

UNITED STATES
ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

TELEPHONE
(312) 858-2660

June 22, 1971

Gen W. Roy, Chief, Materials and Fuel Facilities Branch
Division of Compliance, Headquarters

INSPECTION REPORT - MALLINCKRODT CHEMICAL WORKS, MALLINCKRODT/NUCLEAR
ST. LOUIS, MISSOURI - LICENSE NO. 24-04206-01

Enclosed is a report of an inspection of the byproduct material program conducted by the subject licensee under License No. 24-04206-01. The announced inspection was conducted on May 10-14, 1971.

The enclosed inspection report sets forth a total of four items of noncompliance. These items concern excessive radiation levels in unrestricted areas, failure to perform air surveys, in all cases, to determine compliance with 10 CFR 20.103(a) and 10 CFR 20.106(a), and inadequate surveys to determine compliance with 10 CFR 20.105.

As part of the Commission's independent measurement program, the TLD station located on the roof of an unrestricted building across a driveway north of the licensee's facilities showed a measurement of 536 millirads during the period April 11 through May 11, 1970. This is an average of 0.75 millirad/hr for the entire 30-day period. Following this measurement, no excessive radiation levels were detected at the TLD station until the period December 29, 1970 to February 6, 1971 when 1212 millirads were measured, which is a repeat item of noncompliance with 10 CFR 20.105(b)(2). As part of their own evaluation of this problem, the licensee began their own TLD measurements on the subject roof area beginning December 28, 1970. For the period December 28, 1970 through February 8, 1971, the licensee's TLD measurements show 1180 millirads which compares to the Commission's data for the same period. The licensee's TLD data is broken down into weekly periods and shows a measurement of 510 millirads for the week of January 4 through 11, 1971 and 560 millirads for the week of January 11 through 18, 1971. During this inspection, the licensee advised that there was no known unusual occurrence during the week of January 4 which they could contribute to the 510 millirad reading. As a result, the licensee is being cited for failure to perform adequate radiation level surveys to determine compliance with 10 CFR 20.105(b)(2). The 560 millirads reading during the week of January 11 apparently was caused by a large quantity of molybdenum 99

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on the absolute filters resulting from a molybdenum 99 processing problem in the hot cell. This filter, reading 1 R/hr at the time of the incident, was changed and the licensee's TLD data for the week of January 13, 1971, showed a total of 25 millirad.

In the past year or so, the licensee has spent much time and effort in an attempt to reduce or eliminate this problem of excessive radiation levels in the unrestricted area noted above. At the present time no radioactive waste is being stored and handled in the open yard north of Building 100. New shielded waste handling and storage areas have been set up in a new Building 400 and the hot waste room in Building 100 is no longer used for the storage of high level waste. Also, the licensee has just completed plans and is about to begin an extensive roof modification on top of Building 100 which will include changing the air handling system of the hot cell and will also include lead shielding around the filter banks. These modifications are expected to be completed sometime during the Summer of 1971.

The dispensing lab in the new Building 300 began operation on January 11, 1971. No air sampling was performed in house or in the stack at that facility until the week of May 10, 1971. The licensee is therefore being cited for failure to perform air surveys to determine compliance with 10 CFR 20.103(a) and 10 CFR 20.106(a), respectively.

The licensee's Radiological Protection Committee gave its approval for the start up of the new dispensing lab although knowing the air sampling equipment for that facility was not yet operational. It is suggested that in the enforcement letter this be brought to the attention of licensee management as a matter of poor management control.

Two employees showed excessive extremity exposures during the second calendar quarter of 1970 according to film badge results. The licensee challenged the validity of these exposure results from several points of view. These included directionality effects, missing filters, and inaccuracies in evaluating film exposures resulting from low energy gamma. Ex 6

The first employee, [REDACTED] showed 22.83 rem. R. S. Landauer, the film badge supplier, agreed that one badge which was reported as 11.9 rem should have been about 5.0 rem. That subtraction plus one addition of 240 mrem which resulted from a reporting error gives a total reduction of 6.66 rem from the 22.83 rem, or a quarterly total of 16.17 rem for [REDACTED]. Please see Exhibit I, attached to the report details. We accept this total reduction as appropriate.

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The second employee [REDACTED] showed 19.17 rem. In this case Landauer felt the film badge readings were valid. As a result the licensee had their Radocon 555 recalibrated by Victoreen at low x-ray energies ranging from 32 Kev up to 660 Kev. The calibration curve supplied by Victoreen showed the relative response ranged between 0.94 and 1.06 of the actual radiation at these energies. With this information, the licensee exposed the recalibrated R-meter to mercury 197 sources in order to obtain the "true" exposure to Hg-197. As a result of this study, the licensee calculated the "corrected" exposure for the periods when pocket chamber and film badge data were available for [REDACTED] during the second quarter of 1970. These calculations and "corrected" exposures are shown on pages 2 and 3 of Exhibit J, attached to this report. Included as Exhibit B in the inspection report dated November 12, 1970, covering the inspection of this licensee conducted in October 1970, are the details of much of this study including [REDACTED] work assignment regarding Hg-197 during the second calendar quarter, 1970 and the results of test film exposure to Hg-197. En 6

The licensee was advised there are too many unknowns in the relationship between the results of randomly exposed test film badges and the actual movements of [REDACTED] wrist film badge and dosimeter to allow the exposure adjustments noted on pages 2 and 3 of Exhibit J in which an attempt was made to calculate "corrected" exposures from the wrist film badge total, as reported by Landauer, of 19.17 rem to 16.24 rem based on dosimeter data. Landauer made this adjustment at Mallinckrodt's request. (See Exhibit K.)

In a letter to Mallinckrodt dated September 28, 1970 (see Exhibit I), Landauer acknowledged that film badge results are normally $\pm 20\%$ of the actual exposure and that the set of test films exposed to 1520 mr from a Hg-197 source were "only" 10% high at 1710 mr average reading.

While the licensee's calculated reductions in [REDACTED] exposure do not appear to be justified, Region III feels that a 10% reduction is reasonable in view of the known Hg-197 work performed by [REDACTED] vs her wrist badge results during the 2nd quarter of 1970 (see Exhibit B-4 of November 12, 1970 inspection report), the results of the test film study noted above, and from a review of articles recently appearing in the Health Physics Journal regarding this subject in Volume 18, No. 1 January, 1970, pages 93 and 94 and Volume 18, No. 3, March, 1970, pages 289-293.

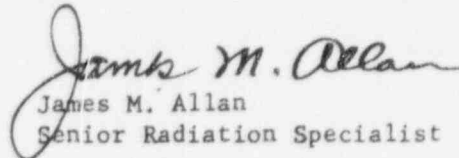
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The licensee advised he will, upon receipt of correspondence from the Commission regarding the results of this inspection, request Landauer to readjust [REDACTED] second calendar quarter of 1970 wrist badge exposure upwards from 16.24 rem (see Exhibit K) to 17.25 rem (a reduction of 10% from the originally reported 19.17 rem) and also will notify [REDACTED] accordingly. We recommend your enforcement letter take exception to the licensee's reduction from 19.17 rem to 16.24 and indicate that a reduction to 17.25 rem appears more appropriate based on their own studies and that of Landauer. Ex 6

It is suggested that any correspondence concerning the results of this inspection be directed to Mr. Norman E. Drissell, Director of Operations.


James M. Allan
Senior Radiation Specialist

CO:III:ECA

Enclosure:
Inspection Report (orig. & 2 cys)

cc: A. Giambusso, CO:HQ
L. Kornblith, CO:HQ
R. H. Engelken, CO:HQ

ROUTING SLIP

June 30, 1971

Buchanan
Brinkman
gen file

1. R. E. Cunningham, Acting Director
Division of Materials Licensing

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3. G. W. Roy, Chief, MFFB
Division of Compliance

The following Compliance inspection/investigation report is submitted
for your information:

Licensee: Mallinckrodt Chemical Works
Mallinckrodt/Nuclear
St. Louis, Missouri

License No: 24-4206-1

Date of Insp/Inv: May 10-14, 1971

G. W. Roy

G. W. Roy, Chief
Materials and Fuel Facilities Branch
Division of Compliance

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