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ACTIVITY OF IRRADIATED REGULAR METAL IN BUCKETS

Raymond H. Smith
Manufacturing Section
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ACTIVITY OF IRRADIATED REGULAR METAL IN BUCKETS

INTRODUCTION

The potential of shipping a bucket of metal that has not had sufficient decay time is a common problem to all Reactor Processing Operations. The only method at present to assure shipping adequately decayed metal is by procedural control.

This study was performed to determine the feasibility of establishing decay time for irradiated metal in buckets by radiation activity measurements.

SUMMARY

As a result of the photon attenuation in the shielding of the shipping casks, it was determined that activity measurements could only be obtained prior to cask loading.

The activity measurements obtained for the study were from a minimum number of buckets; however, it appears that a simple method is available to determine irradiated metal decay time prior to shipping.

The measurements are not a positive means of determining exact decay time, but they will provide a "warning flag" to further investigate the shipment and verify that the decay time has been adequate.

MEASUREMENT METHODS

All measurements were obtained in the vicinity of the transfer area pits to reduce the activity background from other metal in buckets. The buckets measured contained 240 pieces.

A total of three different methods was used to obtain the activity measurements shown in the attached charts.

The measurements obtained in Chart I were made with a logarithmic picoammeter connected to an ion chamber inside a sealed process tube. The tube containing the chamber was placed directly over the bucket with the chamber one foot from the metal. As shown by the chart, the activity curve tends to flatten at about 110 days decay time.

The measurements shown in Chart II were obtained with a high range TP meter. The ion chamber was encased in a piece of metal pipe approximately 16 inches in length. As a result of the range of the instrument, the measurements were taken with the chamber two feet from the top of the bucket.

The activity curve becomes flat at approximately 105 days. The portion of the curve tends to flatten more from the difficulty of reading the meter at this range than from the activity of the metal.

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Chart III shows the measurements obtained with a high range TP meter. The ion chamber was placed in the end of a sealed tube to obtain approximately a 23 foot air column from the bucket to the chamber.

This method permits all instrumentation to be located above the water surface and reduces length of cable required for the chamber. The curve becomes flat here at about 80 days. This flattening is primarily a result of the difficulty of reading the meter at this range.

DISCUSSION

The activity measurement methods which have been described will not provide exact determinations of decay time for regular metal. Each of the methods, however, will provide another check point to supplement the approved procedures for handling and shipping irradiated metal in buckets. When any bucket appears to have a high activity compared to the established curve, it will provide a signal for the Processing Supervisor to investigate the shipment.

The methods discussed in Charts II and III can easily be placed in use since each area has the instrumentation and rejected process tubes are available.

Measurements of the type made for Chart III could be more easily determined in these ranges using a low range TP instrument or a CP instrument chamber centered in a fixed bracket over the open end of the process tube. The methods using a process tube as an air column would require a shielding piece for the open end of the tube when not in use.

RECOMMENDATIONS

1. Each Reactor Processing Operation should adopt one of the methods discussed, based on available equipment and instrumentation.

2. Each Reactor Processing Operation should obtain activity measurements on several buckets of metal with various ages and establish a decay curve for their use. The use of this measurement method should be included in the metal handling and shipping procedure.

3. The curve established by each operation relating activity to decay time should be classified and filed for reference. The chart for use with the instrument at the transfer area should show only a scale for activity with a designated alarm point for investigating the shipment.

ACKNOWLEDGEMENTS

The author gratefully acknowledges the assistance of M. L. Smith, T. H. Essig, R. A. Winship, and the Processing Operations personnel in obtaining these activity measurements.

Raymond H. Smith

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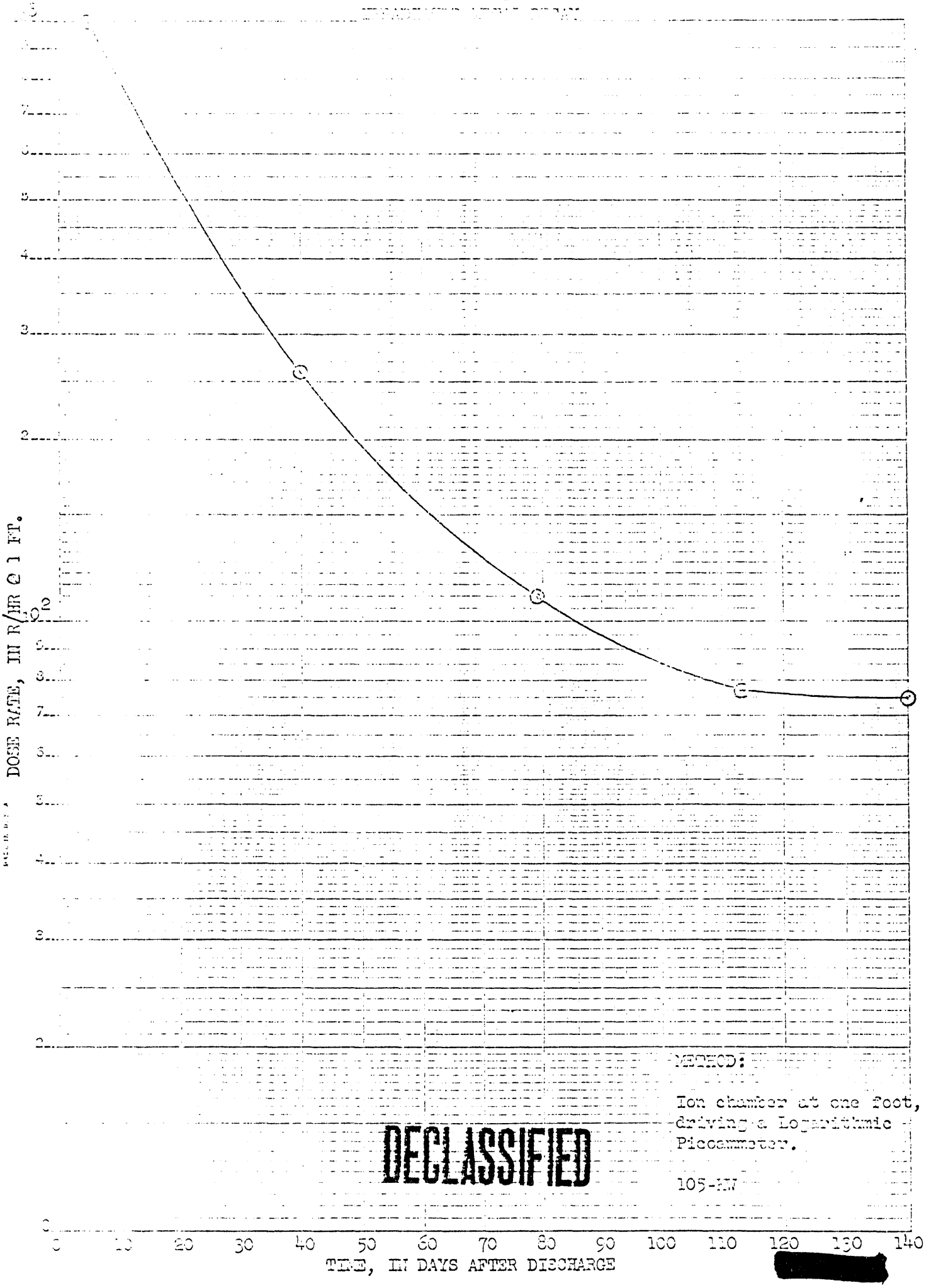
CHART I



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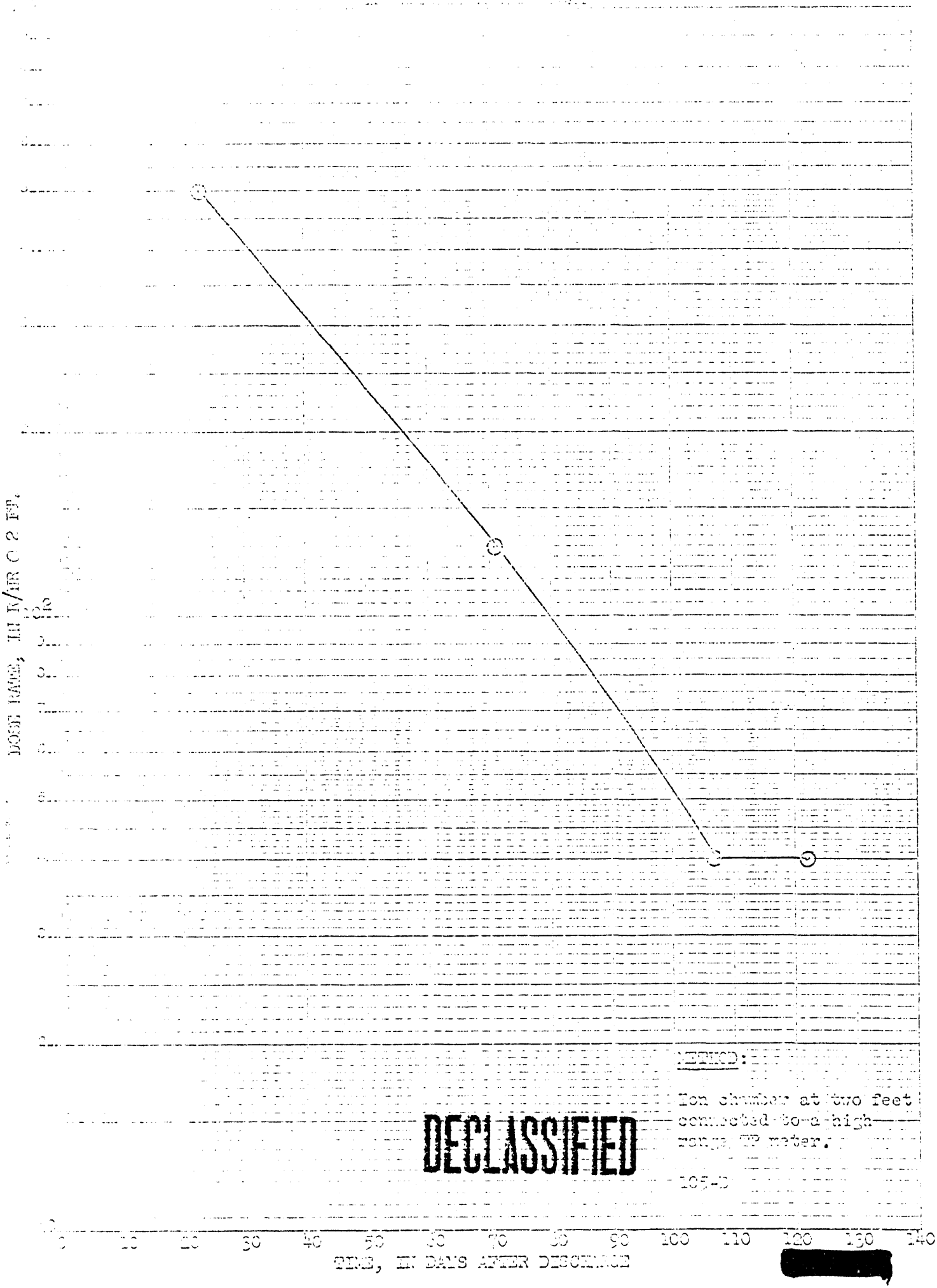

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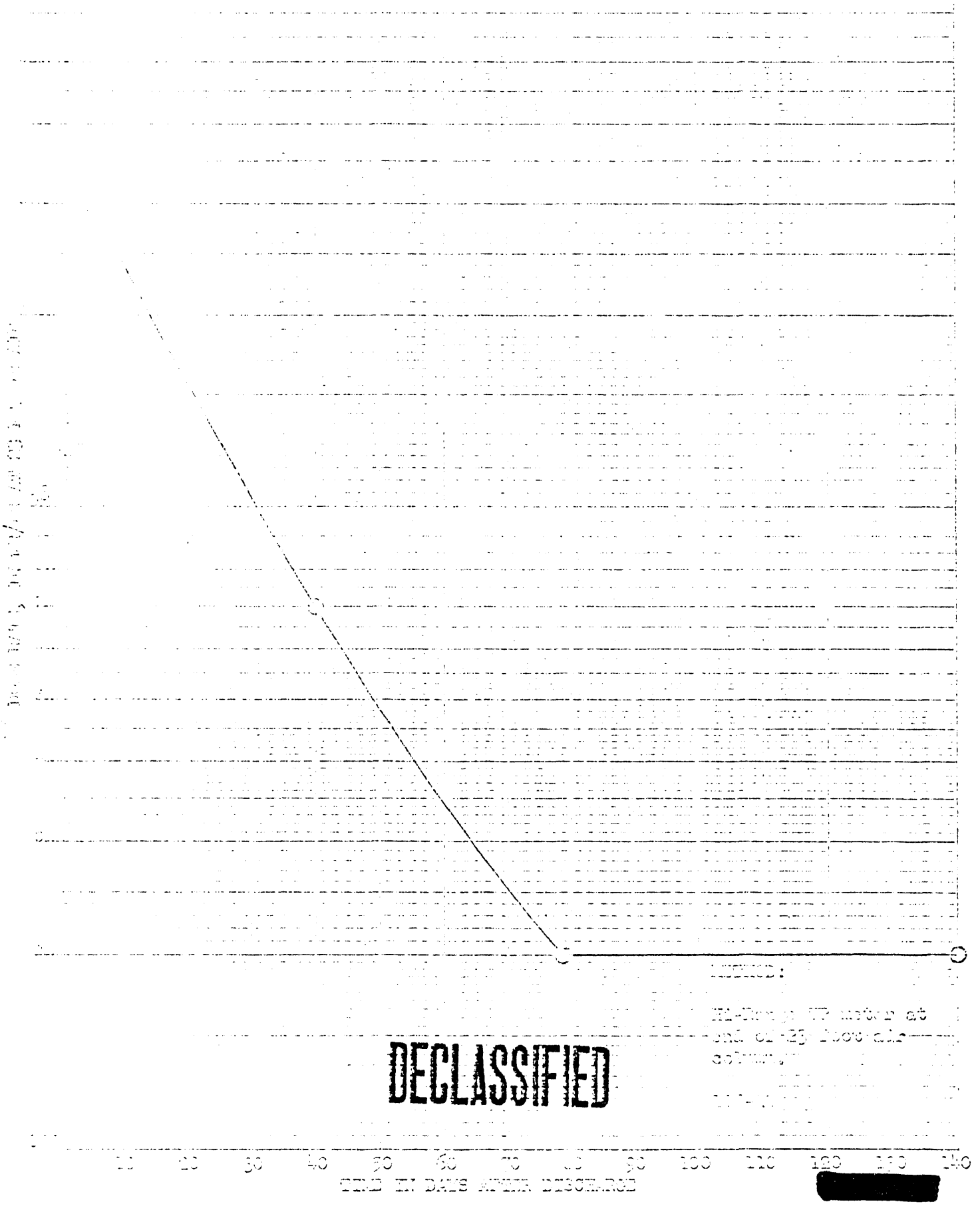

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