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September 10, 2001
5928-01-20241

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: THREE MILE ISLAND, UNIT 1 (TMI UNIT 1)
OPERATING LICENSE NO. DPR-50
DOCKET NO. 50-289
CYCLE 13 CORE OPERATING LIMITS REPORT, REVISION 1

Dear Sir or Madam:

Pursuant to TMI Unit 1 Technical Specification Section 6.9.5.4, enclosed is a copy of the Cycle 13 Core Operating Limits Report (COLR), Revision 1. The Cycle 13 COLR, Revision 1, provides the cycle-specific limits established to support operation of Cycle 13 up to 691 Effective Full Power Days, and provides updated references. The cycle-specific core operating limits contained in this report have been determined in accordance with Technical Specification 6.9.5.

If additional information is required, please contact David J. Distel at (610) 765-5517.

Very truly yours,

Michael P. Gallagher

Michael P. Gallagher
Director, Licensing & Regulatory Affairs
Mid-Atlantic Regional Operating Group

MPG/djd

Enclosure: TMI Unit 1 Cycle 13 Core Operating Limits Report,
Topical Report 133, Revision 1

cc: H. J. Miller, USNRC, Administrator, Region 1
T. G. Colburn, USNRC, Senior Project Manager
J. D. Orr, USNRC, Senior Resident Inspector
File 95055

A001

TMI-1 Cycle 13
Core Operating Limits Report

TOPICAL REPORT 133
Rev. 1

BA Number 135400

TMI-1 Cycle 13 Reload Task Force
August, 2001

APPROVALS;

R. JAFFA / R. Jaffa 8/20/01
Originator Date

R.T. Tropasso / R. T. Tropasso 8/20/01
Manager, PWR Nuclear Design Date

Kevin P. Donovan / Kevin P. Donovan 8/21/2001
Director, Nuclear Fuel Management Date

[signature] 8/31/01
Plant Oversight Review Committee Date

AmerGen	**DOCUMENT NO.** TR 133

TITLE TMI-1 Cycle 13 Core Operating Limits Report

REV	SUMMARY OF CHANGE	DATE
1	The Abstract section was revised to include reference to the APSR position limits and to reflect that the core operating limits and RPS limits/setpoints were analyzed to 691 EFPD. The LOCA Limited Maximum Allowable Linear Heat Rates for the Core Monitoring System were revised to cover Cycle 13 operation up to 691 EFPD. APSR Rod Position Limit was added on new page 6a. References and source documents were revised to reflect the Cycle 13 extension analyses, the revised maneuvering analysis calculation which evaluated the revised PSC 7-78 statepoint conditions, and the most recent update to BAW-10179P-A.	8/31/01

ABSTRACT

This Core Operating Limits Report (COLR) has been prepared in accordance with the requirements of TMI-1 Technical Specification 6.9.5. The core operating limits were generated using the methodologies described in References 1 through 10 and were documented in References 11 through 20.

The Full Incore System (FIS) operability requirements contained within describe the number and location of Self-Powered Neutron Detector (SPND) strings that must be operable in order to monitor imbalance and quadrant tilt using the FIS.

Axial Power Shaping Rod (APSR) position limits and restrictions describe how the APSRs must be operated at the end-of-cycle.

Quadrant tilt limits for FIS, out-of-core detector [OCD] system and minimum incore system [MIS] are given in Table 1. Operation with a quadrant tilt larger than the steady-state tilt limit for a period not exceeding twenty-four (24) hours is allowed [T.S. 3.5.2.4.e], provided that hot channel factors are within the limits given in Tables 2 and 3.

Tables 2 and 3 contain total peaking hot channel factor, $F_Q(Z)$, and nuclear enthalpy rise hot channel factor, $F^N_{\Delta H}$, limits for core monitoring. Additional information on Table 2 is discussed below with Figure 7.

Rod position limits are provided in Figures 1 to 3 to ensure that the safety criteria for DNBR protection, LOCA kw/ft limits, shutdown margin and ejected rod worth are met.

Imbalance limits for FIS, OCD and MIS are given in Figures 4 to 6.

COLR Figures 1 through 6 may have three distinctly defined regions:

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

Figure 1 through 6 core operating limits and Figure 8 and 9 protection system limits and setpoints have been analyzed for a maximum end-of-cycle (EOC) length of 691 EFPD.

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 twenty-four (24) hour time frame, inadvertent operation within the Restricted Region for a period not

exceeding twenty-four (24) hours is allowed [T.S. 3.5.2.5.b and 3.5.2.7.e], provided that hot channel factors are within the limits given in Tables 2 and 3.

The limiting criterion within the Not Allowed Region is the shutdown margin limit. Inadvertent operation in this region is not permitted and requires immediate action to exit the region. Acceptable control rod positions shall be attained within two (2) hours [T.S. 3.5.2.5.b.2].

COLR Figure 7 indicates the LOCA limited maximum allowable linear heat rates as a function of fuel rod burnup and fuel elevation for Mark B8 and Mark B9 fuel. Bounding values for monitoring these limits for the current cycle in terms of fuel batch, cycle burnup and axial detector levels are listed in Table 2. The full power linear heat rate limits can be maintained for partial-power and three-pump operation since the allowable moderator temperature coefficient (MTC) as a function of full power shown on page 3 of Figure 7 is preserved.

COLR Figure 8 provides the Axial Power Imbalance Protective Limits (APIPL) that preserve the DNBR and Centerline Fuel Melt design criteria.

COLR Figure 9 provides the Protection System Maximum Allowable Setpoints for Axial Power Imbalance which combine the power/flow and error-adjusted axial imbalance trip setpoints that ensure the APIPL of Figure 8 are not exceeded.

Note: Figures 8 and 9 show the conservative generic limits and setpoints currently installed on the plant hardware. The cycle-specific values have been verified to be conservatively bounded by the generic values.

Enclosure 1 contains operating limits not required by TS. The core minimum DNBR and the Maximum Allowable LOCA Linear Heat Rate limits are monitored by the Process Computer Nuclear Applications Software as part of the bases of the required limits and setpoints. The minimum boron volumes and concentrations for the Boric Acid Mix Tank (BAMT) and Reclaimed Boric Acid Storage Tanks (RBAT) are the boron levels needed to achieve cold shutdown conditions throughout the cycle using these tanks.

Enclosure 2 contains the bases descriptions of the Power-to-Flow Trip Setpoint to prevent violation of DNBR criteria and the Design Nuclear Power Peaking Factors for axial flux shape (F^N_Z) and hot channel nuclear enthalpy rise ($F^N_{\Delta H}$) that define the reference design peaking condition in the core.

TABLE OF CONTENTS

References:

1. GPUN TR-092P-A, Rev. 0, "TMI-1 Reload Design and Setpoint Methodology," April 22, 1997.

2. GPUN TR-087-A, Rev. 0, "TMI-1 Core Thermal-Hydraulic Methodology Using the VIPRE-01 Computer Code," December 19, 1996.

3. GPUN TR-091-A, Rev. 0, "Steady State Reactor Physics Methodology for TMI-1," March 12, 1996.

4. BAW-10179P-A, Rev. 3, "Safety Criteria and Methodology for Acceptable Cycle Reload Analyses," October 1999.

5. BWFC Doc. No 86-1172640-00, "Detector Lifetime Extension Final Report for TMI-1," September 1988.

6. BAW-10103A, Rev. 3, "ECCS Analysis of B&W's 177-FA Lowered Loop NSS," July 1977.

7. BAW-1915P-A, "Bounding Analytical Assessment of NUREG-0630 Models on LOCA kw/ft Limits with Use of FLECSET," November 1988.

8. BAW-10104P-A, Rev. 5, "B&W ECCS Evaluation Model," November 1988.

9. BAW-10192P-A, Rev. 0, "BWNT LOCA - BWNT Loss-of-Coolant-Accident Evaluation Model for Once-Through Steam Generator Plants," June 1998.

10. BWFC Doc. No 51-1269121-02, "Fuel Design Licensing Report – TMI-1 Cycle 13," June 1999.

11. GPUN Calc. C-1101-202-E620-367, Rev. 1, "TMI-1 Cycle 13 Final Fuel Cycle Design," July 9, 1999.

12. GPUN Calc. C-1101-202-E620-387, Rev. 1, "TMI-1 Cycle 13 Maneuvering Analysis," July 2001.

13. GPUN Calc. C-1101-202-E620-374, Rev. 0, "TMI-1 Cycle 13 Reload Core T-H Analysis," June 9, 1999.

14. GPUN Calc. C-1101-202-E620-371, Rev. 0, "TMI-1 Cycle 13 Core Parameters," June 7, 1999.

15. GPUN Calc. C-1101-202-E620-389, Rev. 1, "TMI-1 Cycle 13 OLC LOCA-Limited Maximum Allowable LHRs," October 1999.

16. GPUN Calc. C-1101-202-E620-392, Rev. 0, "TMI-1 Cycle 13 Boric Acid Storage Requirement," September 17, 1999.

References (cont.):

17. GPUN Calc. C-1101-202-E620-385, Rev. 0, "TMI-1 Cycle 13 Quadrant Tilt Setpoints," June 18, 1999.

18. GPUN Calc. C-1101-202-E620-402, Rev. 0, "TMI-1 Cycle 13 FFCD Redesign," October 13, 1999.

19. FTI Doc. 86-5002073-02, "Summary Report for BWOG 20% TP LOCA," July 19, 1999.

20. AmerGen Calc. C-1101-202-E620-426, Rev. 0, "TMI-1 Cycle 13 Extension Evaluation," August 2001.

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.**

Quadrant	SPNDs	75%
WX	85.75	64.5
XY	99.75	75.0
YZ	89.25	67.0
ZW	89.25	67.0

- **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).**

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

Source Doc.: B&W 86-1172640-00
Referred to by: Tech. Spec. 3.5.2.4.a and 3.5.2.7.a

APSR Position Limits

Before the end-of-cycle APSR pull maneuver is completed, the APSRs may be positioned as necessary for transient imbalance control. The APSR pull maneuver shall be completed (i.e. APSRs fully withdrawn) at 653 ±10 EFPD. Once the APSR pull maneuver has been completed, the APSRs shall not be inserted for the remainder of the fuel cycle and 0-99% WD shall be considered a "Restricted Region" as defined in the abstract section of this COLR.

Source Doc.: AmerGen Calc. C-1101-202-E620-426, Rev. 0

TABLE 1
Quadrant Tilt Limits

	Steady State Limit 15% ≺ Power ≤ 50%	Steady State Limit Power ≻ 50%	Maximum Limit Power ≻ 15%
Full Incore System (FIS)	6.83	4.12	16.8
Minimum Incore System (MIS)	2.8	1.9	9.5

Referred to by: Tech. Spec. 3.5.2.4

TABLE 2
Core Monitoring System Bounding Values for LOCA Limited Maximum Allowable Linear Heat Rate (kW/ft)

Batch 13C, 13G and 14 Once-Burned Fuel Mk-B9 / modified-B9					
CMS LEVEL	0 - 268 EFPD	268 - 376 EFPD	376 - 480 EFPD	480 - 586 EFPD	586 - 691 EFPD
1	15.4	14.8	14.3	13.7	13.2
2	15.7	15.0	14.4	13.8	13.3
3	16.3	15.5	14.8	14.1	13.4
4	16.3	15.5	14.8	14.1	13.4
5	16.3	15.6	14.8	14.1	13.4
6	16.3	15.5	14.8	14.1	13.4
7	15.8	15.1	14.5	13.9	13.3
8	15.4	14.8	14.3	13.7	13.2

Center Assembly H-08 Twice-Burned Fuel Mk-B8					
CMS LEVEL	0 - 144 EFPD	144 - 252 EFPD	252 - 383 EFPD	383 - 534 EFPD	534 - 691 EFPD
1	14.7	14.7	13.6	12.4	11.2
2	15.0	14.7	13.6	12.4	11.2
3	15.5	14.7	13.6	12.4	11.2
4	15.5	14.7	13.6	12.4	11.2
5	15.5	14.7	13.6	12.4	11.2
6	15.5	14.7	13.6	12.4	11.2
7	15.1	14.7	13.6	12.4	11.2
8	14.7	14.7	13.6	12.4	11.2

Batch 15 Fresh Fuel Modified-B9	
CMS LEVEL	0 - 691 EFPD
1	15.4
2	15.7
3	16.3
4	16.3
5	16.3
6	16.3
7	15.8
8	15.4

Batch 12A Twice-Burned Fuel Mk-B8V	
CMS LEVEL	0 - 691 EFPD
1	10.9
2	10.9
3	10.9
4	10.9
5	10.9
6	10.9
7	10.9
8	10.9

Batch 13F and 13J Twice-Burned Fuel Mk-B9	
CMS LEVEL	0 - 691 EFPD
1	12.4
2	12.4
3	12.4
4	12.4
5	12.4
6	12.4
7	12.4
8	12.4

The maximum linear heat rate for each CMS level, as measured with the NAS Thermal Hydraulic Package (Display 4), should be less than the corresponding bounding value from Table 2 above.

Note: The LHR limits above are equivalent to the total peaking hot channel factor limits, $F_Q(Z)$, referred to in T.S. 3.5.2 by dividing the LHR limits by the product of the core average linear heat rate (5.79 kW/ft) and the current fraction of rated power.

TABLE 3
LCO DNB Maximum Allowable Peaking Factors

Axial Peak	Axial Peak Elevation (Fraction from Core Inlet)			
	0.2	0.4	0.6	0.8
1.1	1.9595	1.9492	1.9462	1.9082
1.2	2.2006	2.1767	2.1433	2.0429
1.3	2.4476	2.4019	2.2834	2.1560
1.4	2.6548	2.5304	2.3872	2.2514
1.5	2.8043	2.6626	2.5007	2.3524
1.7	3.0616	2.8891	2.7002	2.5220
1.9	3.2559	3.0646	2.8593	2.6662

Note: The LCO DNB Maximum Allowable Peaking (MAP) values above are equivalent to nuclear enthalpy rise hot channel factor limits, $F^N_{\Delta H}$, referred to in T.S. 3.5.2 by using the following conversion:

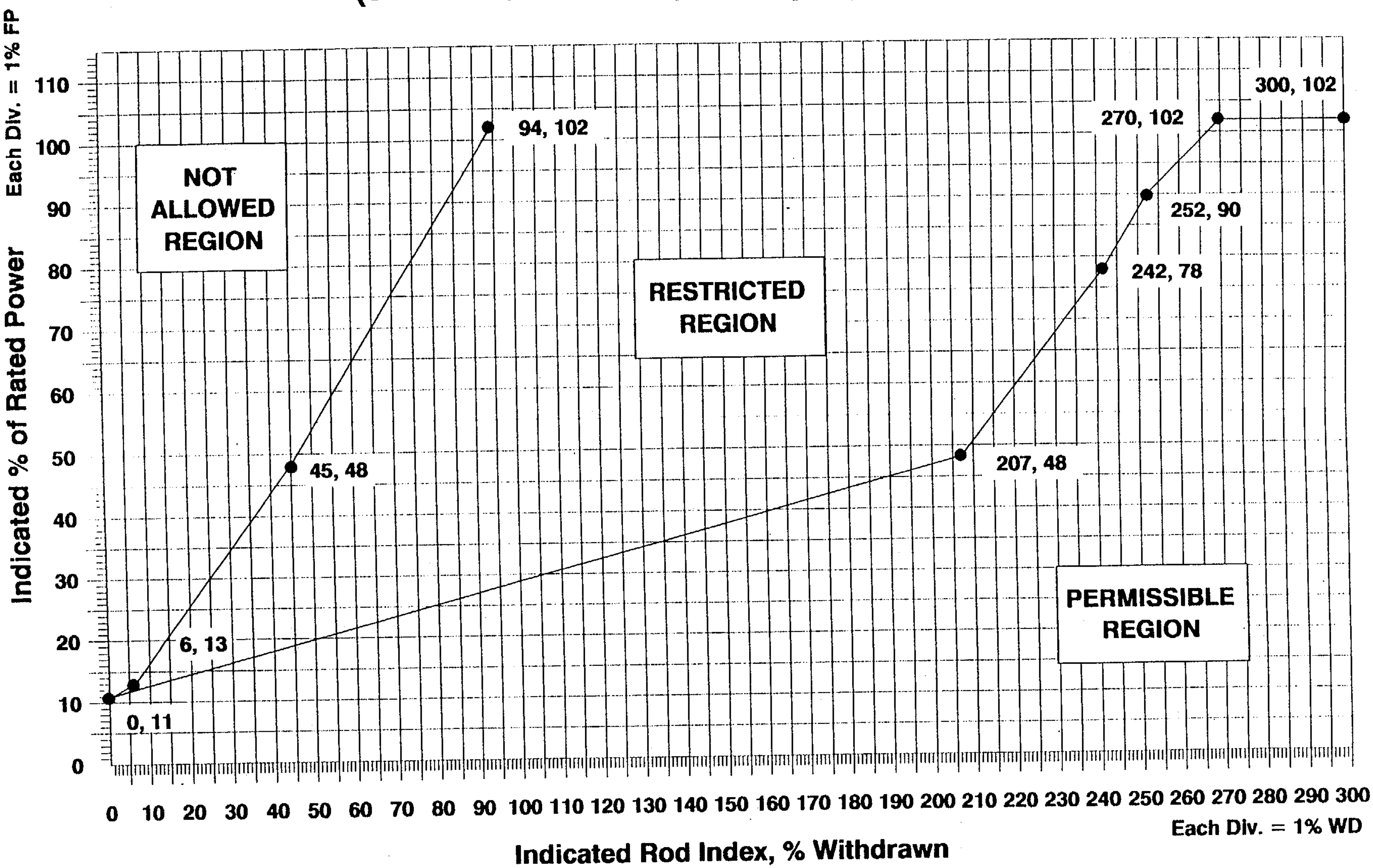
$$F^N_{\Delta H} \text{ limit} = (\text{LCO DNB MAP/Axial Peak}) * [1 + 0.3 * (1 - P/P_m)]$$

where: P = Current fraction of power and,
P_m = RC Pump adjustment factor
(1.0 for 4 pump, 0.75 for 3 pump)

These limits are applicable for 3 and 4 RC pump operation.

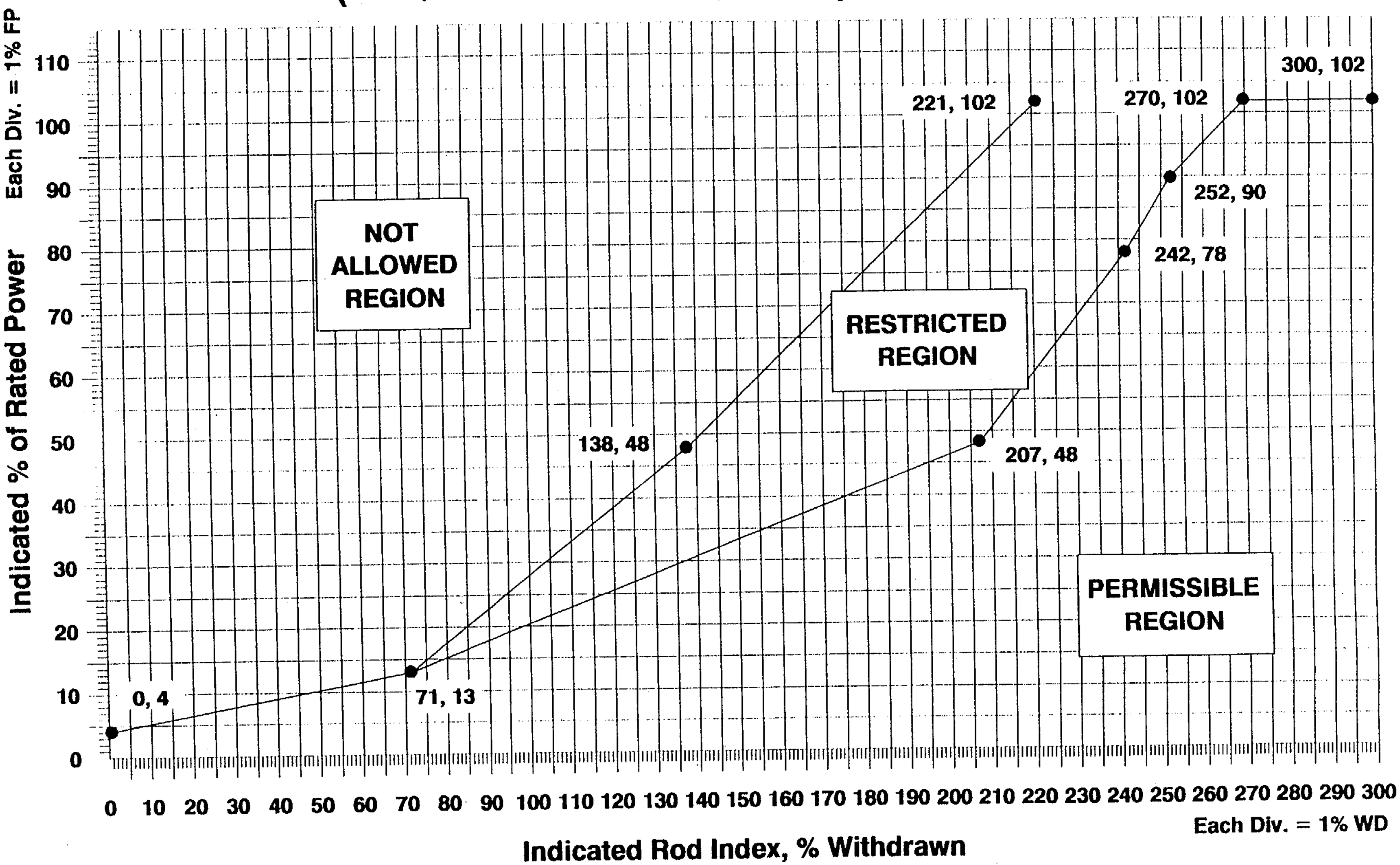
Source: GPUN Calc. C-1101-202-E620-374, Rev. 0

Figure 1 (Page 1 of 2)
Error Adjusted Rod Insertion Limits
(0 to 75 +/- 10 EFPD; 4 Pump Operation)



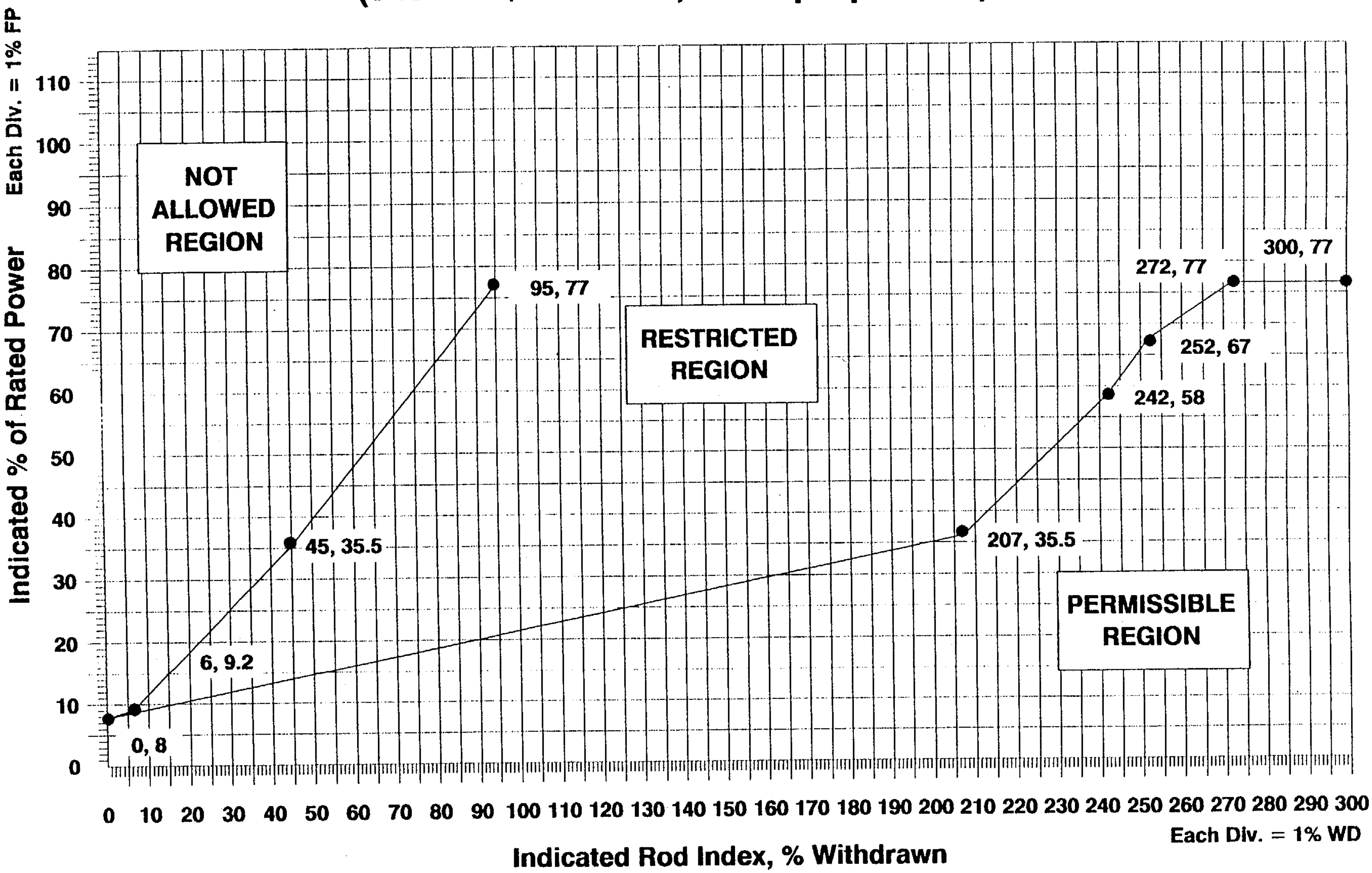
Referred to by Tech Spec 3.5.2.5.b and 3.5.2.4.e.3

Figure 1 (Page 2 of 2)
Error Adjusted Rod Insertion Limits
(75 +/- 10 EFPD to EOC; 4 Pump Operation)



Referred to by Tech Spec 3.5.2.5.b and 3.5.2.4.e.3

Figure 2 (Page 1 of 2)
Error Adjusted Rod Insertion Limits
(0 to 75 +/- 10 EFPD; 3 Pump Operation)



Referred to by Tech Spec 3.5.2.5.b and 3.5.2.4.e.3

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Error Adjusted Rod Insertion Limits
(75 +/- 10 EFPD to EOC; 3 Pump Operation)

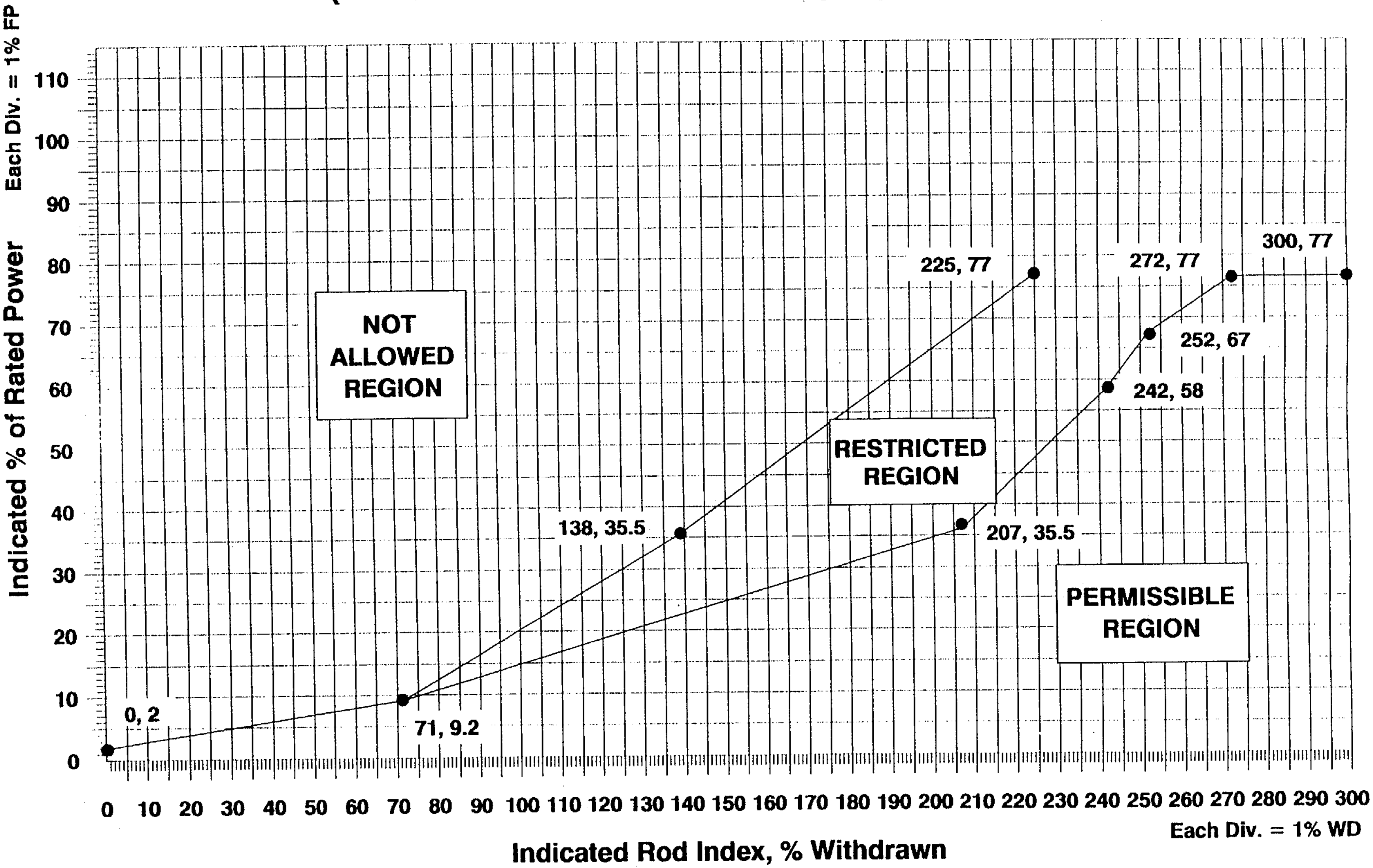

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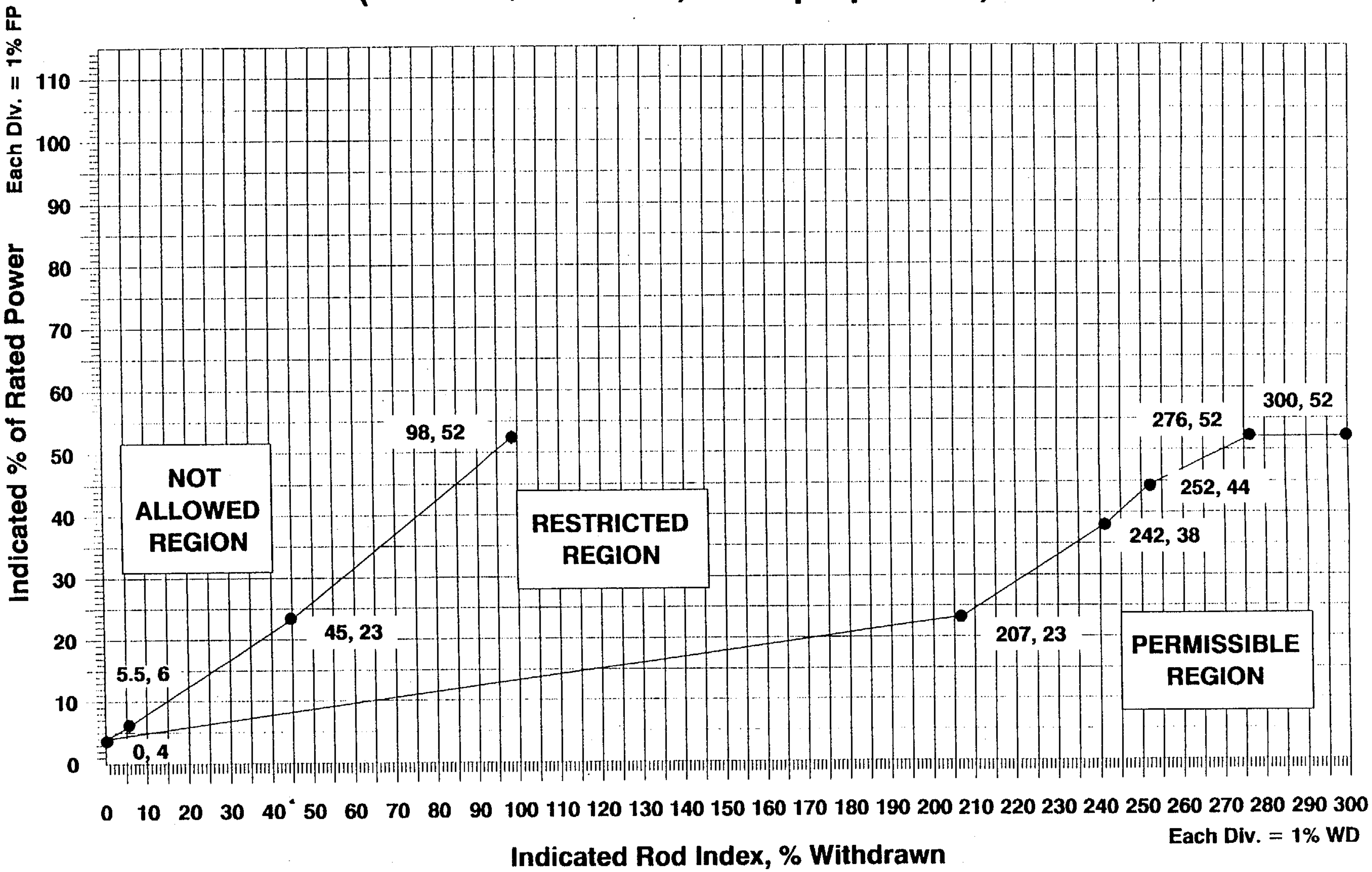
Figure 3 (Page 1 of 2)
Error Adjusted Rod Insertion Limits
(0 to 75 +/- 10 EFPD; 2 Pump Operation)



Referred to by Tech Spec 3.5.2.5.b and 3.5.2.4.e.3

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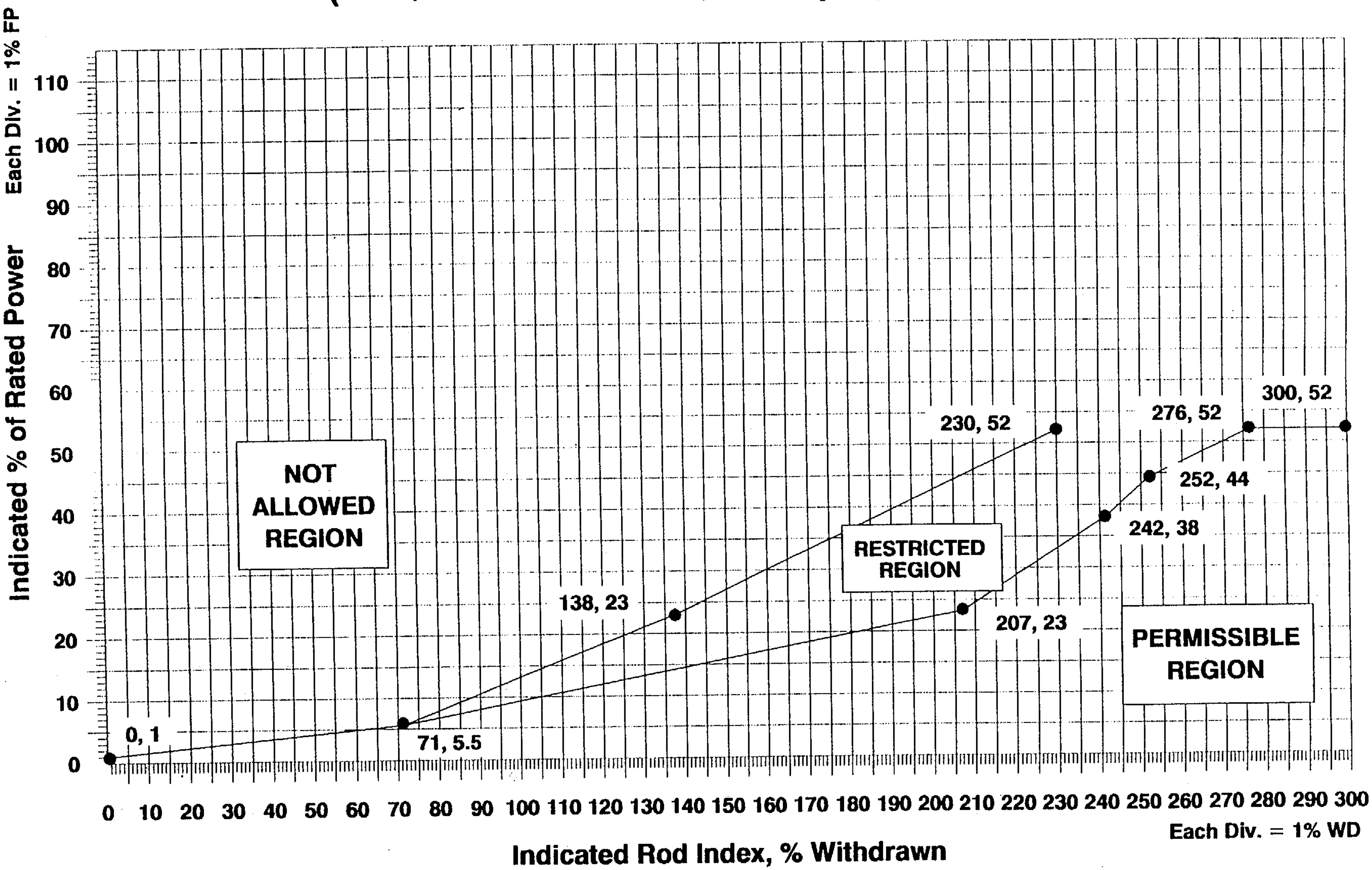
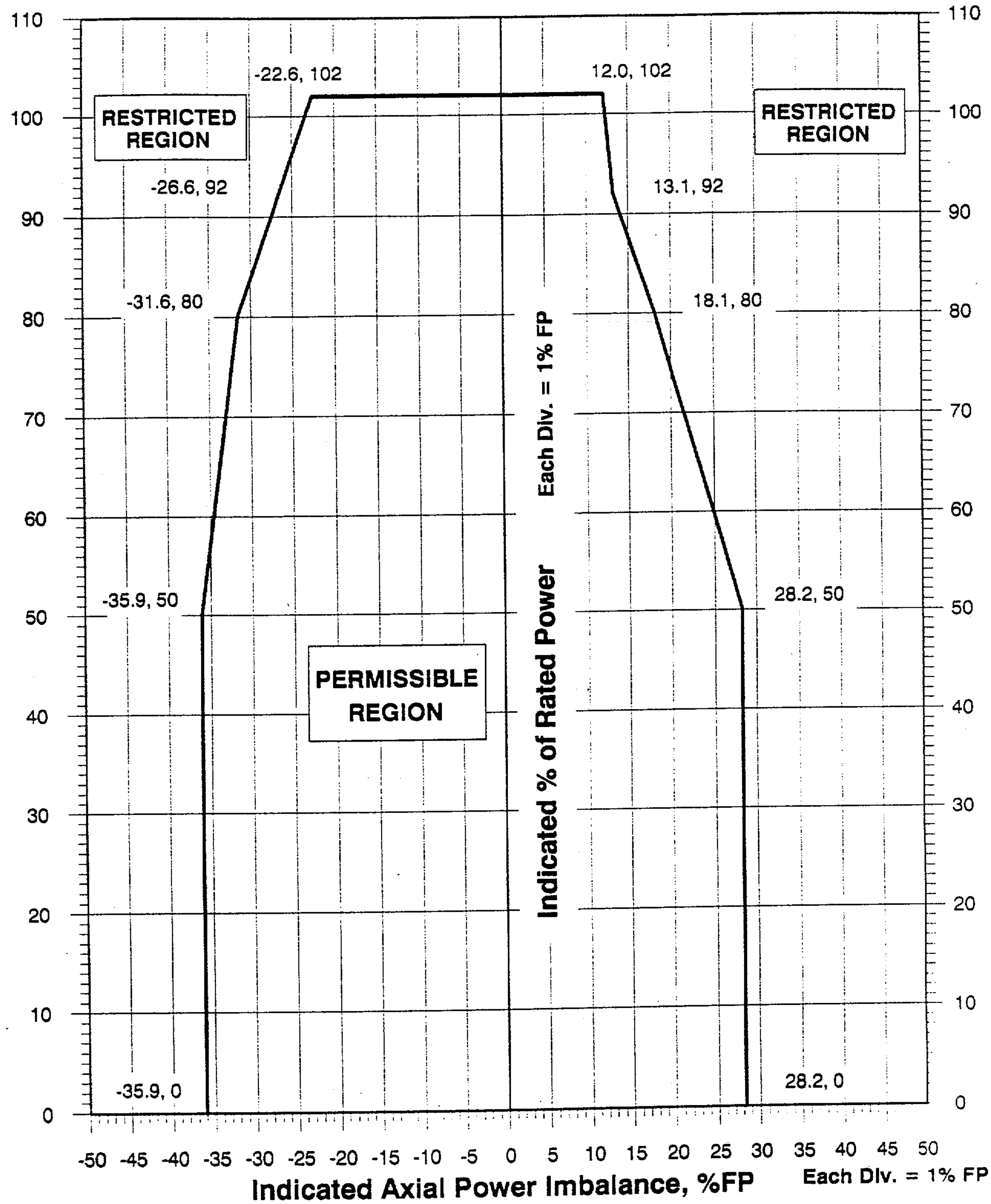
(75 +/- 10 EFPD to EOC; 2 Pump Operation)



Referred to by Tech Spec 3.5.2.5.b and 3.5.2.4.e.3

Figure 4 (Page 1 of 4)
Full Incore System Error Adjusted Imbalance Limits
(0 to 75 +/- 10 EFPD)



Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

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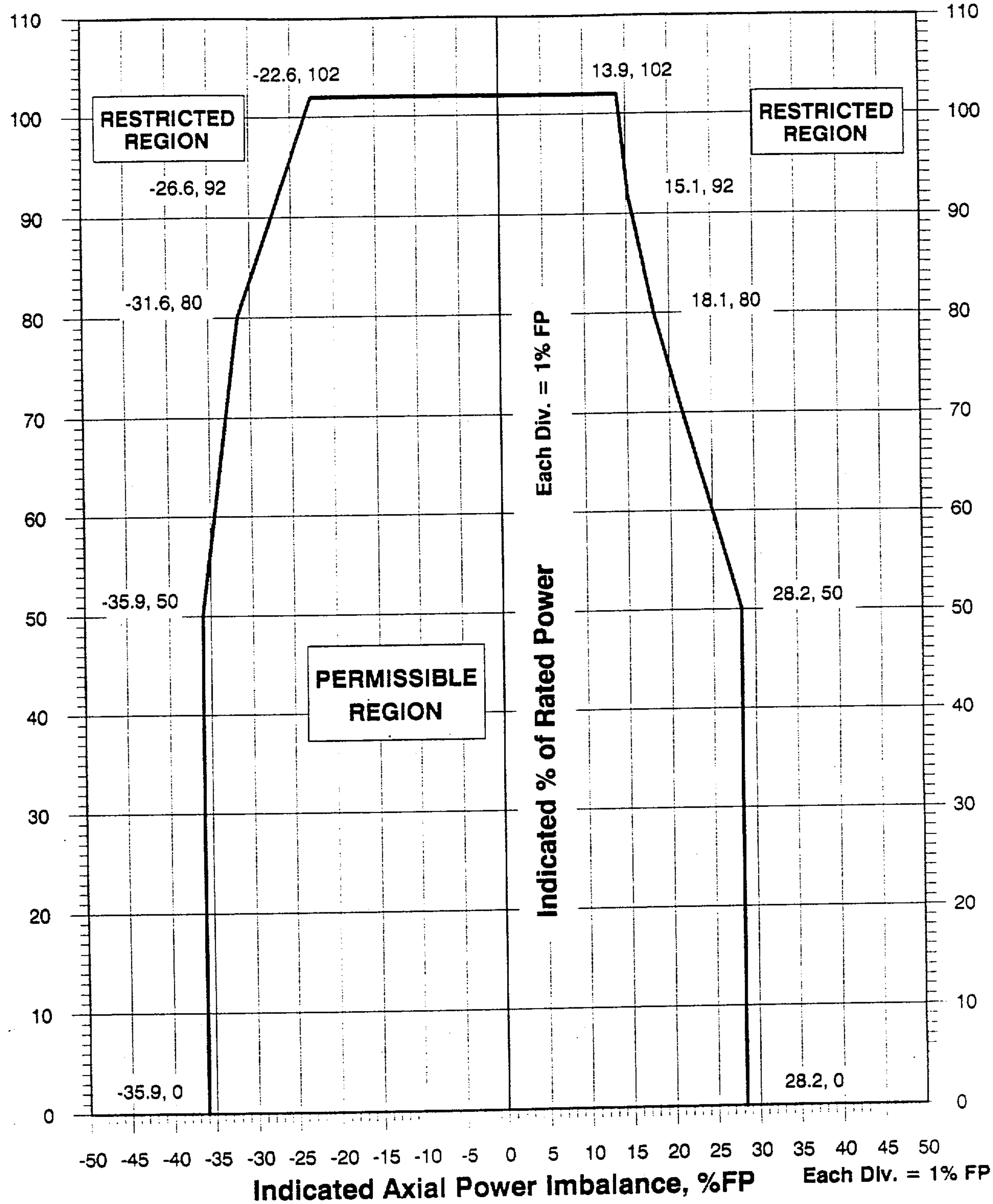
Full Incore System Error Adjusted Imbalance Limits
(75 +/- 10 to 200 +/- 10 EFPD)



Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

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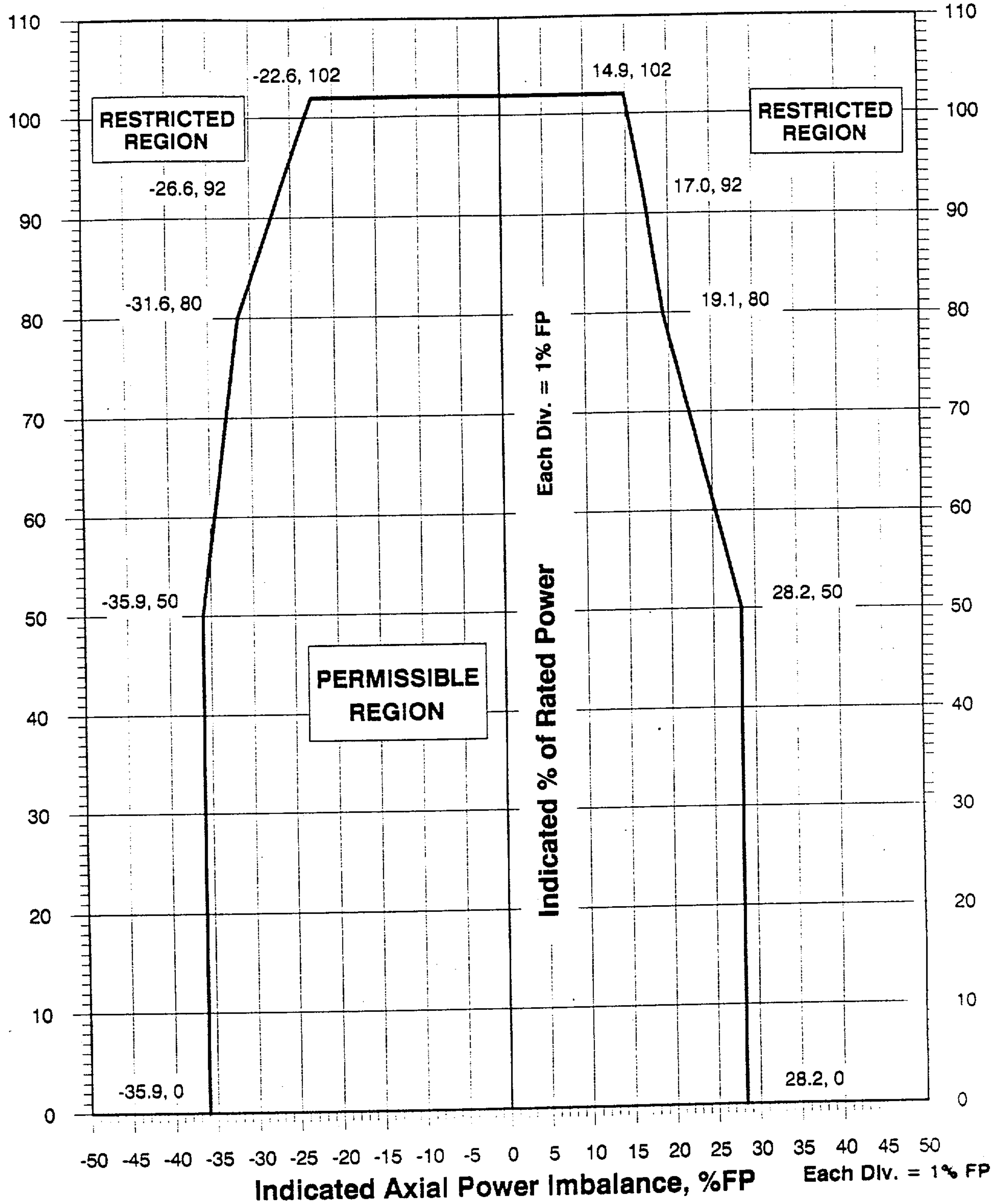
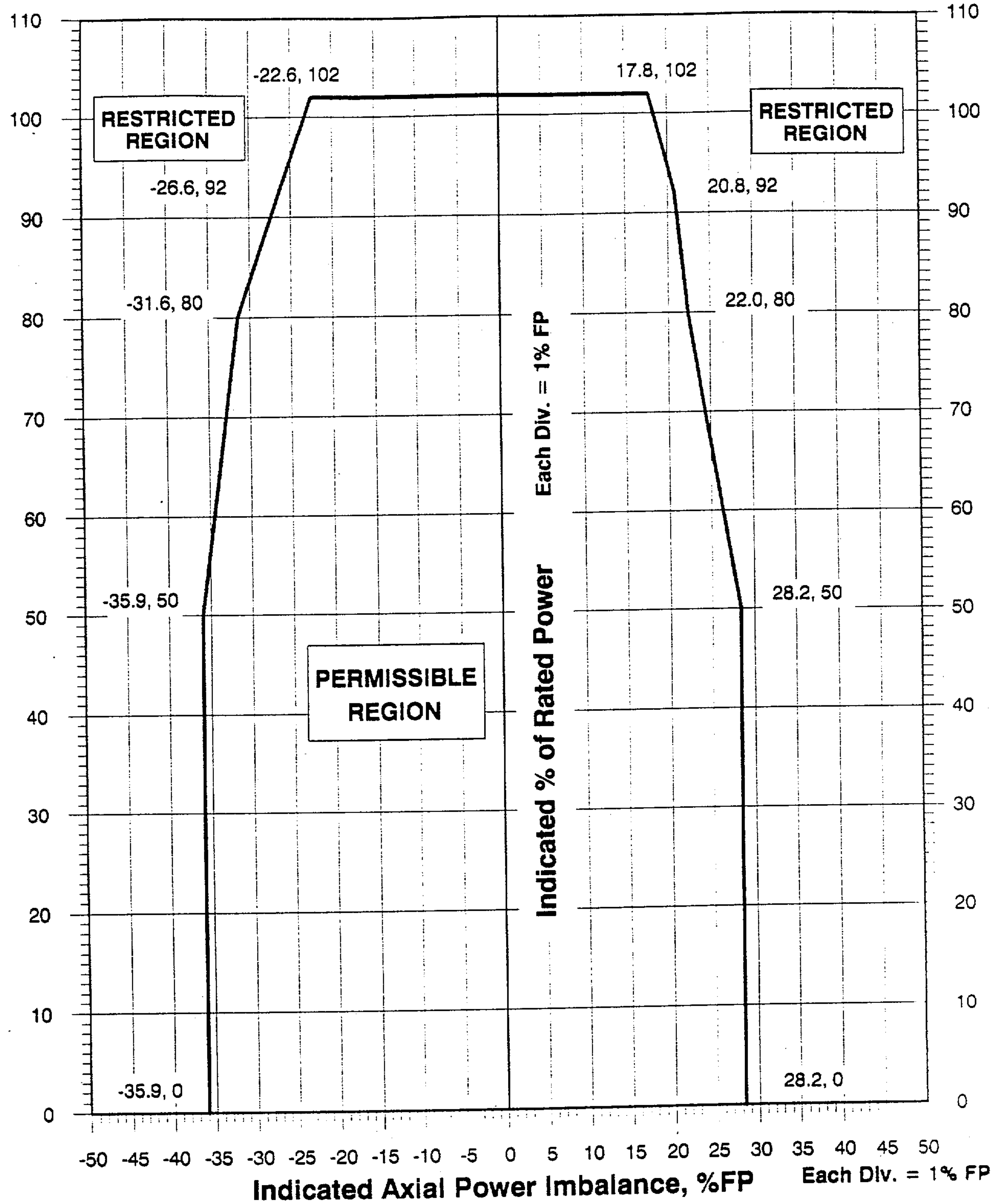
Full Incore System Error Adjusted Imbalance Limits
(200 +/- 10 to 500 +/- 10 EFPD)



Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

Figure 4 (Page 4 of 4)
Full Incore System Error Adjusted Imbalance Limits
(500 +/- 10 EFPD to EOC)



Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

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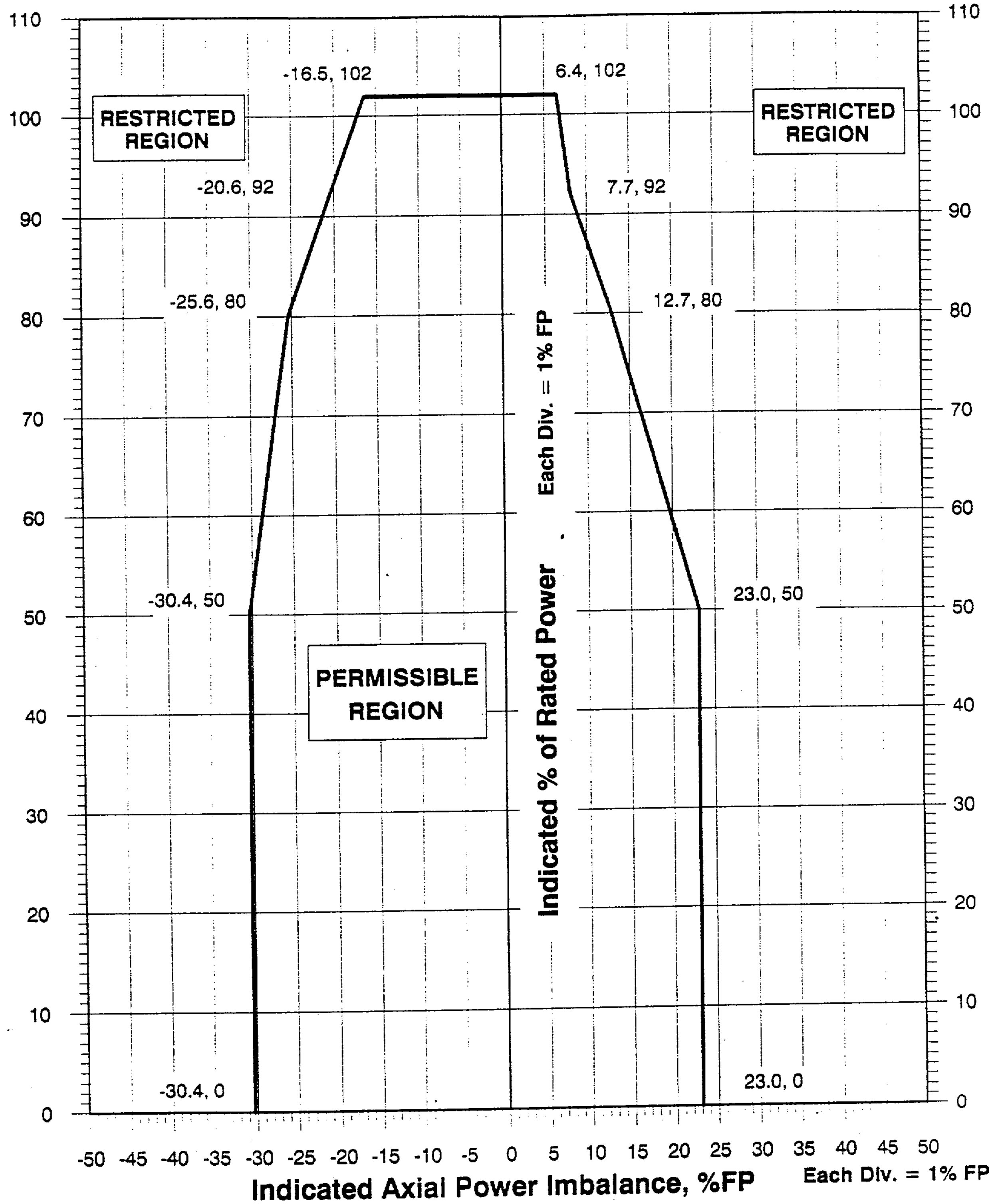
Out-of-Core Detector System Error Adjusted Imbalance Limits
(0 to 75 +/- 10 EFPD)



Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

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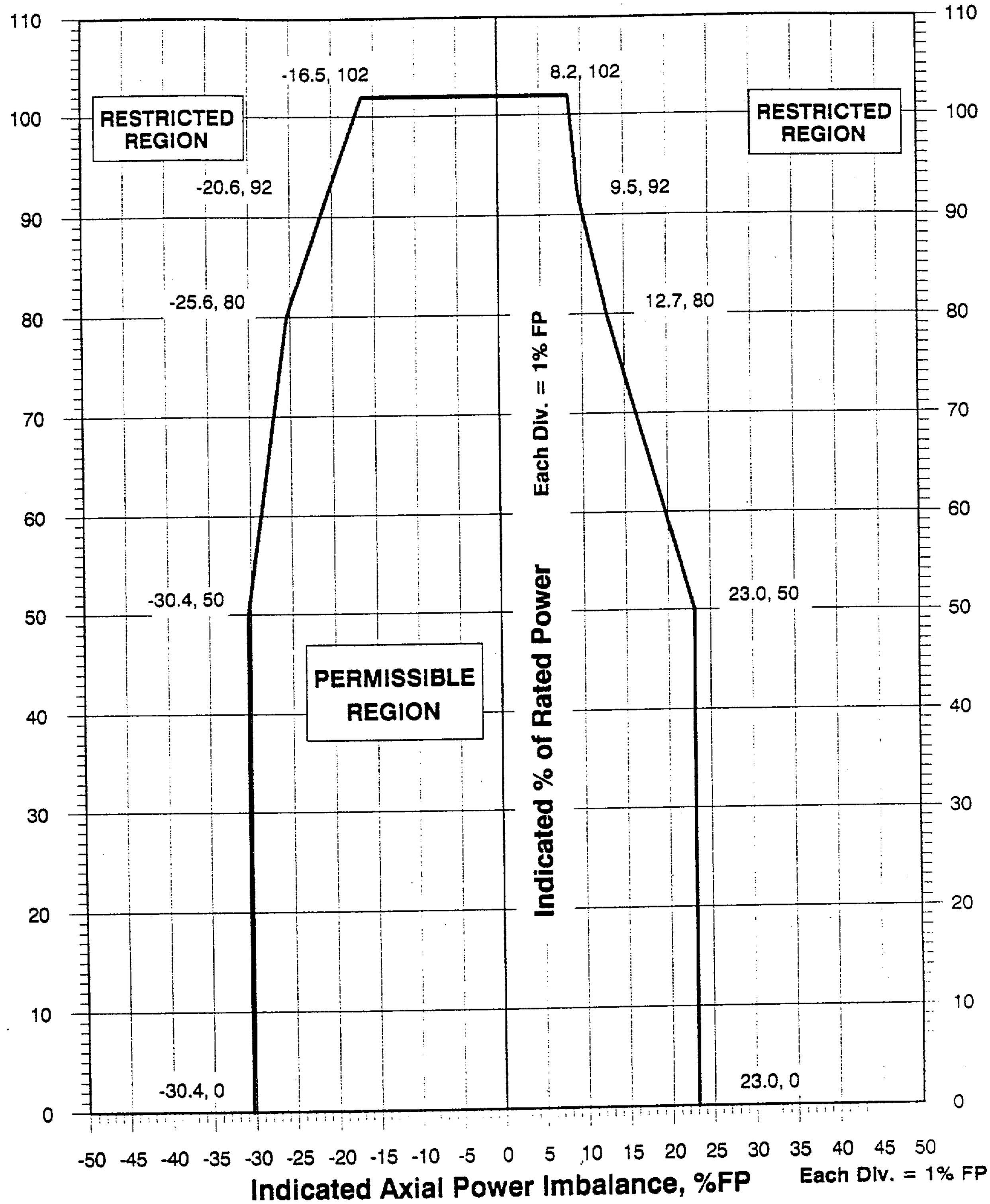
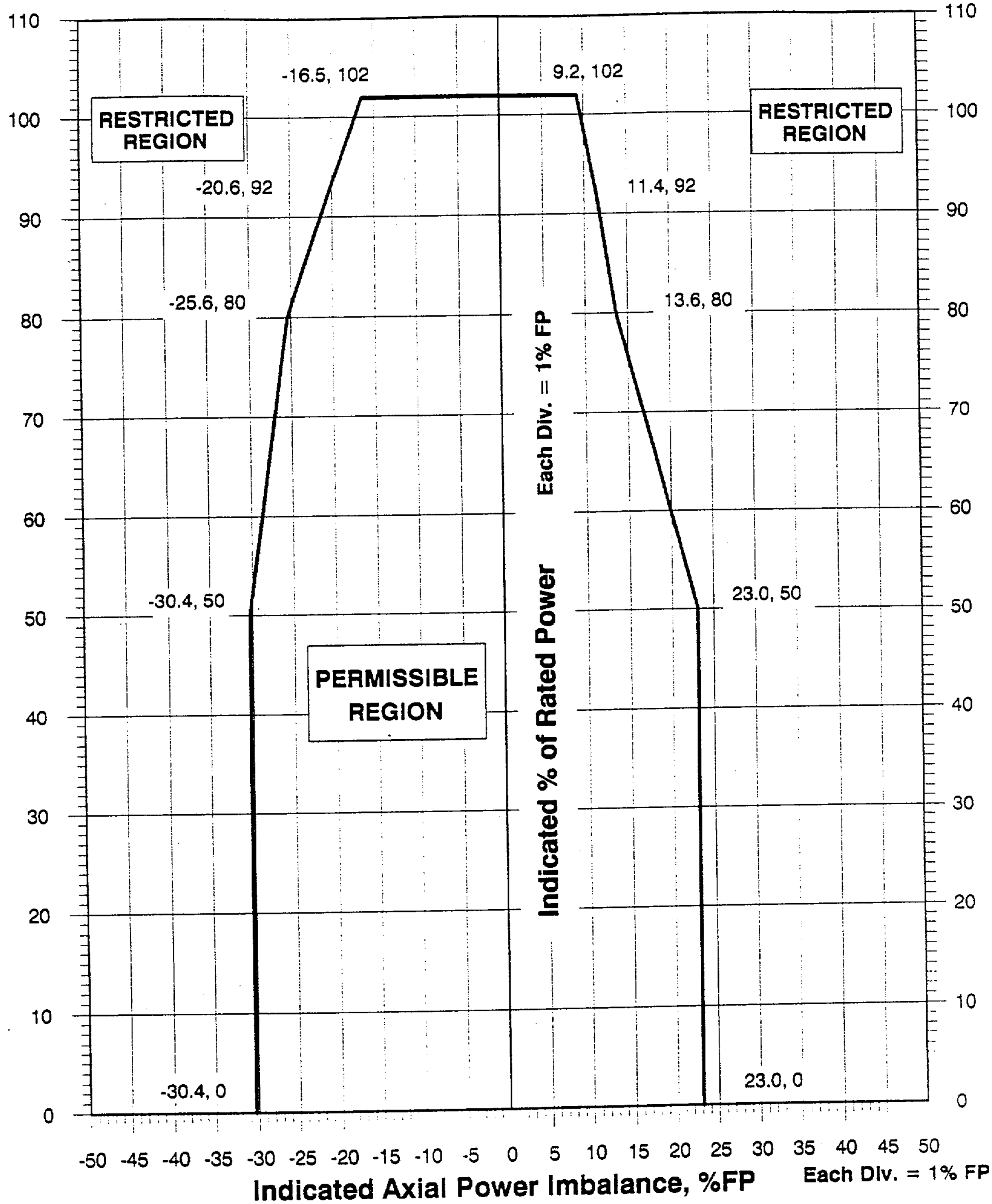
Out-of-Core Detector System Error Adjusted Imbalance Limits
(75 +/- 10 to 200 +/- 10 EFPD)



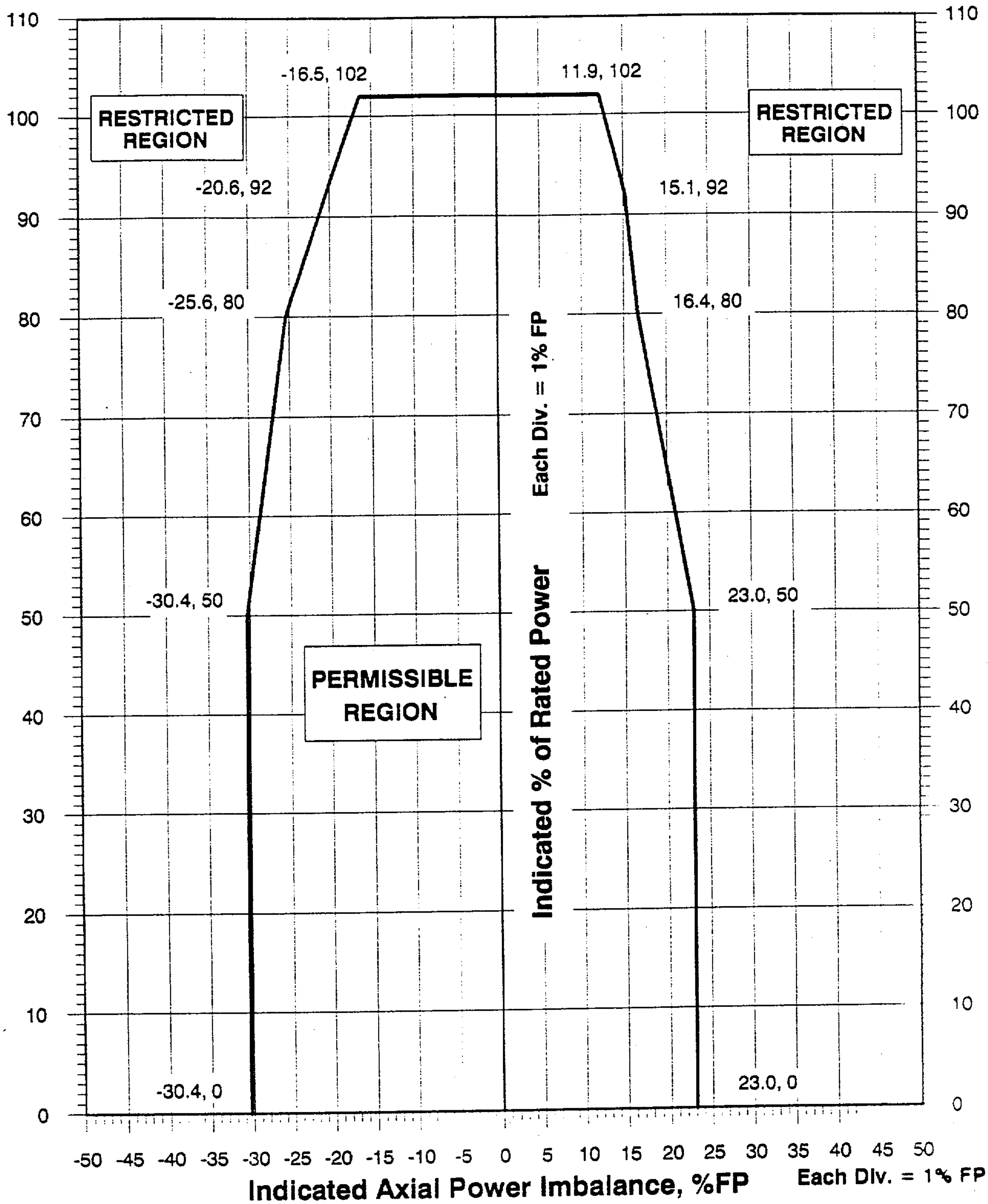
Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

Figure 5 (Page 3 of 4)
Out-of-Core Detector System Error Adjusted Imbalance Limits
(200 +/- 10 to 500 +/- 10 EFPD)



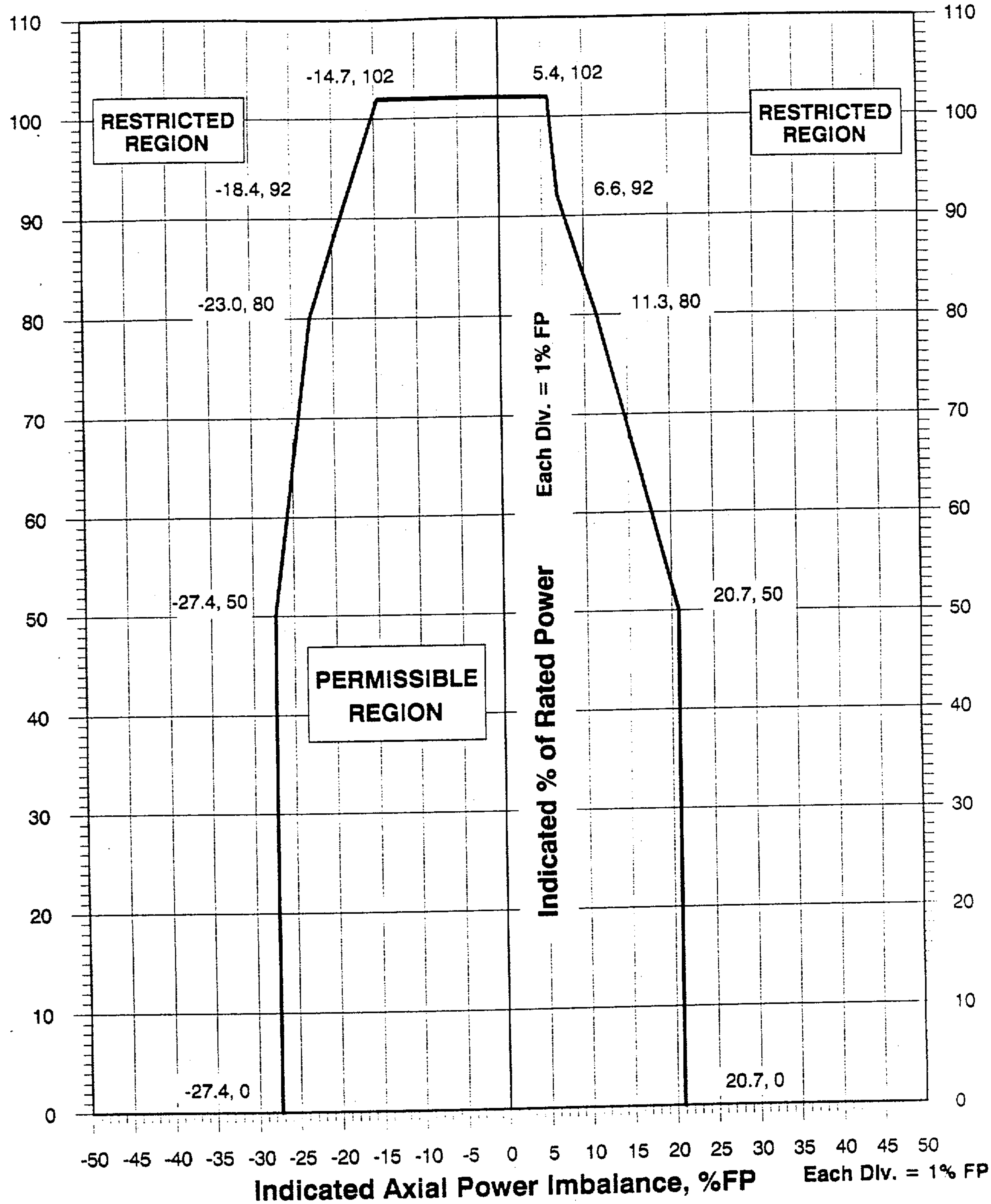
Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

Figure 5 (Page 4 of 4)
Out-of-Core Detector System Error Adjusted Imbalance Limits (500 +/- 10 EFPD to EOC)



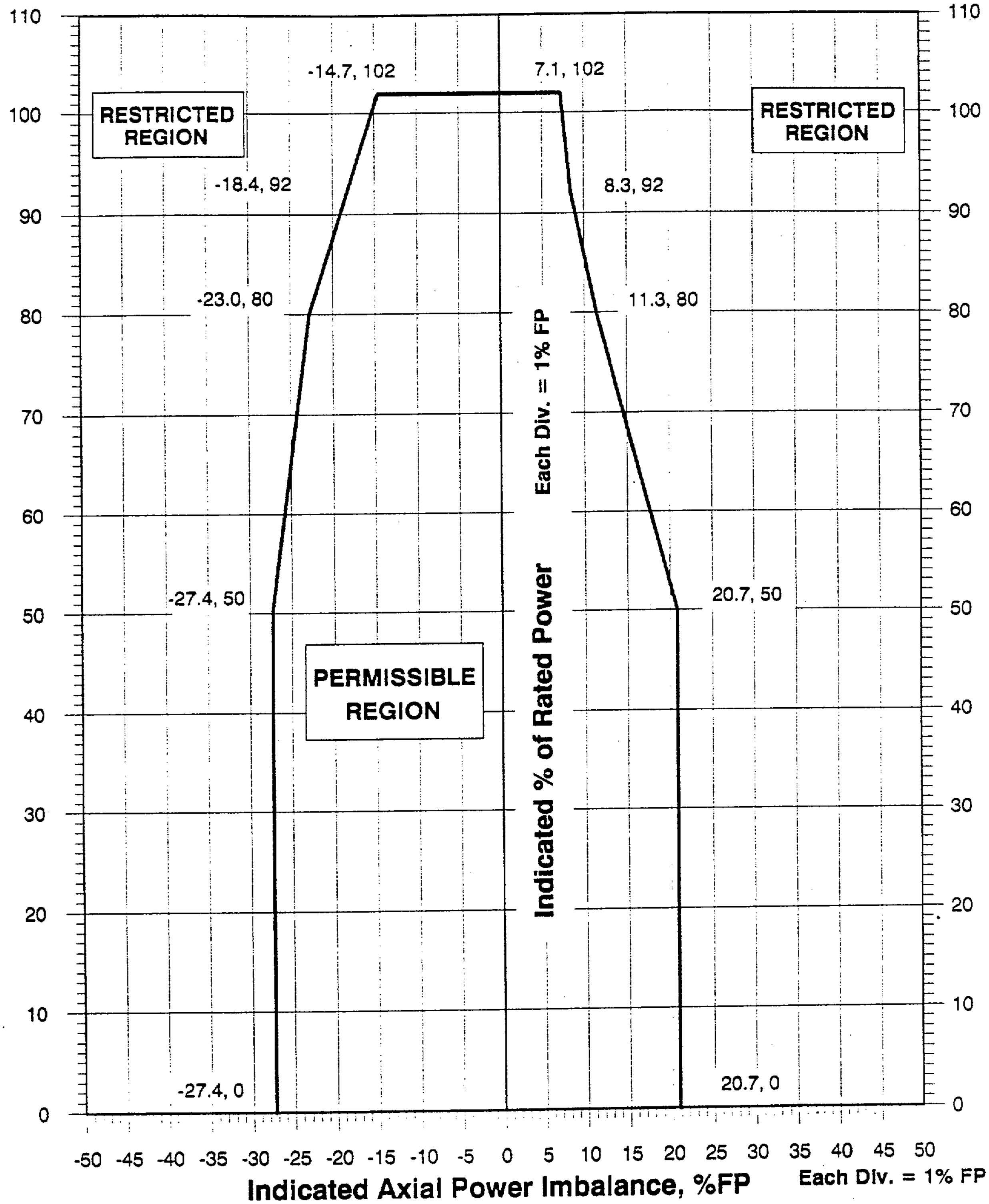
Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

Figure 6 (Page 1 of 4)
Minimum Incore System Error Adjusted Imbalance Limits
(0 to 75 +/- 10 EFPD)



Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

Figure 6 (Page 2 of 4)
Minimum Incore System Error Adjusted Imbalance Limits
(75 +/- 10 to 200 +/- 10 EFPD)



Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

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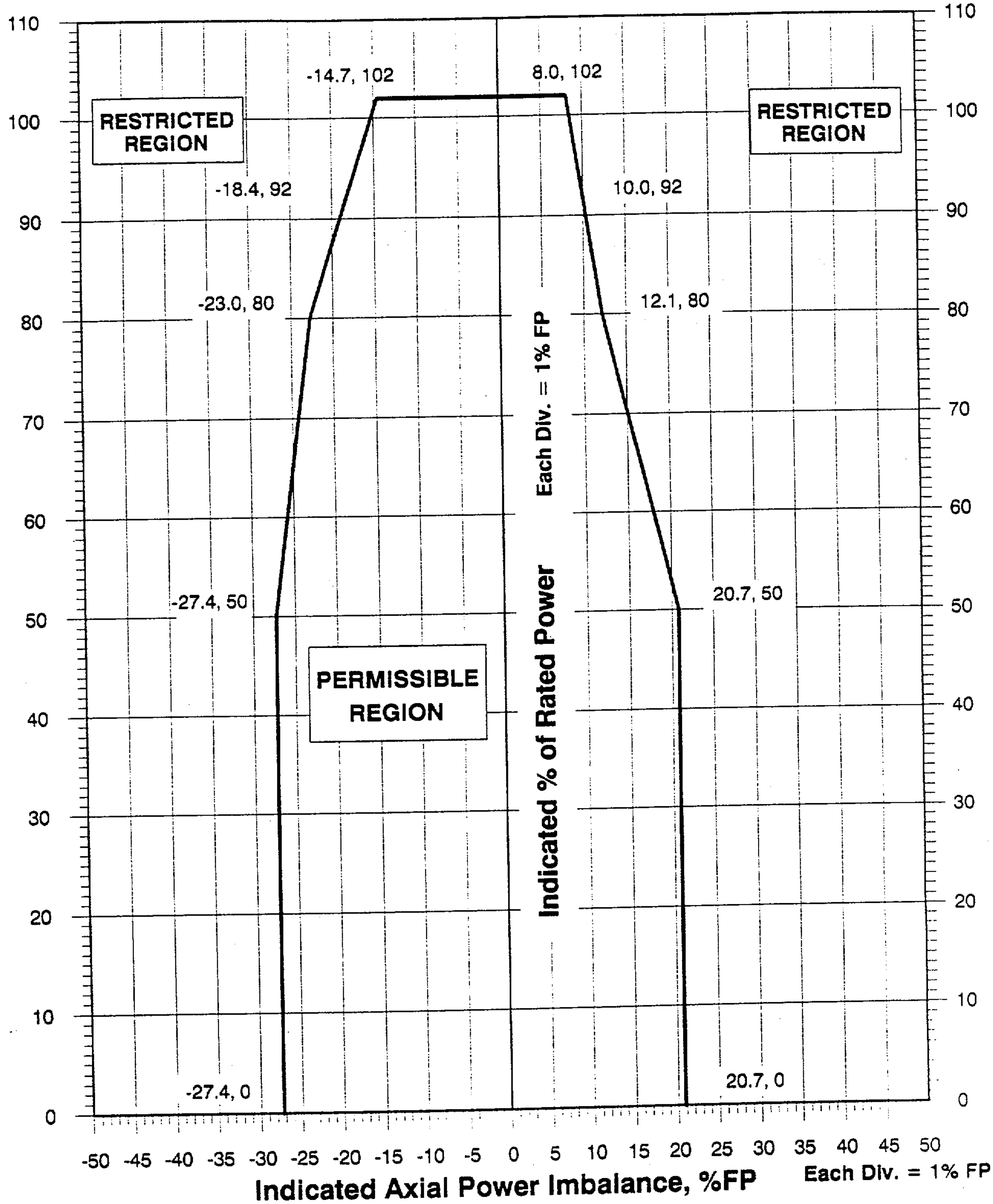
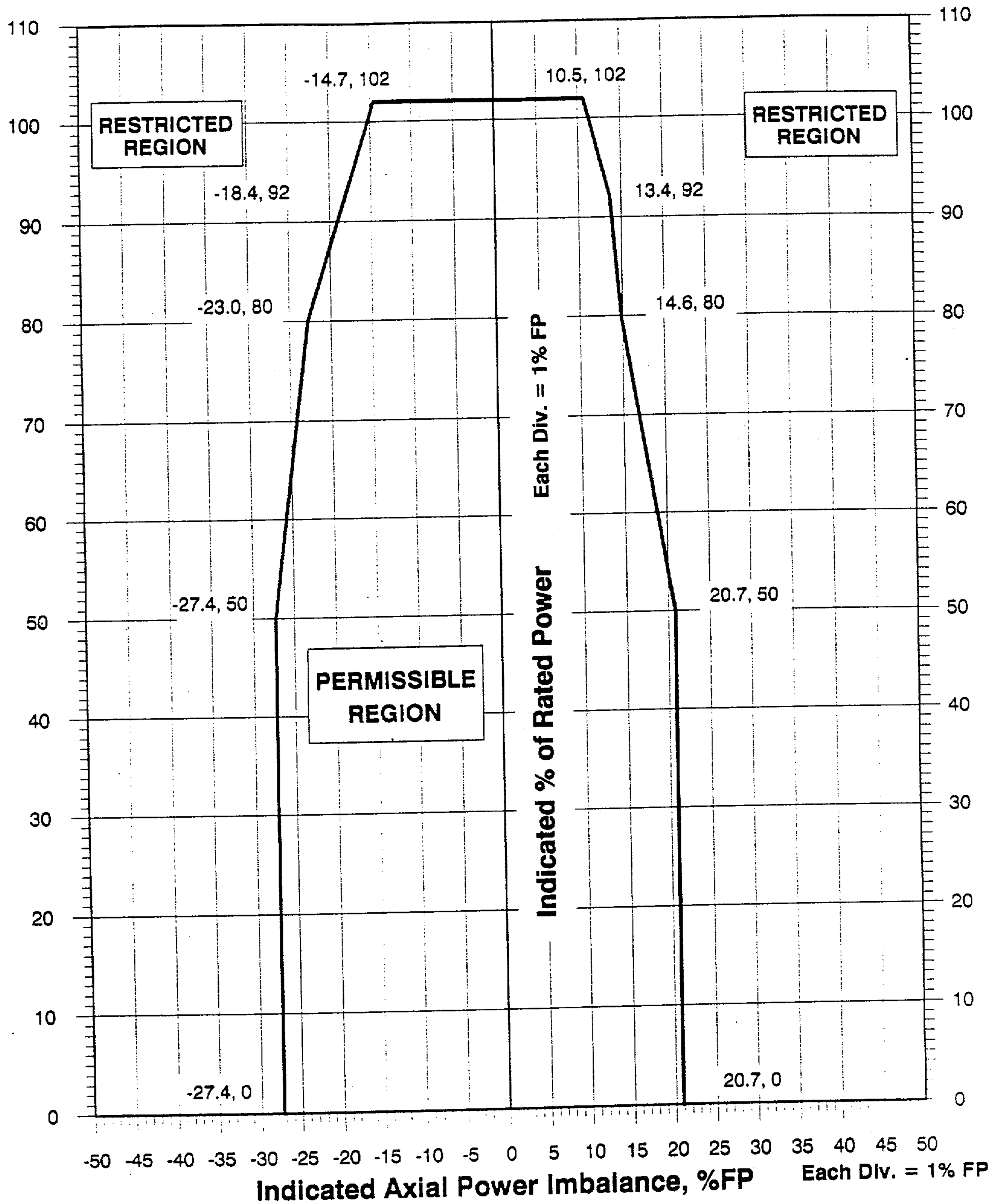
Minimum Incore System Error Adjusted Imbalance Limits
(200 +/- 10 to 500 +/- 10 EFPD)



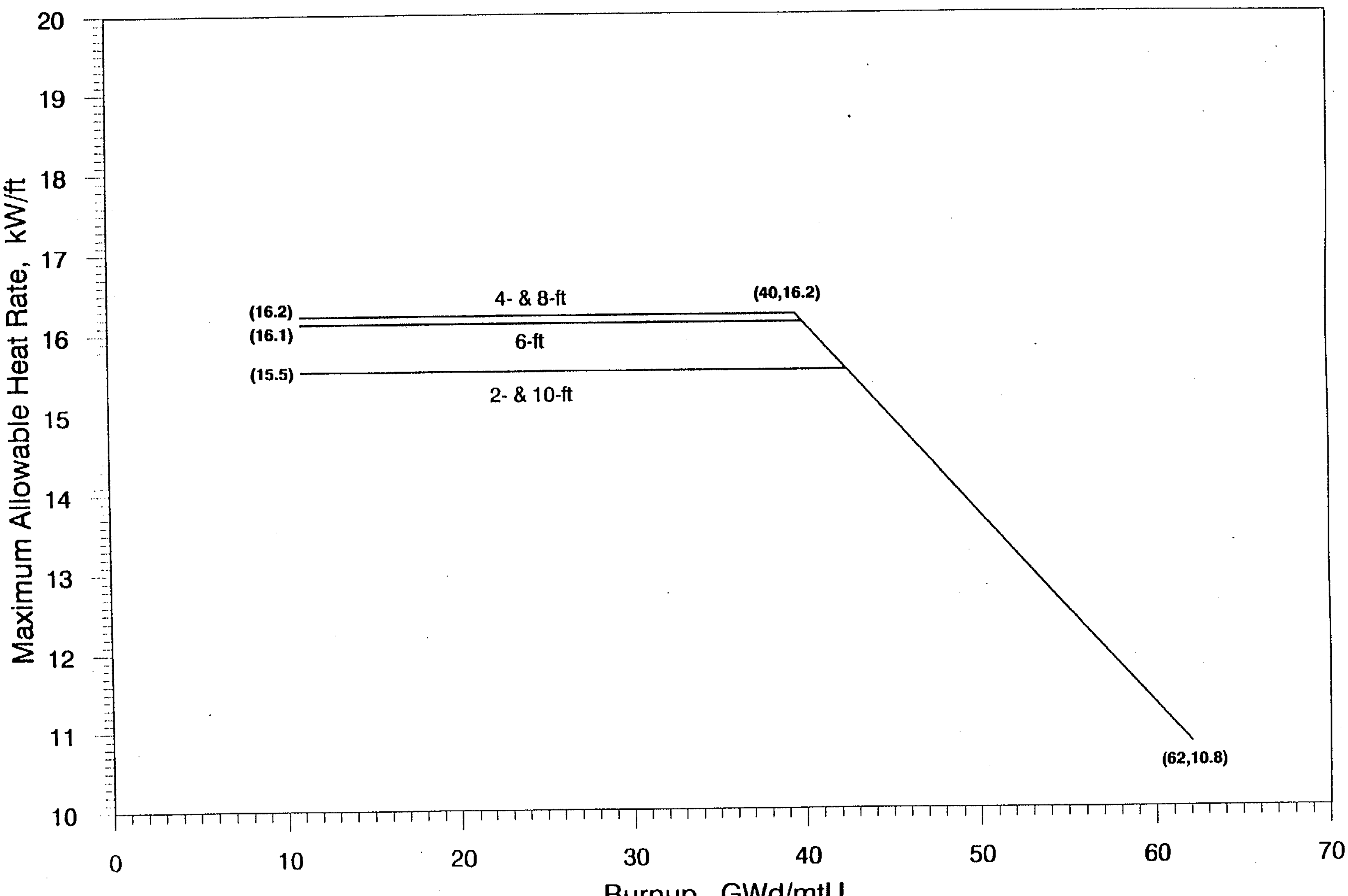
Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

Figure 6 (Page 4 of 4)
Minimum Incore System Error Adjusted Imbalance Limits
(500 +/- 10 EFPD to EOC)



Referred to by Tech Spec 3.5.2.7 and 3.5.2.4.e.4

Figure 7 (Page 1 of 3)
LOCA Limited Maximum Allowable Linear Heat Rates
Mark-B8, Mark-B8V Fuel Types



Referred to by Tech Spec 3.5.2.8

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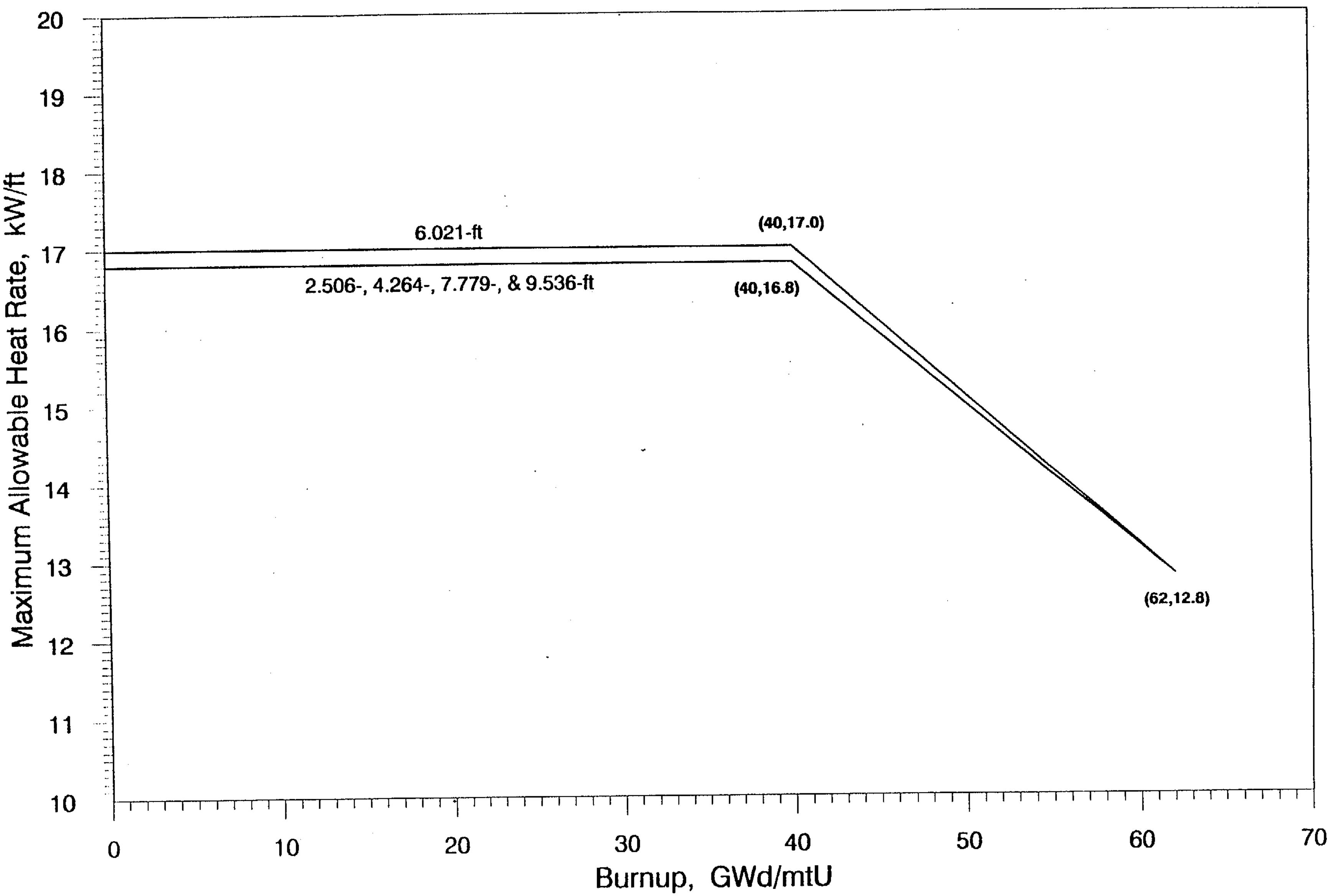
LOCA Limited Maximum Allowable Linear Heat Rates

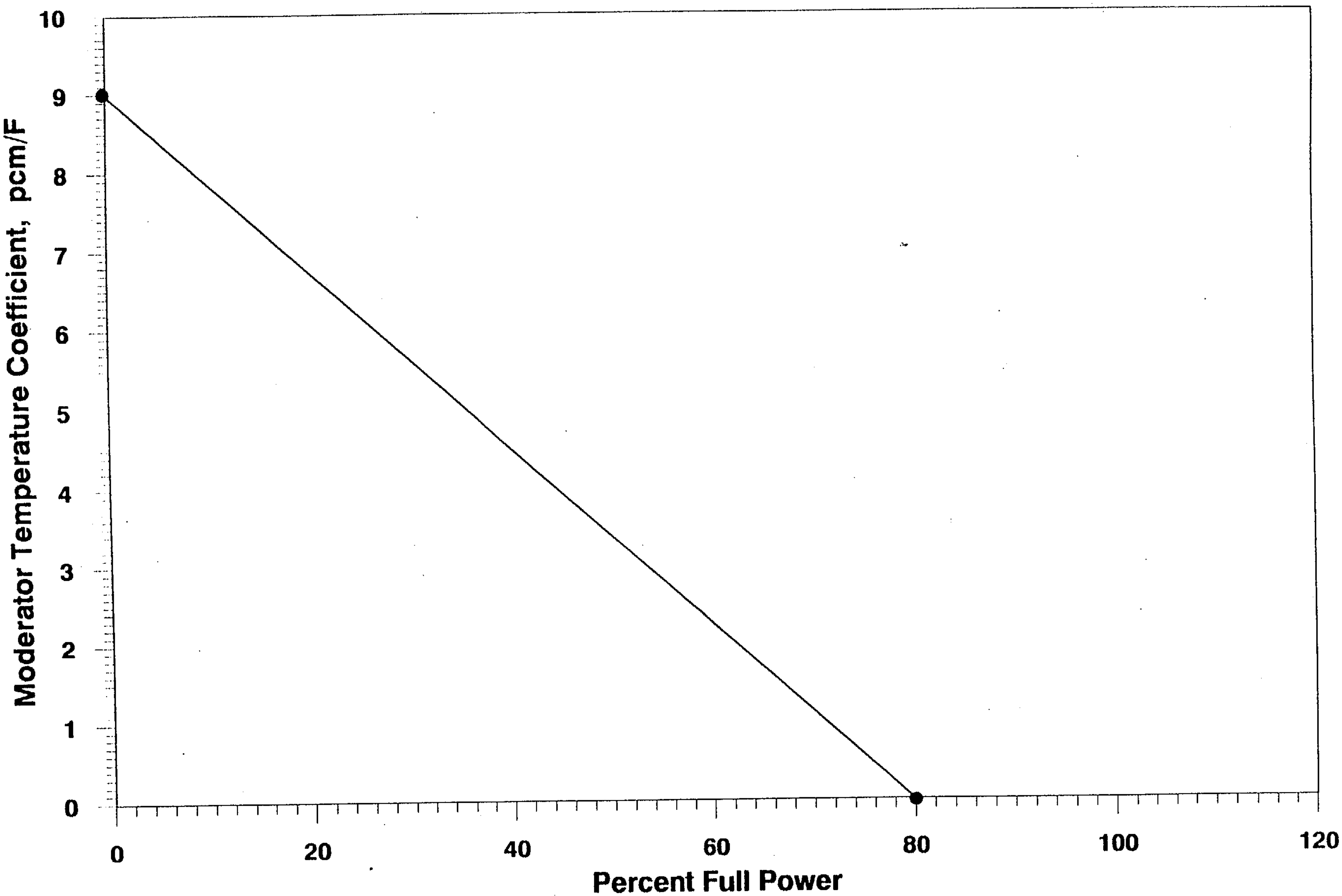
Mark-B9, Modified Mark-B9 Fuel Types



Referred to by Tech Spec 3.5.2.8

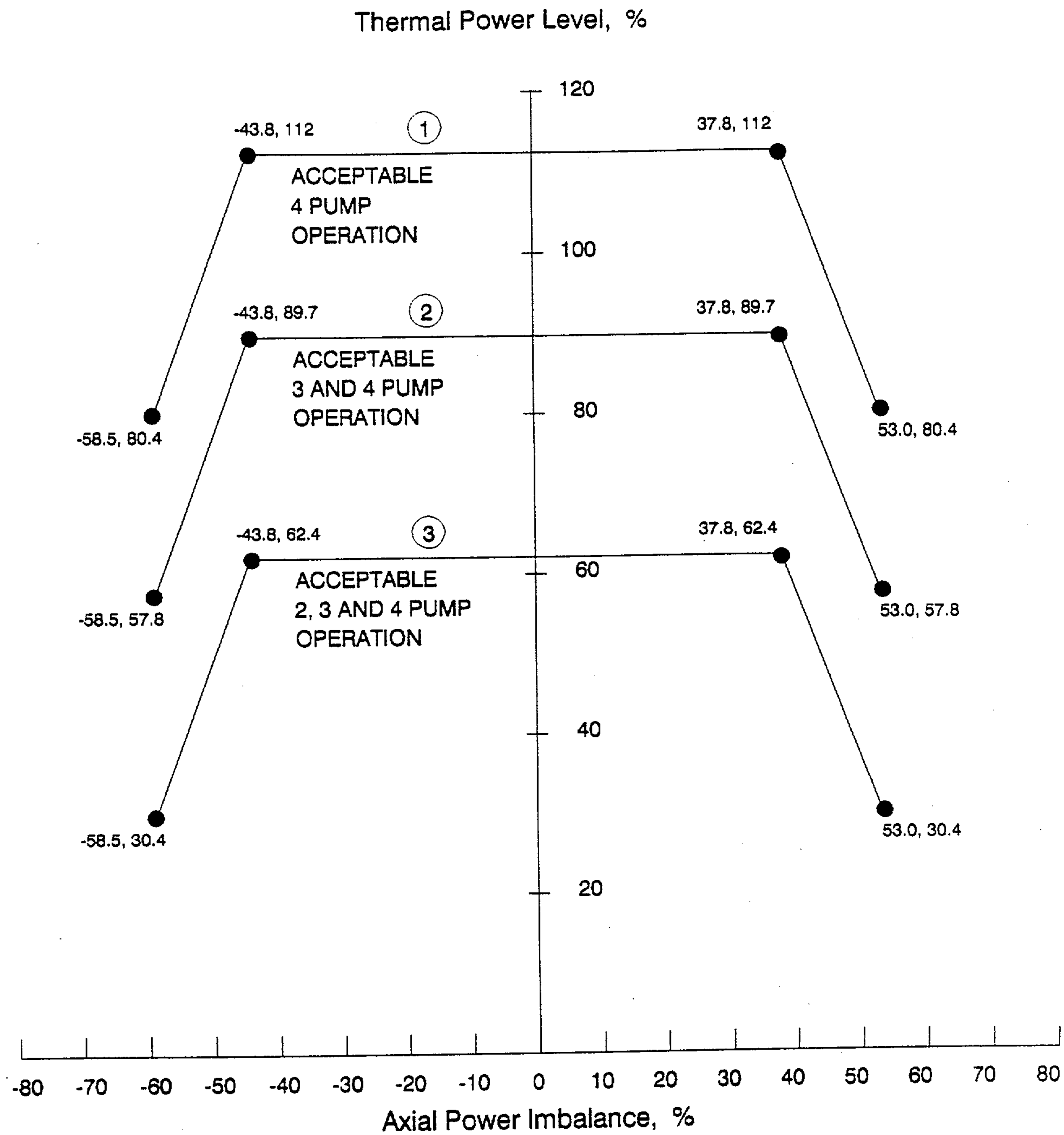
Note: The MALHR of 16.8 kW/ft at the 7.779 ft. elevation is administrative.
A limit of 17.3 kW/ft is acceptable providing cycle-specific evaluation of PCT

Figure 7 (Page 3 of 3)
MTC Limit vs. Power Level



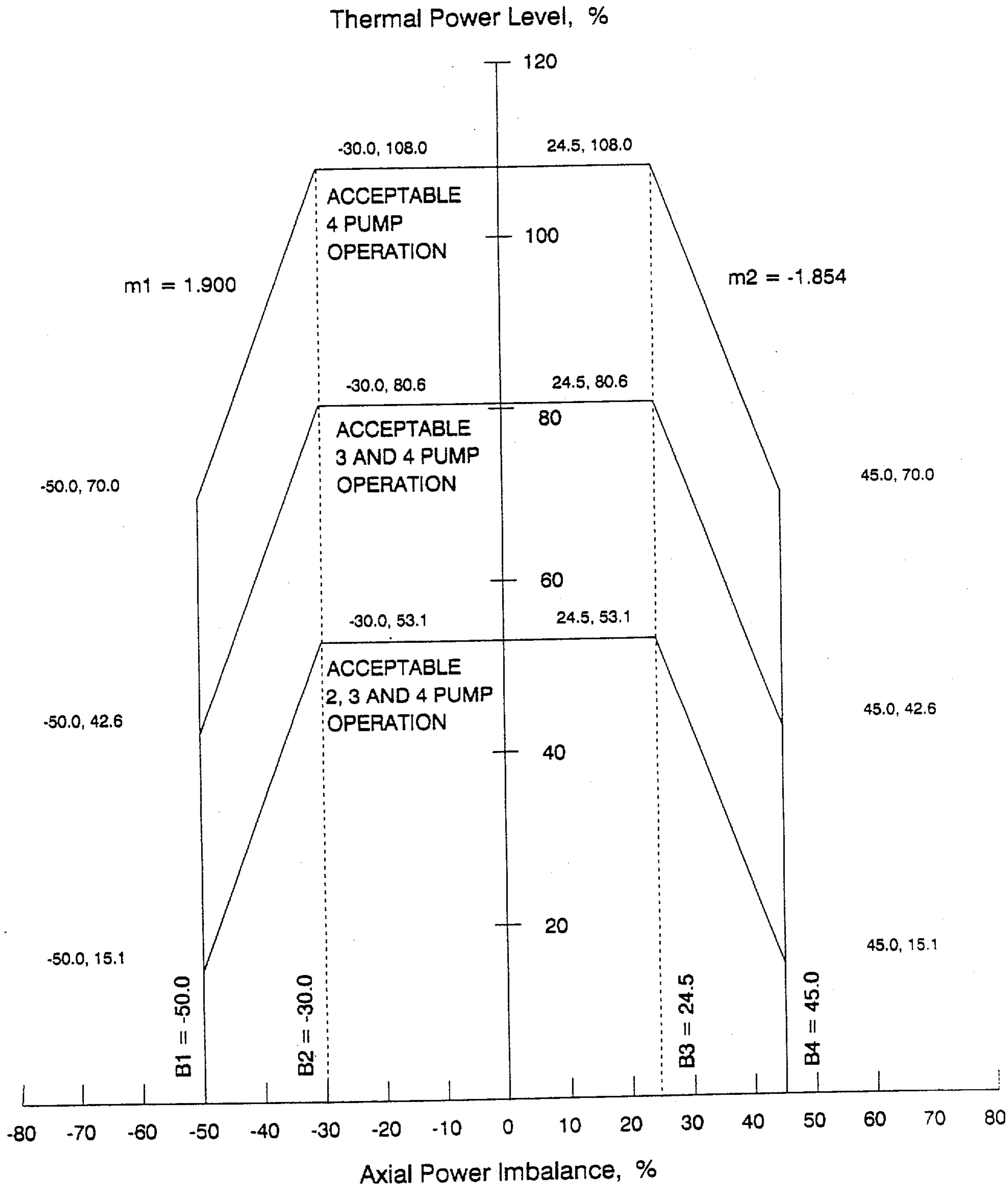
Source: FTI Doc. 86-5002073-02

Figure 8
Axial Power Imbalance Protective Limits



CURVE	EXPECTED MINIMUM REACTOR COOLANT FLOW (lb/hr)
1	134.02 x 10E+6
2	100.35 x 10E+6
3	66.28 x 10E+6

Figure 9
Protection System Maximum Allowable Setpoints for Axial Power Imbalance



Enclosure 1

Operating Limits Not Required by Technical Specifications

1. **Core Minimum DNBR Operating Limit**

   (Reference: BAW-2250)

   The core minimum DNBR value as measured with the NAS Thermal Hydraulic Package (Display 1 or 4) should not be less than 2.02 (102% ICDNBR).

2. **Maximum Allowable Local Linear Heat Rate Limits**

   (Reference: T.S. 2.1 Bases)

   The maximum allowable local linear heat rate limit is the minimum LHR that will cause centerline fuel melt in the rod. This limit is the basis for the imbalance portions of the Axial Power Imbalance Protective Limits and Setpoints in Figures 8 and 9 of the COLR, respectively. The limit is fuel design-specific; the value for the most limiting fuel design in the current core is used for monitoring as given below:

   - BWFC Mark-B8/B8V

     LHR to melt = 20.5 kW/ft

3. **Alternate Minimum Boron Requirements for Cold Shutdown**

   (References: T.S. 3.3.1.1.a, T.S. 3.3. Bases, FSAR 9.2.1.2)

   - The BWST is required by Technical Specifications 3.3.1.1.a to be available as a source of borated water to meet ECCS LOCA criteria. The T.S. 3.3.1.1.a requirements also ensure that there is a sufficient source of borated water available to bring the reactor to cold shutdown under normal operating conditions. Although not required by T.S., other sources of borated water can be used in lieu of the BWST for the purpose of achieving cold shutdown under normal operating conditions.

     The minimum boron level needed in the BAMT or RBATs to achieve cold shutdown conditions throughout the cycle is the equivalent of at least 1052 ft3 of 8,700 ppm boron. There is no T.S. requirement to maintain these tanks at this level.

Enclosure 2

DNBR-Related Bases Descriptions

1. **Power-to-Flow Trip Setpoints**

The nuclear overpower trip setpoint based on RCS flow (power/flow or flux/flow trip) for the current cycle is 1.08. This setpoint applies to four-, three- and two-pump operation as described in T.S. Table 2.3-1 and Figure 9 of the COLR.

The power/flow trip, in combination with the axial power imbalance trip, provides steady-state DNB protection for the Axial Power Imbalance Protective Limit (Figure 8). A reactor trip is initiated when the core power, axial power peaking and reactor coolant flow conditions indicate an approach to the DNBR limit. The power/flow trip also provides transient protection for loss of reactor coolant flow events, such as loss of one RC pump from a four RC pump operating condition and a locked rotor accident.

Power level and reactor flow rate combinations for four-, three- and two-pump operating conditions are as follows:

1. **Trip would occur when four reactor coolant pumps are operating if power level is 108 percent and flow rate is 100 percent, or power level is 100 percent and flow rate is 92.5 percent.**

2. **Trip would occur when three reactor coolant pumps are operating if power level is 80.6 percent and flow rate is 74.7 percent or power level is 75 percent and flow rate is 69.4 percent.**

3. **Trip would occur when one reactor coolant pump is operating in each loop (total of two pumps operating) if power level is 53.1 percent and flow rate is 49.2 percent or power level is 49 percent and flow rate is 45.4 percent.**

The power level trip and associated reactor power/axial power imbalance boundaries are reduced by the power-to-flow ratio as a percent (1.08 percent) for each one percent flow reduction.

2. Design Nuclear Power Peaking Factors

(Reference: T.S. 2.1 Bases)

The design nuclear power peaking factors given below define the reference design peaking condition in the core for operation at the maximum overpower. These peaking factors serve as the basis for the pressure/temperature core protection safety limits and the power-to-flow limit that prevent cladding failure due to DNB overheating.

- **Nuclear Enthalpy Rise Hot Channel Factor (Radial-Local Peaking Factor), $F^N_{\Delta H}$**

- $F^N_{\Delta H} = 1.714$

- **Axial Flux Shape Peaking Factor, F^N_Z**

  $F^N_Z = 1.65$ (cosine with tails)

- **Total Nuclear Power Peaking Factor, F^N_q**

- $F^N_q = F^N_{\Delta H} \times F^N_Z$

  $F^N_q = 2.828$