

TMI-1 Cycle 7
Core Operating Limits Report

TOPICAL REPORT 062
Rev. 2

BA Number 135400

TMI-1 Cycle 7 Reload Task Force
May, 1989

APPROVALS;

John D. McCarty 5/18/89
Robert C Crawford 5/18/89
Cycle 7 Reload Task Force Chairman Date

John A. Xoma 5/18/89
Manager, TMI Fuel Projects Date

G.R. Bond for PSW 5-18-89
Director, Nuclear Analysis & Fuels Date

ABSTRACT

This Core Operating Limits Report (COLR) has been prepared in accordance with the requirements of TMI-1 Technical Specification 6.9.5. The information in this report was reviewed and approved for use at TMI-1 by means of the Cycle 7 Reload Design Safety Evaluation TI-135400-005, dated April 6, 1988. The Cycle 7 core operating limits were generated using the NRC approved codes and methodologies defined by References 1 through 5. The rod index, axial power imbalance, and quadrant tilt limits were then error adjusted for observability and measurement uncertainties (Refs 4 and 5). These error adjusted alarm setpoint values are the ones provided in this COLR.

The COLR figures may have three distinctly defined regions:

1. Permissible Region
2. Restricted Region
3. Not Allowed Region (Operation in this region is not allowed)

Inadvertent operation within the Restricted Region for a period not exceeding four (4) hours is not considered a violation of a limiting condition for operation. The limiting criteria within the Restricted Region are potential ejected rod worth and ECCS power peaking. Since the probability of these accidents is very low, especially in a four (4) hour time frame, inadvertent operation within the Restricted Region for a period not exceeding four (4) hours is allowed.

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References:

Main Body

1. NRC Safety Evaluation Supporting Amendment No. 142 to License No. DPR-50 dated July 18, 1988 (Cycle 7 Operation).
2. NRC Safety Evaluation Supporting Amendment No. 143 to License No. DPR-50 dated July 26, 1988 (Power Stretch to 2568 MWt).
3. BAW-10152A, "NOODLE - A Multi-Dimensional Two-Group Reactor Simulator", June 1985.
4. BAW-10122A Rev. 1, "Normal Operating Controls", May 1984.
5. Letter from J. H. Taylor (B&W) to H. R. Denton (NRC), "Revised Incore Detector Error Allowances", July 23, 1986, JHT/86-111.

Enclosure (Non-Tech. Spec. Required Operating Limits)

1. BAW-10143PA, "BWC Correlation of Critical Heat Flux", April 1985.
2. BAW-10156A "LYNXT: Core Transient Thermal Hydraulic Program", February 1986.

Full Incore System (FIS) Operability Requirements

- The Full Incore System (FIS) is operable for monitoring axial power imbalance provided the number of valid Self Powered Neutron Detector (SPND) signals in any one quadrant is not less than 75 % of the total number of SPNDs in the quadrant.

<u>Quadrant</u>	<u>SPNDs</u>	<u>75 %</u>
WX	85.75	64.50
XY	99.75	75.00
YZ	89.25	67.00
ZW	89.25	67.00

- The Full Incore System (FIS) is operable for monitoring quadrant tilt provided the number of valid symmetric string individual SPND signals in any one quadrant is not less than 75 % (21) of the total number of SPNDs in the quadrant (28).

<u>Quadrant</u>	<u>Symmetric Strings</u>
WX	7, 9, 32, 35
XY	5, 23, 25, 28
YZ	16, 19, 47, 50
ZW	11, 13, 39, 43

Source Doc. : B&W 86-1164356-00
Referred To By : Tech. Spec. 3.5.4.1

Table 1
Quadrant Tilt Limits

	Steady State Limit 15% < Power ≤ 50%	Steady State Limit Indicated Power > 50%	Maximum Limit Indicated Power > 15%
Actual Tilt Used in the Analysis	7.50 %	4.92 %	20.0 %
Full Incore System (FIS)	6.83 %	4.12 %	16.8 %
Out-of-Core Detector System (OCD)	4.05 %	1.96 %	14.2 %
Minimum Incore System (MIS)	2.80 %	1.90 %	9.5 %

Figure 1 (Page 1 of 3)
Error Adjusted Rod Insertion Limits
0 to 45 EFPD ± 5 EFPD
4 Pump Operation

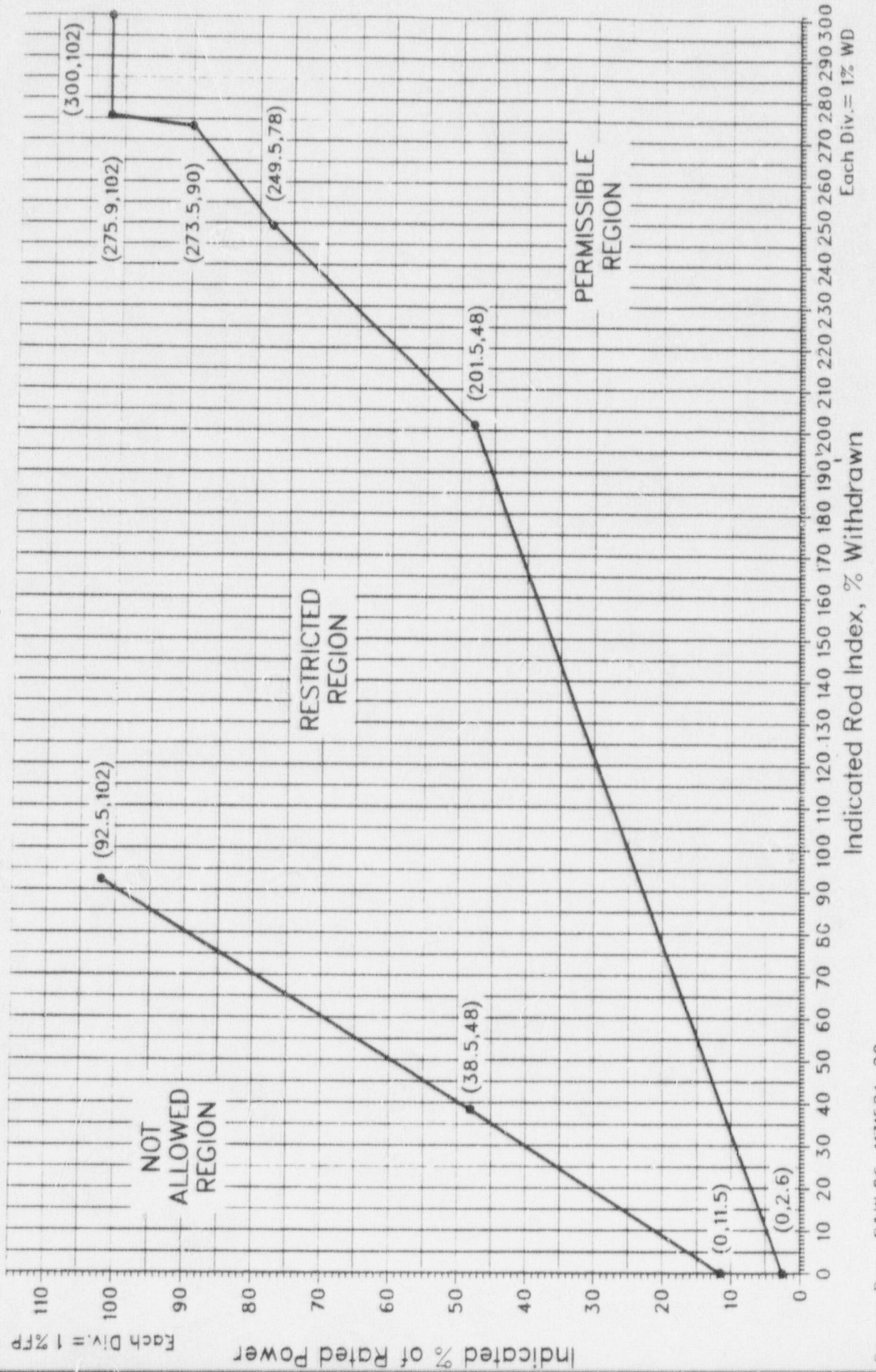


Figure 1 (Page 2 of 3)
 Error Adjusted Rod Insertion Limits
 45 +/- 5 EFPD to 105 +/- 5 EFPD
 4 Pump Operation

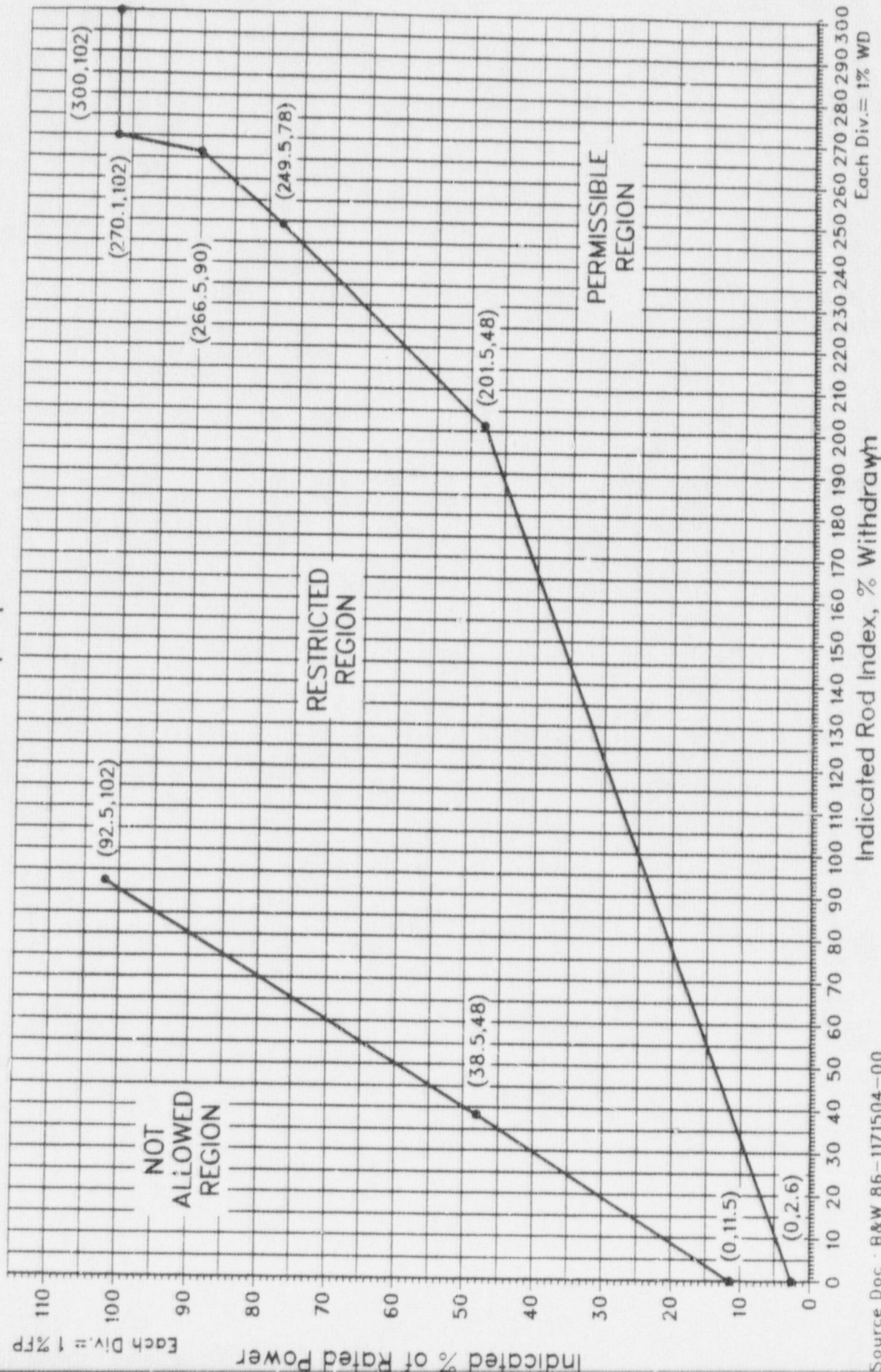


Figure 1 (Page 3 of 3)
 Error Adjusted Rod Insertion Limits
 105 $\pm$ 5 EFPD to EOC
 4 Pump Operation

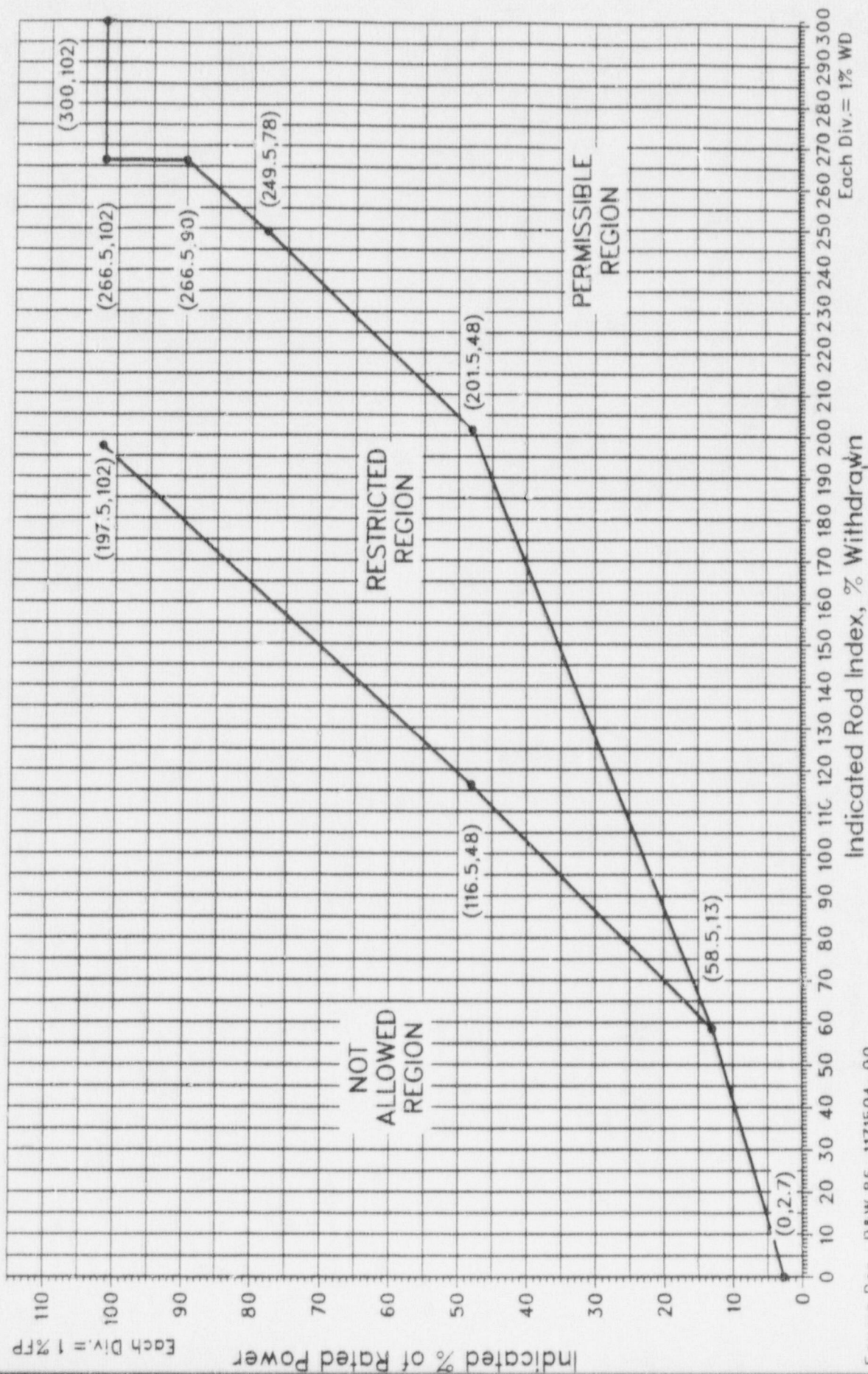
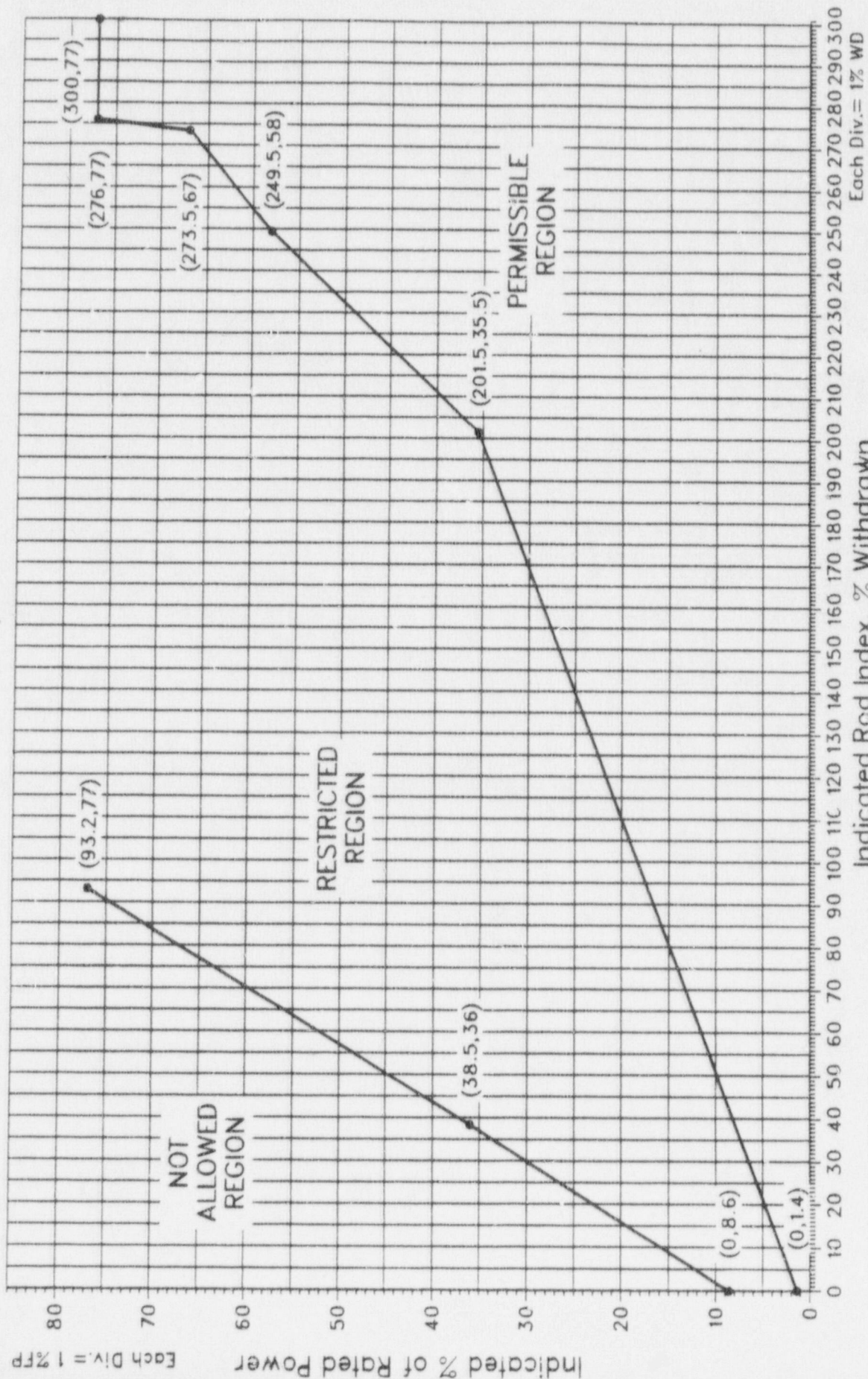


Figure 2 (Page 1 of 3)
Error Adjusted Rod Insertion Limits
0 to 45 +/−5 EFPD
3 Pump Operation



Source Doc - B&W 86-1171504-00

Referred to by Tech. Spec. 3.5.2.5.b and 3.5.2.4.e.2

Figure 2 (Page 2 of 3)
 Error Adjusted Rod Insertion Limits
 45 $\pm$ 5 EFPD to 105 $\pm$ 5 EFPD
 3 Pump Operation

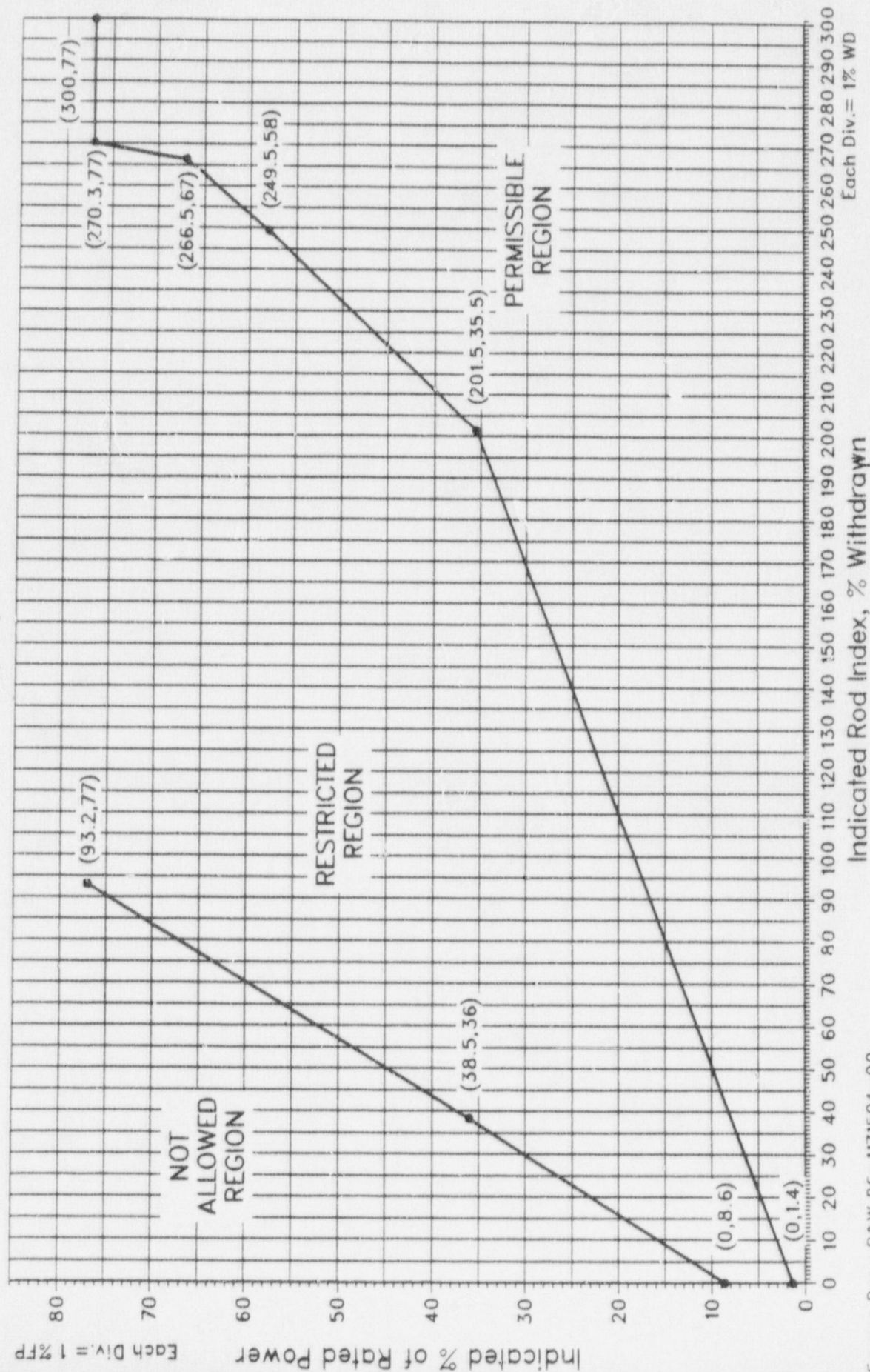


Figure 2 (Page 3 of 3)
 Error Adjusted Rod Insertion Limits
 105 +/- 5 EFPD to EOC
 3 Pump Operation

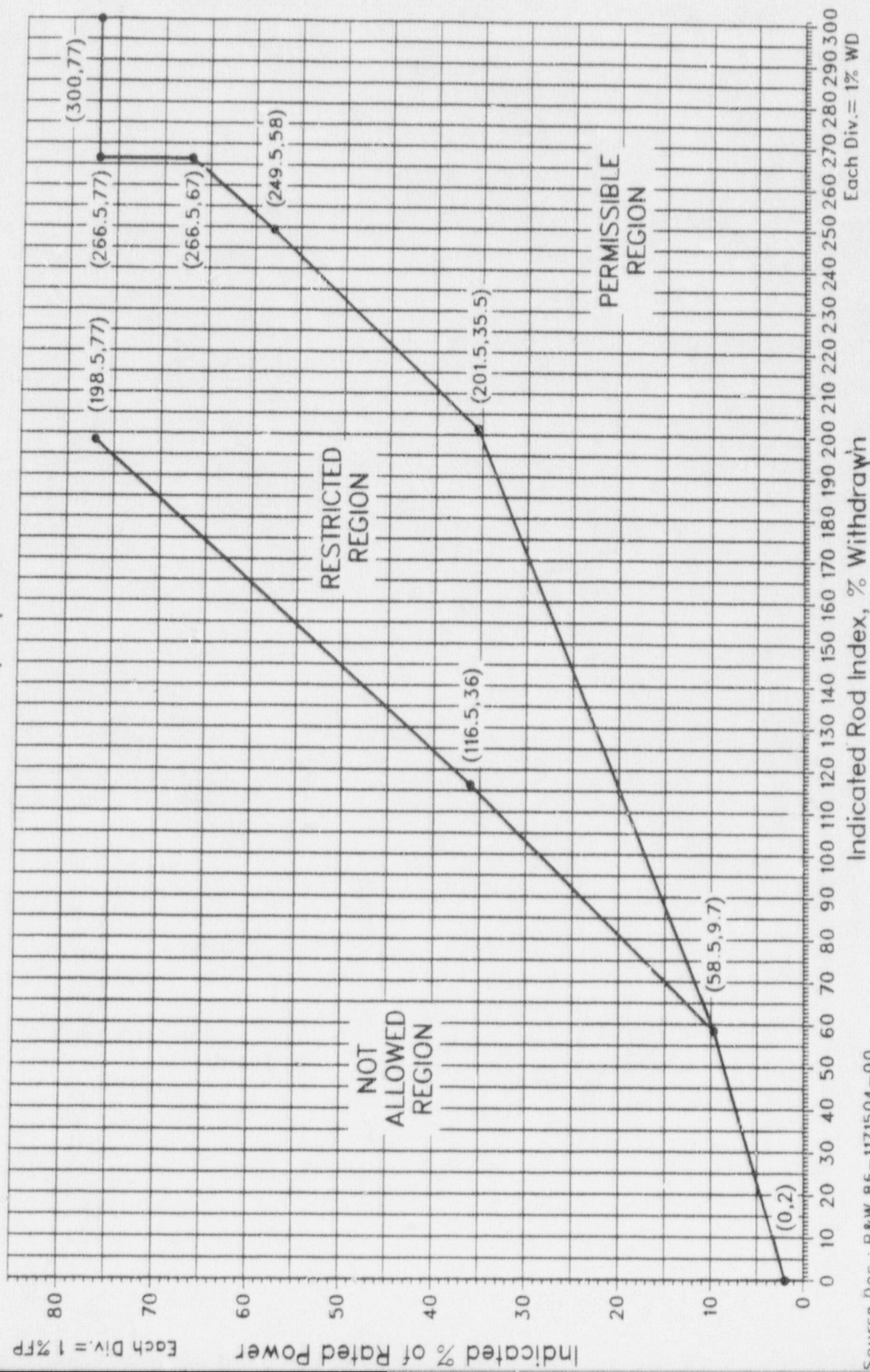
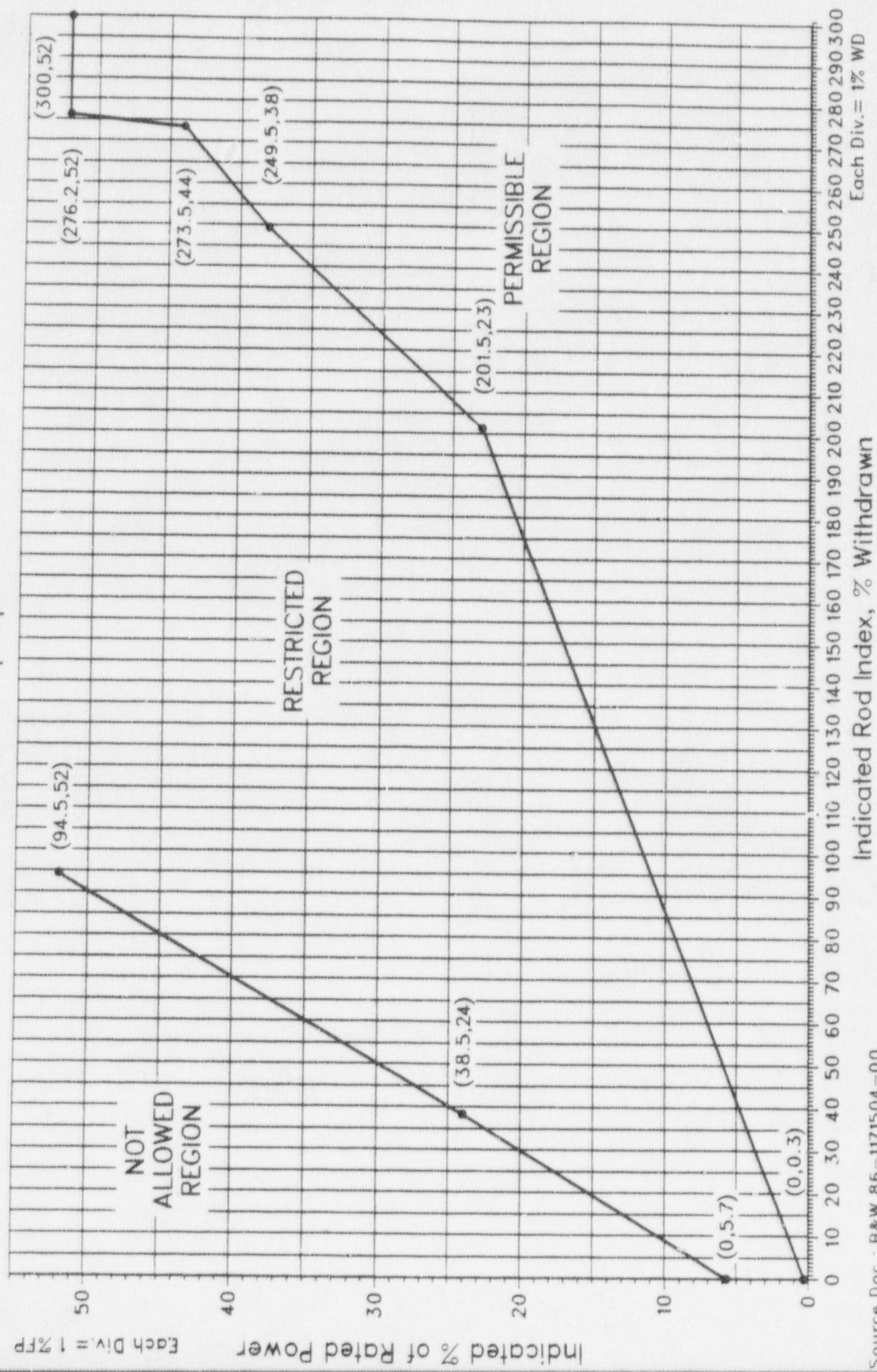


Figure 3 (Page 1 of 3)
 Error Adjusted Rod Insertion Limits
 0 to 45 EFPD ± 5 EFPD
 2 Pump Operation



Source Doc: B&W 86-1171504-00

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 Error Adjusted Rod Insertion Limits
 45 $\pm$ 5 EFPD to 105 $\pm$ 5 EFPD
 2 Pump Operation

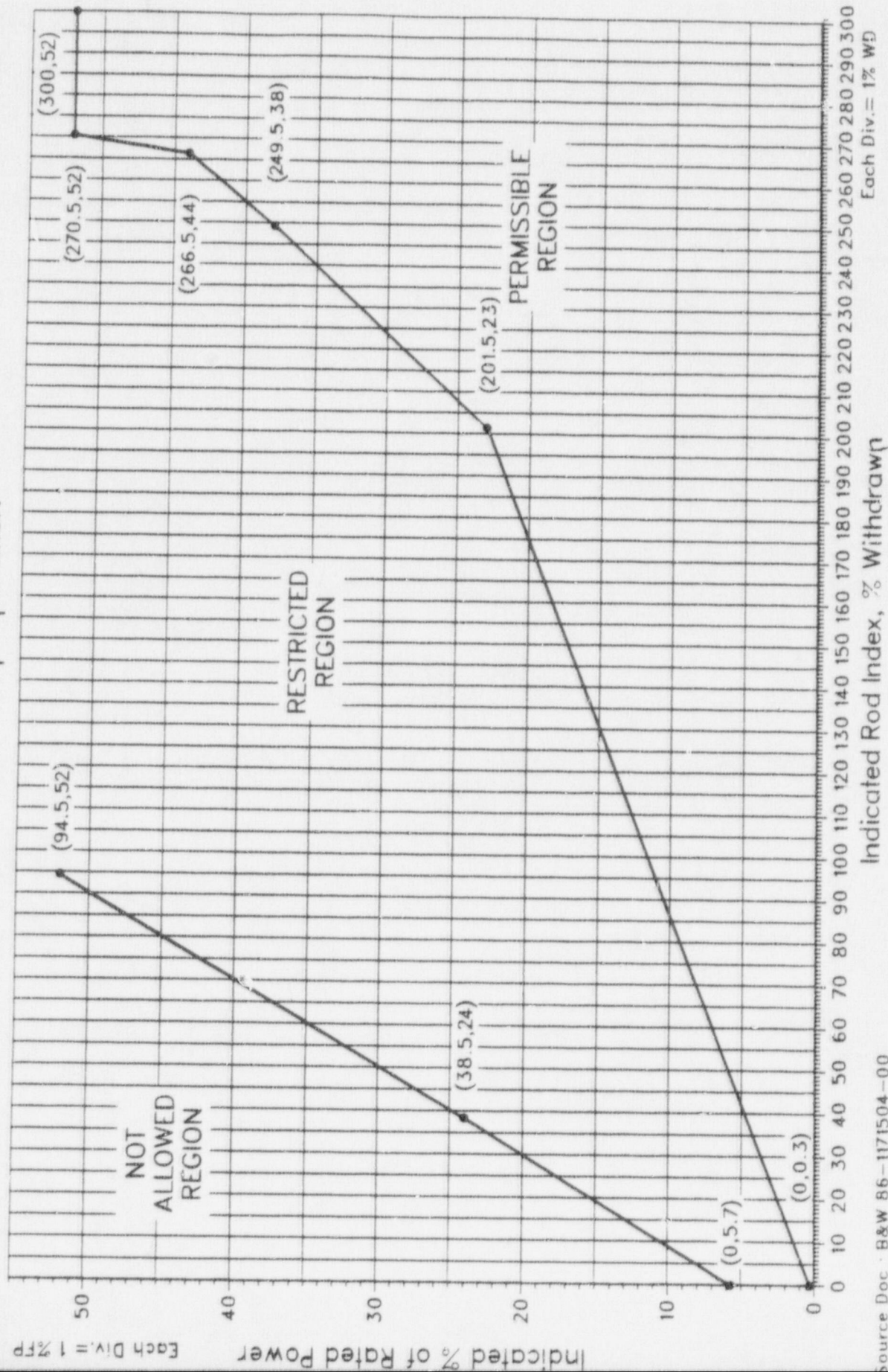


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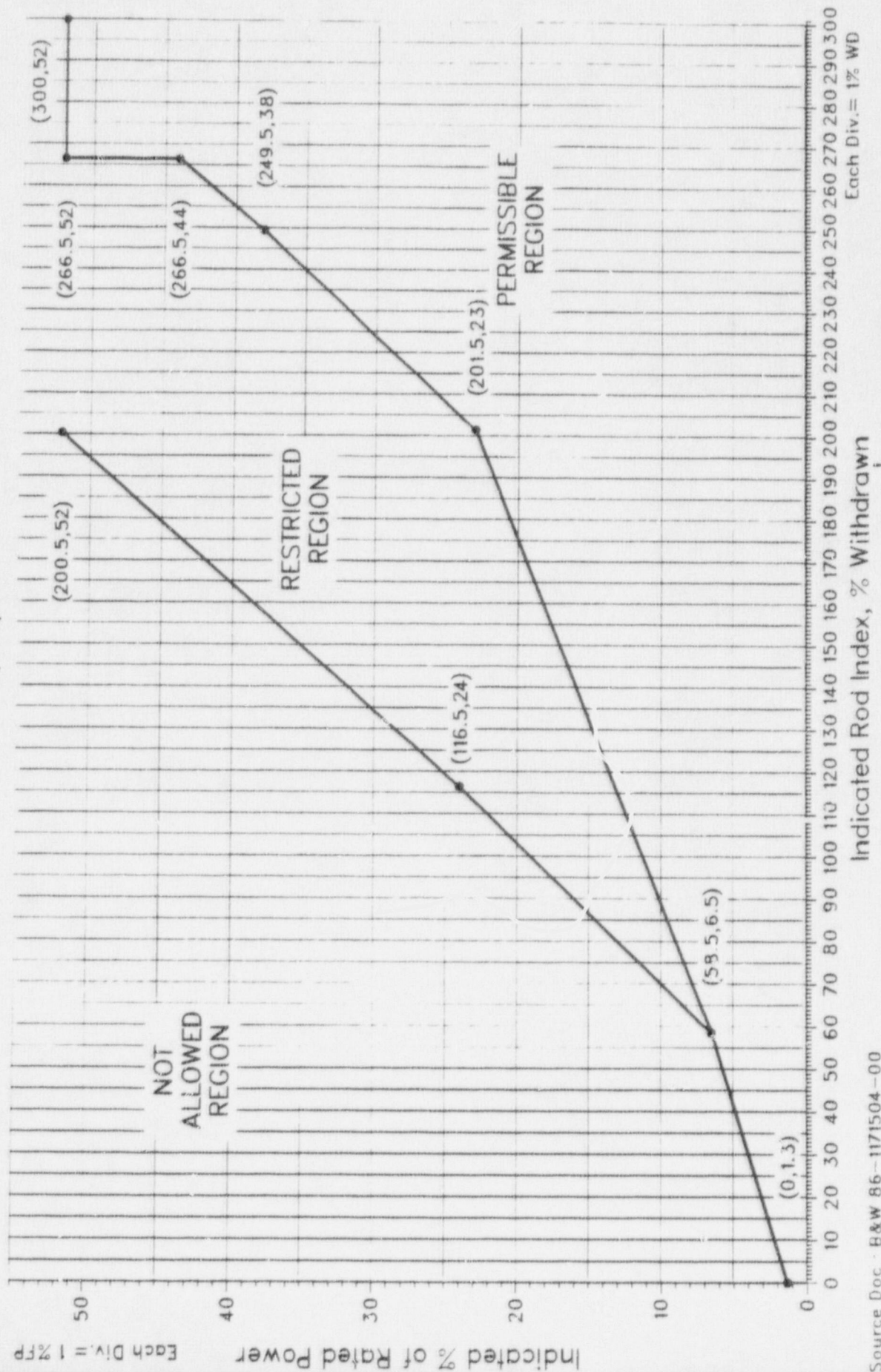
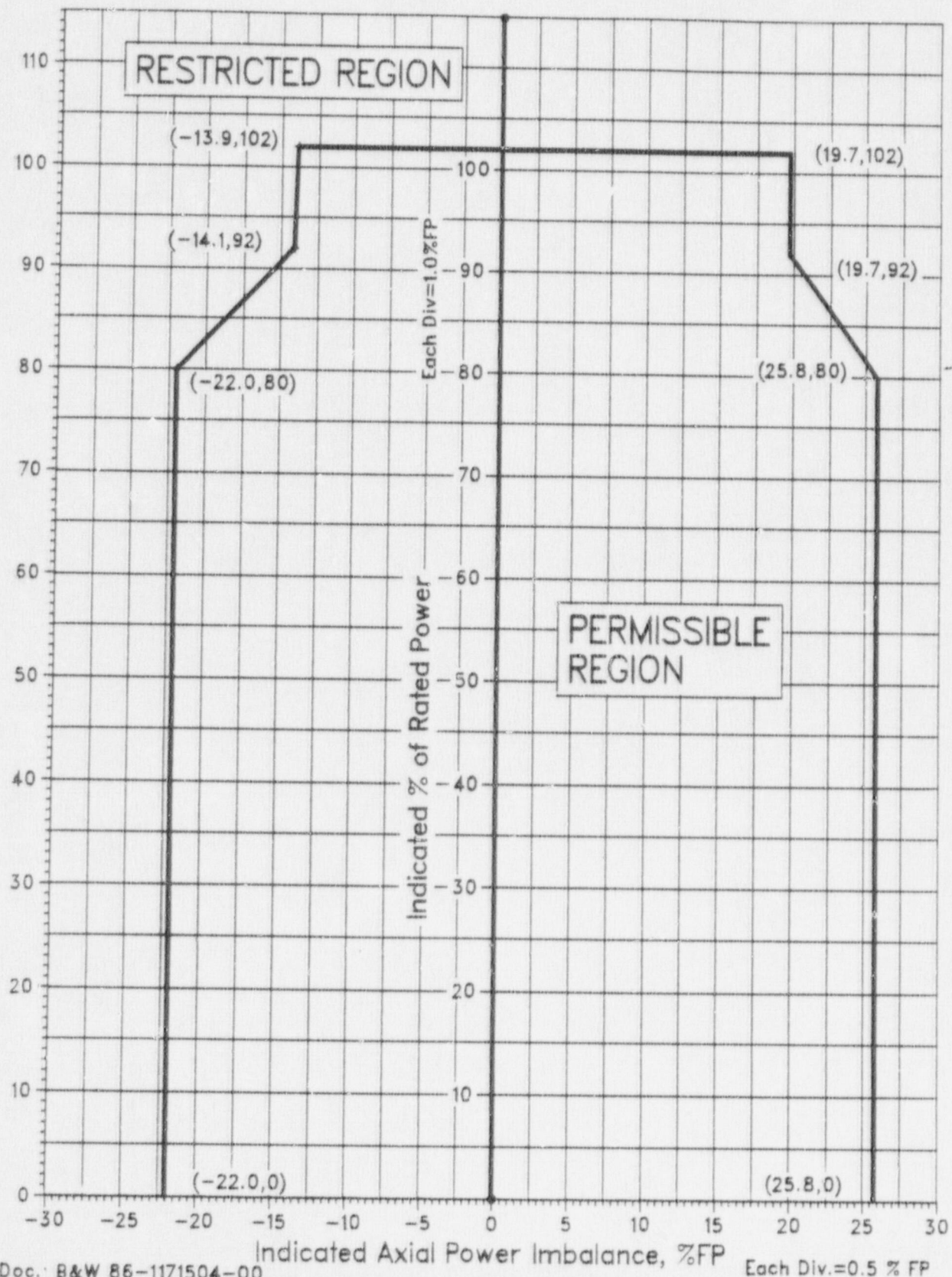


Figure 4 (Page 1 of 3)
Full Incore System
Error Adjusted Imbalance Limits
0 to 45 ± 5 EFPD

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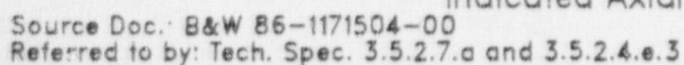


Figure 4 (Page 3 of 3)
Full Incore System
Error Adjusted Imbalance Limits
 105 ± 5 EFPD to EOC

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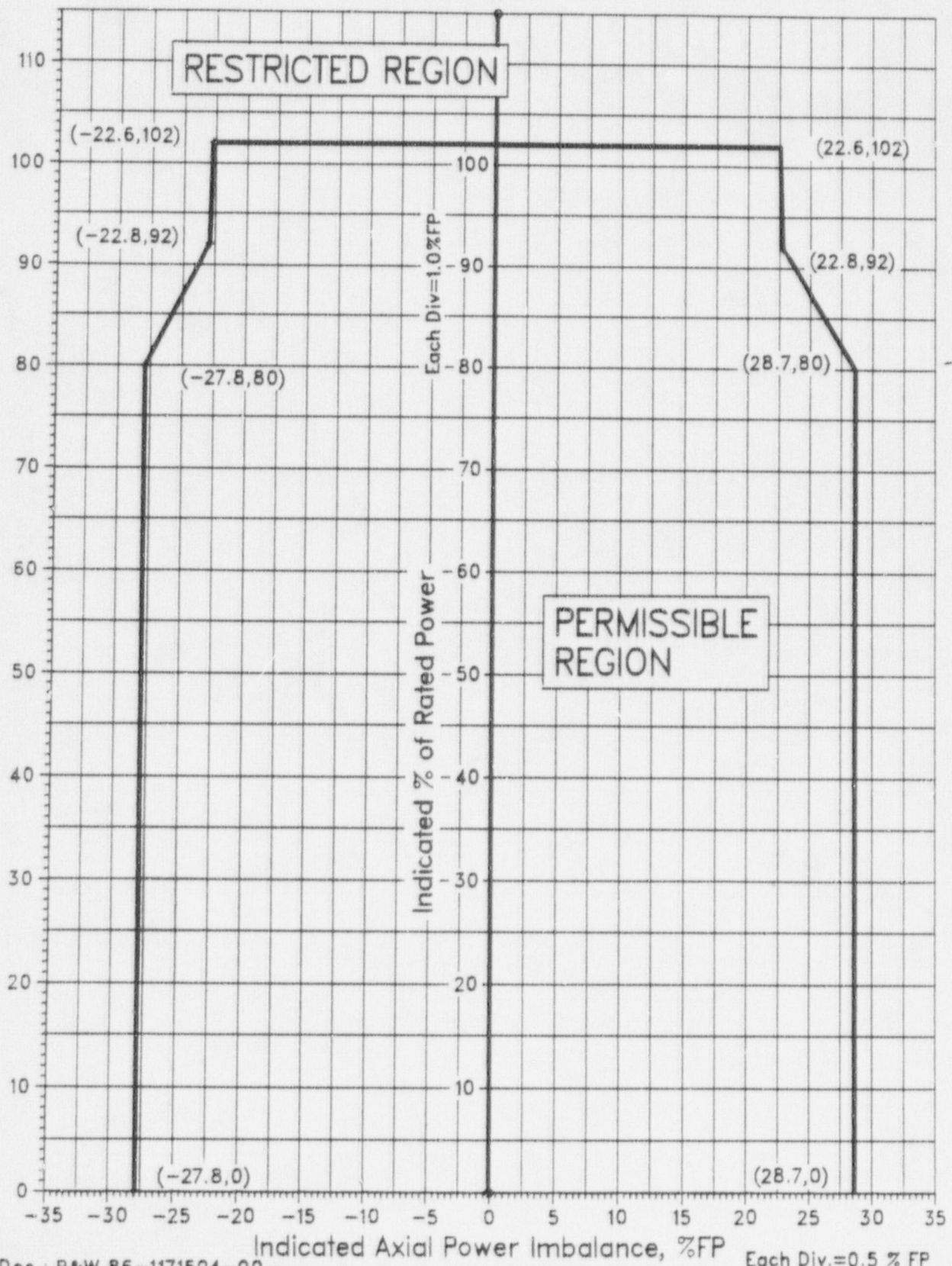


Figure 5 (Page 1 of 3)
 Out-of-Core Detector System
 Error Adjusted Imbalance Limits
 0 to 45 $\pm$ 5 EFPD

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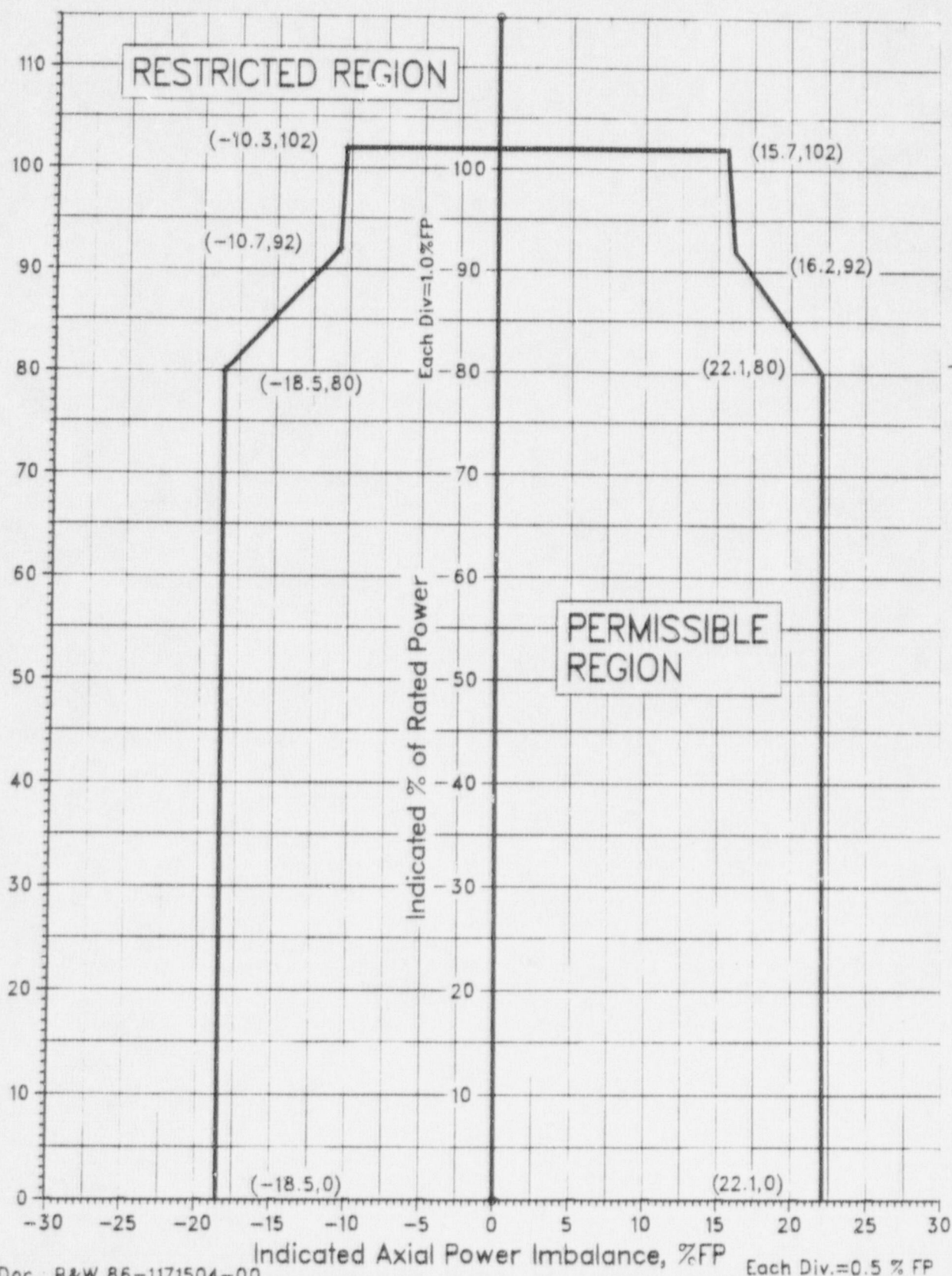


Figure 5 (Page 2 of 3)
 Out-of-Core Detector System
 Error Adjusted Imbalance Limits
 45 ± 5 EFPD to 105 ± 5 EFPD

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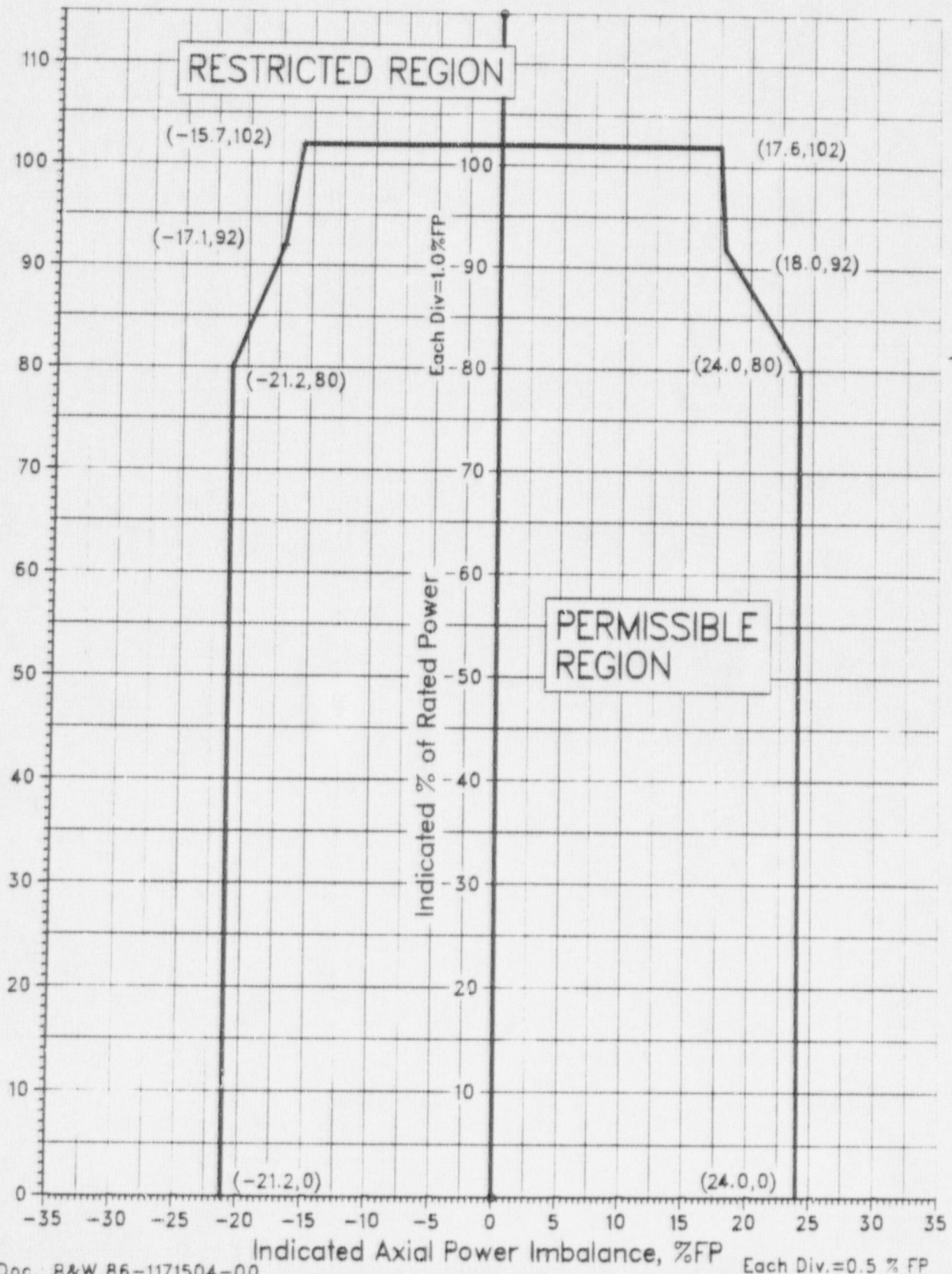


Figure 5 (Page 3 of 3)
 Out-of-Core Detector System
 Error Adjusted Imbalance Limits
 105 ± 5 EFPD to EOC

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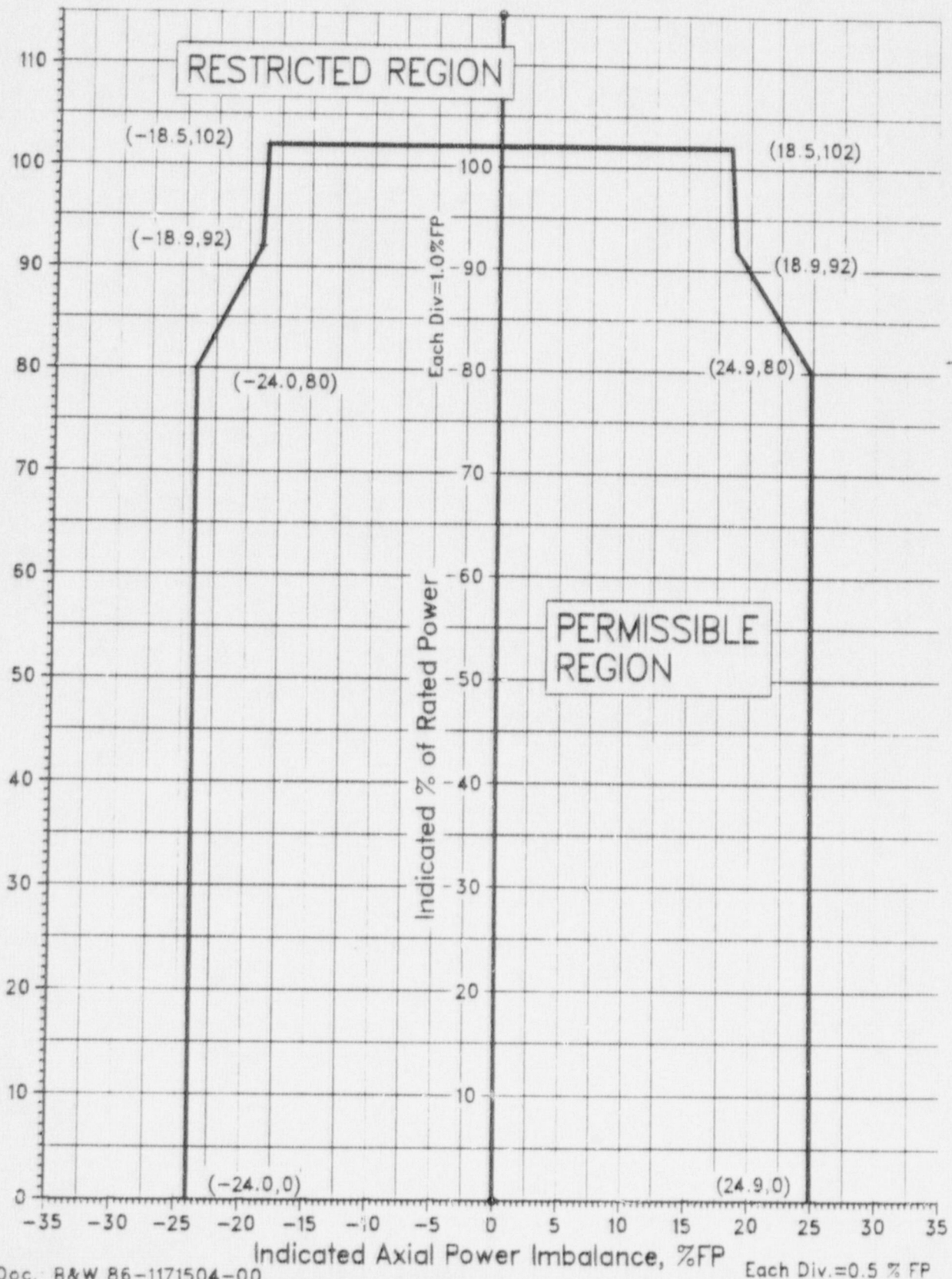


Figure 6 (Page 1 of 3)
Minimum Incore System
Error Adjusted Imbalance Limits
0 to 45 ± 5 EFPD

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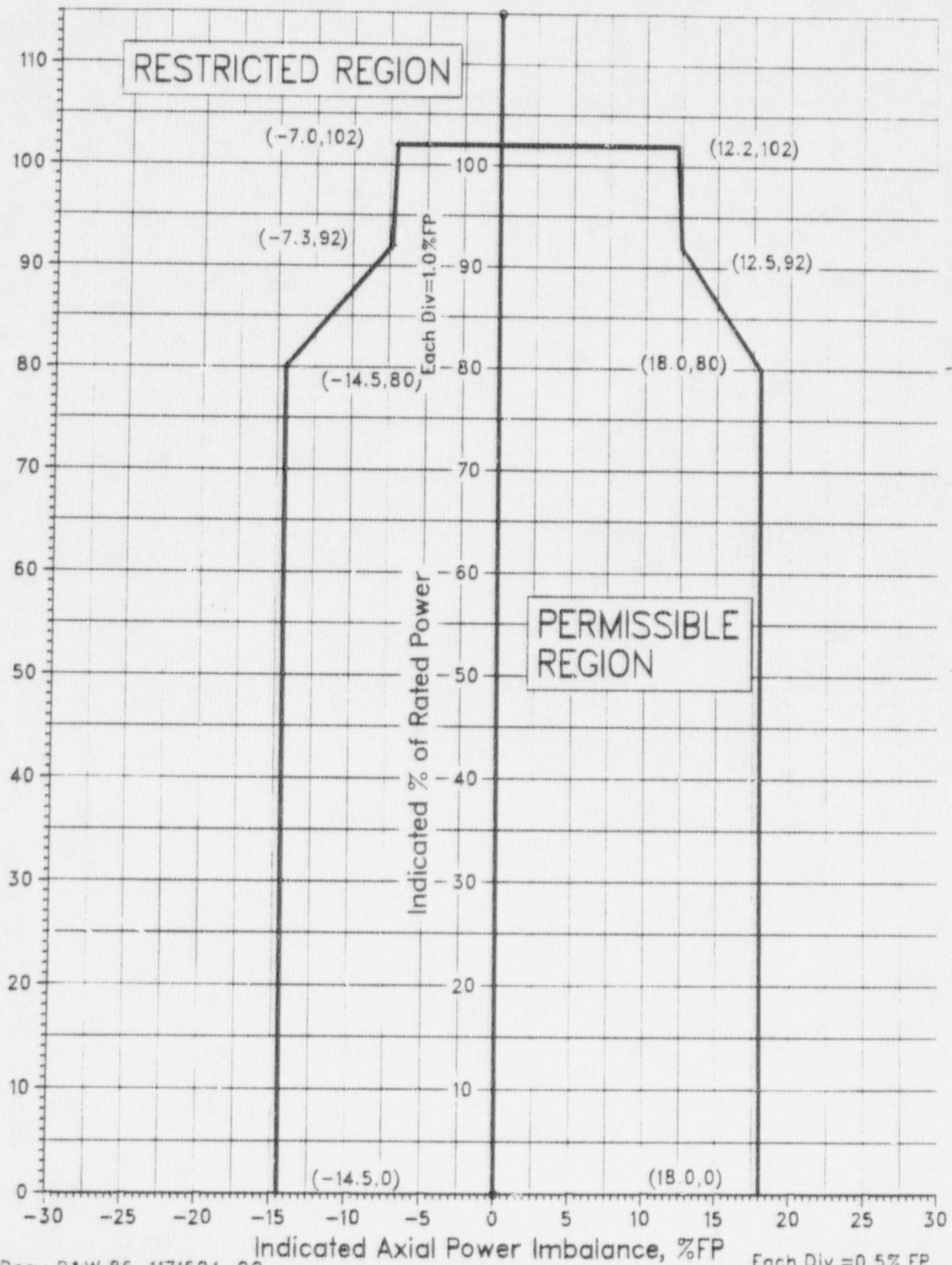


Figure 6 (Page 2 of 3)
Minimum Incore System
Error Adjusted Imbalance Limits
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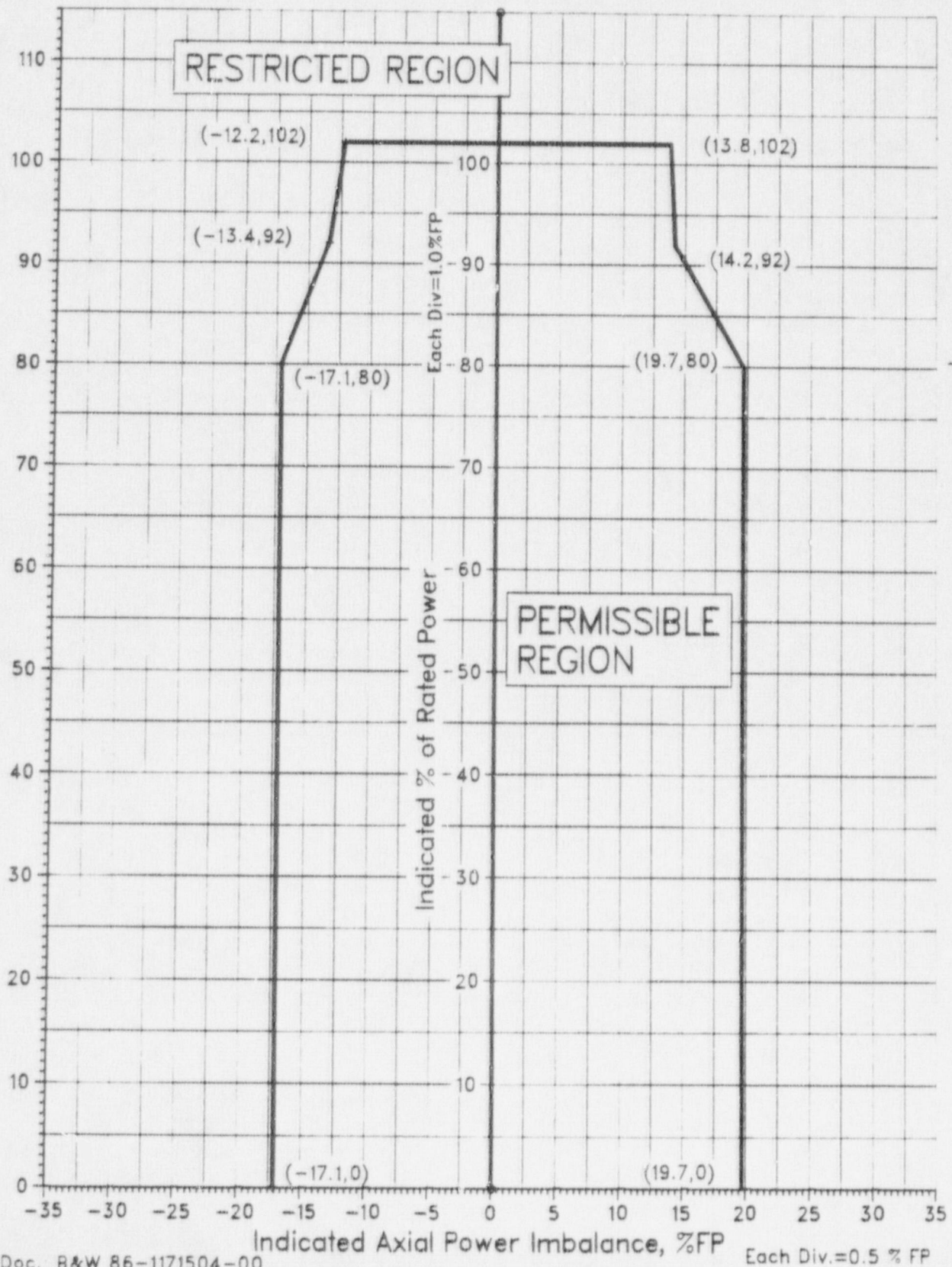
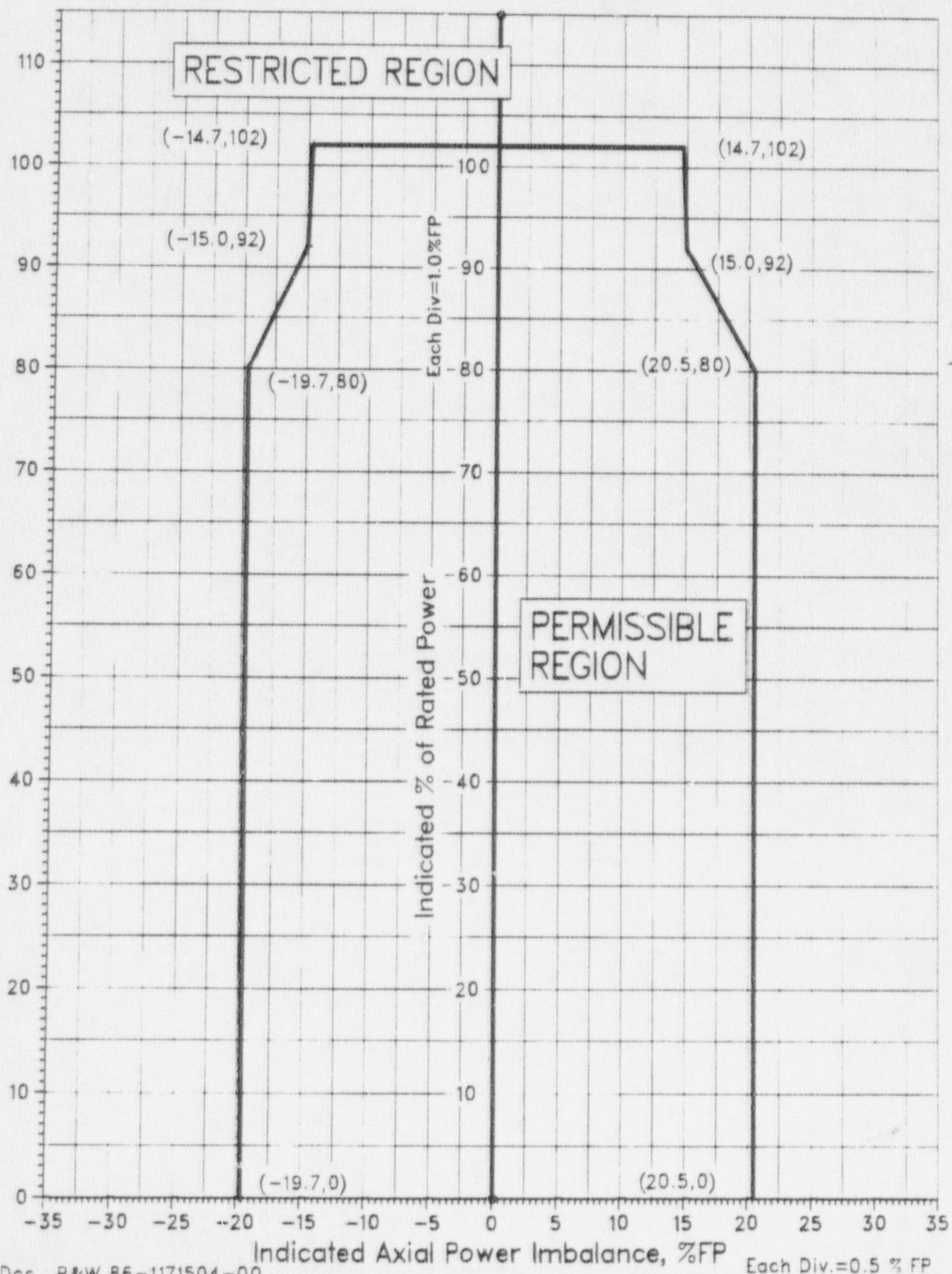


Figure 6 (Page 3 of 3)
Minimum Incore System
Error Adjusted Imbalance Limits
 105 ± 5 EFPD to EOC

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Enclosure

Non-Tech. Spec. Required Operating Limits

Core Minimum DNBR Operating Limit

The core minimum DNBR value as measured with the NAS Thermal Hydraulic Package (Display 1 or 4) should not be less than 2.01 (MDNBR at 102% FP).

Source Doc. : BAW 2015

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