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105-F INTERMEDIATE RANGE TEST HOLE PARAMETERS

by

G. L. Erickson

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105-F INTERMEDIATE RANGE

TEST HOLE PARAMETERS

INTRODUCTION

The 105 intermediate range test hole was bored in 105-F to demonstrate reactor hole boring techniques. This test hole was then utilized to (1) determine the performance of neutron sensitive gamma compensated ion chambers (CIC), (2) the effectiveness of epoxy reactor shield plug designs, (3) the compatibility of the prototype components intermediate range instrumentation, and (4) demonstrate the performance of an intermediate range monitor system on a typical Hanford reactor application. The results of these objectives are documented in HW-83252.

In the process of determining the above information, the following physical, nuclear, gamma, and temperature data was recorded as related to the 105-F intermediate range monitor test hole.

DATA PRESENTATION

The 105-F intermediate range monitoring test hole is located at an elevation of 11 feet, 8-7/16 inches and 13-1/8 inches upstream of reactor center line on the far side.⁽¹⁾ Figure 1⁽²⁾ shows the cross section of the 105-F intermediate range monitoring test hole.

Figure 2 shows the dimensions of the finished Thimble which provide the reactor gas seal, the epoxy ion reactor shield plug (RSP), the relative position of the RSP in the reactor side shield, and the fully inserted positions of the Westinghouse WX30110 CIC and 20th Century Electronics Ltd. RC6/EB/H180 CIC.

Curve B Graph 1 shows neutron chamber current as a function of the distance of the active chamber volume center from the reactor skin. This data was taken at equilibrium power level (EPL) by withdrawing the chamber in 2-inch increments from the fully inserted position. The chamber current measurements were made with a linear picoammeter (Keithly Model 409). Measurements were made to insure the neutron sensitive chamber was fully saturated for this data. A 20th Century Ltd. RC6/EB/H180 CIC which has a thermal neutron sensitivity of 2.0×10^{-14} amperes/neutron/cm²/sec, was used for this measurement.

Curve A Graph 1 shows the DR Octant Neutron Chamber current in the 105-DR, 3B Octant hole as a function of distance from the reactor skin to the center of the active chamber volume as reported by R. R. Cone.⁽³⁾

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The neutron sensitivity of the DR Octant chamber used is nominally 1.5×10^{-14} amperes/neutron/cm²/sec.

Curves A and B show a similarity in thermal neutron flux gradient between the two reactors.

Both 105-F and 105-DR have similar reactor shield structures but were operating at different EPL.

Graph 2 shows the CIC gamma volume chamber current as a function of the distance of the active chamber volume center from the reactor skin. It is believed that a sufficiently high negative chamber polarizing voltage (-300) was used to insure the gamma volume was saturated; however, no confirming data was taken. The gamma volume sensitivity of the 20th Century Ltd. CIC is stated by the manufacturer to be 5.5×10^{-12} amperes/R/hr. This data was taken at EPL by withdrawing the CIC in 2-inch increments from the fully inserted position.

Graph 3 shows the chamber current of a small gamma sensitive chamber as a function of the distance of the active volume center from the reactor skin. The data for this graph was taken nominally 45 hours after reactor shutdown with a 1-inch diameter by 1-inch long ion chamber having a gamma sensitivity of 6.13×10^{-12} amperes/R/hr. Measurements were taken which showed the chamber to be fully saturated during all measurements taken.

The following temperatures were recorded during equilibrium power level conditions (December, 1963) from thermocouples mounted on the nose and connector of the Westinghouse WX30110 CIC when fully inserted in the 105-F IMRM test hole.

Distance From Reactor Skin To Thermocouple	Temperature
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36-1/4"	155° F
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50"	183° F
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1. PT-IP-624-CE, "F Reactor Installation and Test of an Intermediate Range Nuclear Monitor", W. H. Clemans, G. L. Erickson, W. L. Stiede, 9-25-63.
2. Final Report B, D, F Reactor Side Shield Hole Boring Technology, W. H. Clemans, 2-3-64.
3. HWN-2536 Personal Notes: Instrument Development Lab Record Book, page 39.

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1817 16 1514 13 1211 10 98 7 65 4 32 1 0

FIGURE 1

INTERMEDIATE RANGE NUCLEAR MONITORING STEEP PLUG HOLE CROSS SECTION

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FIGURE 2

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