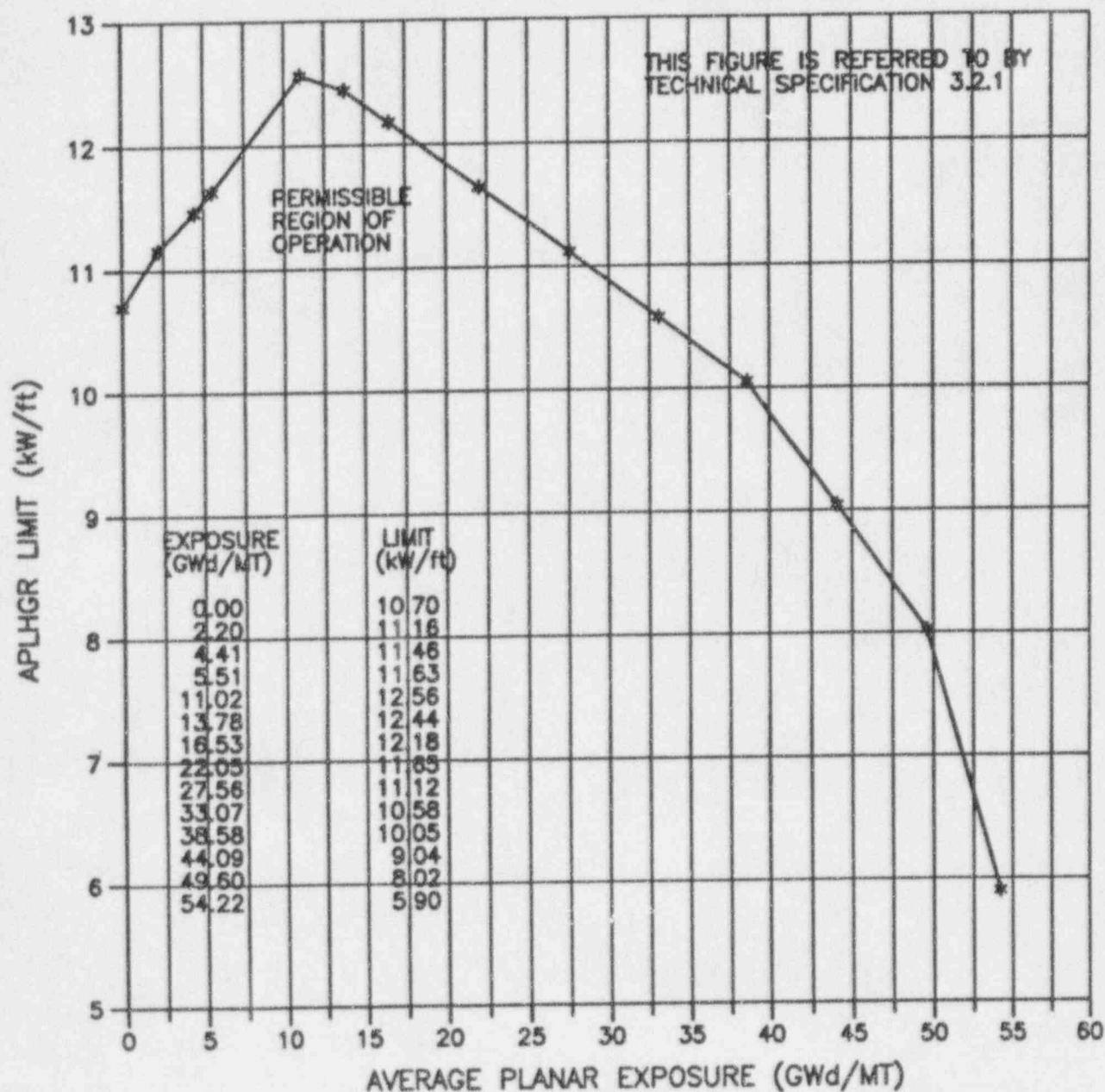


Figure 6

FUEL TYPE GE10-P8HXB329-12GZ1-100M-150-T (GE8X8NB-3)
AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (APLHGR) LIMIT
VERSUS AVERAGE PLANAR EXPOSURE

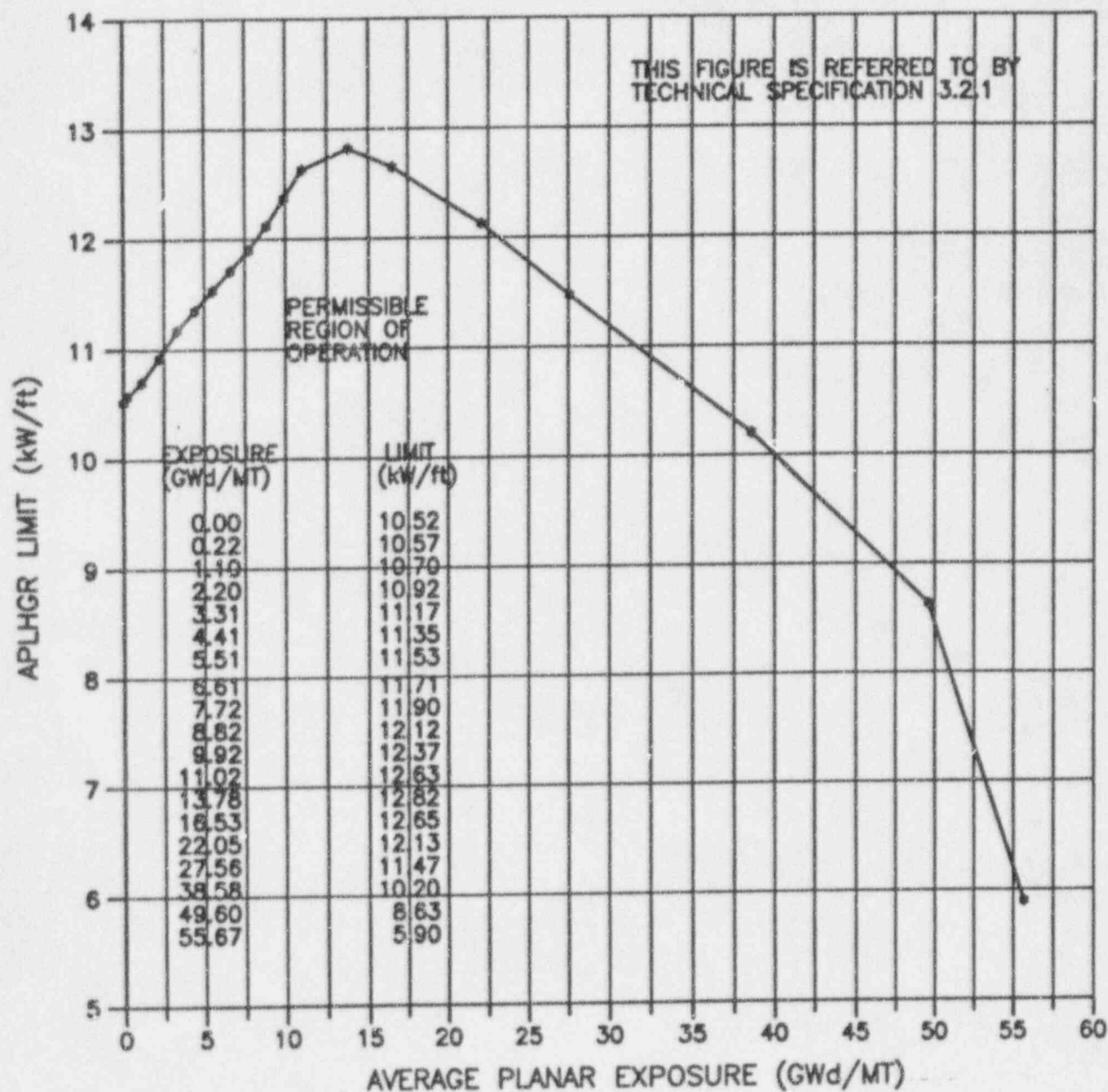


Figure 7

FUEL TYPE GE10-P8HXB324-12GZ-70M-150-T (GE8X8NB-3)
AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (APLHGR) LIMIT
VERSUS AVERAGE PLANAR EXPOSURE

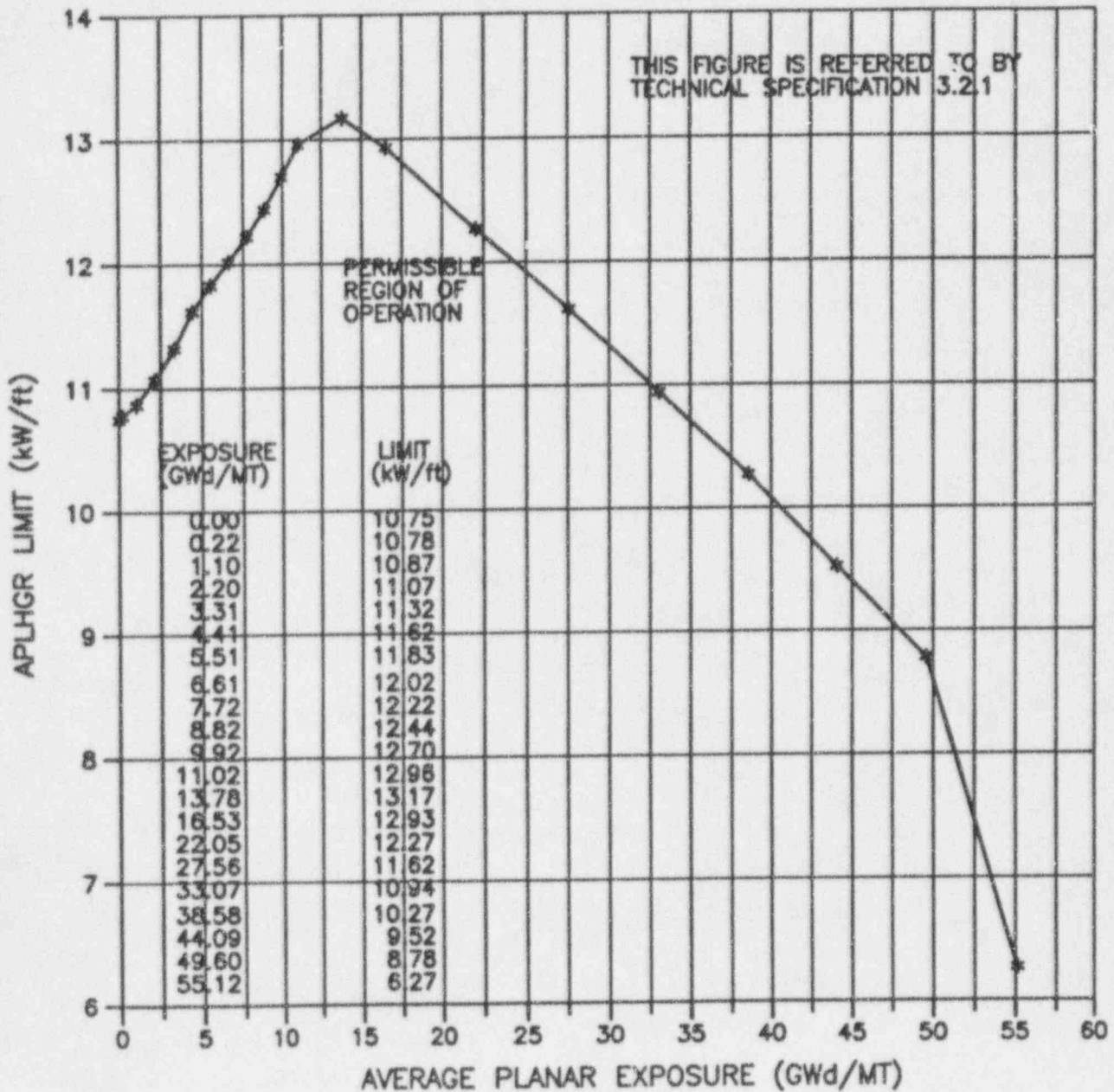


Figure 8

FUEL TYPE GE10-P8HXB320-11GZ-100M-150-T (GE8X8NB-3)
AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (APLHGR) LIMIT
VERSUS AVERAGE PLANAR EXPOSURE

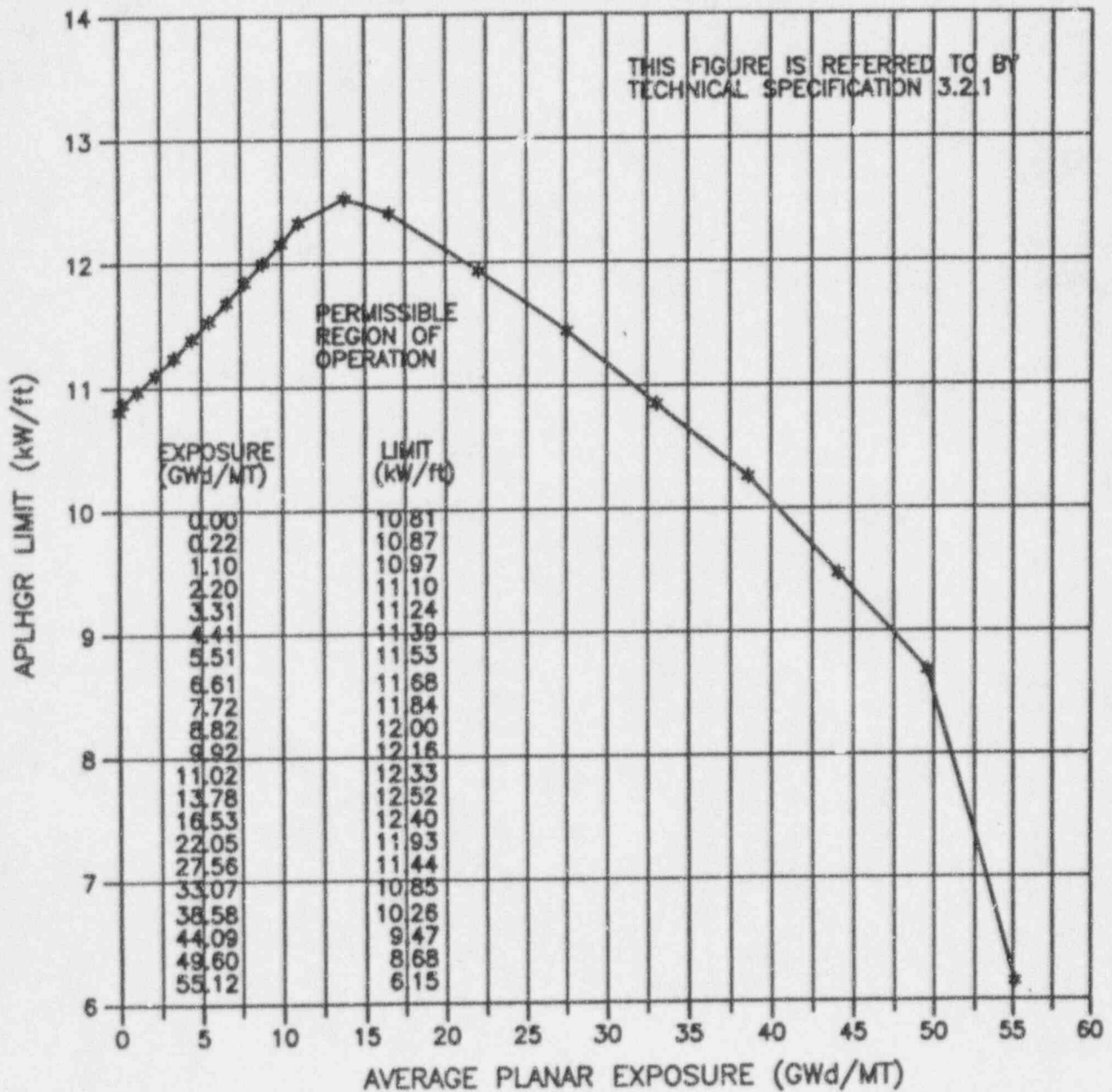


Figure 9

FUEL TYPE GE10-P8HXB322-11GZ-70M-150-T (GE8X8NB-3)
AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (APLHGR) LIMIT
VERSUS AVERAGE PLANAR EXPOSURE

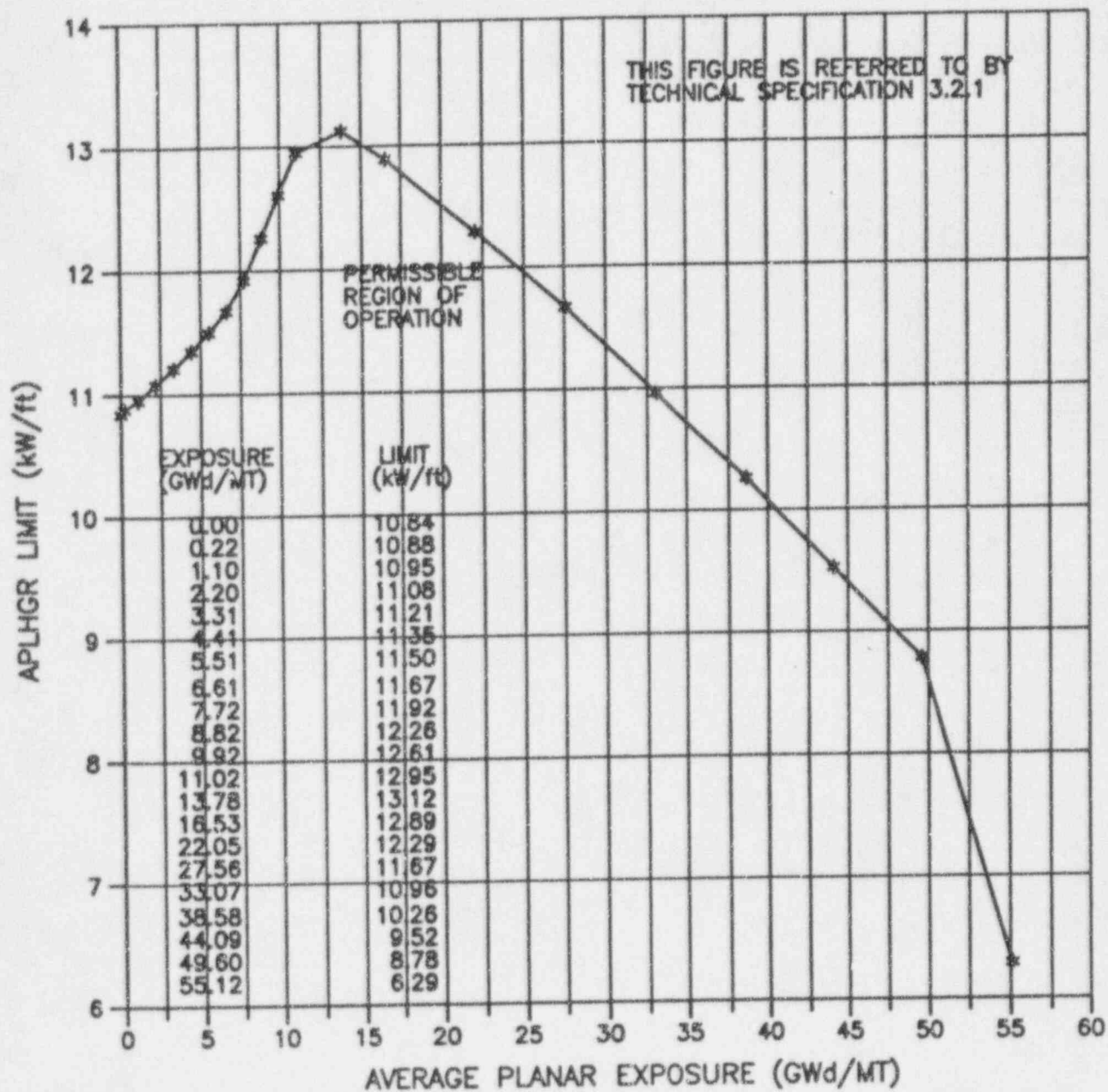
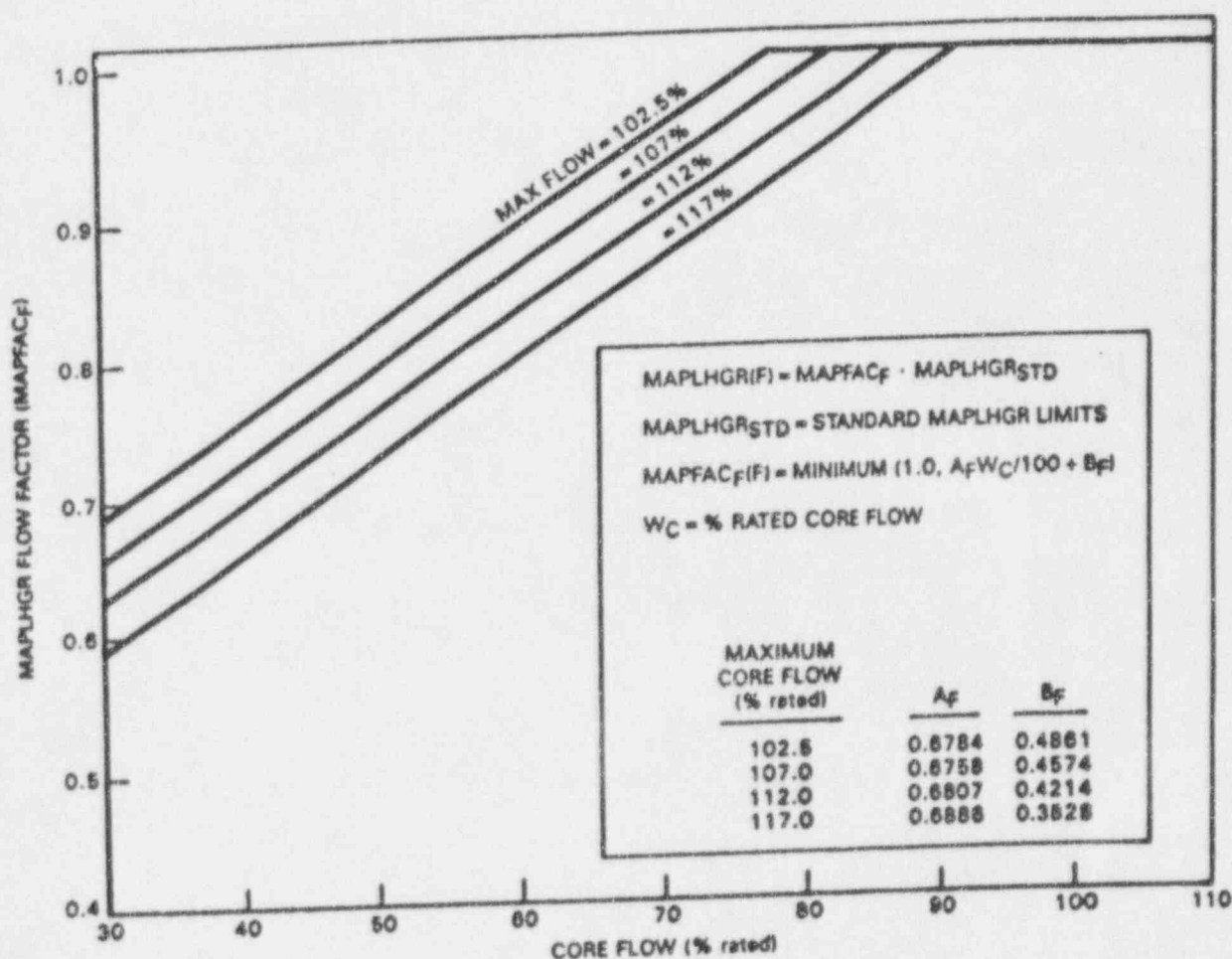


Figure 10

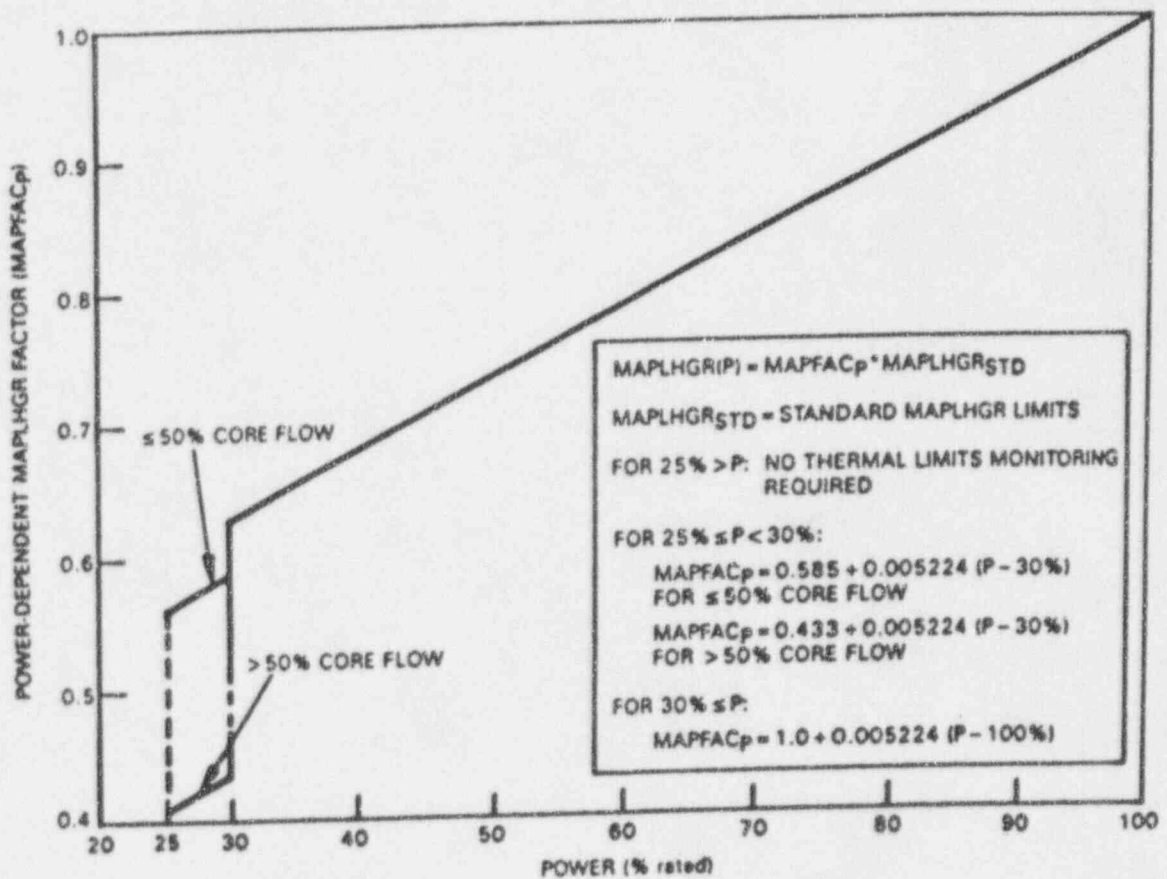
Flow - Dependent MAPLHGR Limit, MAPLHGR (F)



This figure is referred to by
Technical Specification 3.2.1

Figure 11

Power - Dependent MAPLHGR Limit, MAPLHGR (P)



This figure is referred to by
Technical Specification 3.2.1

Table 1

MCPR Limits
(EOC-RPT Not Required)

Non-pressurization Transient MCPR Limits

Exposure Range: BOC11 to EOC11

<u>GE8x8NB-3</u>	<u>GE8x8NB-3</u>	<u>BP8x8R/GE8x8EB/GE8x8NB</u>
GE10-P8HXB324-12GZ-70M-150-T	GE10-P8HXB322-11GZ-70M-150-T/ GE10-P8HXB320-11GZ-100M-150-T/ GE10-P8HXB329-12GZ1-100M-150-T	All
1.31	1.25	1.20

Pressurization Transient MCPR Limits

MCPR - Option A

	<u>GE8x8NB/GE8x8NB-3</u>	<u>BP8x8R/GE8x8EB</u>
Exposure Range: BOC11 to EOC11-3000 MWd/MT	1.34	1.33
Exposure Range: EOC11-3000 MWd/MT to EOC11	1.35	1.33

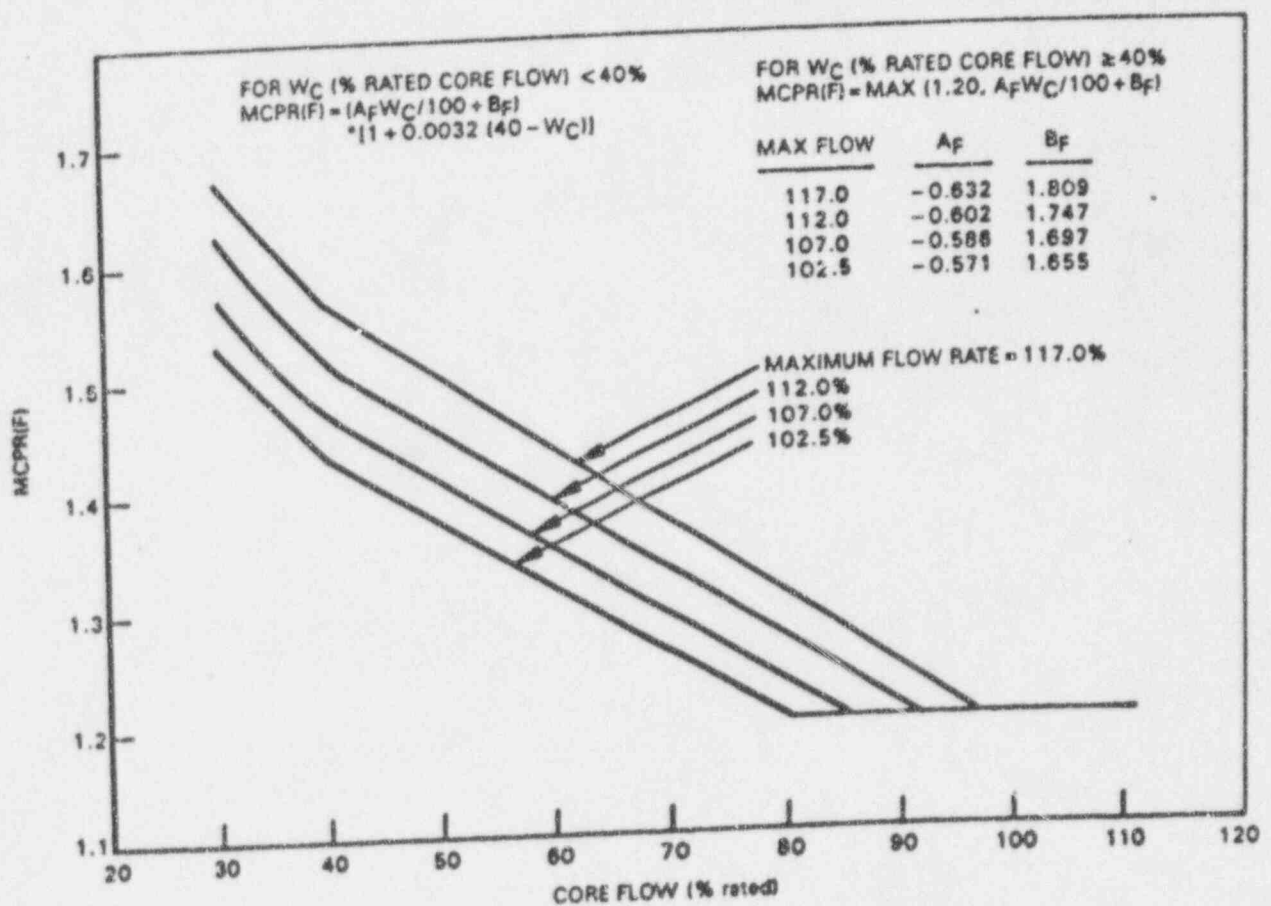
MCPR - Option B

	<u>GE8x8NB/GE8x8NB-3</u>	<u>BP8x8R/GE8x8EB</u>
Exposure Range: BOC11 to EOC11-3000 MWd/MT	1.27	1.26
Exposure Range: EOC11-3000 MWd/MT to EOC11	1.31	1.29

This table is referred to by
Technical Specifications 3.2.2.1 and 3.2.2.2

Figure 12

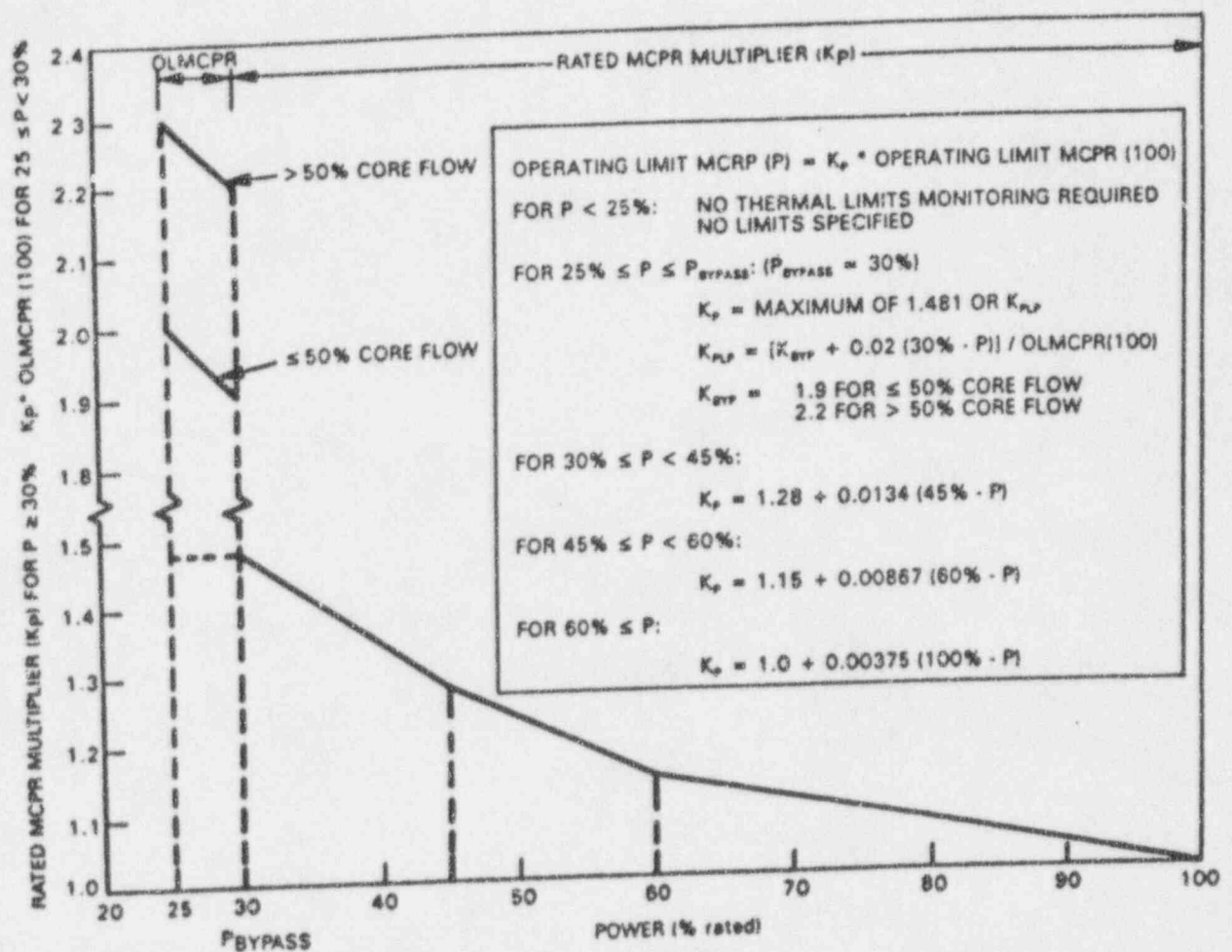
Flow - Dependent MCPR Limit, MCPR (F)



This figure is referred to by
Technical Specification 3.2.2.1

Figure 13

Power - Dependent MCPR Limit, MCPR (P)



This figure is referred to by
Technical Specification 3.2.2.1

Table 2

RBM System Setpoints

<u>Setpoint</u>	<u>Trip Setpoint</u>	<u>Allowable Value</u>
Low Power Setpoint (LPSP ^a)	27.0	≤ 29.0
Intermediate Power Setpoint (IPSP ^a)	62.0	≤ 64.0
High Power Setpoint (HPSP ^a)	82.0	≤ 84.0
Low Trip Setpoint (LTSP ^b)	≤ 115.1	≤ 115.5
Intermediate Trip Setpoint (ITSP ^b)	≤ 109.3	≤ 109.7
High Trip Setpoint (HTSP ^b)	≤ 105.5	≤ 105.9
t_{d2}	≤ 2.0 seconds	≤ 2.0 seconds

^a Setpoints in percent of Rated Thermal Power.

^b Setpoints relative to a full scale reading of 125. For example, ≤ 115.1 means ≤ 115.1/125.0 of full scale.

This table is referred to by
Technical Specification 3.3.4 (Table 3.3.4-2)