# CORE OPERATING LIMITS REPORT

# FOR

# PEACH BOTTOM ATOMIC POWER STATION UNIT 2

# RELOAD 8, CYCLE 9

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## LIST OF EFFECTIVE PAGES

| Page(s) | Revision |
|---|---|
| 1-25 | 0 |

## INTRODUCTION AND SUMMARY

This report provides the cycle-specific parameter limits for: Average Planar Linear Heat Generation Rate (APLHGR); Minimum Critical Power Ratio (MCPR); Flow Adjustment Factor ($K_f$); Linear Heat Generation Rate (LHGR); and Rod Block Monitor flow biased upscale setpoints for Peach Bottom Atomic Power Station Unit 2, Cycle 9, Reload 8. These values have been determined using NRC-approved methodology and are established such that all applicable limits of the plant safety analysis are met.

This report is submitted in accordance with Technical Specification 6.9.1.e of Reference (1). Preparation of this report was performed in accordance with PECO Nuclear Group Procedure NP-11F122.

## APLHGR LIMITS

The limiting APLHGR value for the most limiting lattice (excluding natural uranium) of each fuel type as a function of AVERAGE PLANAR EXPOSURE is given in Figures 1 through 8. Figures 1 through 8 are used when hand calculations are required as specified in Technical Specification 3.5.I. The reduction factors for use during single recirculation loop operation are shown in Table 1.

## MCPR LIMITS

The MCPR values for use in Technical Specification 3.5.K for each fuel type are given in Figures 9 through 15 and in Tables 2 and 3. Table 2 is used when the requirement of 4.5.K.2.a is met, when this requirement cannot be met the Operating Limit MCPR values as a function of TAU are given in Figures 9 through 15. At times when the surveillance requirement of specification 4.5.K.2 is not performed Table 3 is used. The $K_f$ core flow adjustment factor for use in Technical Specification 3.5.K is given in Figure 16.

The MCPR limits to be used during cycle extension (Increased Core Flow (ICF), Final Feedwater Temperature Reduction, and Power Coastdown) following EOC are the EOC-2000 Mwd/st to EOC, Increased Core Flow limits.

ROD BLOCK MONITOR SETPOINTS

The N value for the RBM flow biased upscale setpoints for use in Technical Specification 3.2.C is given in Table 4.

LINEAR HEAT GENERATION RATES

The LHGR value for use in Technical Specification 3.5.J for each fuel type is given in Table 5.

QUALIFICATION FUEL BUNDLES

The thermal limits for the Advanced Nuclear Fuels and the ABB Atom Inc. Qualification Fuel Bundles (QFBs) are determined by comparison to the Cycle 9 reload bundle (Fuel Type P8DWB320, GE8X8NB). The results of these comparisons demonstrate that the QFBs are bounded by the reload bundle thermal limits with the exception of Critical Power Ratio (CPR). Therefore, the thermal limits of the GE8X8NB bundle will be applied to the QFBs for all limits except the CPR. The Minimum CPR values for the QFBs are found in Figures 14 and 15 and in Tables 2 and 3. Specific values for all thermal limits are given for the GE11 QFB (LUA307).

REFERENCES

1) "Technical Specifications and Bases for Peach Bottom Atomic Power Station Unit 2", Docket No. 50-277 Appendix A to License No. DPR-44.

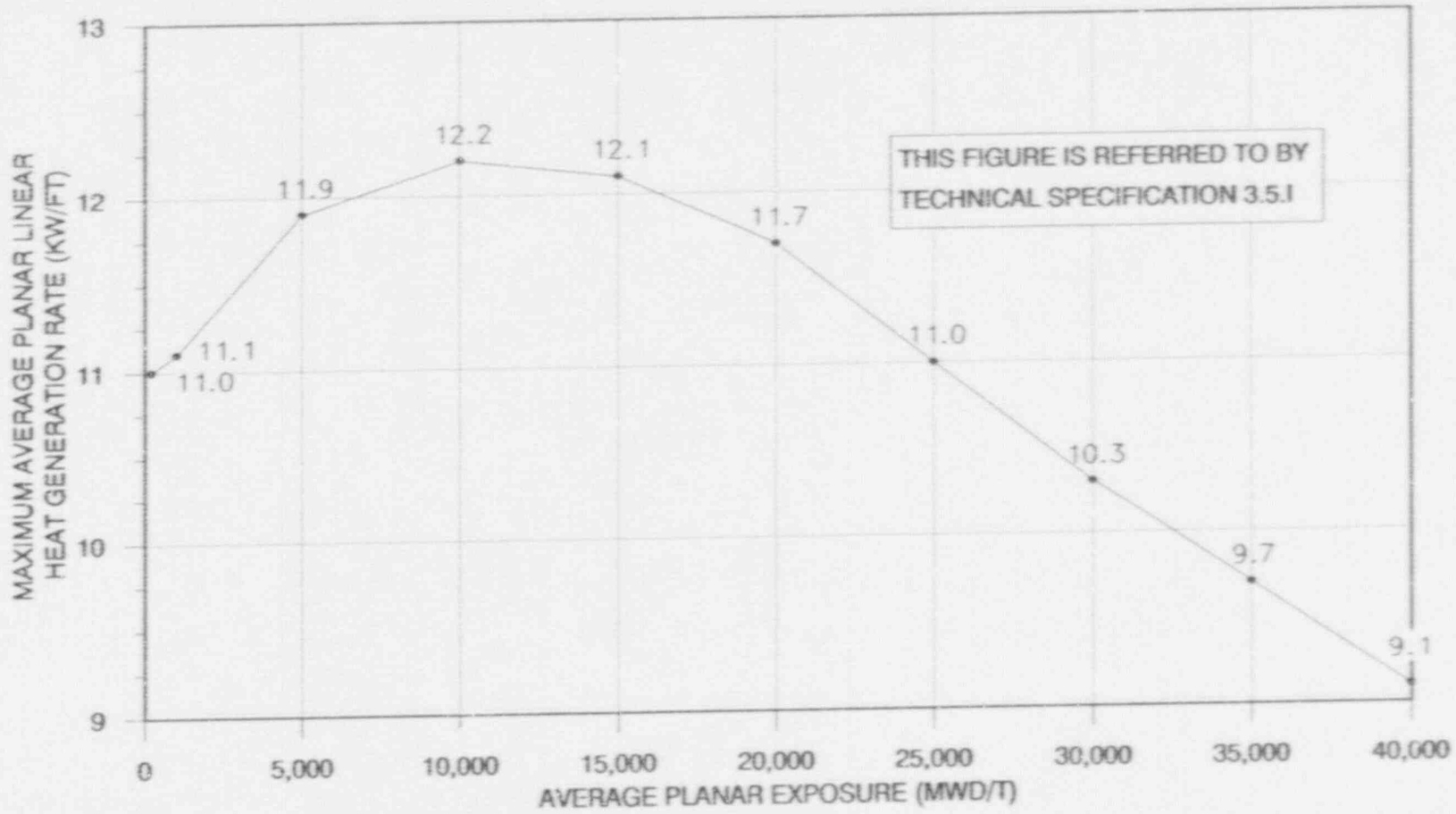
2) "Supplemental Reload Licensing Report for Peach Bottom Atomic Power Station Unit 2, Reload 8, Cycle 9", 23A6539, Revision 0, January 1991.

3) "Peach Bottom 9x9-9X+ Qualification Fuel Assembly Safety Analysis Report", ANF-90-133(p), Rev. 1, November 1990.

4)ABB Atom Report BR 90-004, "Supplemental Lead Fuel Assembly Licensing Report, SVEA-96 LFAs for Peach Bottom-2, Summary", October, 1990.

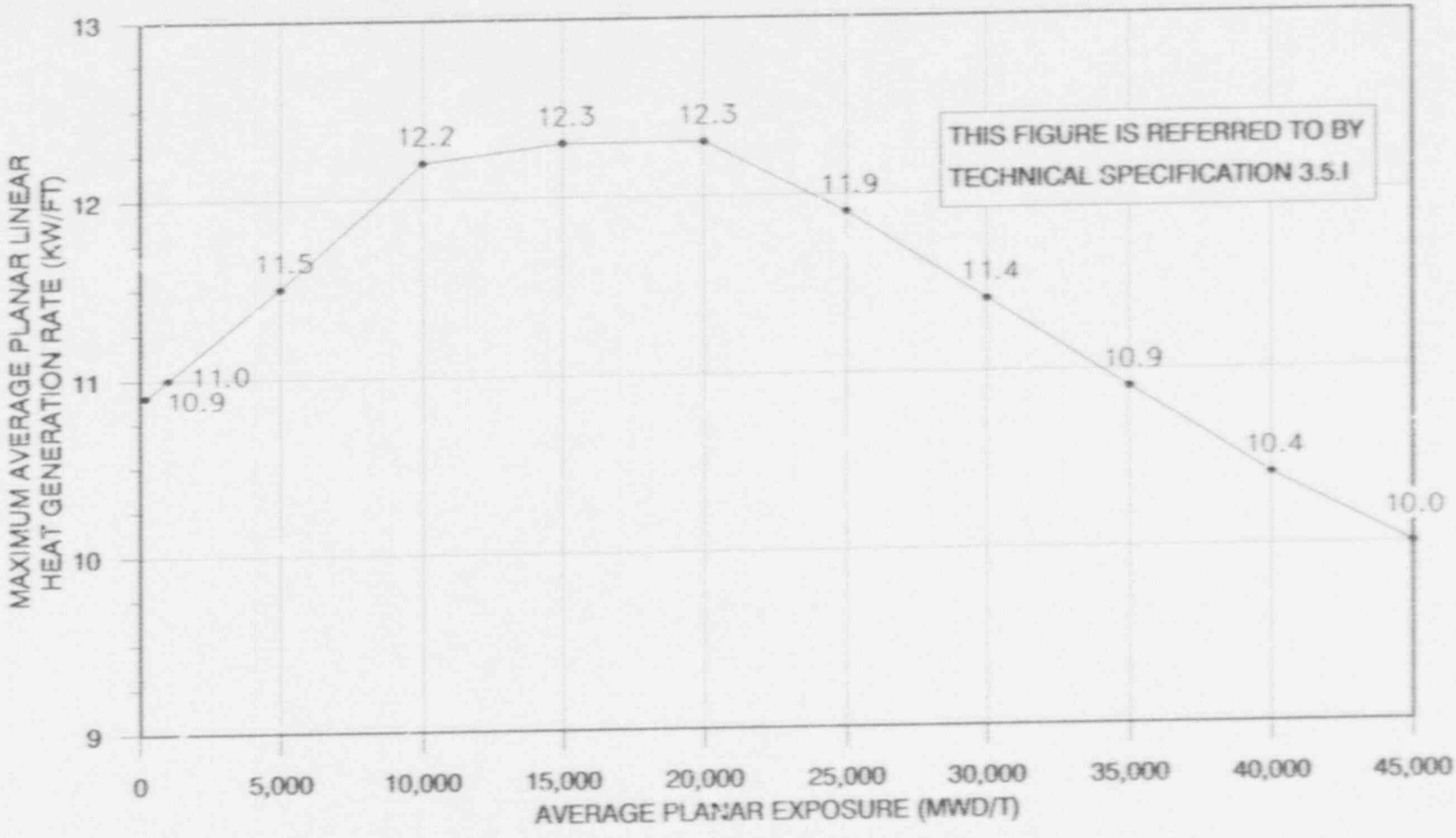
# P8X8R FUEL TYPE P8DRB285

(Applicable to 100 mil Channels)




MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE VERSUS AVERAGE PLANAR EXPOSURE

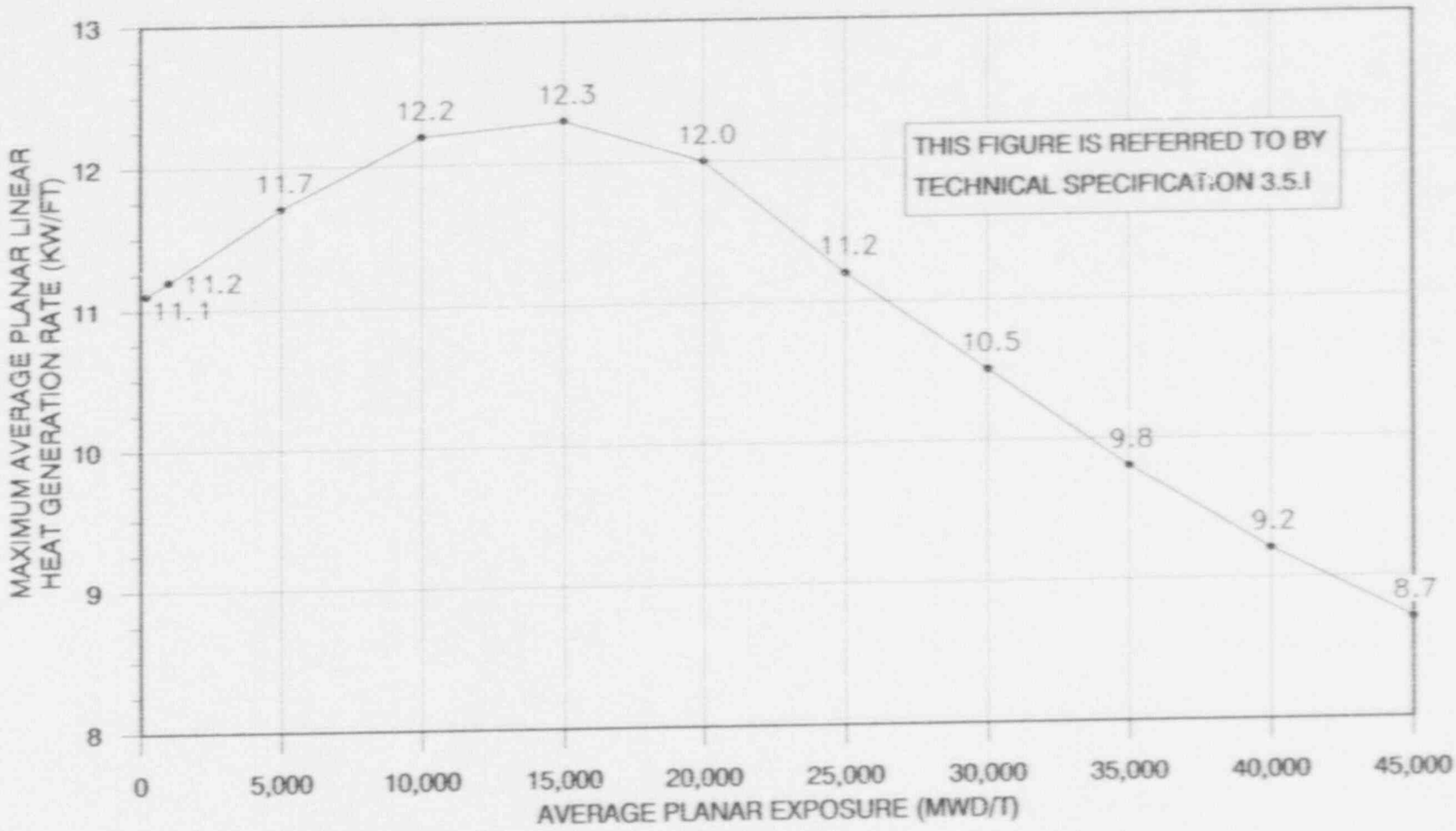
FIGURE 1




MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE VERSUS AVERAGE PLANAR EXPOSURE

FIGURE 2

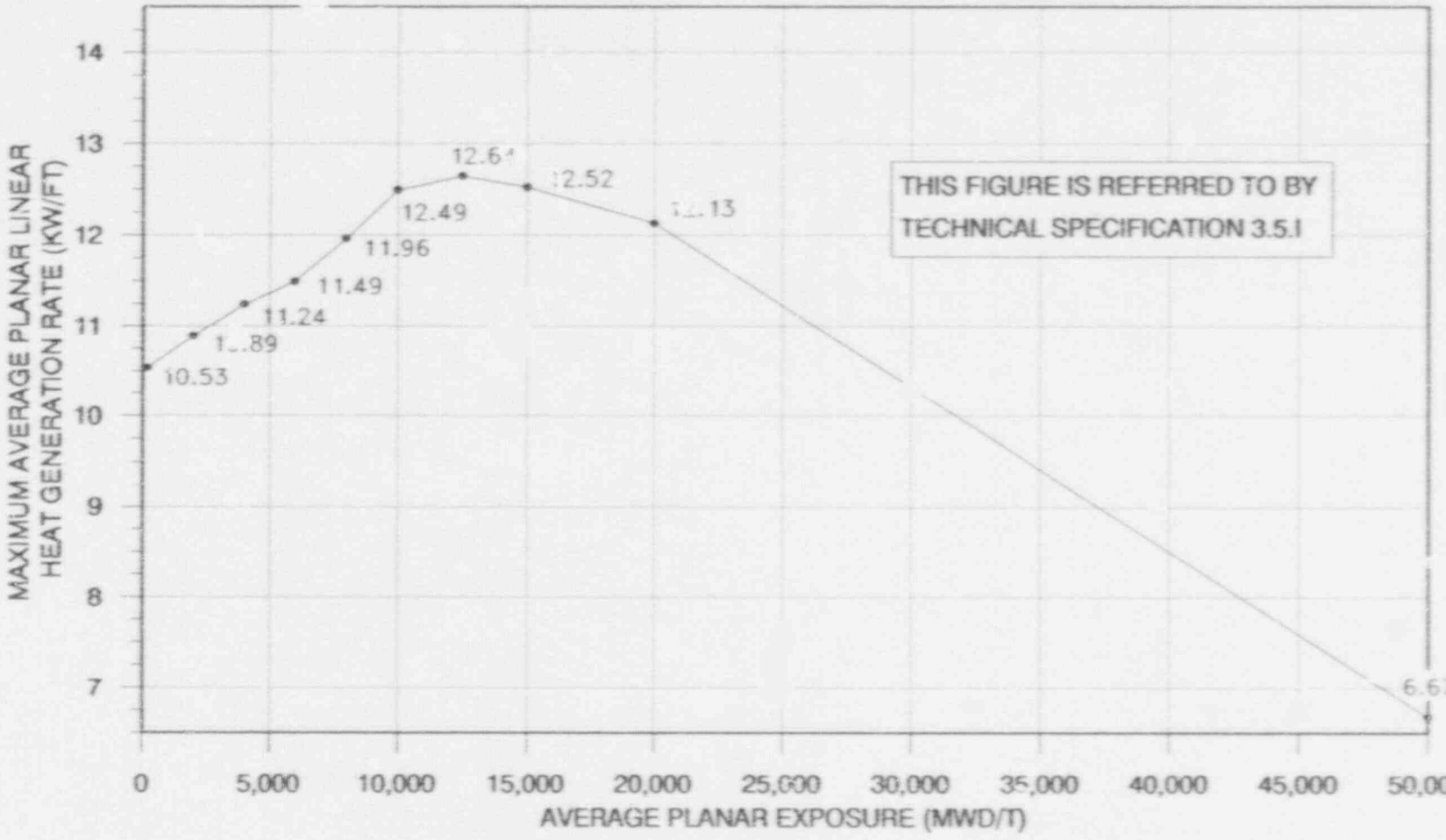
# FUEL TYPE BP8DRB299H




MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE VERSUS AVERAGE PLANAR EXPOSURE

FIGURE 3

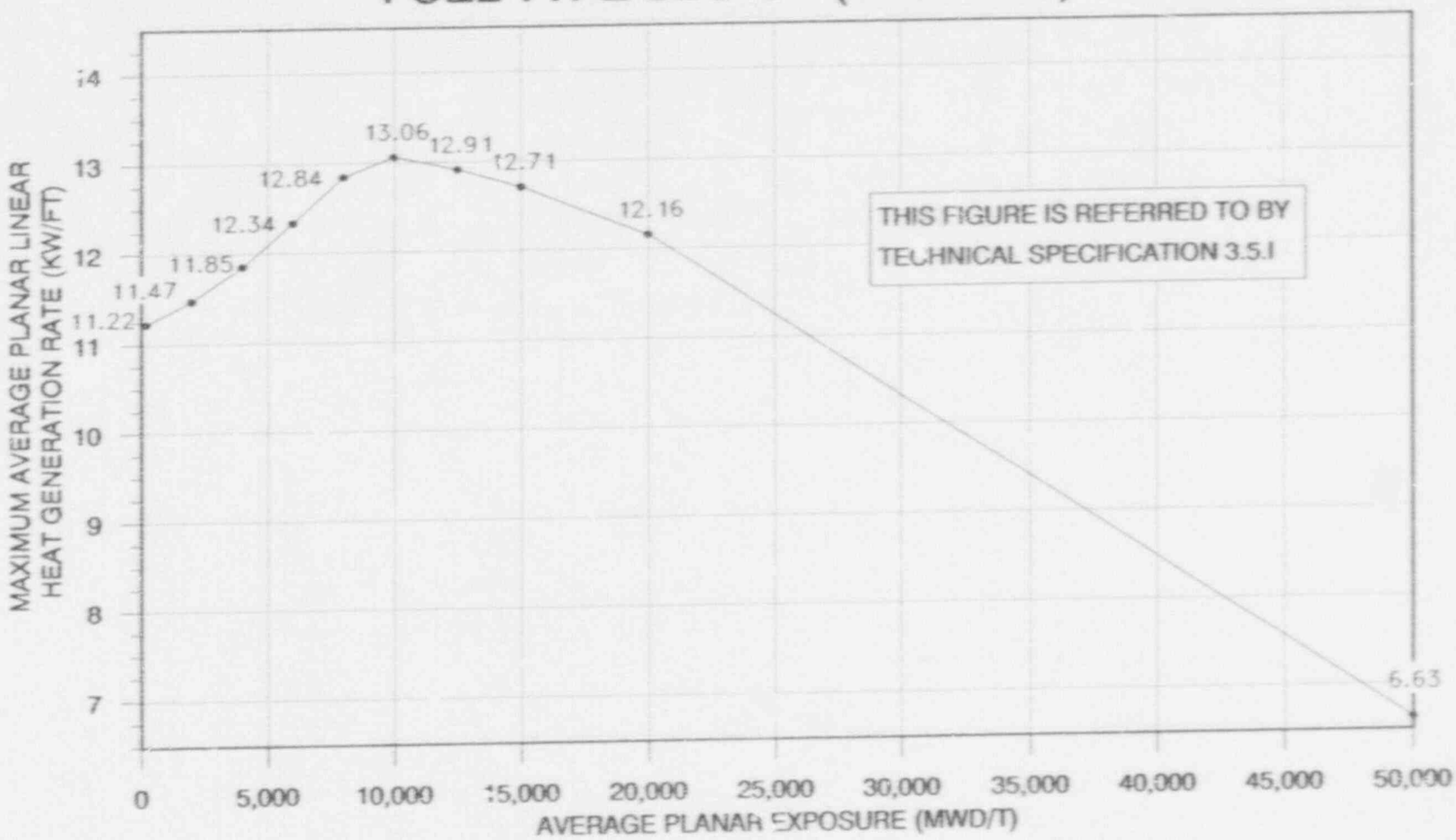
# FUEL TYPE LTA310




MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE VERSUS AVERAGE PLANAR EXPOSURE

FIGURE 4

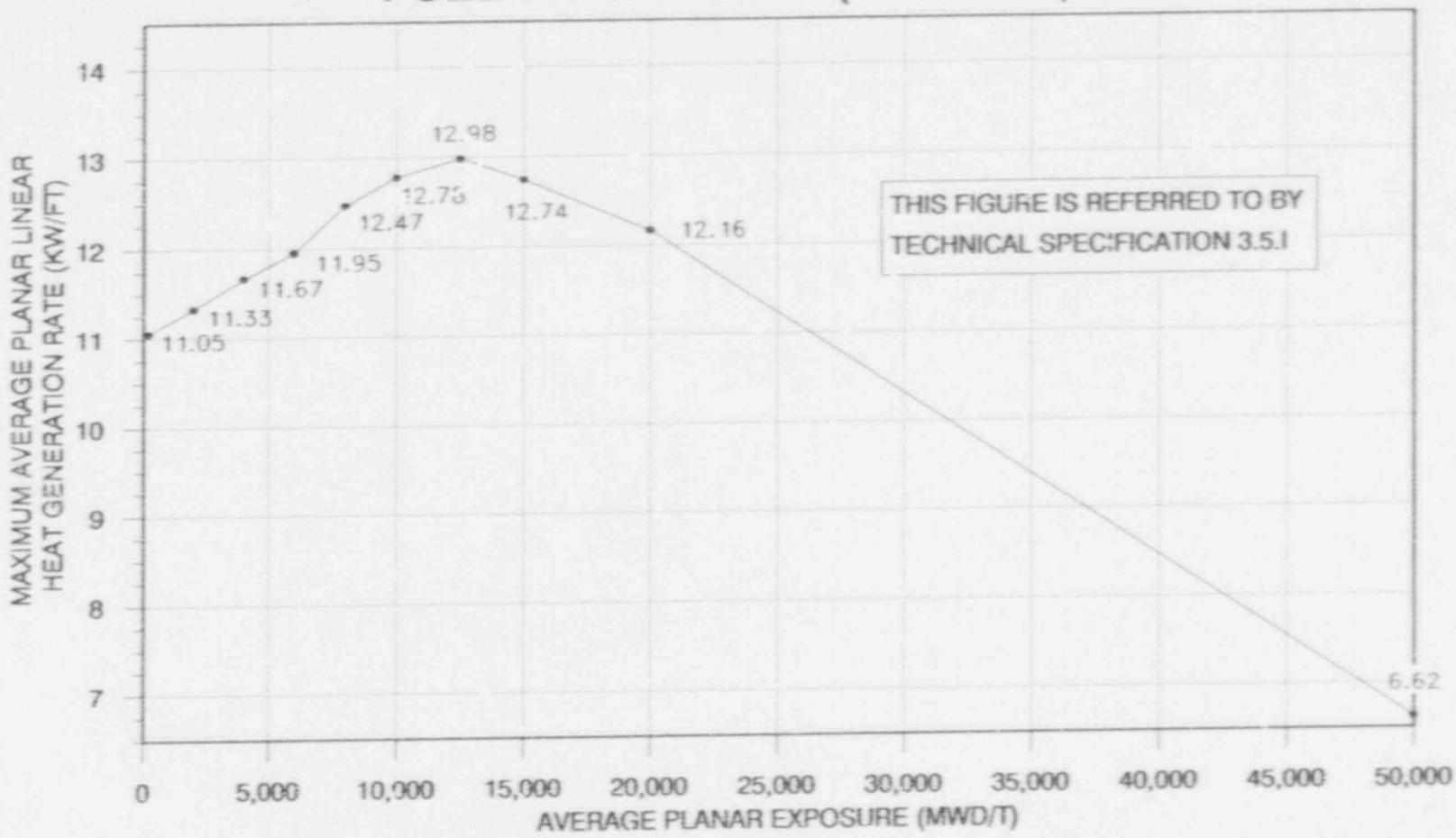
# FUEL TYPE BD319A (GE8X8EB)




MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE VERSUS AVERAGE PLANAR EXPOSURE

FIGURE 5

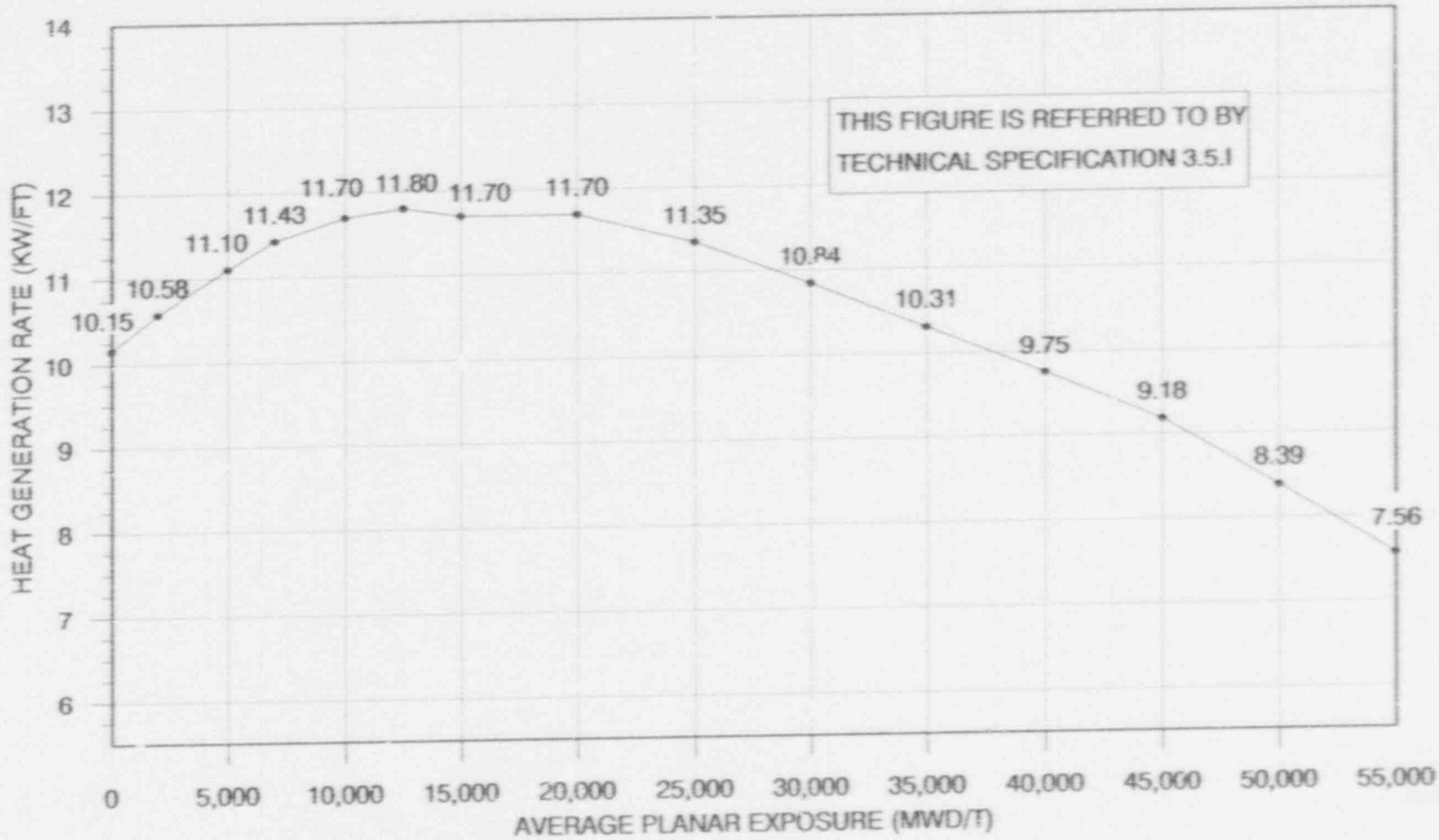
# FUEL TYPE BD321A (GE8X8EB)




MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE VERSUS AVERAGE PLANAR EXPOSURE

FIGURE 6

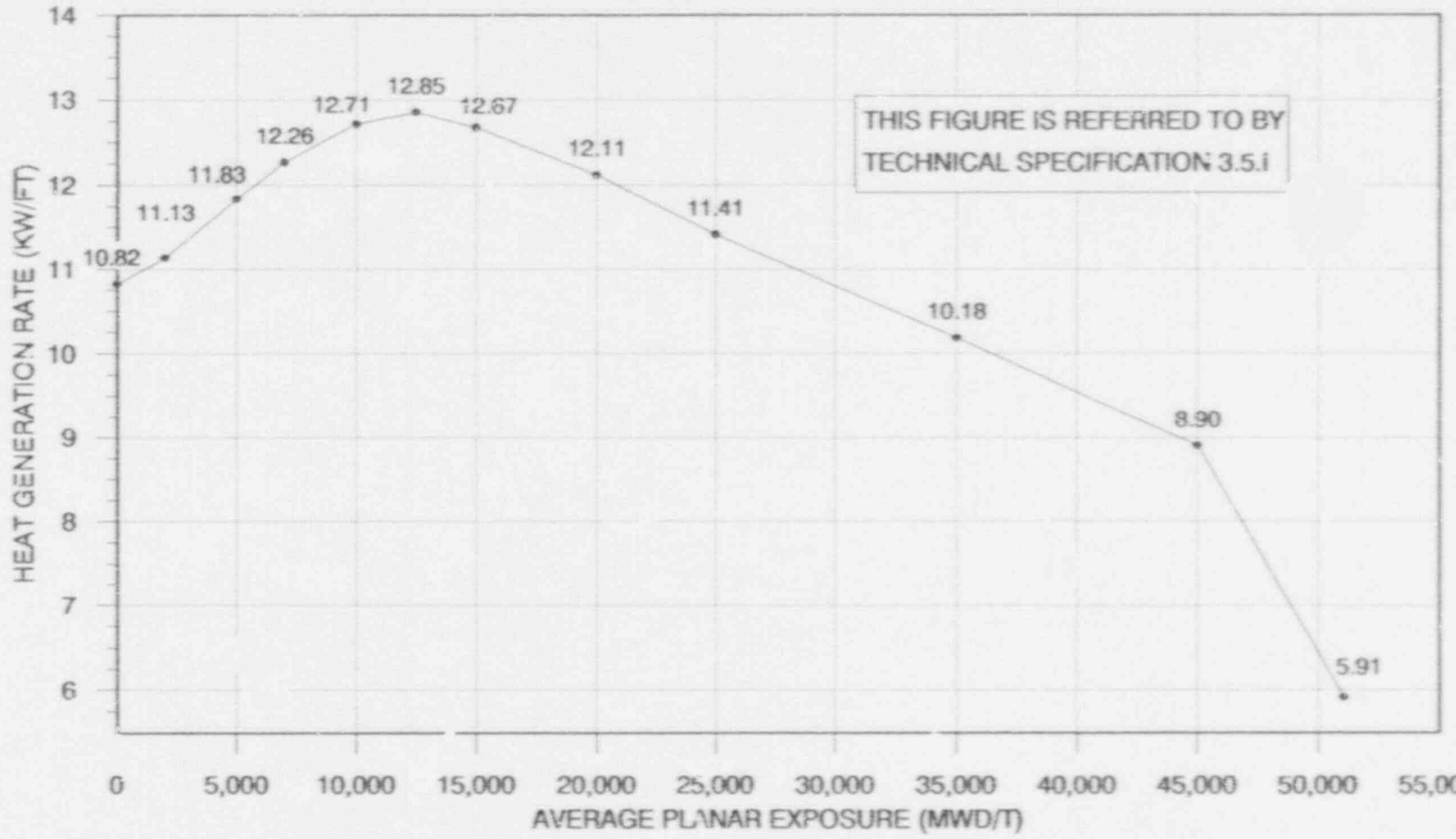
# FUEL TYPE LUA307 (GE11)




MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE VERSUS AVERAGE PLANAR EXPOSURE

FIGURE 7

# FUEL TYPE P8DWB320 (GE8X8NB)




MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE VERSUS AVERAGE PLANAR EXPOSURE

FIGURE 8

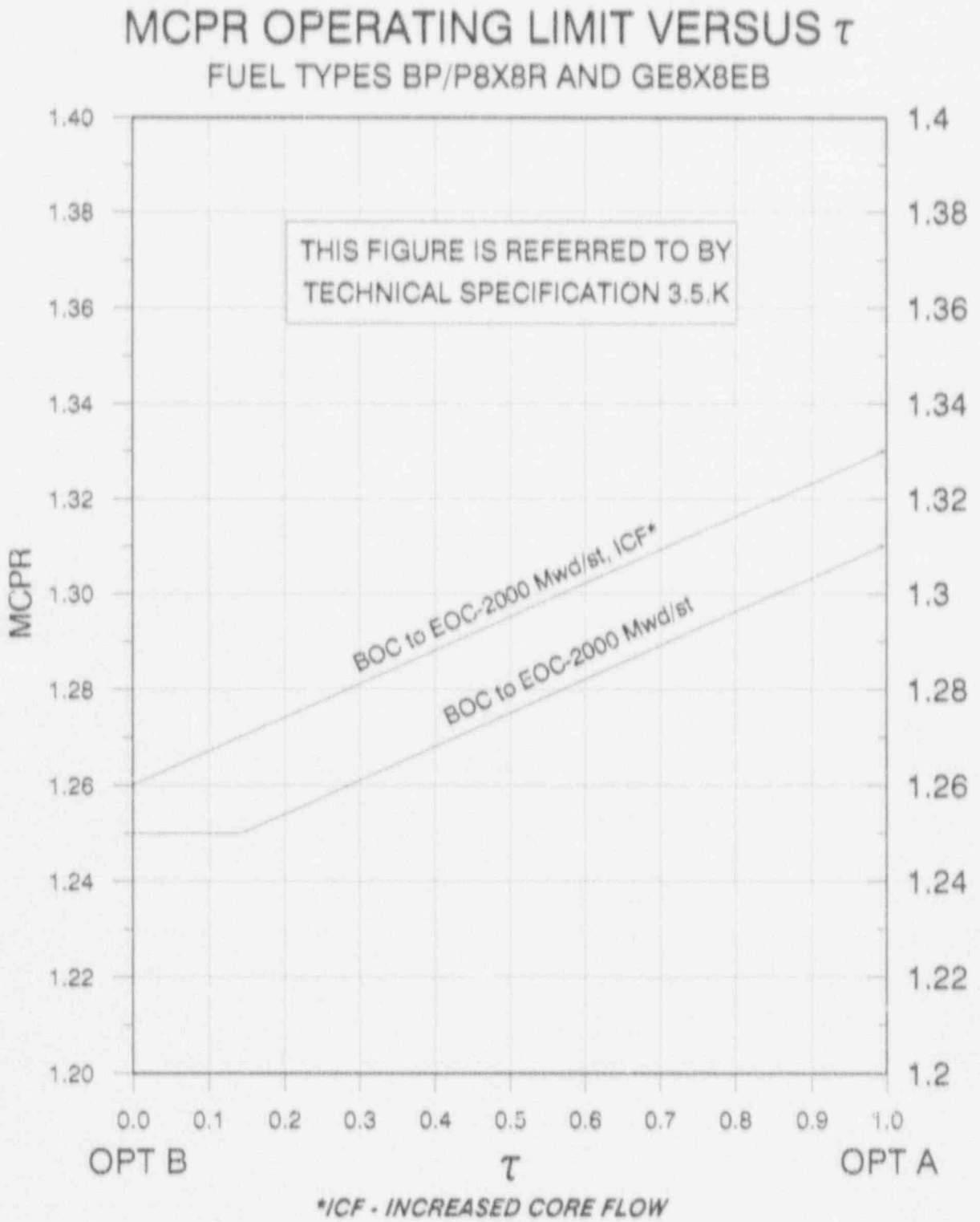

MCPR OPERATING LIMIT VERSUS τ
FUEL TYPES BP/P8X8R AND GE8X8EB
THIS FIGURE IS REFERRED TO BY
TECHNICAL SPECIFICATION 3.5.K
BOC to EOC-2000 Mwd/st, ICF*
BOC to EOC-2000 Mwd/st
MCPR
1.40
1.38
1.36
1.34
1.32
1.30
1.28
1.26
1.24
1.22
1.20
1.4
1.38
1.36
1.34
1.32
1.3
1.28
1.26
1.24
1.22
1.2
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
OPT B
τ
OPT A
*ICF - INCREASED CORE FLOW

FIGURE 9

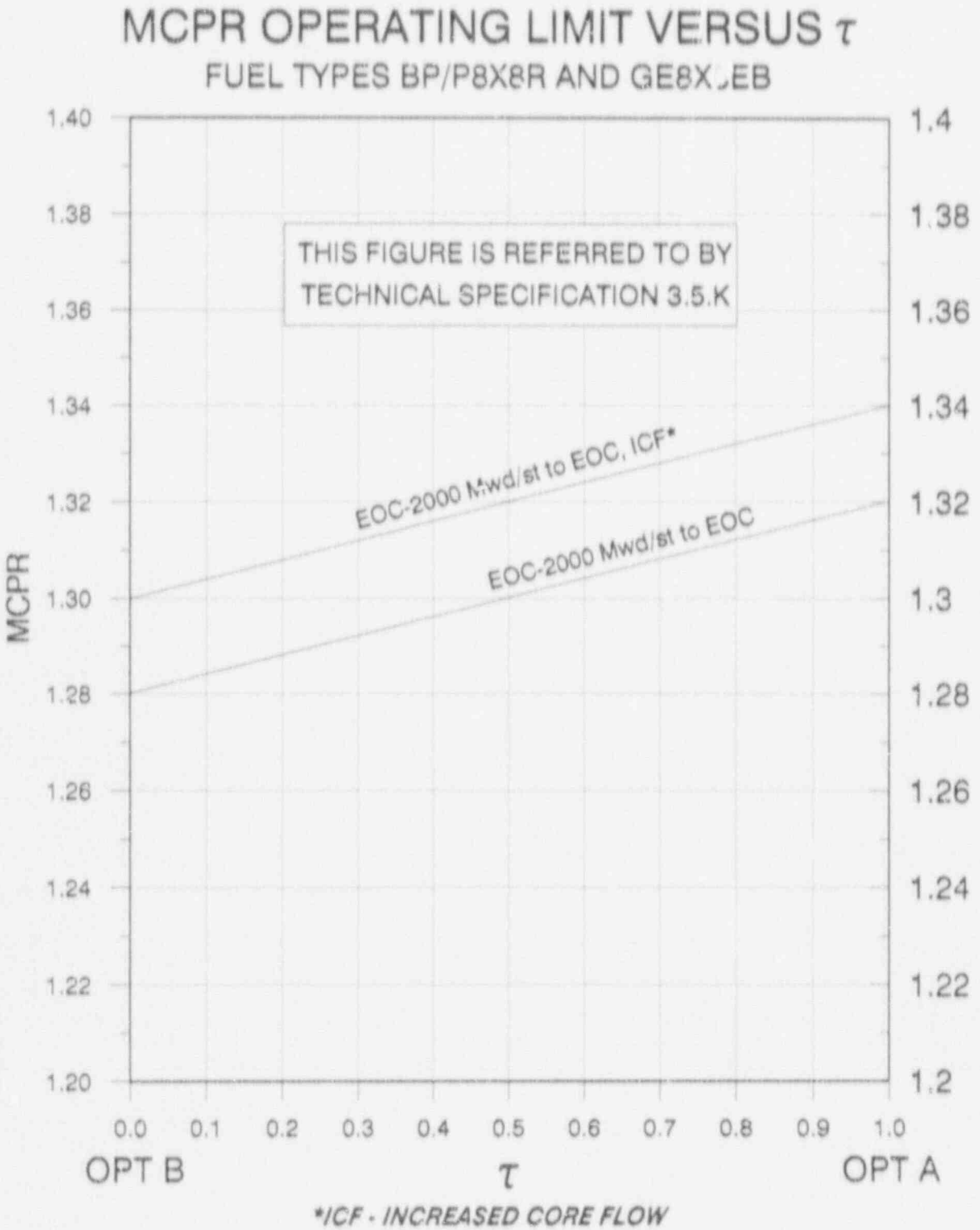
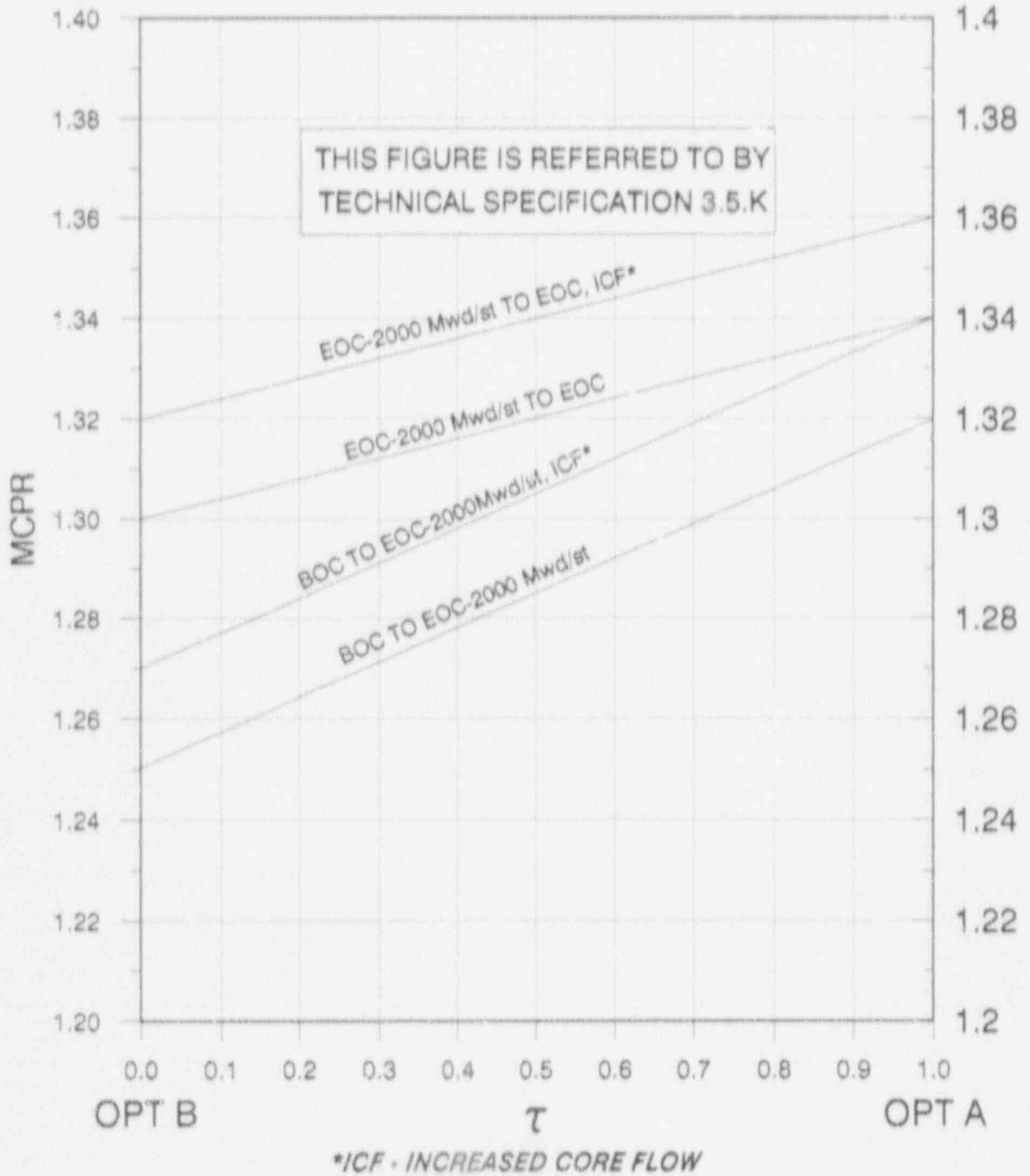

MCPR OPERATING LIMIT VERSUS τ
FUEL TYPES BP/P8X8R AND GE8X.EB
THIS FIGURE IS REFERRED TO BY
TECHNICAL SPECIFICATION 3.5.K
EOC-2000 Mwd/st to EOC, ICF*
EOC-2000 Mwd/st to EOC
MCPR
1.40
1.38
1.36
1.34
1.32
1.30
1.28
1.26
1.24
1.22
1.20
1.4
1.38
1.36
1.34
1.32
1.3
1.28
1.26
1.24
1.22
1.2
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
OPT B
τ
OPT A
*ICF - INCREASED CORE FLOW

FIGURE 10

# MCPR OPERATING LIMIT VERSUS $\tau$

## FUEL TYPE LTA310

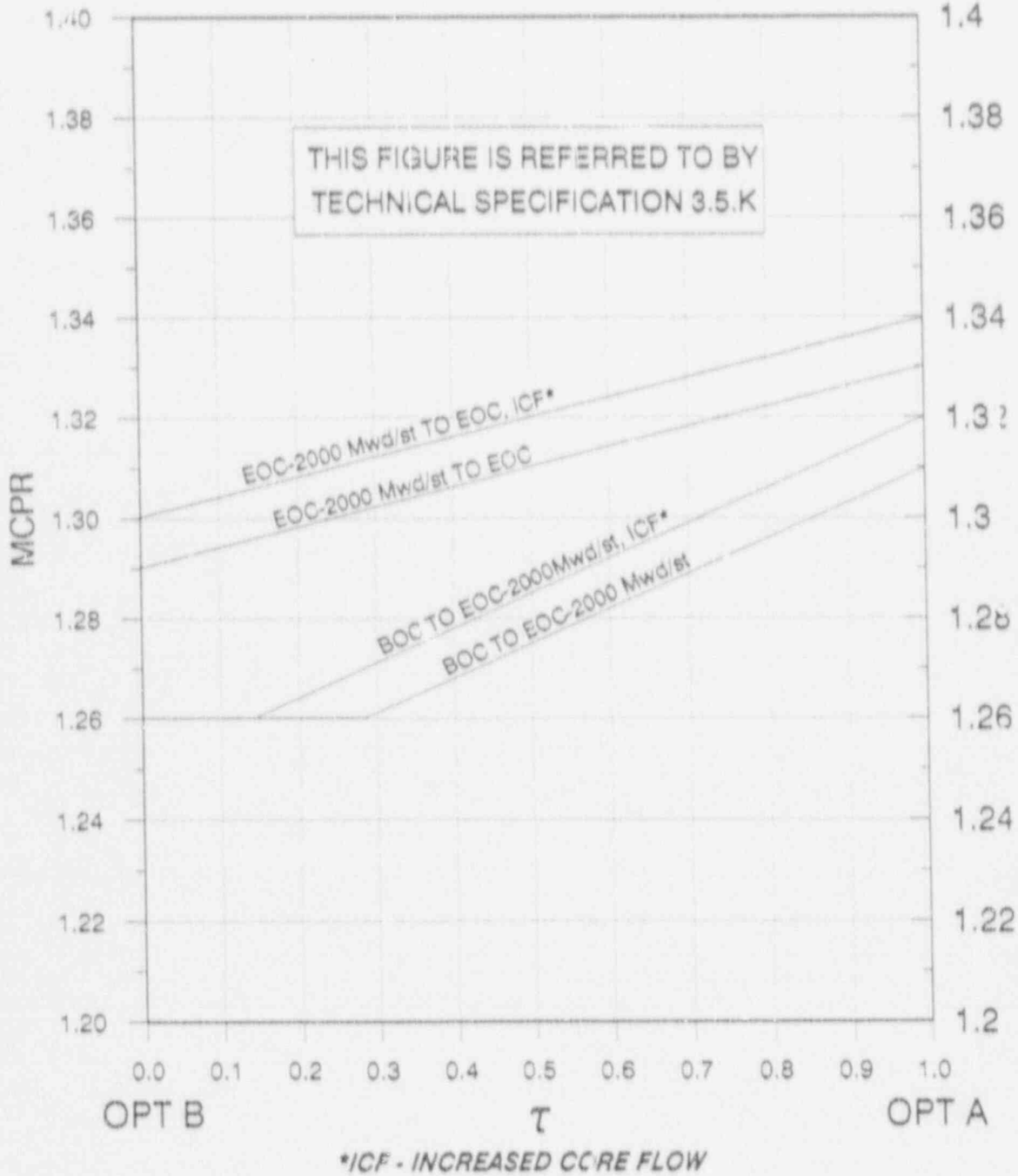



**ICF - INCREASED CORE FLOW*

FIGURE 11

# MCPR OPERATING LIMIT VERSUS τ

## FUEL TYPE GE8X8NB

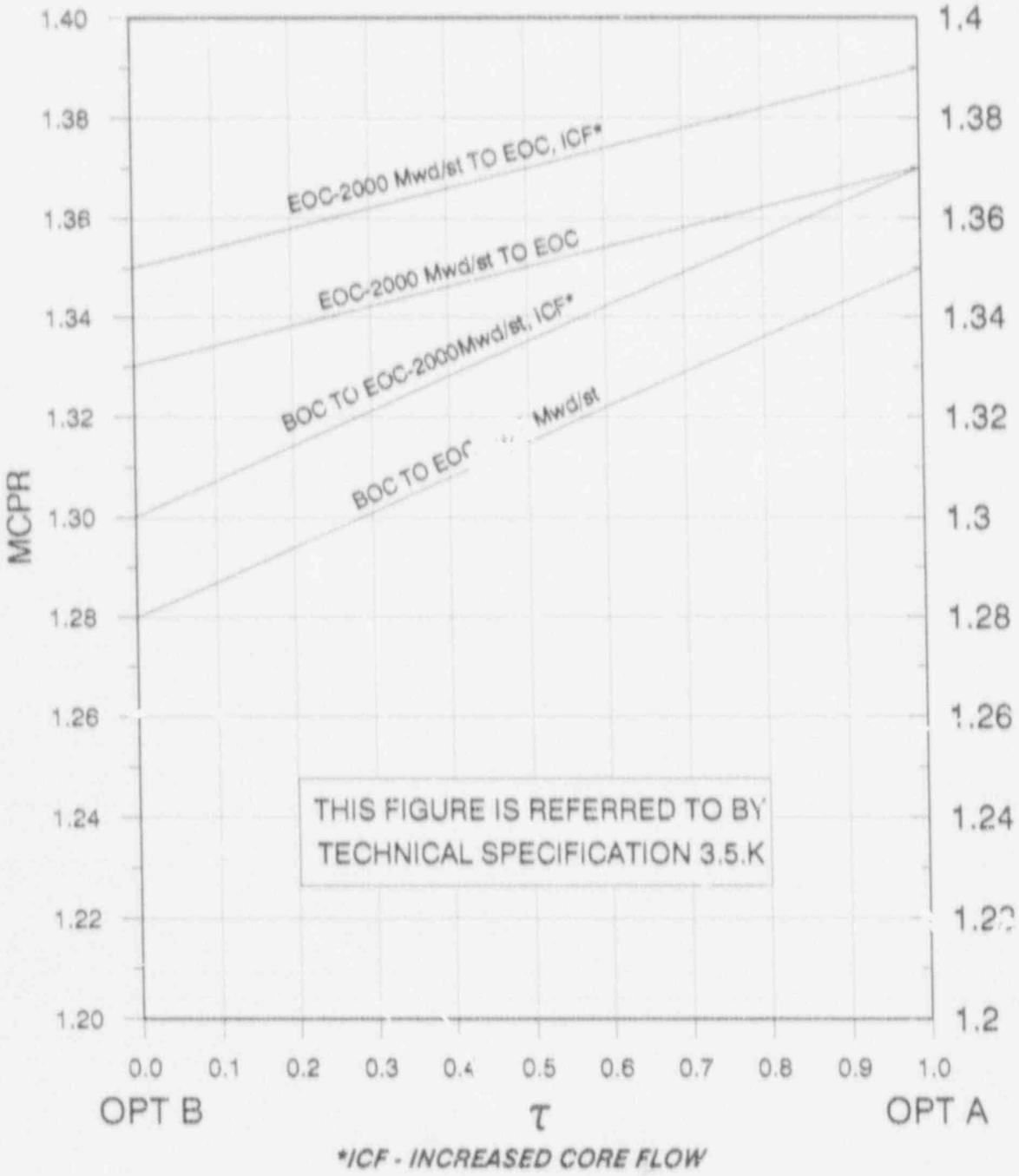



**ICF - INCREASED CORE FLOW*

FIGURE 12

# MCPR OPERATING LIMIT VERSUS τ

## FUEL TYPE LUA307 (GE11 QFB)

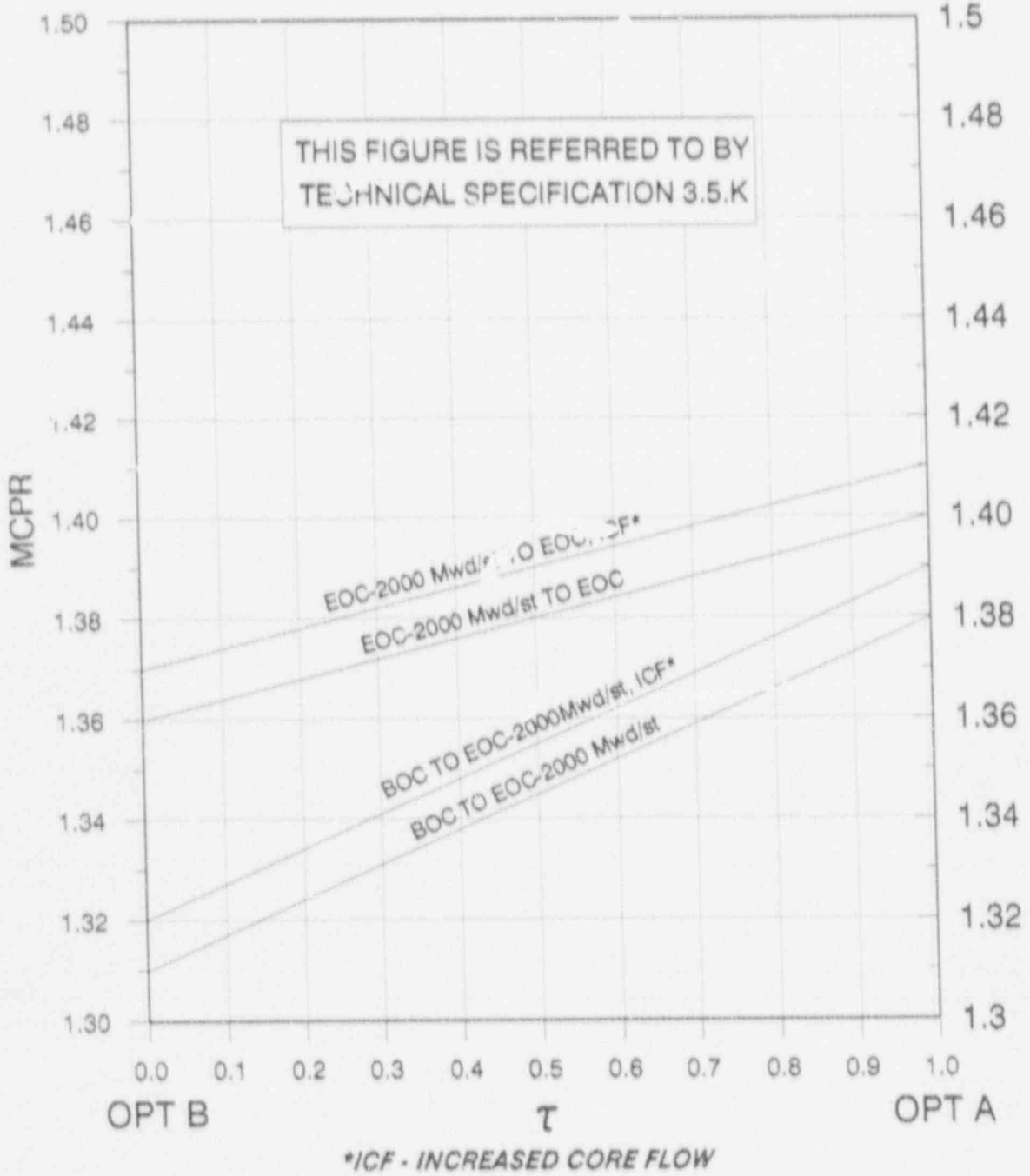



**ICF - INCREASED CORE FLOW*

FIGURE 13

# MCPR OPERATING LIMIT VERSUS τ

## FUEL TYPE ANF QFB

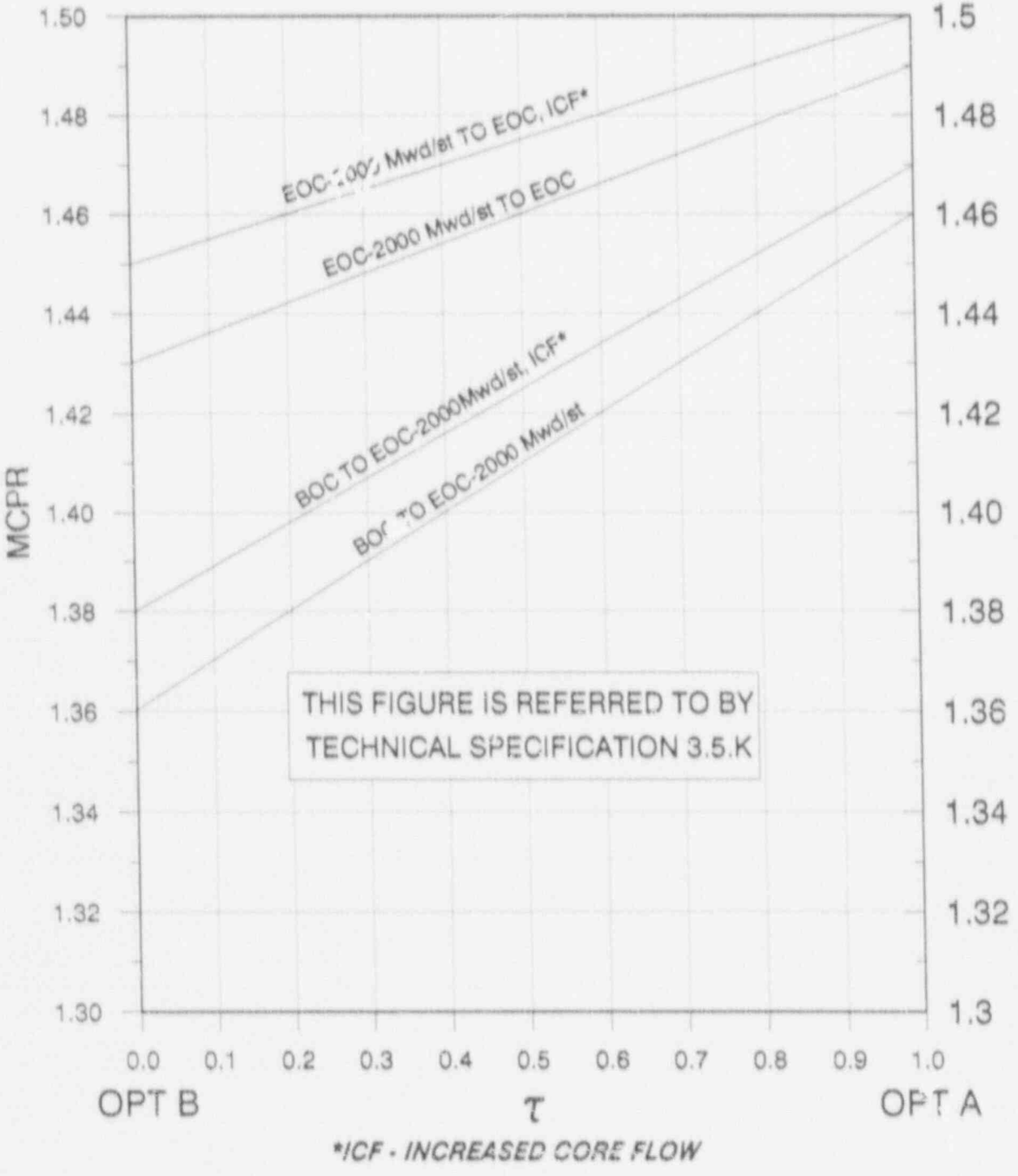



*ICF - INCREASED CORE FLOW

FIGURE 14

# MCPR OPERATING LIMIT VERSUS $\tau$

## FUEL TYPE ABB QFB




**ICF - INCREASED CORE FLOW*

FIGURE 15

# Kf Factor vs Core Flow

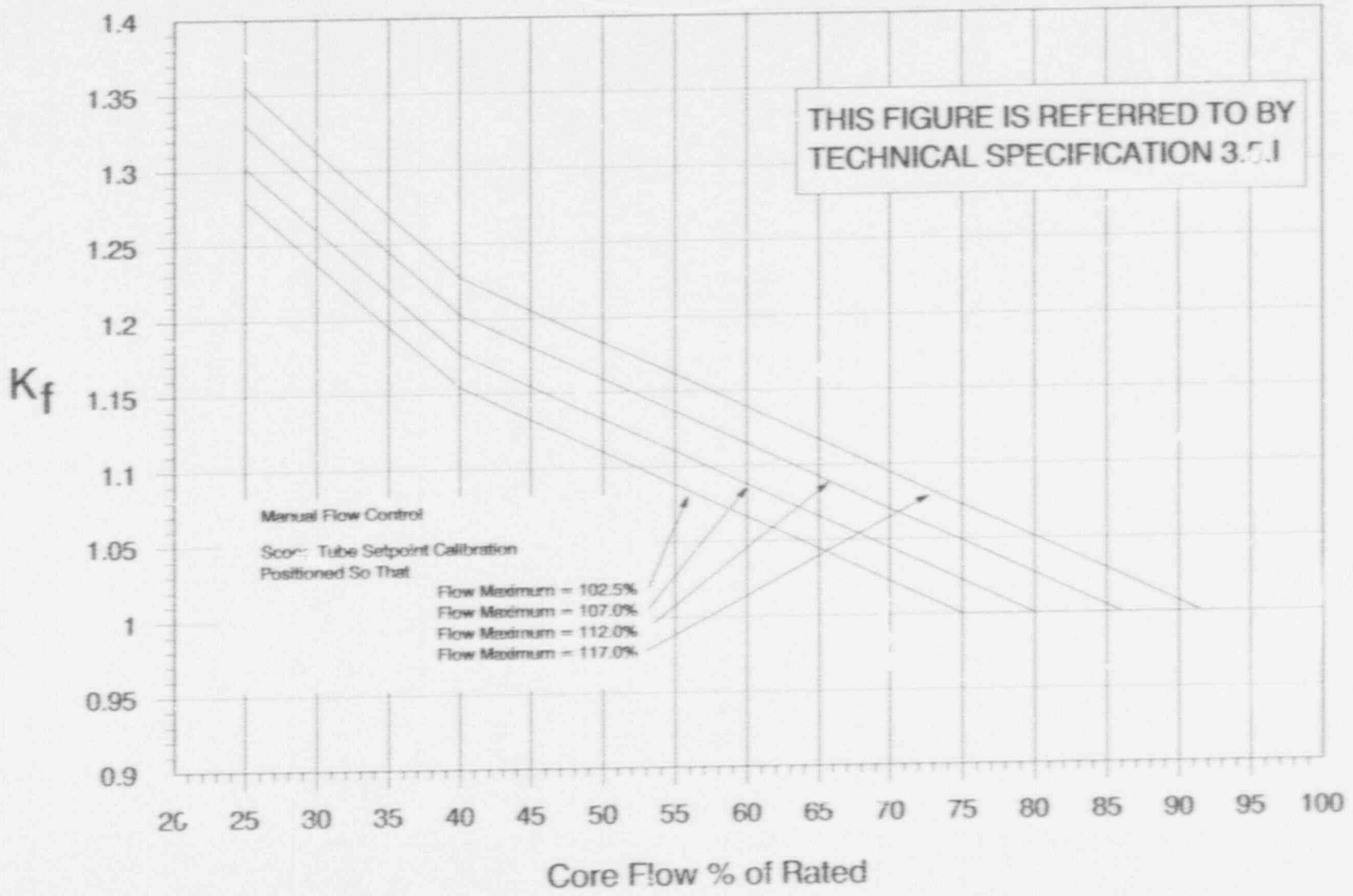



FIGURE 16

## TABLE 1

### SINGLE LOOP REDUCTION FACTORS

| FUEL TYPE | REDUCTION FACTOR |
|---|---|
| BP/P8X8R | 0.79 |
| GE8X8EB | 0.73 |
| LTA310 | 0.73 |
| LUA307 | 0.73 |
| GE8X8NB | 0.73 |

THIS TABLE IS REFERRED TO BY
TECHNICAL SPECIFICATION 3.5.I

**TABLE 2**

**OPERATING LIMIT MCPR VALUES
FOR VARIOUS CORE EXPOSURES***

| FUEL TYPE | MCPR OPERATING LIMIT** FOR INCREMENTAL CYCLE CORE AVERAGE EXPOSURE | |
|---|---|---|
| | BOC TO 2000 MWD/T BEFORE EOC | 2000 MWD/T BEFORE EOC TO EOC |
| **Standard Operating Conditions** | | |
| BP/P8X8R | 1.25 | 1.28 |
| GE8X8EB | 1.25 | 1.28 |
| LTA310 | 1.25 | 1.30 |
| LUA307 | 1.28 | 1.33 |
| GE8X8NB | 1.26 | 1.29 |
| ABB QFB | 1.36 | 1.43 |
| ANF QFB | 1.31 | 1.36 |
| **Increased Core Flow** | | |
| BP/P8X8R | 1.26 | 1.30 |
| GE8X8EB | 1.26 | 1.30 |
| LTA310 | 1.27 | 1.32 |
| LUA307 | 1.30 | 1.35 |
| GE8X8NB | 1.26 | 1.30 |
| ABB QFB | 1.38 | 1.45 |
| ANF QFB | 1.32 | 1.37 |

* If Technical Specification requirement 4.5.K.2.a is met.

** These values shall be increased by 0.01 for single loop operation.

THIS TABLE IS REFERRED TO BY
TECHNICAL SPECIFICATION 3.5.K

**TABLE 3**

**OPERATING LIMIT MCPR VALUES
FOR VARIOUS CORE EXPOSURES***

| FUEL TYPE | MCPR OPERATING LIMIT** FOR INCREMENTAL CYCLE CORE AVERAGE EXPOSURE | |
|---|---|---|
| | BOC TO 2000 MWD/T BEFORE EOC | 2000 MWD/T BEFORE EOC TO EOC |
| Standard Operating Conditions | | |
| BP/P8X8R | 1.31 | 1.32 |
| GE8X8EB | 1.31 | 1.32 |
| LTA310 | 1.32 | 1.34 |
| LUA307 | 1.35 | 1.37 |
| GE8X8NB | 1.31 | 1.33 |
| ABB QFB | 1.46 | 1.49 |
| ANF QFB | 1.38 | 1.40 |
| Increased Core Flow | | |
| BP/P8X8R | 1.33 | 1.34 |
| GE8X8EB | 1.33 | 1.34 |
| LTA310 | 1.34 | 1.36 |
| LUA307 | 1.37 | 1.39 |
| GE8X8NB | 1.32 | 1.34 |
| ABB QFB | 1.47 | 1.50 |
| ANF QFB | 1.39 | 1.41 |

* If Technical Specification Surveillance Requirement 4.5.K.2 is not performed.

** These values shall be increased by 0.01 for single loop operation.

THIS TABLE IS REFERRED TO BY
TECHNICAL SPECIFICATION 3.5.K

## TABLE 4

### ROD BLOCK MONITOR SETPOINT

N=109

THIS TABLE IS REFERRED TO BY
TECHNICAL SPECIFICATION 3.2.C

## TABLE 5

## DESIGN LINEAR HEAT GENERATION RATE LIMITS

| FUEL TYPE | LHGR Limit |
|---|---|
| BP/P8X8R | 13.4 KW/ft |
| GE8X8EB | 14.4 KW/ft |
| LTA210 | 14.4 KW/ft |
| GE8X8NB | 14.4 KW/ft |
| LUA307 | 14.4 KW/ft |

THIS TABLE IS REFERRED TO BY
TECHNICAL SPECIFICATION 3.5.J