SWITCHING SYSTEMS MANAGEMENT
LINE CONCENTRATORS-SUBSCRIBER LOOP MULTIPLEXER
ADMINISTRATION

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APPENDIX

CHART 1

DIAL FACILITIES MANAGEMENT PRACTICES — USER COMMENTS

Form E-6366
(11-73)

D.F.M.P. Div._____ Sec. _____

Note: This form is provided for use in submitting user comments on the above numbered practice. Comments should be as specific as possible. Include the number of the particular page, paragraph, figure and exhibit if applicable.

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1. GENERAL

1.01 *Purpose:*

This section describes in detail the procedures required to administer a Subscriber Loop Multiplexer (SLM). It introduces new administrative concepts through the use of weekly peak load data to predict main station capacity and to establish loading guidelines. Procedures for monitoring the service performance and deloading of the SLM system are included. Another DFMP, Division H, Section 15b(1) describes:

(a) System Description

(b) Assignment Procedure

(c) Service Order processing

(d) Traffic characteristics for loading considerations

(e) Departmental responsibilities

1.02 *Basic Description:*

The Subscriber Loop Multiplexer (SLM) is a system that will serve 80 *lines,* some of which may be multi-party, all sharing 24 voice-channels.

> *NOTE:* Throughout this Practice it is important to distinguish carefully between lines and main stations.

At most, 24 main stations can be involved in conversations at one time. Thus, it is possible for communication between a customer and the central office to be temporarily blocked because all 24 channels are busy handling calls to or from other lines. Blocking should be held to the lowest level that can reasonably be achieved, so that service provided to customers on an SLM is virtually indistinguishable from a traffic viewpoint from service provided on cable pairs. For this reason, traffic performance of the SLM is discussed in terms of the number of times per year in which the probability of blocking exceeds one-half of one percent (B.005). (A more detailed description of the SLM system can be found in DFMP Div. H, Sec. 15b(1)).

1.03 *Measurement Use:*

Traffic studies have shown that the loads generated by subcribers vary widely from place to place, from customer to customer, and from time to time for any group of customers. If an upper limit to the number of main stations that can be served by an SLM were small enough so that all SLM systems could be used without traffic measurements, then most systems would be substantially underloaded. The SLM is therefore equipped with traffic measurements which are used to monitor the performance and to prevent (or in very rare cases to detect) overloads. These measurements are also used to determine the number of main stations that can be served by a particular system without exceeding the traffic capacity of the SLM. This Practice describes how these measurements are used to calculate ***Allowed Main Station capacity*** (the number of main stations that can safely be served by the SLM system based on the available data), and to monitor performance of a fully loaded system. Use of these procedures should make it unnecessary, in almost all cases, to deload a system.

1.04 *Loading:*

Although the SLM is physicallly limited to 80 lines, considerably more than 80 main stations could be connected if some are on multi-party lines. Todays knowledge of traffic patterns indicate that fewer than one percent of SLM systems would be overloaded when serving 80 rural residential main stations. Maximum fills below 80 main stations will be found more often among systems serving other than rural residential subscribers. Thus, no more than 60 main stations should be connected to an SLM before at least four weeks of traffic measurements are taken. In addition, no more than 160 main stations should ever be served by a single SLM system.

1.05 *Traffic Characteristics:*

As a general rule an SLM is most effectively used if it serves low-usage lines, thus utilizing the line concentration in the SLM. Lines with a known high usage, such as business lines, professional people and full eight-party lines, should be excluded from an SLM (and served on cable pairs) in favor of low-usage lines. (See DFMP Div. H, 15b(1) for loading considerations).

2. MEASUREMENTS

2.01 *Measurement Capability:*

Each SLM system is equipped with two registers, the all channels busy (ACB) and the weekly peak

load (WPL) register. These registers are used to determine the Allowed Main Station capacity and to detect overloaded conditions. The registers are the resettable type and are located on a Control Terminal in the central office. It is possible to multiple the register leads to standard 14 type registers.

2.02 *All Channels Busy (ACB) Register:*

A measure of the current performance of the system comes from the readings of the ACB register which accumulates the amount of time all 24 channels are busy. The ACB register is reset to zero when it is read, and when next read contains the total amount of time all channels were busy since the register was reset. Each score on the ACB register represents six seconds of time when 24 channels were busy and is similar to a group busy timing (GBT) register normally used in other systems. The interpretation of this measurement is discussed in section 7 and 8.

2.03 *Weekly Peak Load (WPL) Register:*

This register records the highest hourly carried load in CCS that has occurred since the register was last read and reset to zero. The weekly peak load register must be read once a week for the procedure described below to be valid. This register should be read at a specified time each week. Maintenance and permanent signal usage are included in the CCS readings.

2.04 *Measurement Concept:*

Those familiar with other traffic measurements used in the Bell System, and with administrative procedures based on them, will notice that the method used for the SLM is considerably different. The load carried in a time consistent busy hour is not measured. Instead only the peak hourly load per week is measured. Also, the ongoing performance of an SLM is monitored by determining the amount of time per week that all channels are busy and, thus, the amount of time during which blocking can occur. The main purposes of this new approach are to maintain surveillance 24 hours per day and to minimize the amount of traffic data that have to be recorded and processed.

3. SERVICE CRITERION

3.01 *Service Objective:*

The SLM is designed to be basically transparent or non-blocking. Transparency is defined as no more than four occurrences of one half of one percent (B.005) blockage during a 12 month period. This service objective has been established so that service provided by an SLM is virtually indistinguishable from service provided on outside plant facilities (cable & pair).

3.02 *Heavy Load Hour:*

Blocking occurs in the SLM when, because all 24 channels are busy, a customer served by the system encounters dial-tone delay when trying to originate a call, or a terminating call cannot reach the called line and the calling party receives reorder tone (120 IPM). The probability of blocking is one-half percent (B.005) when, on the average, one out of every 200 calls is blocked. An hour in which the offered load is high enough to cause blocking of (B.005) or greater is called a ***heavy-load hour.***

4. LOADING PROCEDURE – GENERAL DESCRIPTION

4.01 *Loading:*

The basic approach to loading an SLM is to first measure the weekly peak loads generated by the customers presently served by the system, then from these measurements and a knowledge of the number of customers assigned when the data were collected, predict how many customers can be assigned to a given SLM. (See DFMP, Div. H, Sec. 15b(1) for loading considerations). As the loading continues, this procedure is repeated, thus providing increasingly accurate estimates of the eventual Allowed Main Station capacity. Consequently, the eventual Allowed Main Station capacity is determined by the traffic characteristics of the customers on an SLM and will differ for individual SLM systems. The predictive feature allows a planned loading of the SLM and gives information necessary for the provision of additional facilities when needed. In doing this it is assumed that the customers who will be served by a system in the future are, as a group, similar to those whose traffic is measured. There is no way of ensuring the truth of this assumption. It leads to certain precautions in the rules that follow; the Dial Administrator should never knowingly load onto an SLM system a large group of customers who are thought likely to generate substantially more traffic than do the customers already served. The loading administrative procedure should begin when there are 40 or more main stations being served as there is little predictive value in weekly

peak load measurements from fewer than 40 main stations. (No more than 60 main stations should be served before weekly peak load measurements are taken).

4.02 *Measurement Week:*

The total administrative procedure requires 16 valid weekly readings. The basic measurement interval is called a ***measurement week*** and is the period corresponding to a valid reading of the weekly peak load register. A measurement week should normally include five business days. This, however, may not always be possible. Measurement weeks may be made up of no fewer than four business days. For example, if the weekly peak load register is read every Friday and a Monday is a holiday, the fact that the week has only four business days is ignored and the week is treated like any other week. Or, suppose that the register is usually read on Friday but in one case is read the following Monday afternoon or evening instead: The two adjacent measurement weeks would consist of (almost) six business days and (just over) four business days respectively, both of these weeks would be considered as valid measurement weeks. Data could not be used, on the other hand, if readings were more than one business day away from the normal schedule i.e., if the period over which a peak load was measured contained more than six or less than four business days. When this happens, the period involved is not a measurement week and the measured peak load must be discarded and not used in administering the SLM.

4.03 *Measurement Month:*

The measurement weeks are grouped into a ***measurement month*** which consist of four measurement weeks. The weeks need not be consecutive and need not be in the same calendar month. The measurement month is merely that last four valid measurement weeks that can be used to predict Allowed Main Station capacity. Suppose, for example, that a weekly reading of the peak load register is skipped one week, so that when next read, the register contains the peak load that occurred over a two-week period. Such a reading must be discarded. But if data are obtained for subsequent weeks in the usual way, they can be used to make up a measurement month that has a two-week gap in it — for example, using weeks 1, 2, 5, and 6, if no valid readings were obtained in weeks 3 and 4.

4.04 *Estimated Main Station Capacity:*

At the end of each measurement month, an *estimated* main-station capacity is calculated by using Form E6341 (Figure 1) and Chart 1 (Appendix), described later. The system is allowed to be loaded according to the rules on Form E6342 (Figure 2) and explained in section 5. No system should be loaded beyond 60 main stations until at least four weeks of data are collected and the procedure indicates that it is safe to do so.

4.05 *Predicted and Allowed Main Station Capacity:*

The ***predicted*** main-station capacity is determined by computing the weighted mean of the estimated main stations capacity from up to and including four measurement months (See Form E6342). The *Allowed Main Station* capacity is the number of main stations that can safely be served by the SLM based on the available traffic data. With four measurement months of data, the Allowed Main Station capacity is the smaller of the ***predicted*** main station capacity and the current average number of working main stations plus 40. With less than four measurement months additional restrictions are imposed in computing the Allowed Main Station capacity.

4.06 *Measurement Frequency (Fully Loaded Systems):*

An SLM is fully loaded to its traffic capacity if, with four measurement months of weekly peak load data, the current number of working main stations is equal to or greater than the Allowed Main Station capacity. At this point no main stations should be added to the SLM and continuous weekly peak load readings are not needed, but the Allowed Main Station capacity of the SLM system with the all channel busy reading, according to the procedures in sections 7 and 8, should be continued.

5. LOADING PROCEDURE – WORKSHEET

5.01 *Form E6431 (Measurement Month Calculations):*

The weekly peak load readings and working main stations are recorded on Form E6431 (Figure 1). It also serves as a worksheet to accumulate weekly figures into a measurement month total. Three of

the primary uses of this form are:

1. To check the ten percent growth limit on main stations.

2. To calculate the average and variance of the weekly peak load.

3. To calculate an estimated main station capacity for a single measurement month.

5.02 *10% Growth Limit Check:*

This limit is checked by taking the smallest number of working main stations which is 66, adding ten percent (6.6) which rounds up to 73. Now check to see that that the other three weekly main station values do not exceed 73. In the example 66, 69 and 70 do not exceed 73; thus, we proceed by finding the average working main stations.

5.02.1 *Over 10% Growth Limit:*

You would not proceed if, for example, the number of working main stations were 66, 69, 70, 74. These weeks could not constitute a valid measurement month because 74 is greater than the lowest week, 66, plus 10%. You would discard week 1 and start with the second week where working main stations = 69. Adding ten percent to 69, a new growth limit of 69, + 7 = 76 main stations is established. We now have measurement weeks of 69, 70 and 74 main stations with a growth limit of 76. If the next measurement week of readings has 76 or less working main stations it constitutes a valid measurement month. If working main stations exceed 76, the procedure starts again with 70 main stations.

5.03 *Estimated Main Station Capacity:*

In order to determine the estimated main station capacity three values are need:

1. Average weekly working main stations

2. Average weekly peak load

3. The variance of the weekly peak loads

5.03.1 *Average Weekly Working Main Station:*

Enter the dates, in column 1, when weekly peak load readings were taken. In column 2, enter the number of ***working*** main stations for each period. When four weeks of valid data are collected add all four numbers in column 2 and record the total in the space marked Sum. Average weekly working main stations is determined by taking the sum and dividing by four. In the example it would be 271 ÷ 4 = 68.

5.03.2 *Average Weekly Peak Load:*

Average weekly peak load is determined by taking the sum of column 3, and dividing by four. In the example it would be 1233 ÷ 4 = 308. The average weekly peak load is then copied into column 4.

5.03.3 *Varaiance of the Weekly Peak Load:*

The variance of the weekly peak load is found by finding the differences between columns 3 (weekly peak load) and 4 (average weekly peak load). Subtract the smaller figure from the larger. The smaller figure may be in either column 3 or 4 but since we are determing variance this does not present a problem. Enter the differences in column 5 and square them. Example 27 x 27 = 729. The squared differences are entered in column 6 and totaled. This total is then divided by 3 (not 4) to obtain the variance of the weekly peak loads. (728 is our example).

5.03.4 *Determining Estimated Main Station Capacity:*

Following the example we now have the three figures necessary to determine the estimated main station capacity for the SLM system. They are:

1. Average weekly working main stations, rounded to the nearest 10 = 70 (use Chart 1-70, Appendix)

2. Average weekly peak load = 308

3. The variance of the weekly peak loads = 728

Follow step 5 on Form E6341 and use Chart 1-70. Find the point on the chart where average weekly peak load (308) and weekly peak load variance (728) cross. This point lies in a band between two curved lines on the chart, and in this band is a number which is a multiple of 5. This number is the ***estimated*** main station capacity for Month 1. In this example, the estimated main station capacity is 95. Estimated main stations is not used to load the SLM system. It is used in the procedure to determine Allowed Main Station capacity as shown on Form E6342 (See Figure 2).

5.04 *Form E6342 (Monthly Summary):*

The procedure described above (5.03) is repeated for each of three additional measurement months and summarized on Form E6342 (Figure 2). For each measurement month the estimated main station capacity and the end-of-month date (last entry in column 1 on Form E6341 are obtained. Copy this date into column (1) and the estimated main station capacity into column (2). Also copy the average number of working main stations from step 2 of Form E6341 into column (3) for each measurement month.

5.05 *Predicted Main Station Capacity:*

For each month multiply the estimated main stations by the average working main station and enter each product in column (4). When four monthly readings are obtained add columns (3) and (4). Copy these totals into the Box for step 1, divide, and round to the nearest whole number to get the ***predicted*** main station capacity of the SLM system, 105 in this example.

5.06 *Allowed Main Station Capacity:*

Following the YES branch of step 2 because we have data for four measurement months, copy the predicted main stations onto line B and on line A add 40 to the last number of average working main stations in column (3) (82 in Figure 2) to get 122. (40 is added because no more than 40 main stations may be added on the basis of a predicted capacity). The lesser of the numbers on lines A and B is the Allowed Main Station capacity of the system. (If the predicted main stations had been larger than 122 in this example, the Allowed Main Stations would have been 122). 105 is the allowed number of main stations that can safely be served by this SLM on the basis of the weekly peak load measurements already taken. Notice the large differences among the numbers of estimated main stations (column 2, Figure 2) in the four measurement months; this variability is not atypical. If Allowed Main Station capacity is less than the number of currently working main stations, the SLM should not be deloaded. (Deloading should only be done according to the monitoring procedures described in sections 7 and 8). When four measurement months of data are available and the Allowed Main Station capacity is less than or equal to the number of currently working main stations, the system is fully loaded and all channels busy measurement should be used to monitor the SLM system. Each busy season the Allowed Main Station capacity should be recomputed to determine that the SLM system is fully utilized. Monitoring with the all channels busy readings should continue on an ongoing basis.

5.07 *SLM Loading With Less Than 4 Months of Data:*

Occasions may arise on which decisions about loading of SLM systems must be made before four measurement months of traffic data have been obtained. The following rules, which embody precautions that are otherwise unnecessary, will allow a system's main station fill to increase before four measurement months have elasped.

1. No more than 40 additional main stations can be added to the last average working stations.

2. The predicted main station capacity minus 20 main stations is the most that can be added.

3. The number of main stations added can not exceed the predicted main station capacity plus the last average working main stations divided by two.

In other words, the system must remain at least 20 main stations below its predicted fill when the predicted main station capacity is based on insufficant data; and furthermore, the fill must not go more than half way from the last average working main stations to the predicted main station capacity. What this means in practice is that three separate limits must be found, as shown in the box on branch NO of step 2 on Form E6342 (Figure 3). The system can then be loaded to the ***smallest*** of these three numbers of main stations. One, two,or three measurement months of data can be obtained in the usual way, and their estimated main station capacity found. These can be combined into a predicted main station capacity, but this value of predicted main stations must be used somewhat differently. An example for two measurement months is shown on Form E6342 (Figure 3). Suppose for example that held orders will occur unless some customers are promptly added to a system for which the predicted main stations is 100 based on only two measurement months, and that the last of these measurement months had an average working main stations of 72. As shown, the three limits are 112, 80, and 86 main station respectively. The fill could be increased to 80 main stations without waiting

for additional measurements. It is possible for the predicted main stations − 20 to be *less* than the last average working main stations. If this happens, the system does not have to be deloaded; it simply means that it is not safe to add more main stations given the available data and additional data must be collected.

6. USING THE PROCEDURE

6.01 *System Growth:*

System growth is limited to ten percent within a measuremnet month. If this rule is violated the procedure is likely to yield inaccurate results. However, between measurement months, the system may be loaded to the Allowed Main Station capacity even if this growth is more than ten percent. The weekly peak load register readings may have to be discarded during this period. When main stations are added in this manner the predicted main station capacity will be derived from measurement months of widely varying values. An example of when this would apply is when we have a predicted main station capacity of 140 that came from measurement months with average working main station of 68, 72, 78 and 82. The allowed main station capacity would be 122 (82+40). If 40 main stations were added immediately, a new predicted main stations capacity would be based on measurement months with 72, 78, 82 and 122 main stations. But plainly it is better to take further measurements with about 120 working main stations, if possible getting four measurement months with an average working main stations of about 120 to find a new value for predicted main station capacity before additional main stations are loaded onto the SLM system.

6.02 *Busy Season Considerations:*

No mention has been made so far of a busy season. Some studies of rural traffic have shown little variation in peak loads between seasons of the year, but this pattern of uniformity does not describe all communities. Some groups of main stations will generate traffic having a pronounced busy season. Local knowledge will usually warn of this possibility. This Practice contains no specific rules for handling seasonal SLM systems, but it is obvious that the measurement months used for loading such a system must lie in the busy season if one is known to exist.

6.03 *Loading Limits:*

The last page of Chart 1 is for 160 average working main stations because no system should ever serve more than 160 main stations. The first page is Chart 1-40 because peak-load measurements on fewer than 40 main stations are not worth the trouble of collecting. They tell so little about the performance of a system at typical final fills that no provision for their use is made in this Practice, and the weekly peak load register need not be read until a fill of 40 main stations is reached.

7. MONITORING PROCEDURE – GENERAL

7.01 *All Channels Busy Register – Use:*

The all-channels-busy (ACB) register is used primarily to detect systems that do not meet the service objective of four heavy-load hours in a 12 month period. The monitoring procedure should begin when there are more than 40 main stations or 24 lines being served. This register should be read and reset to zero once a week. The register scores once when all channels are busy for six seconds; thus, for example a reading of 12 implies that all channels were busy for a total of 1.2 minutes during the week and that during that time no additional calls (originating or terminating) could have been completed. Traffic on an SLM is expected to be highly variable and any blocking at all should be very rare. Therefore, it is assumed that most of the blocking experienced over the period of a week occurs during one hour. For example, if an SLM measures 3 or more scorings on the ACB register during a week, a heavy-load hour has probably occurred. *NOTE:* 3 ACB readings are the equivalent of .3 minutes or .005 of an hour. Such a week will be called a ***heavy-load week.*** Since a nonrecurring local disaster may temporarily cause high traffic or an equipment malfunction may cause a false reading, and since removing main stations that are being served by an SLM may be expensive or impossible, the procedure is designed so that deloading is recommended only when there is a reasonable degree of assurance that the service criterion is being violated. Consequently, deloading on the basis of one or two weekly ACB measurements alone, is not recommended.

8. MONITORING PROCEDURE – WORKSHEET

8.01 *Form E6343 (Weekly All Channels Busy Record):*

Figure 4 is a numerical example of how Form E6343 is to be used. Each line represents a measurement week. The date of the reading is

written in column (1) and the reading is recorded in column (3). If the reading is 3 or greater, indicating a heavy-load week, the reading is copied into column (4). Column (4) is used as described in paragraph 8.03 when the monitoring process indicates that deloading is necessary.

8.02 *Monitoring Procedure:*

The SLM is monitored by using the four columns labeled State (2). Each week an (X) mark is placed in one of the four boxes labeled 0, 1, 2 or 3. If the week is a heavy-load week, the mark is moved one box to the right of where it was the previous week. Examples of heavy-load weeks in Appendix 2 are weeks dated 2-12, 2-26, 3-5, 4-2, 4-9, 4-23 and 4-30. If the week is not a heavy-load week, the mark is moved one box to the left of where it was the previous week unless the process was in state 0 the previous week; in this case the new mark is also placed in state 0. In Figure 4, examples of weeks that are not heavy-load weeks are the ones dated 2-5, 2-19, 3-12, 3-19, 3-26 and 4-16. If the process goes into state 3 (such as for the week dated 4-30) the SLM is overloaded and customers must be removed from the system.

8.03 *Deloading:*

When the process goes to state 3 and the system requires deloading, the heavy users should be removed from the system if they are known. An approximate method of determining the number of subscribers to be removed can be obtained from the entries in column (4) as described at the bottom of Form E6343. Add the entries in column (4) from the week in which the process went into state 3 back to the week when the process was last in state 0. In the example, this is 8 + 6 + 15 + 3 = 32. This number is recorded in the box entitled "Total" on the bottom of Form E6343. In the second box enter the number of readings that were added to arrive at the Total. Dividing the Total by the number, as indicated, we arrive at the mean, which is 8 in the example. This number is the recommended percentage of load that should be removed. That is, in the example, 8 percent of the load should be removed from the SLM. In using the percentage procedure for deloading, it must be remembered that the recommendations are approximate and some judgement should be used in selecting main stations to be removed. For example, a subscriber-line usage study should be conducted to determine heavy users. If this is not possible and customers's characteristics are unknown, the percent of main stations could be used instead of percent of load. Also, if the procedure recommends the removal of 16 main stations, four fully-filled 4-party lines would be easier to remove but would reduce the traffic less than would 16 single-party lines. Once the recommended number of main stations have been removed, the procedure in Form E6343 should be renewed by setting the state of the system back to 0. When it is necessary to begin a new Form E6343 the (X) is placed as if the new Form E6343 was a continuation of the previous one. The (X) is *not* reset to state 0.

9. RELATIONSHIP BETWEEN LOADING AND MONITORING

9.01 *Loading and Monitoring Rules:*

Since the theories behind recommended procedures for using weekly peak load and all channels busy readings are approximate, the two procedures may disagree. In such a situation some rules have been established. The rules are based on the idea that the weekly peak load reading is primarily used as a guide for adding main stations and the all channels busy reading is used as a guide for removing main stations. The two rules are:

1. Deload a system if and only if the all channels busy readings show a need to do so, regardless of of what the weekly peak load readings indicate.

2. Increase the main stations load of a system if and only if the weekly peak load readings indicate that it is safe to do so and the all channel busy readings have been less than 3 for the last 13 weeks. (These 13 weeks must not, of course, be in a known off-season).

Under normal conditions the application of rule 2 should eliminate the need to apply rule 1. Some situations which may cause the need to apply rule 1 are:

(a) A sudden shift in the traffic characteristics of the customers being served,

(b) A seasonal variation not adequately accounted for, or

(c) An extreme within-hour variation of traffic load.

9.02 *Monitoring Frequency:*

Reading of the all channels busy register and the monitoring procedure should begin when there are more than 24 lines served by the SLM and should continue as long as the SLM is the only direct indication that blocking of calls has occurred. The SLM is fully loaded when the Allowed Main Station capacity based on four measurement months of weekly peak load data, turns out to be less than or equal to the number of currently working main stations. At this point, no more stations may be added and the weekly peak load readings may be discontinued but the Allowed Main Station capacity should be determined on a yearly basis (See 5.06). Monitoring with the all channels busy reading should continue. Weekly peak load readings, but not all channels busy readings, may be discontinued if the total physical capacity (that is, 80 lines) of the SLM is being utilized and the system is not fully loaded from a traffic viewpoint. In addition, weekly peak load readings can be suspended for a slowlu growing SLM until the main station fill approaches the Allowed Main Station capacity. At this time, weekly peak load readings should be taken and an updated Allowed Main Station capacity should be computed.

SUBSCRIBER LOOP MULTIPLEXER
ESTIMATED MAIN STATIONS

FORM E-6341
(11-73)

OFFICE: | SLM NO.

LOCATION:

Step 1. Check 10% Growth Limit on Working Main Stations

Working Main Stations = W
Maximum Working Main Stations = 1.10 x Smallest W
Maximum Working Main Stations = 1.10 x 66
Maximum Working Main Stations = 73
(Round to nearest whole no.)
Is the value of the Working Main Stations for any week, greater than this value?

NO | YES → 10% growth limit has been exceeded. Start with week 2 and take another week's reading.

WEEK	(1) DATE	(2) WKG. MAIN STATIONS = W	(3) WEEKLY PEAK LOAD = WPL	(4) AVERAGE WPL	(5) COL. 3-COL. 4	(6) SQUARE COL. 5
1	7-10-72	66	335	308	27	729
2	7-17-72	66	277	308	31	961
3	7-24-72	69	295	308	13	169
4	7-31-72	70	326	308	18	324
SUM		271	1233			2183
		÷ 4	÷ 4			÷ 3
		68	308			728
AVG. WKG. MAIN STATIONS		STEP 2	STEP 3	AVG. WPL	WPL VARIANCE	STEP 4

Step 5. Calculate Estimated Main Stations

From Step 2 Above	Round Avg. Main Stations to the nearest 10 and select the proper chart of Appendix 1
From Step 3 Above	Take the Average Weekly Peak Load to find a point on the baseline of the chart.
From Step 4 Above	Take the Weekly Peak Load Variance to Find a point on the lefthand side of the chart.
Find	Where the two values intersect on the chart, read the Estimated Main Stations from the number in that band.
Note: Do Not Use E to load new main stations. Go to the 4-Month Summary	E = 95

REFERENCE: DFMP DIVISION H SECTION 15b(2)

PREPARED BY: | DATE:

FIGURE-1

SUBSCRIBER LOOP MULTIPLEXER
4-MONTH SUMMARY

FORM E-6342
(11-73)

OFFICE: | SLM NO.:

LOCATION:

	(1) Date End of Month	(2) Estimated Main Stations = E	(3) Average Working Main Stations = W	(4) (Col. 2) x (Col. 3)
Month 1	7-31-72	95	68	6460
Month 2	8-28-72	105	72	7560
Month 3	9-25-72	135	78	10530
Month 4	10-23-72	85	82	6970
Sum →			300	31520

Step 1. Calculate Predicted Main Stations

Predicted Main Stations = (Sum Col. 4) ÷ (Sum Col. 3)

Predicted Main Stations = 31520 ÷ 300

Predicted Main Stations = 105

(Round to nearest whole No.)

Step 2. Calculate Allowed Main Stations

Do you have values for all 4 months?

YES — all 4 months

A. Add 40 to the last value of Average Working Main Stations in Col. 3.

last Avg. W + 40 = 122

B. From Step 1, Predicted Main Stations = 105

The Allowed Main Stations is equal to the lower of these two values

Allowed Main Stations = 105

NO — 1, 2, or 3 Months

A. Add 40 to the last value of Average Working Main Stations in Col. 3

last Avg. W + 40 = _____

B. Subtract 20 from Predicted Main Stations (Step 1)

Predicted Main Stations − 20 = _____

C. Find the average of last Average Working Main Stations (Col. 3) and Predicted Main Stations (see Step 1)

(last Avg. W + P) ÷ 2

(_____ + _____) ÷ 2

_____ ÷ 2

= _____

(Round to nearest whole No.)

The Allowed Main Stations is equal to the lowest among these three numbers.

Allowed Main Stations = _____

Note 1:
If the Allowed Main Stations are less than or equal to the Average Working Main Stations for Month 4, the SLM is fully loaded with Allowed Main Stations and the Weekly peak load readings may be discontinued.

Note 2:
The value of the number of Allowed Main Stations determines the number of Main Stations to which this SLM can be loaded until another months' reading is available, and the number of Allowed Main Stations is recalculated.

REFERENCE: DFMP DIVISION H SECTION 15b(2)

PREPARED BY: | DATE:

FIGURE-2

SUBSCRIBER LOOP MULTIPLEXER
4-MONTH SUMMARY

FORM E-6342
(11-73)

OFFICE: | SLM NO.:

LOCATION:

	(1) Date End of Month	(2) Estimated Main Stations = E	(3) Average Working Main Stations = W	(4) (Col. 2) x (Col. 3)
Month 1	7-31-72	95	68	6460
Month 2	8-28-72	105	72	7560
Month 3				
Month 4				
Sum →			140	14020

Step 1. Calculate Predicted Main Stations

Predicted Main Stations = (Sum Col. 4) ÷ (Sum Col. 3)

Predicted Main Stations = _____ ÷ _____

Predicted Main Stations = _____

(Round to nearest whole No.)

Step 2. Calculate Allowed Main Stations

Do you have values for all 4 months?

YES — all 4 months

A. Add 40 to the last value of Average Working Main Stations in Col. 3.

last Avg. W + 40 = _____

B. From Step 1, Predicted Main Stations = _____

The Allowed Main Stations is equal to the lower of these two values

Allowed Main Stations = _____

NO — 1, 2, or 3 Months

A. Add 40 to the last value of Average Working Main Stations in Col. 3

last Avg. W + 40 = 112

B. Subtract 20 from Predicted Main Stations (Step 1)

Predicted Main Stations − 20 = 80

C. Find the average of last Average Working Main Stations (Col. 3) and Predicted Main Stations (see Step 1)

(last Avg. W + P) ÷ 2

(72 + 100) ÷ 2

172 ÷ 2

= 86

(Round to nearest whole No.)

The Allowed Main Stations is equal to the lowest among these three numbers.

Allowed Main Stations = 80

Note 1:
If the Allowed Main Stations are less than or equal to the Average Working Main Stations for Month 4, the SLM is fully loaded with Allowed Main Stations and the Weekly peak load readings may be discontinued.

Note 2:
The value of the number of Allowed Main Stations determines the number of Main Stations to which this SLM can be loaded until another months' reading is available, and the number of Allowed Main Stations is recalculated.

REFERENCE: DFMP DIVISION H SECTION 15b(2)

PREPARED BY: | DATE:

FIGURE-3

SUBSCRIBER LOOP MULTIPLEXER
WEEKLY ALL CHANNELS BUSY RECORD

FORM E-6343
(11-73)

OFFICE: 532 | SLM NO: 01

LOCATION: MAIN ST. BUILDING

- From previous E-6343, copy all weeks since the process was last in state O.
- If the ACB reading is greater or equal to 3, the mark (X) is moved one block to the right. Otherwise it is moved one block to the left or stays in state O.

(1) DATE	(2) STATE				(3) ACB READING	(4) COPY (3) IF ACB IS GREATER THAN OR EQUAL TO 3
	0	1	2	3*		
2-5-73	X				0	–
2-12-73		X			4	4
2-19-73	X				2	–
2-26-73		X			12	12
3-5-73			X		6	6
3-12-73		X			0	–
3-19-73	X				1	–
3-26-73	X				0	–
4-2-73		X			3	3
4-9-73			X		15	15
4-16-73		X			1	–
4-23-13			X		6	6
4-30-73				X	8	8

*If process goes to state 3 the SLM is overloaded.

Add all entries in Column (4) since process was last in state O.	Total = 32
Number of entries in Column (4) since process was last in State 0.	No. = 4
Total ÷ No. = Mean	32 ÷ 4 = Mean = 8

Note: If the mean is less than 25, that number is approximately the percentage of load that should be removed.

REFERENCE: DFMP DIVISION H SECTION 15b(2)

PREPARED BY: | DATE:

FIGURE-4

APPENDIX

CHART 1-70

70 WORKING MAIN-STATIONS

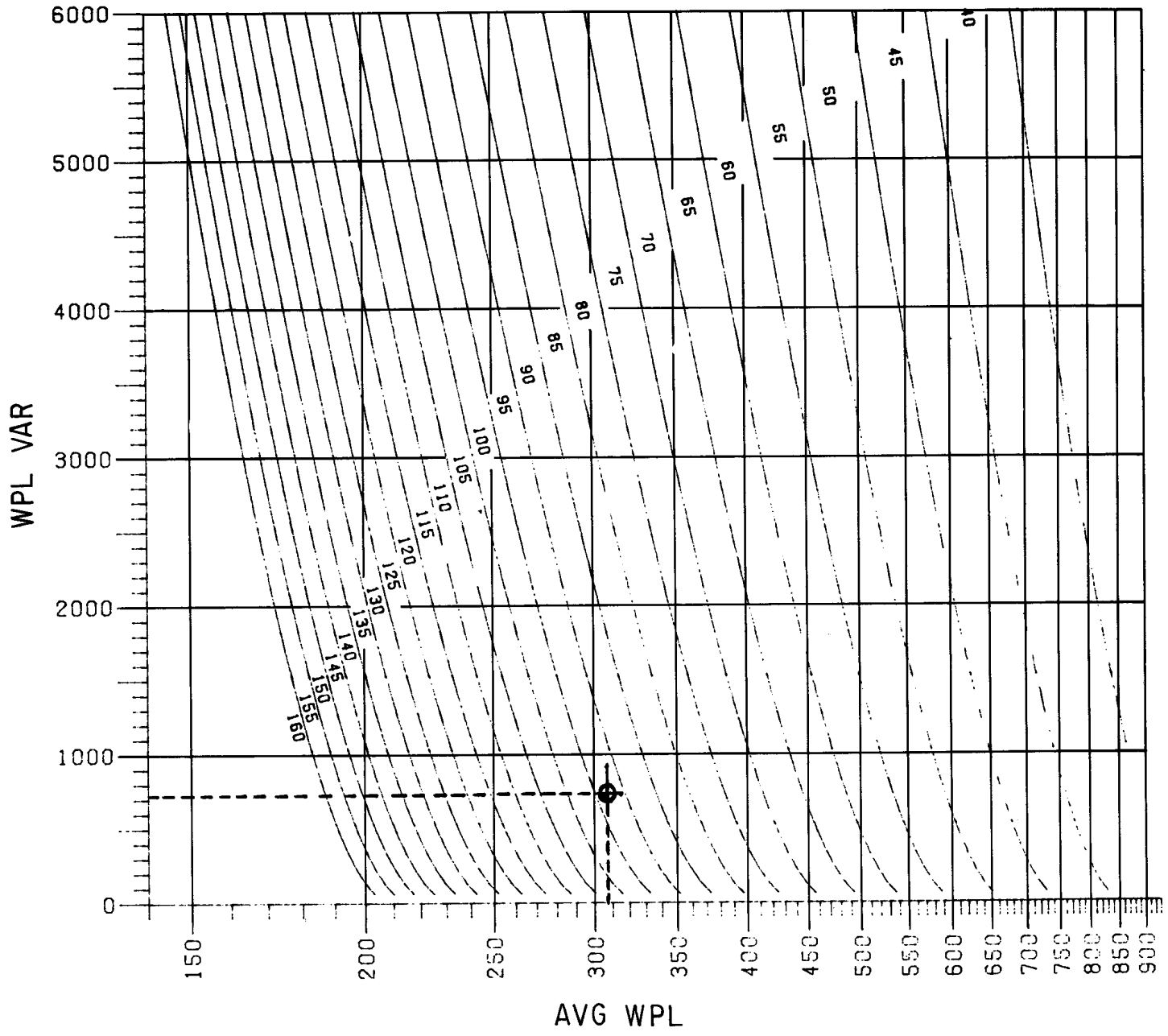

CHART 1 - 40

40 WORKING MAIN-STATIONS

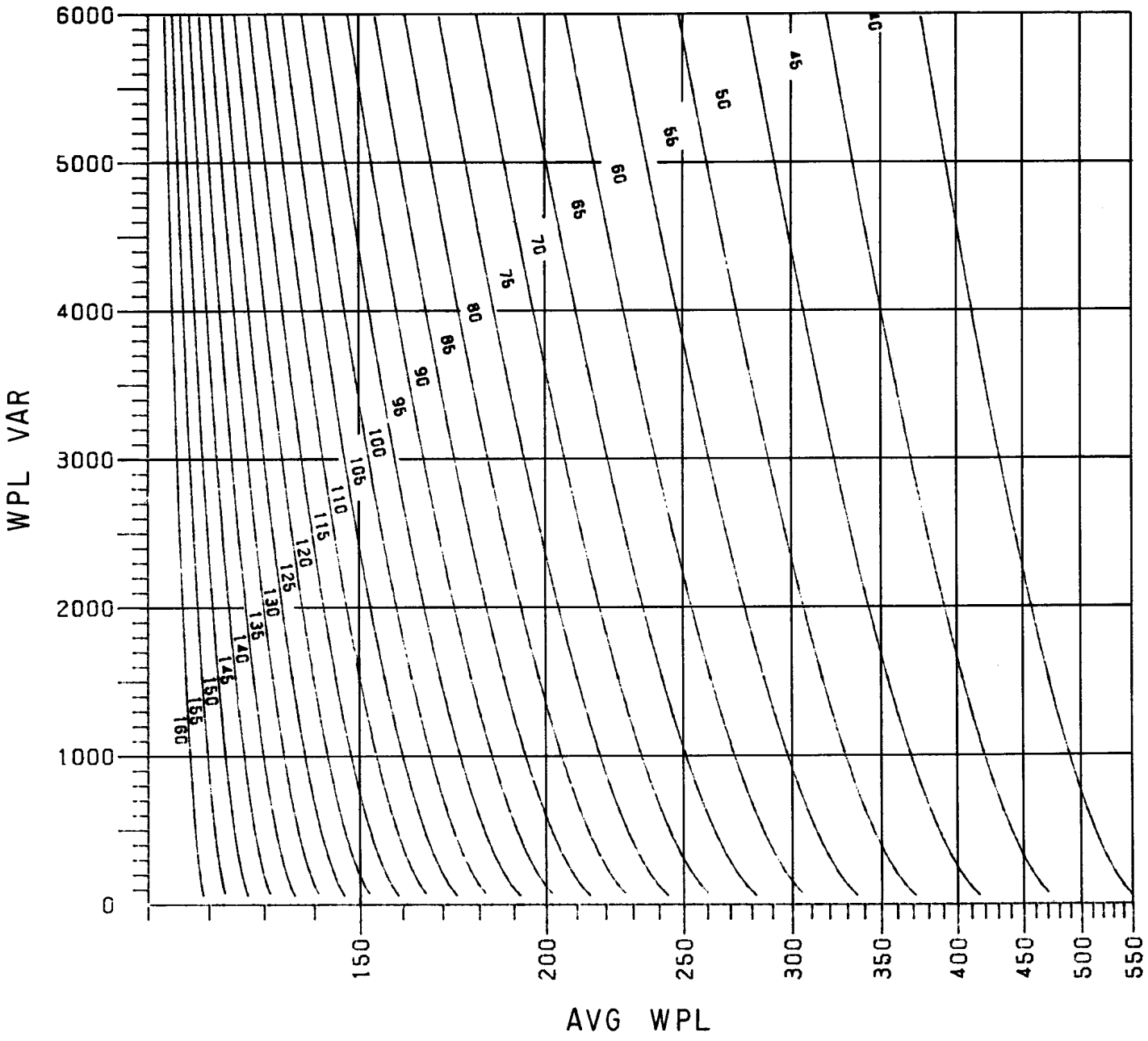

CHART 1-50

50 WORKING MAIN-STATIONS

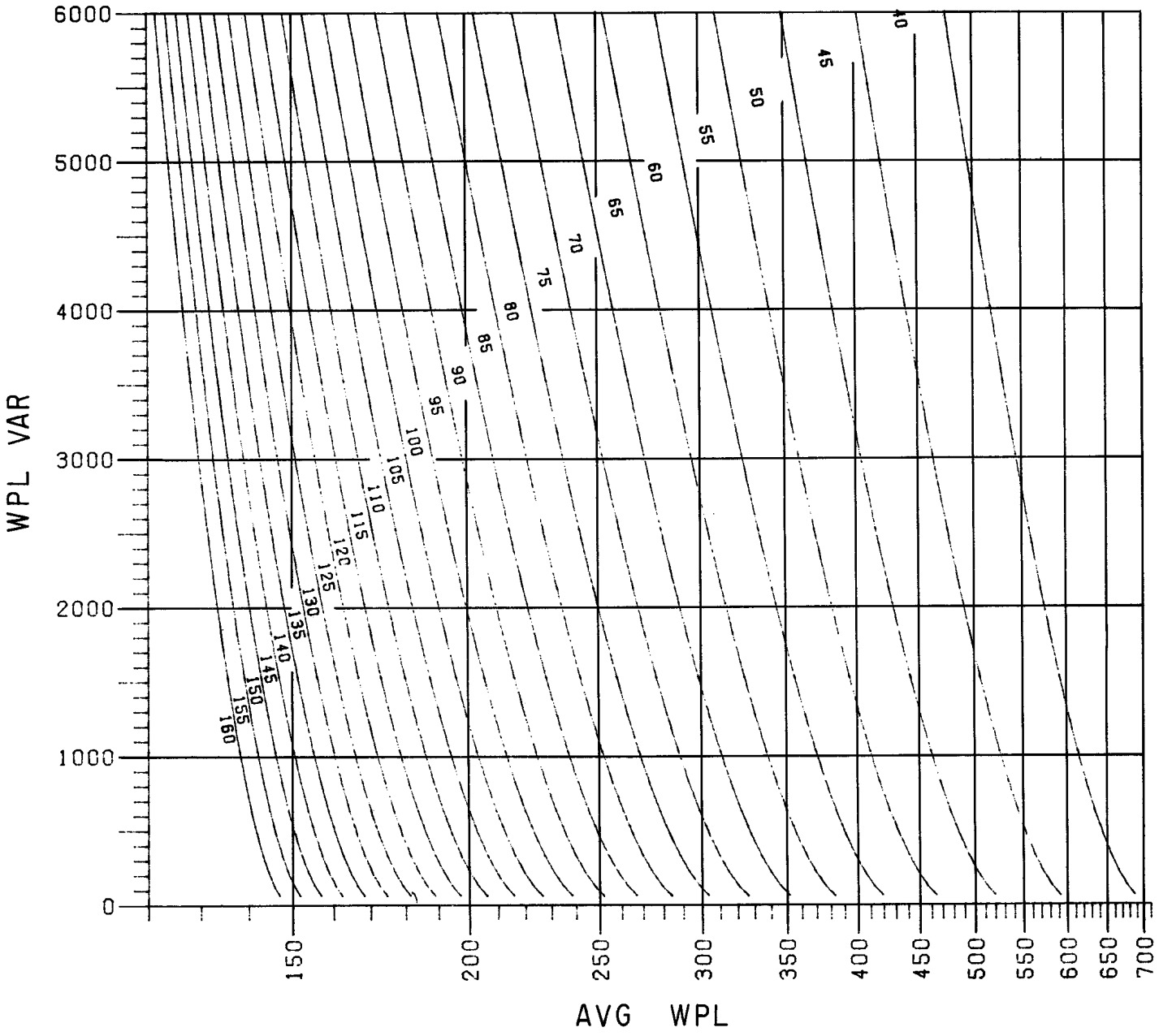

CHART 1 - 60
60 WORKING MAIN-STATIONS

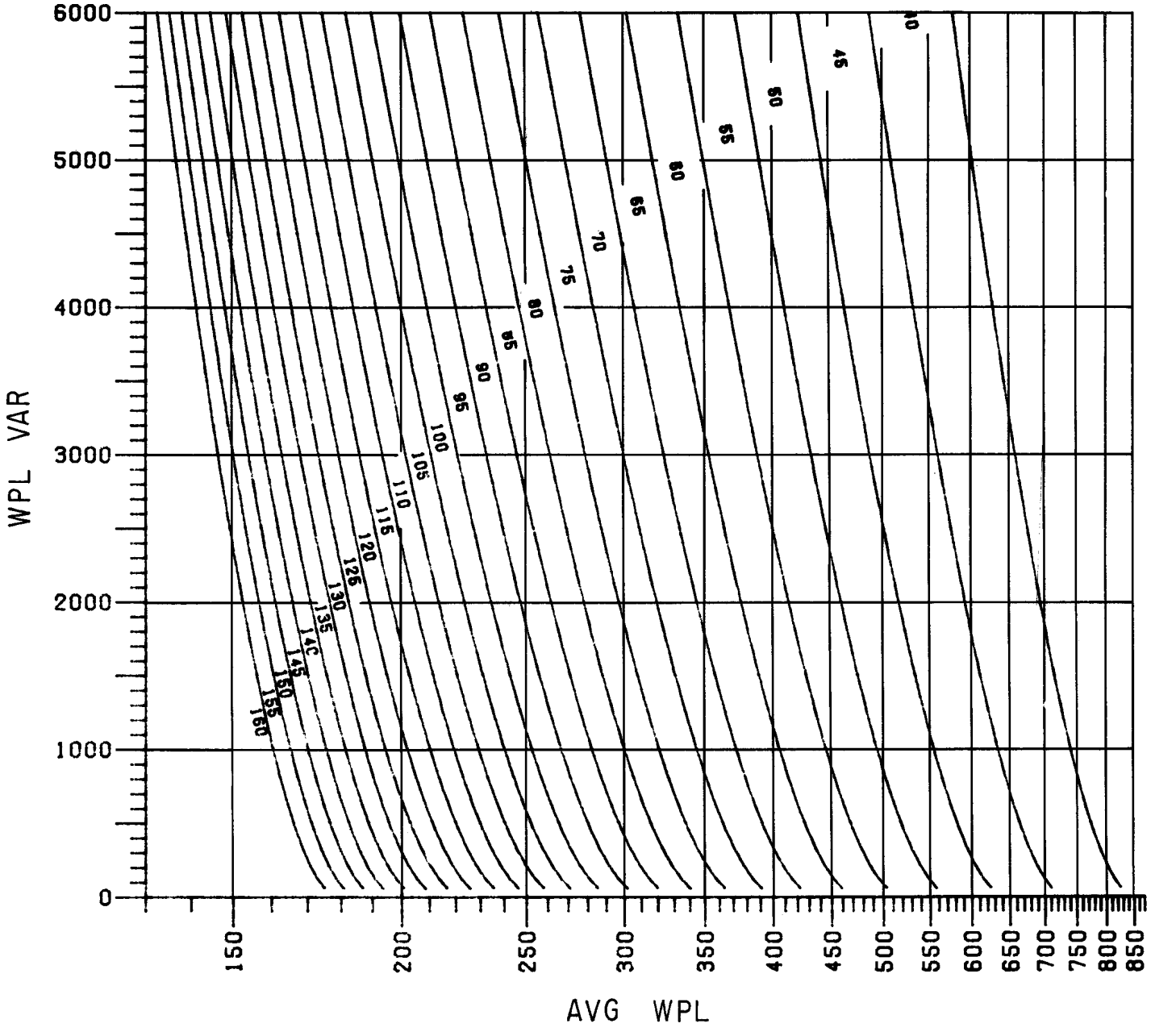

CHART 1 - 70

70 WORKING MAIN-STATIONS

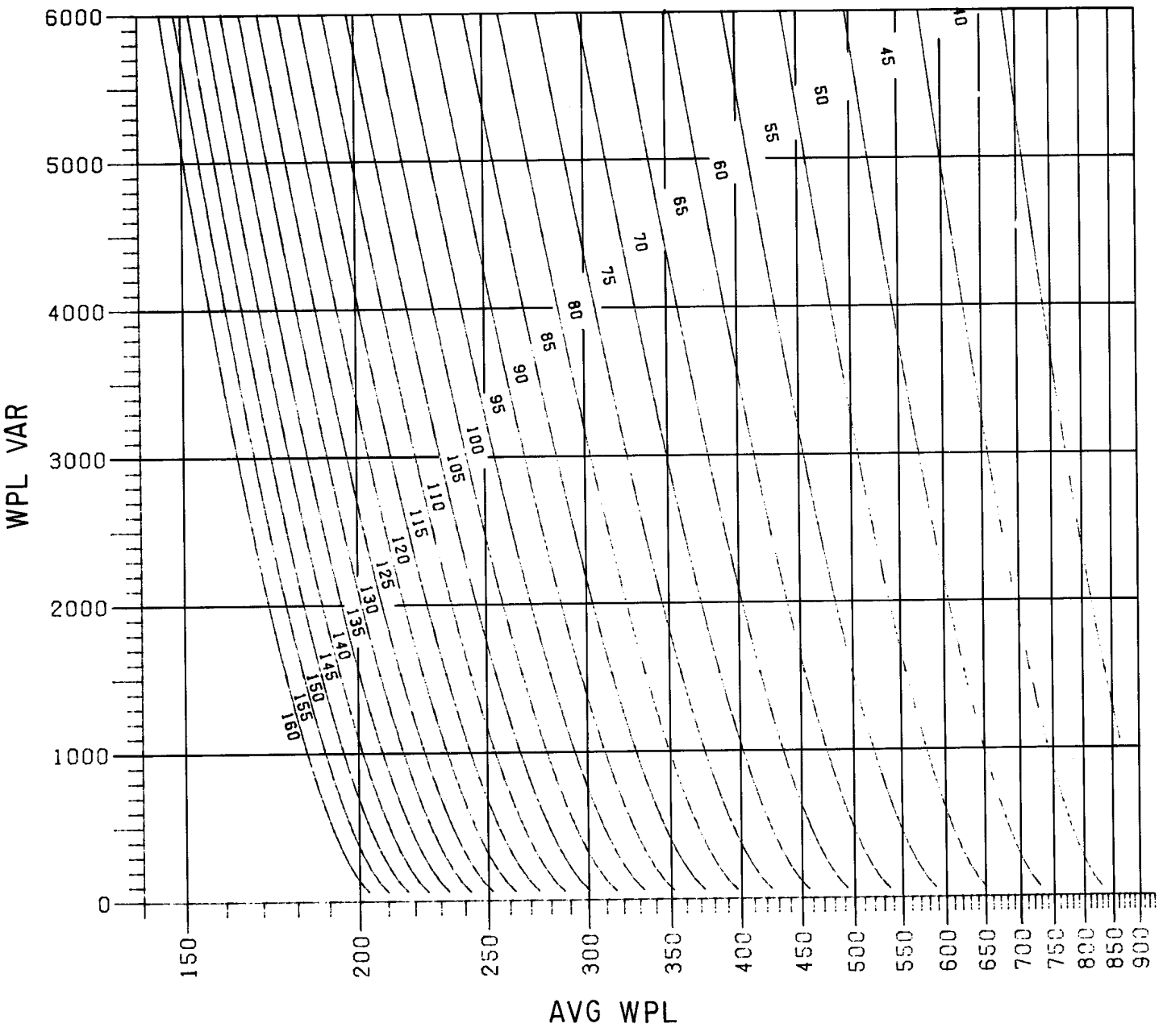

CHART 1-80

80 WORKING MAIN-STATIONS

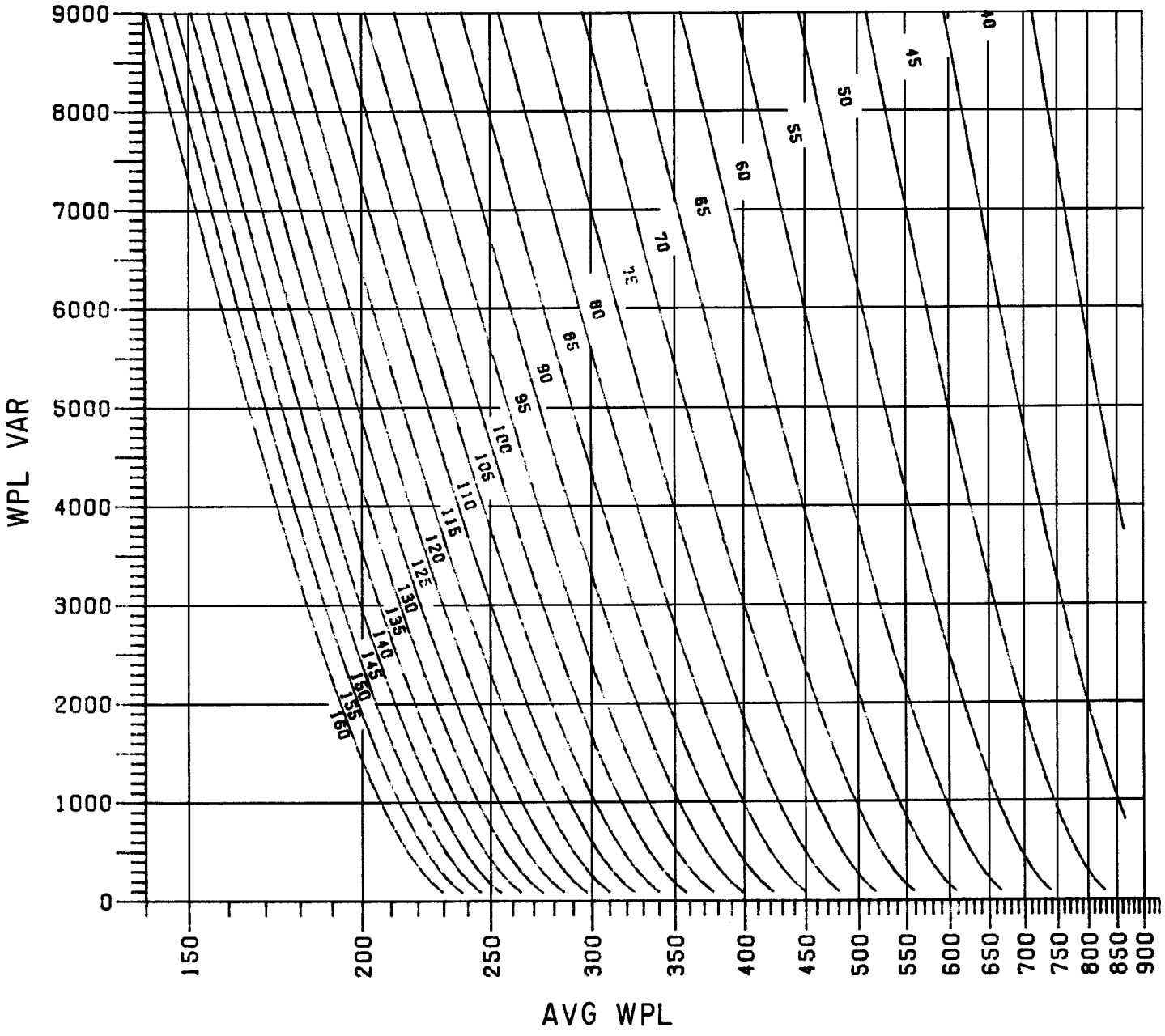

CHART 1-90
90 WORKING MAIN-STATIONS

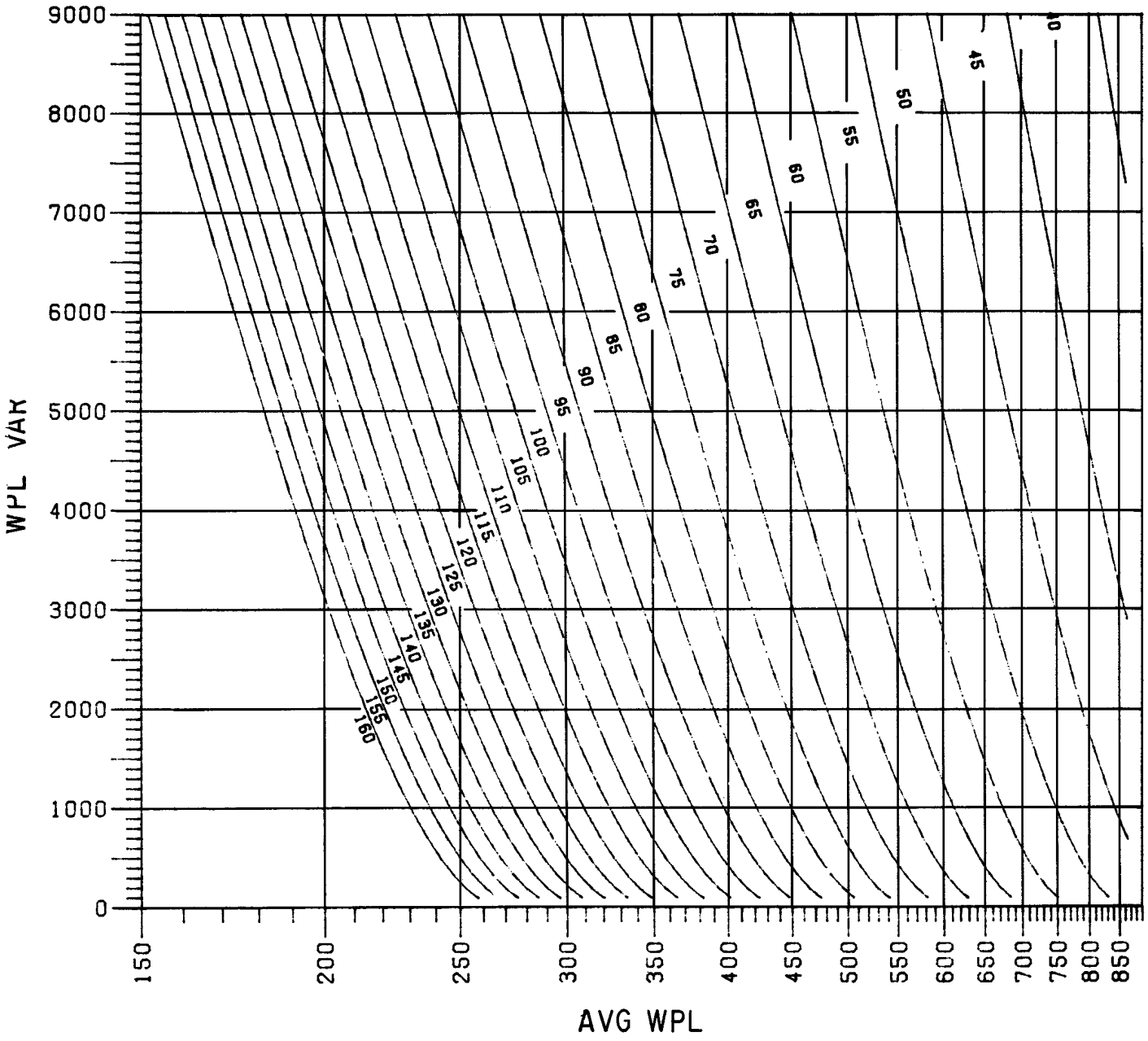

CHART 1-100
100 WORKING MAIN-STATIONS

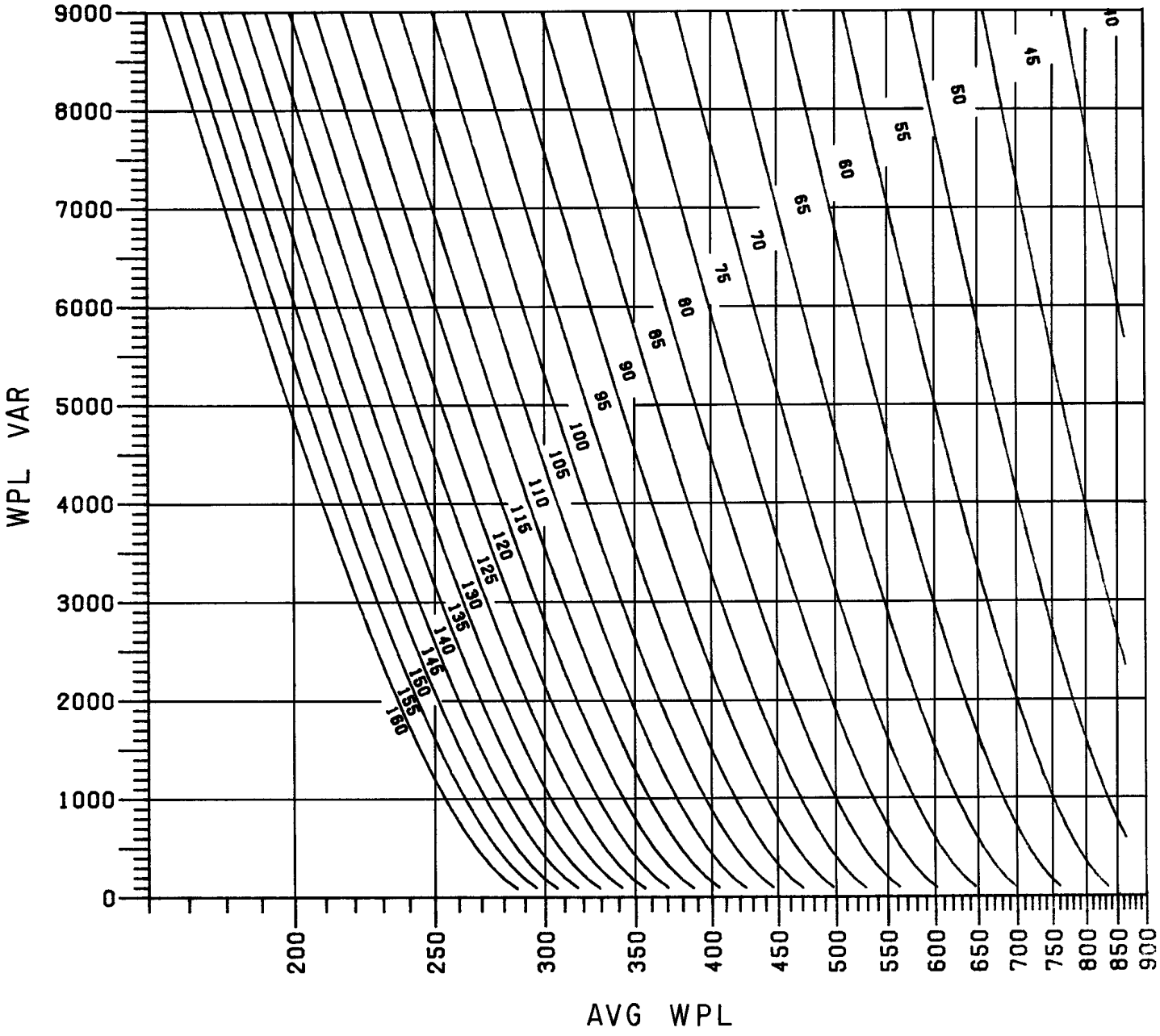

CHART 1-110

110 WORKING MAIN-STATIONS

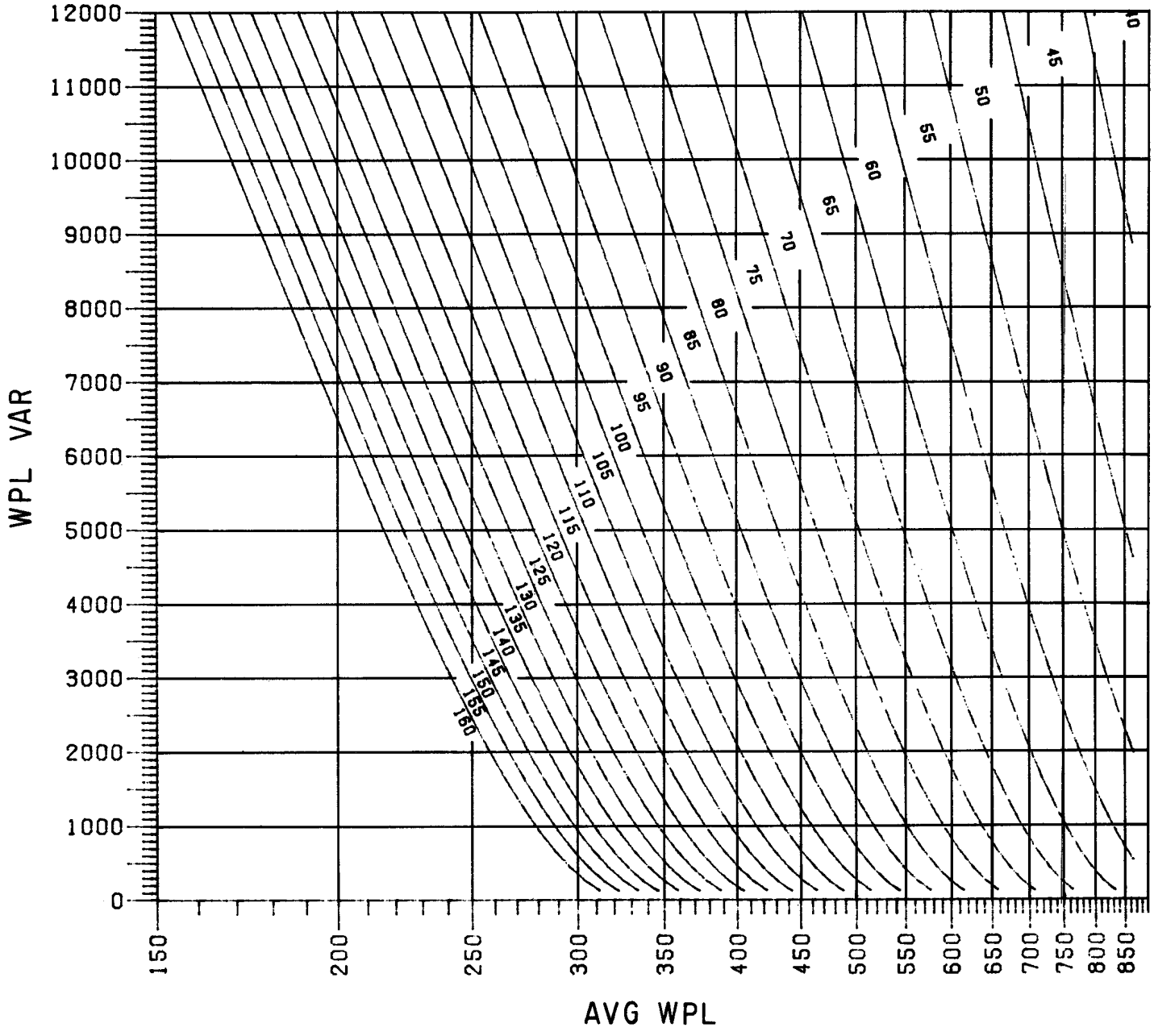

CHART 1-120
120 WORKING MAIN-STATIONS

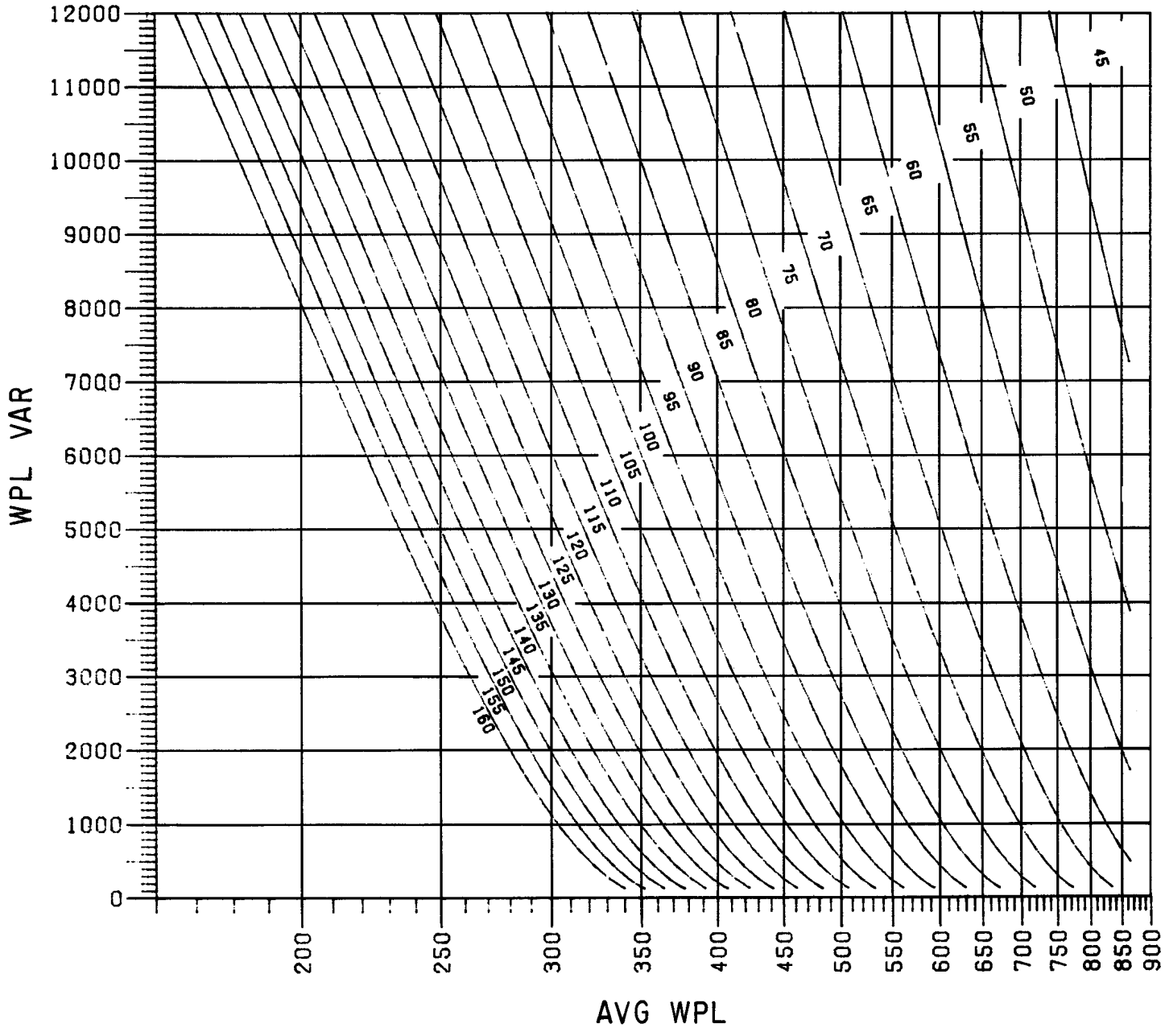

CHART 1-130

130 WORKING MAIN-STATIONS

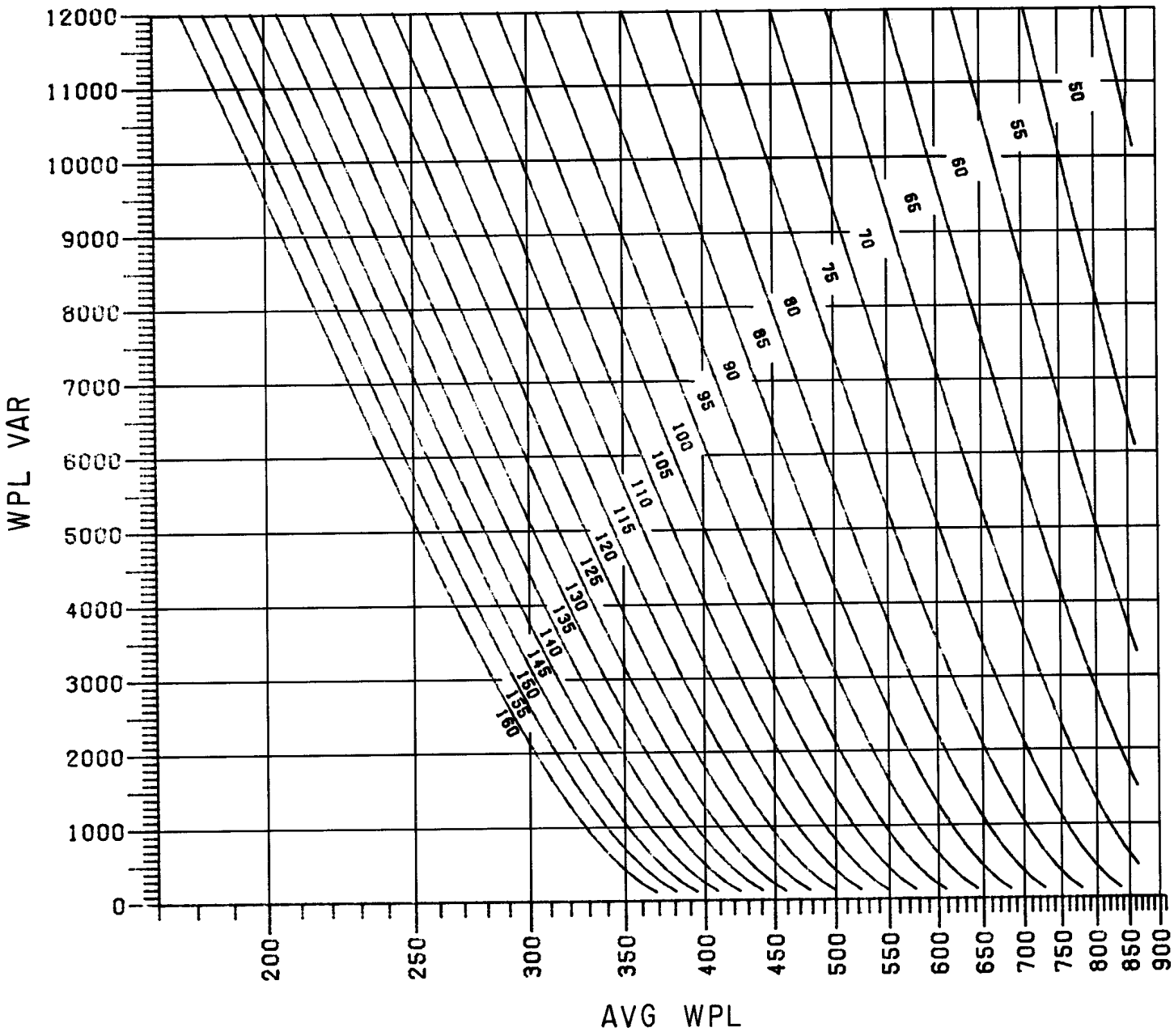

CHART 1-140

140 WORKING MAIN-STATIONS

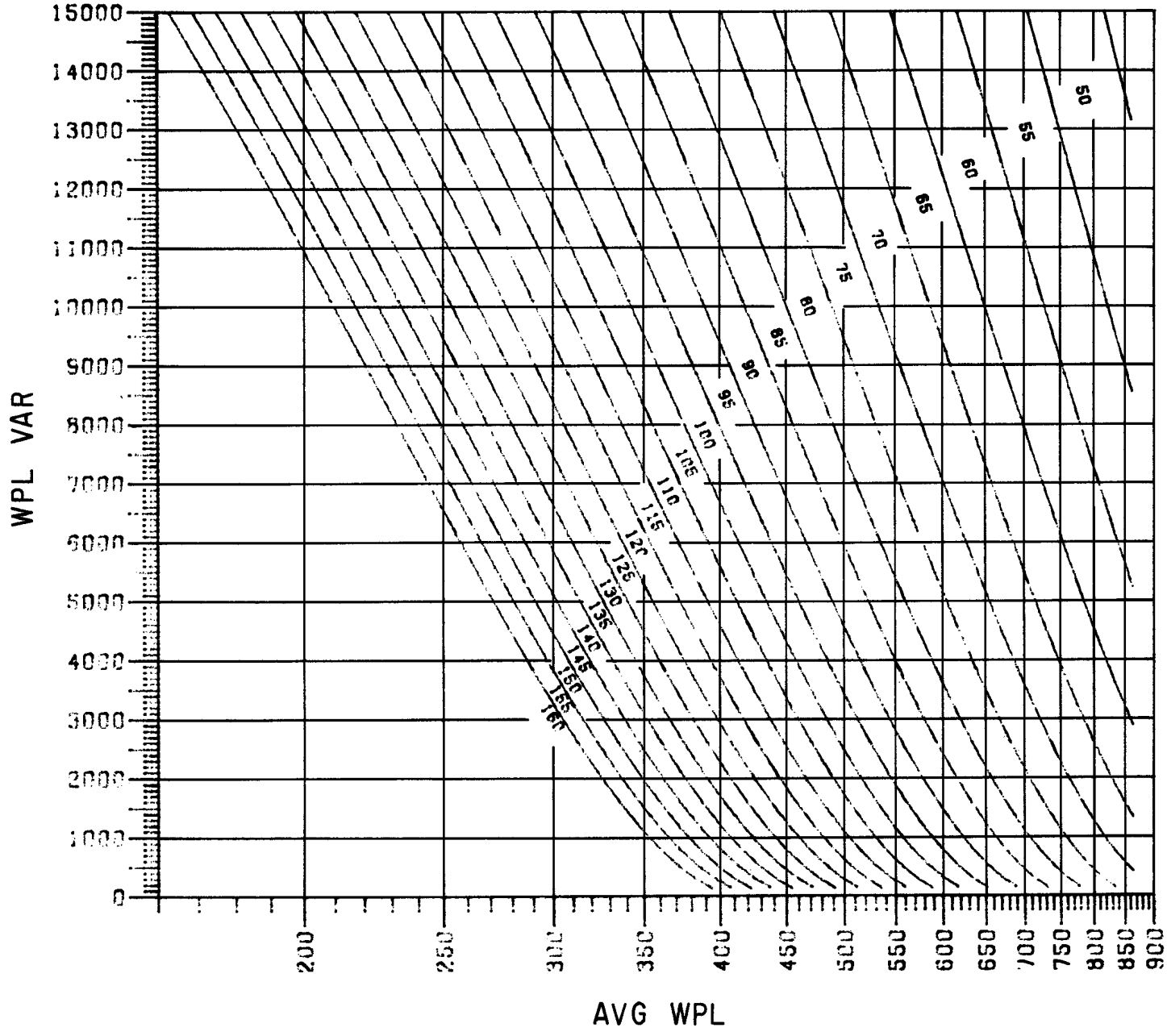

CHART 1 - 150
150 WORKING MAIN-STATIONS

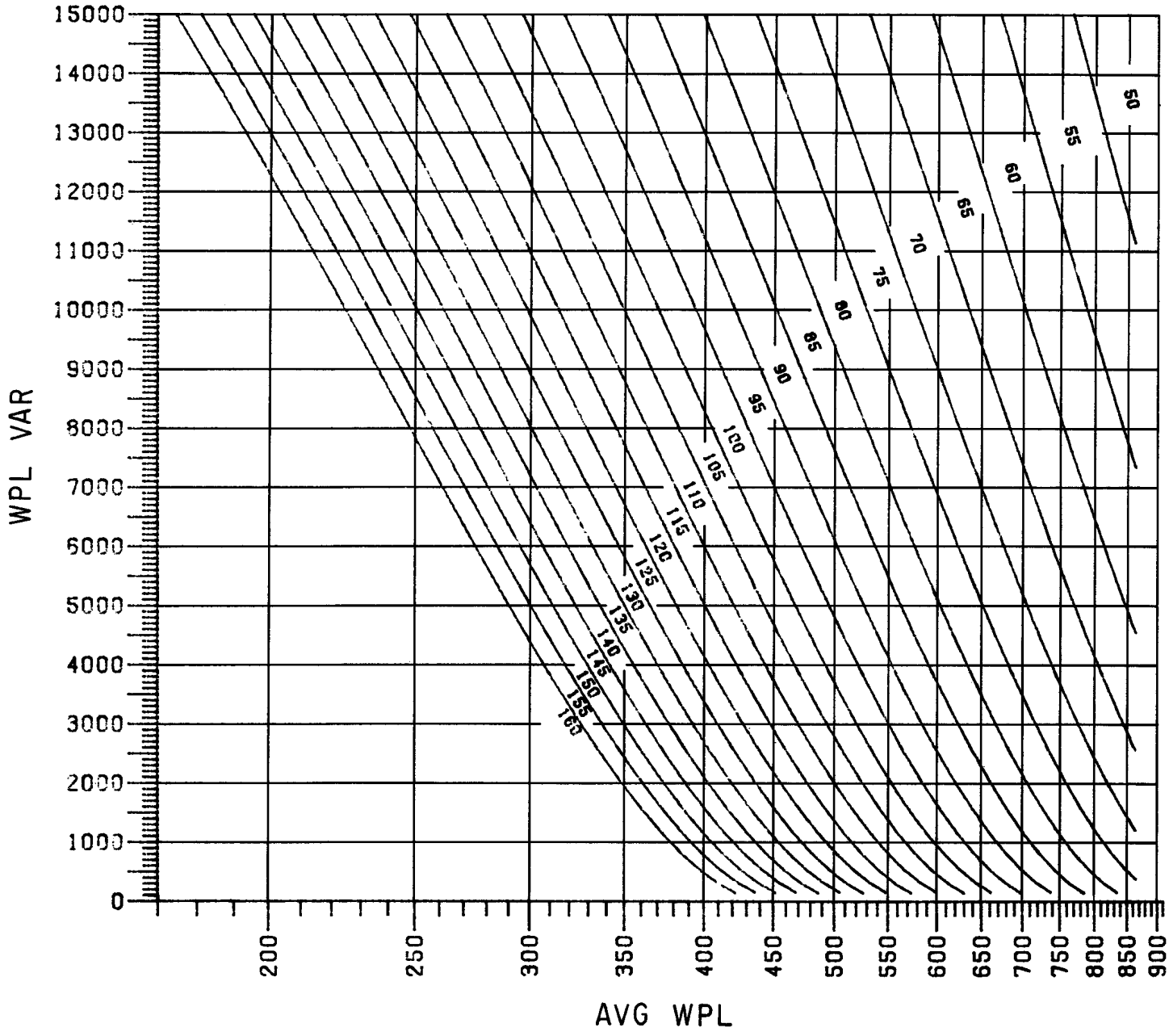

CHART 1 - 160

160 WORKING MAIN-STATIONS