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Title/Subject HEALTH PHYSICS ACTIVITIES FOR

DECEMBER 1948 -- S. Visner and C.L. Gritzner

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ACTIVITIES FOR DECEMBER 1947 -- S. Visner

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Document: # K-86/PT1; Date 11/14/47;

Title/Subject REPORT OF HEALTH PHYSICS ACTIVITIES

AT THE K-25 PLANT FOR OCTOBER 1947 -- S. Visner

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Title: "Report of Health Physics Activities at K-25 Plant for October, 1947,
December, 1947, May 1948, and December 1948"

Authors: S. Visner

Abstract: Early health physics monthly progress reports. These reports
include information on both effluent and environmental water
sampling data, material releases within buildings, room air sampling
data for chemicals, personnel monitoring data, and room air
monitoring data for radionuclides.

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tetrachloride, Nickel

yes, we have a copy.

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APPENDIX

Included herein are the following items which are pertinent to this report:

- I Table I -- Water Survey Program
- Table II -- Urine Analysis

- II Minutes of K-25 Special Hazards Committee Meeting --
October 31, 1947.

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Loam : New File : Health Physics

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This document consists of 24 pages, No. 2 of 50 Copies Series A and one Map.

Report Number: K-86

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CARBIDE AND CARBON CHEMICALS CORPORATION

REPORT OF HEALTH PHYSICS ACTIVITIES
AT K-25 PLANT

for
OCTOBER, 1947

Compiled by S. Visner

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Report Number: K-86
Date of Issue: November 14, 1947

Title: REPORT OF HEALTH PHYSICS
ACTIVITIES AT K-25 PLANT
FOR OCTOBER, 1947.

Author: S. Visner

CLINTON ENGINEER WORKS
CARBIDE AND CARBON CHEMICALS CORPORATION

ABSTRACT

Herein is presented the initial monthly report of Health Physics Activities in the K-25 Carbide and Carbon Chemicals Corporation Plant. Results on surveys, monitoring, and water sampling are reported. Development work on instruments and special problems are also presented.

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HEALTH PHYSICS REPORT
FOR OCTOBER, 1947

I. INTRODUCTION

Health Physics activities in the K-25 Plant are conducted by several groups coordinated by the K-25 Special Hazards Committee. Many of the procedures and policies on Health Physics are now being revised in light of newly available tolerance information and survey instruments. A system of taking and compiling radiation and contamination data is being worked out which will be more in accord with the objectives of the Health Physics program. It is therefore anticipated that information in subsequent reports will be more representative of all activities.

II. ORGANIZATION

The responsibility of administering the policies of the K-25 Plant pertaining to the protection of personnel from the potential radiation hazards inherent in the handling of uranium compounds rests with various groups.

These groups and their responsibilities with respect to Health Physics are as follows:

A. K-25 Special Hazards Committee

This Committee consists of the Plant Superintendent and the superintendents of all divisions of the plant concerned with radiation and critical mass problems and it formulates the policy on Special Hazards and Health Physics.

B. Responsibilities of the Division

It is the responsibility of each division to:

1. Maintain radiation and contamination levels within the established tolerance levels.
2. Formulate and administer within the divisions all rules and regulations required for each area or operation. Copies of rules and regulations applying to radioactivity hazards, are sent to the Health Physics Section.
3. To take whatever measurements are required both for the purpose of determining radiation and contamination levels for immediate action and also as a permanent record of prevailing conditions. Copies of these records are to be forwarded regularly to the Health Physics Section and to Plant Records.
4. To keep the Medical Department informed of all personnel working in locations or engaged in operation where some degree of accidental exposure is possible.

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C. Responsibility of the Radiation Hazards Department

It is the responsibility of the Health Physics Section of the Radiation Hazards group to:

1. Investigate, interpret, and distribute new information which may become available on any aspect of radioactivity hazards, and to advise line organization on health hazards and tolerance specifications.
2. Supply advice and information as requested on health hazards involved in new installations and procedure.
3. To check locations and operations in the plant independently, in order to insure the maintenance of tolerance levels. These checks are to be performed on an irregular schedule and the observed conditions reported promptly to the division head concerned or his designated representative, along with possible recommendations and suggestions.
4. Audit all radiation data taken throughout the plant and review rules and regulations pertaining to health hazards. Recommendations based on these studies should be made whenever necessary.
5. Specify types of radiation instruments necessary to meet tolerance specifications and to standardize the use of these instruments.
6. Specify adequate types of protective equipment for various applications and make available the techniques required for using and handling this equipment.
7. To keep management informed through the K-25 Special Hazards Committee of radioactive hazards conditions throughout the plant.

D. Radiation Emergency Squad

A squad of Process Division Supervisors on each shift are trained for monitoring any radiation resulting from a possible chain reaction in the plant. Duties of this group are defined in the Process Emergency Radiation Procedure. Members of the Radiation Hazards Organization are subject to call in such an emergency.

E. Medical Department

The Medical Department at the dispensary is responsible for administering physical examination periodically to designated personnel in order to determine any possible exposure. Blood and urine analyses are to be performed.

F. Radiation Hazards Department

The Radiation Hazards Department consists of two sections with seven men including one department head.

1. Special Hazards Section

Coordinates all work in the plant concerned with the

avoidance of a chain reaction. .

2. Health Physics Section

The Health Physics Section has the responsibilities enumerated above.

III. ROUTINE SURVEYS

Routine Surveys were conducted throughout K-25 and K-27 during the month of October as indicated in the following table. These include both surveys made by the Process Laboratory Radiation Survey Section, and surveys made routinely by the operating personnel of the areas involved.

A. Routine Survey Locations

<u>Location</u>	<u>Alpha</u>	<u>Beta-Gamma</u>	<u>Air-Samples</u>
Process Buildings			
Operating Floor	-	-	Weekly
Pipe Gallery	-	-	Weekly
Cell Floor	-	-	Weekly
During Pump Pulling Operations	As required	-	As required
During Seal Change Operation	As required	-	As required
Line Recorder Stations	-	-	Weekly
306 Section L. R. "	Weekly	-	Weekly
312 Section L. R. "	Weekly	-	Weekly
312 Section Basement	Daily	-	-
Product Withdrawal Station	Daily	-	Daily
S. S. Area	Semi-Weekly	-	-
Product Cylinder Shop	Weekly	-	-
K-306-6 Ice House	Weekly	-	-
K-1301 C-216 Manufacture, C-616 Recovery	3 Times a week	3 times a week	3 times a week
K-1303 Decontamination and Recovery	3 times a week	3 times a week	3 times a week

A. Routine Survey Locations - Continued

<u>Location</u>	<u>Alpha</u>	<u>Beta-Gamma</u>	<u>Air-Samples</u>
K-1401 A.C. Pump Shop	Semi-Weekly	-	Semi-Weekly
K-1401 Seal Shop	Semi-Weekly	-	Semi-Weekly
K-1405 Lab. & Pilot Plant	Weekly	Weekly	Weekly
K-131 Feed Room	Daily	Daily	Daily
K-631 Waste Room	Semi-Weekly	Weekly	Semi-Weekly

In addition to the above routine schedule, single surveys were made for special conditions, at the following locations:

- K-132 Building - Surface Alpha
- K-1212 " - Surface Alpha
- Warehouse C - Surface Alpha
- Laboratory D
 - Room - 21 - Air Samples
 - Room - 05 - Air Samples

B. Routine Survey Results

<u>Building</u>	<u>Note</u>	<u>No. of Readings</u>	<u>No. of Readings in Alpha counts per minutes with Zuto</u>	
			<u>Between 500 & 5000</u>	<u>Above 5000</u>
K-131 Feed Point	(1)	141	47	15
K-631 Waste Removal	(2)	55	16	None
K-1301 (216 Manufacture 616 Recovery)	(3)	89	63	18
K-1303 (Recovery and Decontamination)	(4)	238	172	73
K-1401 Maintenance Shops	(5)	88	29	1
K-1405 Development Section	(6)	68	13	None

Notes:

(1) These readings were all taken in the feed room, where shipping cylinders are regularly connected and disconnected. Suitable protective measures are in force, gas masks are worn whenever a connection is opened, gloves and coveralls worn at all times. Frequent decontamination is employed and alpha surface readings reported were used to determine when decontamination was required.

- (2) A situation similar to K-131 exists in this building. Supervision is the same and operators interchangeable. Most of the procedure discussed above are in force in both buildings.
- (3) The high readings reported for this building, are again used to determine decontamination frequency. The room in which they were obtained is used only for special operations where dusting is unavoidable. Gas masks, impregnated coveralls, neoprene gloves and rubber boots are worn at all times in this room.
- (4) In this building equipment is decontaminated and the process is such that contamination readings of the magnitude reported are to be expected. Personnel are protected by suitable safety equipment (gloves, coveralls, shoes) and observe proper hygiene rules. The re-design of the entire decontamination process, now in progress, will give far greater control of the contamination problem.
- (5) Many areas covered under this section have been recently brought within the scope of the survey program. Additional protective measures and hygiene rules are being adopted as new problems appear, and extensive decontamination is in progress.
- (6) The work in this building is entirely of an experimental nature, is therefore somewhat intermittent and unpredictable. Close surveillance of all operations has been maintained, decontamination is used where necessary, and rules of hygiene and safety equipment use are followed.

Beta-Gamma Surveys

No beta-gamma readings above 0.100 R/8 hours have been reported this month.

Air Samples

No high air sample readings were reported this month.

C. Water Sampling Program

During October, 1947, a program was in progress of sampling drinking, drain, and river water for the purpose of monitoring the contamination by fluorine, uranium, and other radioactive materials. All possible sources of contamination on the K-25 Area are covered. The purpose of the program is two-fold: the protection of personnel on and about the area; and accumulation of data for purposes of legal record. The water sampling program was discussed and approved in a meeting of the K-25 Special Hazards Committee on October 31, 1947. The minutes of the meeting are presented in Appendix II.

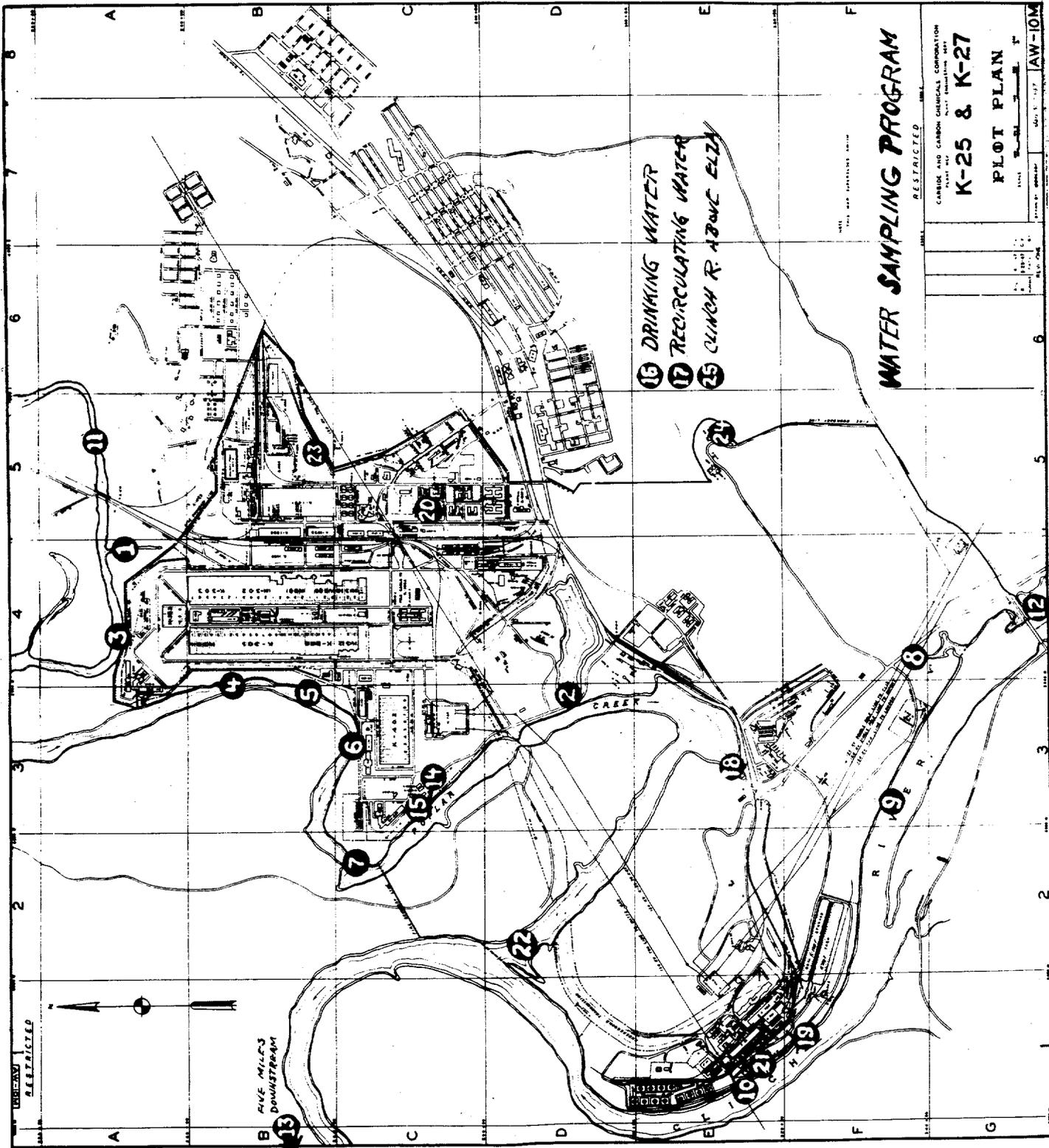
The sampling points and frequency of sampling are listed in Table I of Appendix I along with the results of the analyses. There are two daily samples, 12 weekly, and 13 monthly samples. An analysis of 5 parts per billion is considered significant.

The results to date indicate in general no significant contamination with uranium of waters on and about the K-25 area. The sampling points are also indicated on the accompanying map. With the exception of the S-50 sewer outfall and influent to the K-25 sewage disposal plant, all analyses have indicated less than 40 parts per billion with the vast majority under 10 parts per billion. The S-50 sample, on one occasion, was as high as 4000 parts per billion which can be explained on the basis of the practice of wetting down equipment during dismantling. This activity will shortly cease with the completion of the dismantling of F-01. The effluent to the sewage disposal plant indicated 120 part per billion on one day, which is not considered serious. The daily samples of the Clinch River, five miles downstream from the plant have consistently indicated no significant uranium content.

It is believed at this time that there is no problem of water contamination. If a tolerance value for uranium in drinking water is accepted at 10^{-5} microcuries per cc which corresponds approximately to 10^{-5} grams normal uranium per cc, then the analyses are sufficiently sensitive to detect one ten-thousandth of such a tolerance value. It can be safely assumed that any uranium contamination would be very close to normal assay. Furthermore, the test is sufficiently sensitive to detect any contamination that is significantly higher than the concentration of uranium in sea water.

No significant fluoride contamination was found. In all cases the total alpha activity, found at any point, is less than one-thousandth of the acceptable value, corresponding to 10^{-5} microcuries per cc.

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WATER SAMPLING PROGRAM

- 15 DRINKING WATER
- 17 RECIRCULATING WATER
- 25 CUNYCH R. ABOVE ELZA

K-25 & K-27

PLOT PLAN

RESTRICTED

CARBIDE AND CARBON CHEMICALS CORPORATION

PLANT AND

PLANT

DATE: _____

SCALE: _____

PROJECT: _____

DATE: 1-1-57

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IV. PERSONNEL MONITORING

A. Hand Counts

Program

Hand counts for alpha activity at present taken routinely at two points where the greatest possibility of hand contamination exists.

Laboratory B - Morning and evening hand counts are taken on upwards of fifty employees daily.

Product Withdrawal Station - Hand and foot counts are taken regularly on each entry or departure at the station portal.

Results

Records to date indicate that in all cases the hand count was reduced to safe limits in Laboratory B and in the Product Withdrawal Station.

B. Film Badges

Program

Approximately one-hundred film badges per week were exposed in K-25, K-27 and S-50 during the month of October.

These were distributed as follows:

	<u>Stationary Locations</u>	<u>Worn by Personnel</u>
Process Division	30	25
Works Laboratory	5	15
Instrument Development Section	3	2
S-50 Laboratory	-	15
Emergency Monitors	15	-

Emergency Monitors refer to the Victoreen - 263 Survey Meters that are stationed throughout the plant for use in a radiation emergency. These have film badges attached for monitoring the user in the event of radiation emergency.

Results

Film badge results indicated no exposures over tolerance values to personnel during the month.

V. PROCESS MATERIAL SPILL

A. Line Recorder Spill

On Wednesday, September 24, 1947, at 3:00 P.M., a glass cold trap in the Line Recorder Station at K-303-9 released its contents to the atmosphere.

Personnel exposure was negligible, but all employees, 52 in number, who were within a hundred feet of the spill were given the routine medical Supervisory Examinations. The results of all examinations were negative except for the urine analysis for two personnel. Unconfirmed tests indicated less than 10 micrograms of uranium per liter. A single result of so low a magnitude may not be significant because of the possibility of contamination of the sample. Information on the rechecks is not available at this time.

The Decontamination Crew was at the scene within a few minutes and an initial decontamination was completed within thirty minutes.

After the first decontamination, surface checks with a Victoreen Model 356 showed readings on the floor up to 1500 alpha counts per minute within a three foot radius of the spill center. Beyond this distance there was no detectable alpha activity. The wooden platform which held the thermos flash of refrigerant around the trap had a surface activity of 22000 alpha counts per minute, and was removed, as being incapable of decontamination. The surrounding equipment had been successfully decontaminated and no readings above background on the 356 could be found. A check for beta-gamma activity gave the anticipated negative results. A subsequent decontamination removed all detectable alpha activity.

It was concluded that the spill was minor. Quantity and assay involved were too low to present any hazard other than the slight possibility of inhalation of HF vapors or Uranium dusts.

To prevent the re-occurrence of such a spill, the glass cold traps in the Line Recorder Stations are being replaced by metal traps.

VI. SPECIAL STUDIES

A. Maintenance Shops

A study was conducted in the K-1401 Maintenance Shops to locate possible areas of alpha activity and determine methods of combatting any that might be found. The results were reported in a letter. (1)

The induction heating stand in the seal shop, was found to be above alpha tolerance. Readings up to 11,800 surface alpha counts per minute and 1400 counts on a wipe test were found. Since surrounding areas showed no detectable alpha activity, daily decontamination was recommended to solve the problem. Workers are at present using

(1) Letter to W. B. Humes from G. J. Selvin and S. Visner, October 22, 1947

adequate protective clothing.

Two points were found in the seal cleaning enclosure which had been previously unreported. A table top showed 840 surface alpha counts and a 140 alpha count wipe test, while a point on the floor nearby showed 2240 alpha counts per minute and a 560 alpha count wipe test. Investigation indicated that this activity was brought in on contaminated equipment. Surface and wipe test on equipment stored in the enclosure were as high as 23,800 and 7,140 alpha counts per minute respectively, while beta-gamma activity up to 0.012 R/8 hours was found. It was concluded that a workable solution would call for removal of contaminated equipment, thorough decontamination of the enclosure, and the inauguration of procedures insuring that all equipment delivered to the enclosure be routed through the decontamination section.

The AC Pump Shop was found to be completely free of activity, though some stored pumps showed activity ranging to 47,300 surface alpha counts and 3360 counts on wipe tests. Again prior decontamination and monitoring before delivery was indicated.

Several pump casings, awaiting reworking, were found to exhibit high surface and transferable alpha activity, and decontamination and monitoring was recommended.

The Health Physics Section worked with the supervisors of these areas to establish procedures to avoid these hazards. Most of the resultant procedures are now in effect, limited in some cases by the availability of monitoring instruments.

B. Decontamination of Equipment

Equipment that has been exposed to process material is normally decontaminated in K-1303 before being released for further handling. The procedure followed is to immerse the item in a tank of one percent sodium carbonate solution. It has been determined that this treatment is not entirely effective at all times in decreasing the alpha count to the levels desired. Thus, equipment with some contamination has found its way in the past into various locations where it is desired to maintain clean conditions. To improve this situation, a new decontamination system is being built which incorporates an acid spray from nozzles. Tests by the Engineering Division have indicated that such a method is highly effective in decreasing uranium contamination to a value below tolerance. It is estimated that the new system will be in operation in about one month. In the meanwhile, safe procedures are followed to store and handle equipment that does not meet tolerance levels.

C. Hot Laboratory Design

Consideration was given to a shielding problem in the design of laboratory facilities for handling active waste material from piles. The pertinent factors and answers were reported in a letter. (2)

(2) Letter to J. L. Waters from S. Visner, October 1, 1947.

The product stand hood is essentially an enclosure with 6 inch diameter openings through which the operator can connect and disconnect the product cylinders. For observation of this operation a glass window is provided.

The product cylinder defrosting and air blast drying operation is also accomplished under a hood which prevents material from escaping.

The effectiveness of this installation in reducing air contamination is demonstrated by the fact that all atmosphere samples taken after the installation are below the tolerance value.

VI. DEVELOPMENT PROJECTS

A. Argon Gammagraph Radiation Monitor

The Argon Gammagraph Radiation Monitor is designed for continuous monitoring of gamma radiation in the plant of the order of normal background. As a supplement to the RM-2 Rate Meters, presently located in the plant, the application of the Monitor is to give the first indication of a chain reaction. An adaptation of the Chicago University High Pressure Argon Ionization Chamber, the instrument is modified to drive a recorder and an alarm circuit when the radiation rises to a predesignated level.

The Argon Gammagraph has the following advantages over the RM-2 which employs a Geiger-Muller tube:

1. Since it is self powered, it will remain operative during a power failure.
2. In the event of high radiation levels the meter will not "jam", a property of a meter return to zero because of a continuous discharge in the Geiger Muller tube.

The instrument has been developed by the Instrument Department to the point where its installation in the plant is recommended. The specifications as reported (3) by the Instrument Department is as follows:

Power Supply - Six volt storage battery and vibrator.

<u>Range</u>	Scale #1 =	0	-	8.0×10^{-4}	R/8 hrs.
	Scale #2 =	8.0×10^{-4}	-	4.2×10^{-3}	R/8 hrs.
	Scale #3 =	4.2×10^{-3}	-	0.1	R/8 hrs.
	Scale #4 =	0.1	-	1.8	R/8 hrs.

Recorder - Leeds and Northrup Micromax

B. Alpha Meters

A project has been started (4) in the Instrument Department on

(3) Letter to S. Visner from G. A. Smith and J. R. Mahoney, "Tentative Specifications on the Argon Gammagraph Radiation Monitor." October 15, 1947.

(4) Letter to R. M. Batch from W. B. Humes, October 9, 1947.

standardization and improvement of alpha meters and probes. The scope of the program is as follows:

1. Investigate, design, test and standardize various types of probes for hand, shoe, clothing, and other special monitoring.
2. Improve the electrical circuits for greater stability, better operation and less maintenance expense.
3. Standardize instrument design insofar as possible to minimize the inventory of spare parts and simplify the maintenance and operation. Attention is now being focused on the Zuto (Victoreen Model 356) and A. C. Poppy.

VII. EDUCATIONAL PROGRAM

A. K-25 Program

A series of lectures on Health Physics were given by the Radiation Hazards Department to approximately 80 Process Division technical supervisors. Three groups were each given two 2-hour lectures for a total of 12 hours. The lectures covered the following topics: radioactivity, properties of radiation, radiation from uranium, effect of radiation on living matter, measurement of radiation, hazards of ingestion, and tolerances.

B. Training of Health Physicists

Four technical men of the Health Physics Section are attending the training program at Clinton Laboratories which started October 20, 1947. The instruction includes lectures and on the job training in the field of Health Physics.

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APPENDIX

Included herein are the following items which are pertinent to this report:

- I Table I -- Water Survey Program
- Table II -- Urine Analysis

- II Minutes of K-25 Special Hazards Committee Meeting --
October 31, 1947.

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APPENDIX II

CARBIDE AND CARBON CHEMICALS CORPORATION

K-25 SPECIAL HAZARDS COMMITTEE MEETING OCTOBER 31, 1947
9:30 A.M.
CONFERENCE ROOM K-1001

Present

S. C. Barnett	A. G. Kammer
C. K. Beck	J. A. Marshall
W. J. Clossey	M. G. Means
M. J. Costello	G. T. E. Sheldon
A. P. Dunlap	R. J. Speer (AEC)
A. P. Huber	S. Visner
F. W. Hurd	

A meeting of the K-25 Special Hazards Committee was held to review the ground water sampling program proposed by the Radiation Hazards Department, October 1, 1947, in a letter to S. C. Barnett.

Dr. C. K. Beck opened the meeting by describing the purposes of the program as follows:

1. Protection of personnel on the area.
2. Routine accumulation of data on water analyses for purposes of record. Such information was also requested by the Atomic Energy Commission in a letter to Mr. C. E. Center.

Mr. S. Visner outlined the water sampling program which called for daily, weekly, and monthly sampling. As a result of a thorough survey, 23 sample points were selected for monitoring all possible sources of contamination on the K-25 area, in addition to drinking water and river water upstream and downstream of the plant.

W. J. Clossey, of the Health Physics Section pointed out on a map of the K-25 area the location of the sample points.

Dr. F. W. Hurd, whose laboratories performed the analysis with a sensitivity of one part uranium per billion and are now engaged in taking the samples on a routine basis, summarized the results. In general, with the exception of a sample of the S-50 area all indicated less than 12 ppb. of uranium. K-25 drinking water and effluent 5 miles downstream were all negative. Fluoride indications were less than 0.8 ppm.

Mr. S. Visner reported a meeting with the X-10 Health Physics Department on water sampling subsequent to the formation of the proposed program. X-10 is now also engaged in formulating a sampling program and the meeting was held to determine possible means of cooperation between the two areas. The following points

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were made:

1. The direction of flow of the Clinch River on the area depends on the operation of Watts Bar Dam by the T. V. A. In an effort to determine the contamination of the river upstream of K-25, it is required to take river samples at least as far upstream as Elza Gate. Because the direction of flow varies, it may not be possible to evaluate the contamination if any to the river that each plant on the area is responsible for. Occasional background samples from Norris Dam are also recommended.
2. A study of river phenomena is desirable to evaluate such factors as stratified flow and selective absorption of radioactive materials by various materials in the river as for example, silt and vegetation. Those factors may influence the location of sampling points, and the desirability of taking silt samples. It is intended to maintain contact with the X-10 group during the course of the river studies.
3. Since the K-25 drinking water intake is in the Clinch River downstream of X-10 it appears desirable to monitor the drinking water for fission product contamination by checking the total alpha and beta activity.
4. No value has been established for maximum permissible contamination of river water with uranium. There are at least two schools of thought on this matter. One opinion, as advocated by Stafford Warren is to limit the contamination to twice normal background. The concentration of uranium in the ocean is between 1 and 2×10^{-9} grams per c.c. The other possibility is not to exceed the maximum acceptable contamination level for drinking water. This presently accepted value is 10^{-5} microcuries per cc which corresponds to approximately 10^{-5} grams normal uranium per cc or 10^{-7} grams enriched uranium per c.c.

The following decisions were made by the Committee:

1. The proposed program of water sampling was adopted for the next three months with the modifications suggested at the meeting (see below)
2. It was agreed to set no tolerance values at this time on water contamination. High values, however, will be investigated and corrected if necessary.
3. At the suggestion of S. Cromer, a study of flow rates will be initiated by A. P. Dunlap in an effort to evaluate the relative importance of the contamination at the various sampling points. S. Visner estimated that approximately 2 grams of uranium were carried down the sewer system each day.
4. A. P. Dunlap was requested to coordinate the water sampling program between Y-12 and K-25.

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5. Dr. F. W. Hurd was given the responsibility of standardizing the Y-12 and K-25 water sampling techniques.
6. The daily samples from the water treatment plant are to be checked for total alpha and beta activity in addition to uranium content.
7. Fluoride analyses are to be performed in addition to uranium analysis on those samples requested by the A.E.C.

Sidney Visner

S. Visner
Secretary, K-25 Special Hazards Committee

SV:jr

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APPENDIX -

TABLE I

WATER ANALYSES
(Submitted by Works Laboratory)
October, 1947

D - Daily
W - Weekly
M - Monthly

Activity
Alpha Counts per Min.
per 100 ml.

Plot Plan Reference No.	Location	Date Sampled	Uranium Conc.		Fluoride Conc.		Activity Alpha Counts per Min. per 100 ml.
			P. P. B.	P. P. M.	P. P. M.	P. P. M.	
13-D	Clinch River, effluent from K-25	10-2-47	0	---	---	---	Less than 0.5
		10-9-47	0	0.2	0.2	1	Less than 0.5
		10-10-47	0	0.1	0.1	1	Less than 0.5
		10-13-47	0	0.4	0.4	1	Less than 0.5
		10-14-47	0	0.1	0.1	1	Less than 0.5
		10-15-47	2	0.1	0.1	1	Less than 0.5
		10-16-47	0	No analysis	No analysis	1	Less than 0.5
		10-17-47	0	No analysis	No analysis	2	Less than 0.5
		10-20-47	0	0.5	0.5	2	Less than 0.5
		10-21-47	0	0.5	0.5	1	Less than 0.5
		10-22-47	0	Less than 0.2	Less than 0.2	1	Less than 0.5
		10-23-47	0	Less than 0.2	Less than 0.2	1	Less than 0.5
		10-24-47	0	0.2	0.2	1	Less than 0.5
		10-27-47	0	Less than 0.2	Less than 0.2	1	Less than 0.5
		10-28-47	0	Less than 0.2	Less than 0.2	1	Less than 0.5
10-29-47	0	Less than 0.2	Less than 0.2	1	Less than 0.5		
10-30-47	0	Less than 0.2	Less than 0.2	2	Less than 0.5		
10-31-47	0	Less than 0.2	Less than 0.2	1	Less than 0.5		
24-D	Effluent water from K-25 Water Purification Plant	10-2-47	0	---	---	---	Less than 0.5
		10-9-47	0	---	---	---	Less than 0.5
		10-10-47	0	---	---	---	Less than 0.5
		10-13-47	0	---	---	---	Less than 0.5
		10-14-47	0	---	---	---	1
		10-15-47	0	---	---	---	1
		10-16-47	0	---	---	---	1
		10-17-47	0	---	---	---	1
		10-20-47	0	---	---	---	2
		10-21-47	0	---	---	---	1
		10-22-47	0	---	---	---	0.5
		10-23-47	0	---	---	---	0.5
		10-24-47	0	---	---	---	1
		10-27-47	0	---	---	---	1

~~S-E-C-R-E-T~~

Activity
Alpha Counts per
Min. per ml.

Fluoride Conc.
P. P. M.

Uranium Conc.
P. P. B.

Date
Sampled

Location

Plot Plan
Reference No.

Plot Plan Reference No.	Location	Date Sampled	Uranium Conc. P. P. B.	Fluoride Conc. P. P. M.	Activity Alpha Counts per Min. per ml.
24-D	Effluent water from K-25	10-28-47	0	-----	Less than 0.5
	Water Purification Plant	10-29-47	0	-----	1
		10-30-47	0	-----	1
		10-31-47	0	-----	1
Y-12 Potable Water	Bldg. 9212, Wing A	*	4	-----	9
	Bldg. 9206, N. W. Corridor	*	0	-----	Less than 0.5
	Bldg. 9212, Wing B	*	0	-----	Less than 0.5
	Bldg. 9212, Wing B	*	2	-----	1
	Bldg. 9212	*	0	-----	1
	Bldg. 9212, Wing C	*	0	-----	1
	Bldg. 9212, Wing D	*	0	-----	1
	Bldg. 9212, Wing D	*	2	-----	4
	Bldg. 9206, S. Cent. Corridor	*	0	-----	1
	Bldg. 9202, S. Cent. Corridor	*	2	-----	1
	Bldg. 9204-3, K-23 Mech. Serv. Area	*	0	-----	1
	Bldg. N-37, Chem. Process Area	*	0	-----	0.5
* Sampling Date was not given.					
12-W	Clinch River, Influent to K-25	10-15-47	0	0.2	1
		10-20-47	0	0.2	1
		10-28-47	0	Less than 0.2	1
16-W	K-25 and K-27 Drinking Water	10-1-47	0	-----	Less than 0.5
	Process Utilities Lab.	10-16-47	0	0.4	1
	Bldg. K-1004-D, Room Oll	10-22-47	0	Less than 0.2	1
	Bldg. K-402-7	10-28-47	0	Less than 0.2	1
	Bldg. K-302-3				
10-W	Clinch River, below S-50	10-16-47	0	0.4	1
	Sewer outfall	10-20-47	0	Less than 0.2	1
		10-28-47	2	Less than 0.2	1

~~S-E-C-R-E-T~~

Plot Plan Reference No.	Location	Date Sampled	Uranium Conc. P. P. B.	Fluoride Conc. P. P. M.	Activity	
					Alpha Counts per Min.	per 100 ml.
21-W	S-50 Sewer Outfall	10-1-47	0	---	---	---
		10-17-47	4000	0.8	---	---
		10-20-47	0	Less than 0.2	---	---
		10-28-47	80	0.2	---	---
14-W	Influent to Sewage Disposal Plant	10-1-47	16	---	---	---
		10-15-47	8	---	---	---
		10-22-47	120	---	---	---
		10-29-47	0	---	---	---
15-W	Effluent from Sewage Disposal Plant	10-1-47	12	---	---	---
		10-15-47	8	---	---	---
		10-22-47	2	---	---	---
		10-29-47	2	---	---	---
6-W	K-131 Drainage into Poplar Creek	10-2-47	30	---	---	---
		10-17-47	40	---	---	---
		10-21-47	16	---	---	---
		10-28-47	16	---	---	---
11-W	Poplar Creek, Influent to K-25	10-6-47	1	---	---	---
		10-15-47	0	0.3	1	1
		10-21-47	4	Less than 0.2	1	1
		10-28-47	2	Less than 0.2	1	1
17-W	Recirculating Water K-25	10-2-47	0	---	---	---
		10-15-47	0	---	1	1
		10-23-47	0	---	2	2
		10-28-47	0	---	Less than 0.5	Less than 0.5
22-W	Poplar Creek, before Junction with Clinch River	10-6-47	0	---	---	---
		10-15-47	0	---	2	2
		10-21-47	0	Less than 0.2	2	2
		10-28-47	0	Less than 0.2	1	1

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<u>Plot Plan Reference No.</u>	<u>Location</u>	<u>Date Sampled</u>	<u>Uranium Conc. P. P. M.</u>	<u>Fluoride Conc. P. P. M.</u>	<u>Activity Alpha Counts per Min. per 100 ml.</u>
1-W	Poplar Creek inlet, N. E. of K-303-8	10-1-47	12	---	---
		10-15-47	4	---	---
		10-21-47	8	---	---
		10-28-47	4	---	---
20-W	Cafeteria Cooking Water	10-6-47	0	---	---
2-M	Drainage from pond S.W. of Garage Area into Poplar Creek	10-1-47	4	---	---
3-M	Drainage from Process Bldgs. into Poplar Creek	10-2-47	0	---	---
4-M	Drainage from Process Bldgs. into Poplar Creek	10-2-47	0	---	---
5-M	Drainage from Process Bldgs. into Poplar Creek	10-2-47	0	---	---
19-M	Power House water intake	10-3-47	0	---	---
18-M	Power House water discharge	10-3-47	0	---	---
8-M	Drainage from "hot scrap yard" into Poplar Creek	10-2-47	0	---	---
9-M	Clinch River, west of Jones Scrap Yard	10-2-47	0	---	---

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APPENDIX I

TABLE II

URINE ANALYSES
(Submitted by Works Laboratory)

October, 1947

<u>CONTAMINANT</u>	<u>TOTAL NUMBER OF SAMPLES</u>	<u>NUMBER OF ANALYSES OF 0.00 mg U / liter</u>	<u>NUMBER OF ANALYSES OF * GREATER THAN 0.00 mg U / liter</u>
URANIUM	286	284	2 (1 PROCESS DIVISION) 2 (1 PROCESS MAINTENANCE)
MERCURY	38	13	25. Personnel from Instrument, Laboratory, and Maintenance Divisions.
FLUORIDES	31	28	3

NUMBER OF ANALYSES OF 0.0 mg Hg / liter

NUMBER OF ANALYSES OF ** 0.1-0.3 mg Hg / liter

NUMBER OF ANALYSES OF Less than 0.2-1.0 mg F / liter

NUMBER OF ANALYSES OF ** 1.0-1.2 mg F / liter

* Comments on the Urine Analyses will be forthcoming in a subsequent report.
** Comments on these analyses will be forthcoming in subsequent reports on Industrial Hygiene.

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Report Number: K-86 (Part 3)

CARBIDE AND CARBON CHEMICALS CORPORATION
K-25 PLANT
OAK RIDGE, TENNESSEE

1949
INV.-B

REPORT OF HEALTH PHYSICS ACTIVITIES
FOR
DECEMBER, 1947

Compiled by S. Visner

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Report Number K-86, Part 3
Date of Issue 1-20-48

Title: Report of Health Physics
Activities at K-25 Plant
for December, 1947

Author: S. Visner

CARBIDE AND CARBON CHEMICALS CORPORATION

K-25 PLANT

OAK RIDGE, TENNESSEE

SUMMARY

A report of Health Physics activities in the K-25 Plant for December, 1947, is herein presented. The results of radiation surveys, monitoring, air sampling and laboratory analysis of water, are reported. A description is given of special problems involving radiation hazards control and development work on instrumentation for radiation detection.

I. INTRODUCTION

There has been an improvement in the procedures for reporting and recording radiation monitoring data. The educational program is proceeding as scheduled. Considerable progress has been achieved in informing all personnel of the radiation hazards inherent in the handling of uranium compounds and the necessary precautions.

The primary problem in the K-25 Health Physics Program is the avoidance of the ingestion of alpha emitters. This is being controlled by a policy of area and personal cleanliness determined by radioactive contamination tolerance levels and also the use of personnel protective equipment where it is necessary to work under conditions of above tolerance contamination.

The following are the tolerance levels for alpha emitters (uranium) established for the K-25 Plant:

<u>Item</u>	<u>Instrument</u>	<u>Tolerance Level</u>
Floors, table tops	(Zuto (Wipe Test	800 counts per minute 100 counts per minute
Shoes, clothing, tables, floors, tools, apparatus, process equipment to be worked on in the shops or elsewhere.	(Poppy (Wipe Test	500 counts per minute 100 counts per minute
Above items when protected from handling	Poppy	2500 counts per minute
Hands	Poppy	100 counts per minute
Body	Poppy	250 counts per minute
Atmosphere	Air Sampler	2 counts per minute per cubic foot
Water	- - - - -	11 counts per minute per cc.

The tolerance dosages for external radiation are as follows:

<u>Type of Radiation</u>	<u>Tolerance Per Day</u>
Gamma, x-ray	0.1 Roentgen
Beta	0.1 R.E.P.
Fast Neutrons	0.02 R.E.P.
Slow Neutrons	0.05 R.E.P.
Alpha*	0.01 R.E.P.

* Considered only as an internal emitter.

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As an aid in interpreting the Health Physics Monthly Reports, the following terms are defined:

Tolerance is defined as that quantity of radiation in the case of external sources or quantity of material, in the case of ingested emitters, which can be absorbed by the body per unit time for an indefinitely long period, without producing known harmful effects. In dealing with alpha emitter contamination of surfaces, air, or water, the term "tolerance" is also used to denote the safe levels of contamination.

Wipe Test consists of wiping 12 square inches of surface with a two square inch piece of filter paper. This determines whether the contaminant can be easily removed or transferred by contact.

Contaminated equipment or areas are those having more than tolerance radioactivity.

Decontaminate refers to the process of removing extraneous radioactive materials from areas or equipment to the point where tolerance levels are met.

Material Release is an escape or spill of radioactive material in a working locale such that personnel in the area would be subjected to above tolerance radiation or radioactive contamination.

II. ORGANIZATION

There is no change to report in plant organization with respect to administering the policies pertaining to the protection of personnel from potential radiation hazards. The responsibilities and duties of the various groups concerned with the problem are listed in the report for October, 1947. Essentially, the monitoring of radiation is performed both by the operating groups and the Health Physics Section of the Radiation Hazards Department.

III. RADIATION HAZARDS SURVEYS

Routine surveys were conducted in the plant during the month of December. The locations for which results of such surveys are formally reported are as follows:

<u>Location</u>	<u>Alpha Surfaces</u>	<u>Beta Gamma</u>	<u>Air Samples</u>
K-131 Feed Room	Twice Weekly	Daily	Twice Weekly
K-631 Tails Withdrawal	" "	"	" "
K-1004 Lab. A			
Analysis Section	Weekly	- - - - -	- - - - -
Physics Research	As Required	As Required	- - - - -

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III. (Continued)

<u>Location</u>	<u>Alpha Surfaces</u>	<u>Beta Gamma</u>	<u>Air Samples</u>
K-1004 Lab. B Analysis Section	Weekly	- - - - -	- - - - -
Counting Section	Weekly	As Required	- - - - -
K-1004 Lab. C Physics Section	Weekly	- - - - -	- - - - -
K-1004 Lab. D Research	Weekly	- - - - -	- - - - -
K-1301 Conversion Room	Twice Weekly	Twice Weekly	Twice Weekly
K-1303 Equipment De- contamination Room	Twice Weekly	Twice Weekly	Twice Weekly
K-1405 Process Design and Development	Weekly	- - - - -	Twice Weekly
K-306-7 Product With- drawal Room	On Request	- - - - -	Daily
K-1401 Seal Shop	Twice Monthly	- - - - -	Twice Monthly

In accordance with delegated responsibility, the Radiation Hazards Department conducted spot surveys on an irregular schedule.

The results of routine surveys made or authorized by the Operating Groups and the results of the spot checks by the Health Physics Section are included under sub-captions for each building involved in the following outline:

K-131 -- Feed Purification Building

Routine Surveys (Operating Group):

A total of 167 surface alpha readings were taken during nine (9) surveys conducted in the Fresh Feed Room. Twenty-nine (29) readings recorded as above tolerance were taken on the floor in the immediate vicinity of the evaporating baths and on a ledge located at the end of baths A & D. The cause of this contamination was the placing on this ledge of tools used in connecting and disconnecting of feed cylinders. Of the five air samples taken in this room, none were above tolerance, the highest reading being 1.6 c/m/ft³. All beta gamma readings taken were below tolerance.

Spot Surveys (Radiation Hazards Department):

All surface alpha readings taken on the Fresh Feed Room floor on December 31 gave readings less than 200 c/m. Valve handles and stainless steel bath covers were also below 200 c/m.

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A reading of 2596 c/m was found on a shelf at the north end of Bath D. It was possible to transfer 726 c/m of this material. Gloves are used for all operations in this area. Hand counts are not taken, but it is anticipated that such a program will be started in January.

K-631 -- Waste Disposal Building

Routine Surveys (Operating Group):

Nine (9) surveys were made in the Shipping Room. From a total of 143 surface alpha readings recorded, four (4) were above tolerance, the highest reading being 5500 c/m. Of the seven (7) air samples taken here, the highest reading was 1.4 c/m/ft³. All beta gamma readings taken were below tolerance.

Spot Surveys (Radiation Hazards Department):

All floor surface readings were less than 200 c/m with the exception of a one square foot area directly below a waste sampling point. The maximum reading here was found to be 1320 c/m, approximately 66 c/m of this material being transferable. All other equipment surface readings taken were below tolerance. Gloves are used for all operations in this area. The hand counting program will be strated in the near future.

K-303-2 through K-303-10 -- Process Operating Floor--December 22, 1947

Spot Surveys (Radiation Hazards Department):

A survey of the Line Recorder Station, floor and equipment, Crew Leaders' desks, and area around seal exhaust carbon traps and spot readings of the floor in the vicinity of the panel boards produced below tolerance readings in all cases with the exception of the K-303-8, K-303-9 and K-303-10 Line Recorder Stations. In the K-303-8 and K-303-9 Line Recorder Stations, a high reading of 10,300 alpha c/m was located in an approximately 9 ft.² area. A reading of 10,000 alpha c/m was located in the K-303-10 Line Recorder Station in an area of approximately 1 ft.². Necessary decontamination was effected immediately. Protective equipment for alpha emitting contamination is used only during sampling operation.

K-306-3 through K-312-3 -- Process Operating Floor--December 15, 1947

Spot Surveys (Radiation Hazards Department):

All Line Recorder Stations in this area were surveyed for alpha emitting contamination. Above tolerance readings were found in Line Recorder Stations K-306-4, K-306-5 and K-312-2. In the K-306-4 and K-306-5 Station, it was possible to transfer 2400 alpha c/m from the inside surface of a box and 960 c/m from a spot located on the floor. Protective equipment for alpha emitting contamination is used only during sampling operations, which is believed adequate at this time.

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K-306-7 -- Process Building, S. S. Area

Routine Surveys (Operating Group):

Product Withdrawal Room--Three surveys were conducted in the Product Withdrawal Room. A total of 41 surface alpha readings taken of Product Withdrawal equipment gave readings as high as 37,000 c/m. Of the daily air samples taken, two (2) were reported as being above tolerance, 2.9 and 22.3 c/m/ft³. (The tolerance value is for continuous exposure over a period of one year.) In both instances no abnormal operation or material releases were reported which would account for these findings; however, this matter is being investigated further.

Spot Surveys (Radiation Hazards Department):

Product Withdrawal Room--Survey Conducted December 30, 1947. A high reading of 2090 c/m was located on the cylinder defroster unit. It was possible to transfer 550 c/m of this material. Other surface readings were taken which were all below tolerance. Readings taken on gloves worn by the operators gave a high reading of 1540 c/m. A check air sample taken on December 1 gave an air count of 0.44 c/m/ft³. All above tolerance locations are immediately decontaminated.

Field Assay Laboratory--All surface readings taken were below tolerance.

Coded Chemicals Weigh Room--All surface readings taken were below tolerance.

K-300 Process Area--Seal Changes

Routine Survey (Operating Group):

Seventeen (17) seal change operations on Allis-Chalmers pumps in the Cascade were monitored, an air sample being taken in each case. More data will be obtained on this type of work to attempt to verify the conclusions drawn, which are: Seal and AC Pump changes cause above tolerance atmospheric contamination as high as 500 times tolerance, and gloves in contact with such contaminated equipment do become contaminated. Respiratory protection and rubber or leather gloves are worn during this type of operation.

K-303-10, Cell 6--Seal Change--4 B Pump--December 9, 1947

Spot Survey (Radiation Hazards Department):

Surface and air contamination data were taken. Surface readings of the floor and pump were all below 150 c/m. The result of an air sample taken during the removal of the old seal was 22.6 alpha c/m/ft³. Assault masks, coveralls, and rubber gloves were worn by the men performing the seal removal operation. A second sample taken after the old seal had been removed and a new seal was in the process of being installed

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gave 0.5 alpha c/m/ft³. No masks were worn during this operation, and cloth gloves were used instead of rubber. Surface readings of rubber gloves worn by the maintenance men gave counts as high as 21,000 c/m. Tools used gave readings below tolerance. Hand checks taken after the new seal had been installed gave readings up to 149 alpha c/m. No activity was found on coveralls or shoes.

K-300--Vaults--Coded Chemicals

Spot Survey (Radiation Hazards Department):

The 16A and 17A storage vaults, which are used by Coded Chemicals, were surveyed on December 29, 1947. In the 16A Vault, 7 of the 15 readings were above tolerance for alpha, and one of 5 air samples showed an above tolerance count. Empty drums showed contamination as a result of the drippings from sample solutions. The floor of the working area was above-tolerance, and so was the office floor. However, operators use rubber gloves when sampling.

The decontamination squad had been requested to clean up these areas, and closer monitoring is expected to prevent a recurrence of this situation. Nevertheless, the decontamination job will be difficult due to the extent of the contamination and the fact that the floors are concrete.

In Vault 17A, two above-tolerance alpha counts were found on the floor, and two below-tolerance beta-gamma counts were found in the drums. Neither of two air samples showed above-tolerance alpha counts in the carbon sampling operations. The operators wear canvas gloves and masks for protection. These areas will need to be monitored more closely until they are cleaned up and kept clean.

K-1004 -- Laboratories

Routine Survey (Operating Group):

The inside surfaces of two hoods, both in the Counting Section, were found to have active contamination. Alpha surface readings as high as 17,000 c/m were noted. Decontamination of these surfaces was carried out, and subsequent surveys gave no readings, surface or wipe, higher than 350 c/m. One spot, approximately six square feet, on the floor of the gravimetric lab was found to be seriously contaminated, giving a surface activity of 40,000 c/m. This contamination was not transferrable, giving a zero wipe test. Efforts at decontamination were unsuccessful. Several decontamination solutions, including strong detergents, scrubbing, wire brushing, were tried and proved equally ineffective. Covering or replacing that section of the floor has been recommended.

Spot Survey (Radiation Hazards Department):

A beta-gamma check, by Radiation Hazards Department, of a special operation in the Counting Section showed no activity above 0.008 R/8 hrs., even within five centimeters of containing vessels.

K-1301 -- C-216 Building and Oxide Conversion

Routine Surveys (Operating Group):

Ten (10) surveys were conducted in the Oxide Conversion Room. Of a total of 195 readings taken, 175 were above tolerance. The highest reading recorded was 48,000 c/m. Ten (10) beta gamma surveys conducted gave no readings above the eight-hour tolerance.

Air samples taken in the Oxide Weighing Room were above tolerance in two cases. It is to be expected, however, that above tolerance readings will be found here due to the oxide weighing operation; and respirators, coveralls, gloves and head covers are worn by operators when working in this locale.

Spot Surveys (Radiation Hazards Department):

All readings taken in the Oxide Conversion Room were above tolerance. The highest reading found was 17,000 c/m, which was found on the floor directly beneath the flange opening of the D reactor. Surface floor readings taken in the hallway outside the Oxide Weighing and Conversion Room gave readings as high as 2960 c/m. One air sample taken in the Oxide Weighing Room during a normal weighing indicated the air contamination to be 0.68 c/m/ft³. A second sample of the air in the hallway outside the Weighing Room was 0.05 c/m/ft³. Protective clothing in the form of coveralls, gloves, shoes, respirators and head covers is worn by operators in the Oxide Weighing and Conversion Rooms. No restrictions are enforced governing the use of protective clothing by visitors in these areas.

The operating group is considering relocating and modifying the equipment in order to minimize contamination.

K-1303 -- Decontamination Building

Routine Surveys (Operating Group):

A total of 371 readings were taken during ten (10) surveys. Of these, 306 were recorded as above tolerance. Thirty-four (34) of the above tolerance readings were taken on the floor beside the work benches and twenty-six (26) were taken on tops of work benches. The remaining 246 above-tolerance readings were taken on the decontaminating tanks and on the floor in the immediate vicinity of the tanks. One above tolerance beta-gamma reading of .117 R/8 hrs. was recorded as taken on the floor beside a work bench. This material was immediately removed by the decontaminating group. All air samples taken were below tolerance.

Spot Surveys (Radiation Hazards Department)--December 31, 1947:

In general, a high level of alpha emitting contamination exists in this area. Floor readings taken of areas removed from the decontaminating tanks ranged from 2620 to 7300 c/m. Work

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benches also gave above-tolerance readings. As stated in the previous Health Physics Activities Report, all operating personnel are required to wear protective clothing in the form of coveralls, gloves and shoes. In some operations where acid fumes are likely to exist, gas masks are worn. At the present time, however, there are no restrictions covering the admittance of visitors who are not equipped with protective clothing. Hand counts of operators are taken after a clothing change at the end of shift. All final readings were below tolerance. The operation carried out in this area which involves dipping contaminated equipment into open tanks unavoidably produces the condition described. The status of the new decontamination equipment is described under special development work.

K-1401 -- Maintenance Building

1. Vacuum Pump Shop

Routine Surveys (Operating Group):

More than 2620 alpha readings were taken during the month of December. Three out of thirteen wipe tests were above tolerance, the highest being 2140 alpha counts per minute. Only fifty out of 2603 surface alpha counts were above tolerance, with a maximum of 14,000 alpha counts per minute.

Spot Surveys (Radiation Hazards Department):

Sixty surface alpha counts indicated that some work surfaces were up to 14,000 alpha counts per minute. Above tolerance areas are being decontaminated, and conditions leading to such contamination are being investigated to determine the best method of their elimination. Shoe counts were below tolerance. The new wash-up sink mentioned in the last monthly report is now installed and in use. Daily hand counts are now being taken as discussed in the Personnel Monitoring Section of this report.

2. Seal Shop

Routine Surveys (Operating Group):

All measurements were below tolerance except those alpha surface readings taken on contaminated seals. These seals, however, are being stored awaiting decontamination. Three air samples and fifty-five surface readings were taken and all were below tolerance.

Spot Survey (Radiation Hazards Department):

Thirty (30) surface counts indicated below-tolerance conditions, except on used stored seals awaiting decontamination. Daily hand counts are being made as discussed under Personnel Monitoring. The exhaust hood mentioned in the last monthly report is still in the planning stage, so that used seals are not being serviced.

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3. Valve Shop

Spot Survey (Radiation Hazards Department):

Forty (40) surface alpha measurements were below tolerance in working locale.

K-1405 -- Process Design and Development

Routine Surveys (Operating Group):

Five (5) surveys were made in this building. Of a total of 173 readings recorded, four (4) were above tolerance, the highest reading being 5300 c/m. Decontamination was effected. Seven (7) air samples taken were all below tolerance.

General

Routine Beta-Gamma Surveys:

No beta or gamma reading above 0.10 roentgens per eight hours was reported this month.

Routine Samples for Air-Borne Alpha Emitters:

With the exception of the incidents discussed above, there were no air sample readings reported above the tolerance for one year exposure, 10^{-10} microcuries per cc.

IV. PERSONNEL MONITORING

A. Hand Counts

K-306-7 -- Product Withdrawal Station

Hand, foot and clothing counts are taken daily at the end of shift on the two Product Withdrawal Operators. No readings above tolerance were reported on shoes and clothing. Hand counts in some instances were above tolerance after a first washing, but in every case subsequent washings resulted in below-tolerance readings. The installation of stainless steel floors has started.

K-1004 A and B -- Laboratories

Daily hand counts, before lunch and before leaving work, are taken of all employees in Laboratories A and B. An average of fifty six (56) employees of the Analysis and Counting Sections of Laboratory B were regularly checked during the month, and the results submitted to the Radiation Hazards Department. Members of the Analysis and Physics Research Section at Laboratory A were checked regularly, but no formal reporting system has been established. No instances of hand counts have been reported this month which exceeded the tolerance value.

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K-1300 Area Change House

A regular hand counting program has not been established in this area; however, nine (9) surveys were conducted at the end of shift during the month of December. Of these surveys, two above-tolerance readings were found after a first washing. All final hand counts were below tolerance.

K-1401 -- Maintenance Shops

At present there are two locations in K-1401, within the Maintenance Division, where daily hand counts are taken. These are the Vacuum Pump Shop and Seal Shop. In only one instance was there an above-tolerance hand count after washing. An employee of the Seal Shop had been stacking and sorting contaminated seals without wearing gloves, and at the pre-lunch wash-up and hand count, the alpha activity on his hands was found to be 12,000 counts per minute. Repeated soap and water washing was ineffective. A cold 2 per cent sulphuric acid wash was used at the Dispensary, and three 30-second rinses reduced the count to tolerance. Gloves are usually worn while handling used seals, and all used seals will be decontaminated before being repaired.

B. Film Badges

Program:

	<u>Stationary</u>	<u>Personnel</u>
Process Division	55	2
Works Laboratory	3	15
Instrument Development Section	-	4
Critical Mass Laboratory	-	15
Emergency Monitors	-	11

One hundred (100) additional badges are now on hand and are available for monitoring personnel for beta, gamma, and neutron radiation.

Results:

Film badge results indicate no over-tolerance conditions during the month of December.

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V. PROCESS MATERIAL RELEASES

K-631 Waste Disposal Building, Shipping Room--December 29, 1947

A ten (10) minute release of C-616 Material occurred when a small leak developed at the flange of a sample bomb. Supervision estimated that the possibility of exposure was negligible; therefore, no one was sent to the Dispensary.

K-306-7 Process Building, Scale Room--December 11, 1947

A three minute release of C-616 material occurred when a product cylinder gasket developed a small leak. Two men present reported to the Dispensary.

K-306-7 Process Building, Product Withdrawal--December 31, 1947

A two (2) minute release of C-616 material occurred when a small leak developed in a product cylinder side plug. Six men involved reported to the Dispensary.

K-306-7 Process Building, Product Withdrawal--December 31, 1947

A small material release occurred at a product cylinder side plug. Supervision determined that there was a negligible possibility of exposure; therefore, no one was sent to the Dispensary.

K-310-3 Process Building, Line Recorder--December 15, 1947

A small release of C-616 material resulted when a Hoke sample tube was disconnected. Supervision determined that there was a negligible possibility of exposure; therefore, no one was sent to the Dispensary.

K-310-3 Process Building, Line Recorder--December 16, 1947

A glass cold trap in the calibration manifold was broken when dry ice slush was removed from the trap. Four men in the vicinity of the material release reported to the Dispensary. Glass traps on the sampling manifold have been replaced, and the glass traps on the calibration manifold are now being replaced by metal traps.

K-402-8 Process Building, Line Recorder Station--December 12, 1947

A valve bellows rupture was responsible for a five (5) minute release of C-616 material. Five persons in the immediate vicinity reported to the Dispensary.

K-402-8 Process Building, Line Recorder Station--December 15, 1947

A small release of material resulted when a Hoke sample tube was disconnected. Supervision determined that the possibility of exposure was negligible; therefore, no one was sent to the Dispensary.

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VI. WATER SURVEY PROGRAM

During the month of December, 1947, the water survey program, outlined in the October, 1947, report, proceeded according to schedule. The purpose of the program is to monitor drinking, drainage, and river water for possible contamination by fluorine, uranium, and other radioactive materials. The sampling points, frequency of sampling, and analysis results are presented in Table I (See Appendix of this report).

The results for December continue to indicate that within the scope of the Survey Program, there are no Health Physics Hazards resulting from water contamination on and about the K-25 Area. The S-50 sewer outfall analysis has indicated 170 parts per billion of uranium-- a continued decrease from the 800 and 4000 figures reported November and October, respectively. With the completion of operations in this area, it is anticipated that the analysis will indicate a further decrease. All other analysis indicated less than twelve (12) parts per billion of uranium.

The alpha activity continues to be less than one-thousandth of the tolerance value for one year exposed to alpha emitters in drinking water. The beta activity of the K-25 drinking water remains less than one ten-thousandth of the tolerance value for Iodine--131 for a one-year exposure.

Approximate flow rates measured at several sampling points are presented in the following table:

<u>Sampling Point</u>	<u>Flow Rate</u> GPM*
1W Poplar Creek Inlet NE of K-303-8	550
6W K-131 Drainage into Poplar Creek	80
14W Influent to Sewage Disposal Plant	400
15W Effluent from Sewage Disposal Plant	400
21W S-50 Sewer Outfall	5

* Indicative of average order of magnitude.

VII. SPECIAL PROBLEMS

K-1303 Incinerator

A special study was recently conducted covering the operation of the incinerator located in the K-1303 Building. This incinerator is used for burning contaminated material, such as rags, paper, wood and sponges. The incinerator consists of a fifty-five (55) gallon open top drum and is located under a hood which exhausts to the atmosphere.

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To test the effectiveness of the hood in preventing fly ash or other contaminated material from entering the decontamination room a series of three samples were taken. One sample was taken just outside the hood, another eight feet from the hood and a final sample inside the hood. The results of the samples show the air activity in all cases to be below 0.1 c/m/ft^3 . In view of these findings, respirators are not required, however, further tests should be made which will cover the operation of transferring the ashes from this drum to a Coded Chemicals container.

Plant-wide Inventory of Radiation Instruments

As the result of the request of 1947 by the USAEC, an inventory is being taken of all radiation detection instruments. To supplement this information, the immediate requirements are also being secured to accompany the estimate of first-quarter needs in 1948. This inventory is still in progress.

Handling of Contaminated Materials by Shipping Department

A study is being made of extent of radioactivity contamination present on items handled by the Shipping Department. Information is to be gathered on methods and general efficiency of monitoring for radiation all types of equipment to be shipped. This is necessary both for health hazards considerations and also for restricting the release of radioactive materials into commercial trade channels. The Shipping Department has been given facilities for monitoring all items passing through its control for a period of one month, at which time this program will be evaluated.

Hot Laboratory Vent Stack

A study was made of possible locations for a laboratory to handle radioactive materials. The principal problem is the possibility that a release of radioactive materials to the atmosphere would endanger the health of the people working in neighboring areas. Data on the activity of the materials to be handled were taken from the University of Chicago Handbooks. The dispersion of material in the atmosphere was studied for a variety of conditions. For a stack 50' high, it was determined that under the operating conditions of the laboratory, no real hazard existed. A letter to Mr. J. L. Waters, on December 12, gave these findings in detail.

Sodium-24 Hazards

A problem involving the personnel hazards to be expected while working with radioactive sodium was recently studied by the Health Physics Section. The amount of lead shielding and distance required for 0.1 curie together with 1 millicurie quantities was determined, using 0.05 rcentgens as the tolerance exposure for an eight-hour day; it was found that for 0.1 curie quantities a lead shield 5.3 inches thick would be required. In handling 1 millicurie samples, 10.7 inches is safe for two-hour exposures, or 21.5 inches for an eight-hour exposure, provided the material was handled in glass containers having a wall thickness of at least 2.5 mm. Personnel monitoring radiation detectors such as film badges and beta gamma counters were recommended as well as the usual personal hygiene precautions. The results of this study were transmitted in a letter of December 19, 1947, to Dr. N. Underwood of the Laboratories.

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Decontamination of Process Equipment

The acid spray chamber for decontaminating equipment was put in service this month. It is anticipated that this method of decontaminating will reduce alpha emitters on equipment to satisfactory levels with a minimum spread of contamination in the decontaminating area. Objectionable acid fumes were encountered during the initial operation, making necessary the installation of air exhaust blower. Further operating tests are to be conducted during January.

Instrument Development

Improvement of A. C. Poppy

A hand probe has been assembled and testing of it in the Lab is now in progress. Preliminary tests indicate that considerable work must be done on the instrument before the desired results are obtained.

An improved surface probe was designed and assembled. The method of installing the window and lead connector has been revised so that initial assembly costs may be reduced and field maintenance simplified.

Work on the Poppy pre-amplifier is continuing. Preliminary data indicate that the benefit of such a pre-amplifier will be mainly increasing the signal to background ratio rather than in increasing the absolute sensitivity of the unit. The sensitivity of the Poppy has been brought to within about ninety-five per cent of that of a theoretically perfect instrument by the reduction of the oscillatory tendencies of the amplifier circuit.

Development Work on Zuto

The design of the Zuto is being slightly altered so as to render the disassembly of the instrument more feasible. Slight modification of the chamber design has increased the sensitivity a great deal without affecting stability materially.

High Pressure Argon Ionization Chamber

A new type of trickle charger with a tapered charging rate has been tested for use with the Gammagraph and found to be satisfactory. One unit has been installed in K-302-5 and is operating satisfactorily. The second unit is being held in the Instrument Engineering Laboratory as an experimental instrument until the most advantageous use can be made of it in the plant. Work is almost completed on prints required for the fabrication of more of these instruments. These instruments are intended as a supplement to the RM-2 now monitoring in the Plant.

VIII. EDUCATIONAL PROGRAM

During the month of December, a lecture series, given by the Radiation Hazards Department, was initiated by request of the Maintenance Division for its personnel. A comprehensive lecture with demonstrations was prepared, given first to supervision, and then to working personnel.

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A brief summary of items covered in each lecture follows:

1. Brief explanation of nature of radiation, with examples given of natural and man-made types, such as sunlight, heat, radio, x-rays.
2. Description of alpha radiation, and statement that uranium contamination gives off radiation.
3. Radiation, like radio waves, cannot be detected by the five human senses, and instruments are needed to locate and indicate magnitude of such radiation.
4. How instruments work:
 - a. Radiation makes the air a conductor.
 - b. When a radioactive particle passes between two electrodes, current will flow from the battery or power supply.
 - c. This flow is amplified and measured on a meter, and frequently some audible means such as earphones is also used.
5. Demonstration of Operation and Use of the following instruments:
 - a. Victoreen - 263 -- wrist watch demonstration.
 - b. Victoreen - 356 -- maximum range at which alpha can be detected, and paper will act as a shield, as will paint and water.
 - c. AC Poppy -- the small probe will reach inaccessible spots.
 - d. Filter Queen Air Sampler.
6. Description of standard discs for calibration.
7. Sensitivity requirements of each instrument.
8. Definition of "Tolerance" and statement of tolerance limits in use throughout the Plant.
9. Means of preventing hazards:
 - a. Make the job clean.
 - b. Wear protective equipment.
 - (1) Demonstrate procedure for putting on and removing rubber and leather gloves, mask, respirator and needs for each. Describe need for special coveralls on contaminated jobs.

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- c. Check surfaces and person for contamination, wash up, and clean up area after a job.
 - d. Count hands before eating, smoking, or leaving work.
 - e. Periodically monitor shops and protective equipment.
10. Describe effects of radiation, externally and internally.
11. Answering of questions.

The following table is a listing of lectures given this month. The lecture series will be continued until all personnel in the Maintenance Division are covered. Lectures are given to groups of men as requested by supervision.

<u>Division</u>	<u>Date</u>	<u>Type of Group</u>	<u>Type of Personnel</u>	<u>No. of Persons Present</u>	<u>Location of Lecture</u>
Maintenance	12-23-47	Process Maintenance and	Supervision	12	K-303-1
"	12-10-47	Garage	"	17	"
"	12-12-47	Carpenter, Sheet Metal Electrical	"	15	K-1401
"	12-19-47	Buildings and Grounds	Supervisors, Workers	26	K-1401
"	12-18-47	Instrument Maintenance	Supervision	17	K-1024

TOTAL: Five (5) lectures to eighty-seven (87) Supervisory Personnel

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APPENDIX

Included in this Appendix are the following:

1. Water Survey Analyses (5 pages)
2. Mask Testing Data (3 pages)
3. Report K-112, Part 2, Industrial Hygiene Laboratory Analyses, December, 1947, by N. H. Ketcham. (6 pages)

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Approved for issue by: Dr. M. J. Costello
Date of Issue: December 19, 1947

Report No. K-112, Part 2

CARBIDE AND CARBON CHEMICALS CORPORATION

K-25 PLANT

OAK RIDGE, TENNESSEE

Medical Department

INDUSTRIAL HYGIENE LABORATORY ANALYSES

DECEMBER, 1947

By N. H. Ketcham

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Appendix (Item 3) to Report
of Health Physics Activities
for December, 1947.

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Report No. K-112 - Part II
File No. _____
Date of Issue January 19, 1948

Title: INDUSTRIAL HYGIENE LABORATORY
ANALYSES

Author: N. H. Ketcham

CARBIDE AND CARBON CHEMICALS CORPORATION

K-25 Plant

Medical Department

A B S T R A C T

Tabular summaries of the industrial hygiene air sampling activities, and the special chemical and physical urinalyses, performed during the month of December, 1947, are attached. Brief comment is included with respect to the portions of the data indicative of possibly significant chemical atmospheric contamination. Specific comment with regard to the clinical findings on personnel working in the areas associated with the air or urine analysis data, or involved in particular accidents, is not included, as such information is on record as a part of the established Medical Department reports.

The air samples reported herein were taken by the Works Laboratory, and the air and urine analyses performed by the Works and Research Laboratory staffs, for which grateful acknowledgement is made.

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TABLE I

INDUSTRIAL HYGIENE AIR SAMPLING

DECEMBER, 1947

Air Samples for Uranium Analyses

Total number of samples	13
Number of samples containing 0.00 mg.U/cubic meter	11
Number of samples containing greater than 0.15 mg. U/cubic meter	2*
* Both of these samples were taken in room 21, Building K-1004-D approximately 30 minutes after a UF ₆ leak had occurred on December 30, 1947.	

Air Samples for Mercury Analyses

Total number of samples	59
Number of samples containing less than 0.1 mg. Hg./cubic meter	49
Number of samples containing 0.1 mg. Hg./cubic meter, or greater	10*
* Five of these samples were taken on December 2, 1947 in room 63, K-1004-A. A mercury spill had occurred the preceding day. Clean up efforts were being made. One of these analyses represented atmosphere in a mercury storage area, room 72, K-1004-A. Four were obtained in room 215N, K-1401.	

Air Samples for Trichlorethylene Analyses

Total number of samples	30
Number of samples containing less than 200 ppm	24
Number of samples containing 200 ppm or greater	6*
* These analyses were obtained at working positions around the K-1401 Building Cleaning Area degreasing tank and Pump Shop degreaser. Exposure time of any one man is limited and intermittent, hence the data is not considered indicative of any significant exposure.	

Air Samples for Dust Counts

Total number of samples	6
Number of samples containing less than 5 MPPCF	5
Number of samples containing greater than 5 MPPCF	1*
* For experimental purposes, this sample was taken in the K-1069 Sand Blasting Shop, immediately following a blasting operation. Protective equipment is worn by personnel doing sand blasting.	

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Air Samples for Nitrous Fume Analyses

Total number of samples	7
Number of samples containing less than 10 PPM	3
Number of samples containing 10 PPM or greater	4*

* These analyses were made in the K-1303 Building while operation of a nitric acid decontamination process was in progress. A report of this instance has been issued by the Safety and Inspection Division. Recognition of the possible hazard by the operations personnel, prompt evaluation of the extent of contamination of the atmosphere by the air analyses, and immediate medical treatment of the exposed personnel, very likely avoided what might readily have been a serious accident.

Air Samples for Ammonia Analyses

Total number of samples	2
Number of samples containing less than 10 PPM	2

Air Samples for Phosgene Analyses

Total number of samples	346*
Number of samples in which no phosgene found	346

* 343 of these represent atmosphere samples from inside chlorine type storage cylinders, one shipment of which was received containing residual phosgene in a few cylinders.

Air Samples for Hydrogen Sulfide Analyses

Total number of samples	2
Number of samples containing 0.0% H ₂ S	2

Air Samples for Cadmium Analyses

Total number of samples	2
Number of samples containing less than 0.1 mg. Cd./cubic meter	2

Air Samples for Hydrogen Chloride Analyses

Total number of samples	1
Number of samples containing less than 10 PPM	1

Air Samples for Beryllium Analyses

Total number of samples	2
Number of samples containing 0.00 mg. Be./cubic meter	2

Discussion:

It is to be noted that air analyses for beryllium are included, for the first time, as one of the services which are available to the plant.

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Six air analyses for mercury, not included in the above tabulation, were made to study the mercury vapor concentrations in the exhausts of vacuum cleaners used to clean up mercury spills. A mercury analysis on the dust scraped from one of these vacuum cleaners was also performed. This information is being assembled by the Safety and Inspection Division.

A water-soluble fluoride analysis made on a leak detector probe confirmed a preliminary diagnosis of a hydrogen fluoride burn.

The following analyses were made at the site of the F-01 Building at the request of the Atomic Energy Commission. The results are not included in the above data tabulation.

Air samples for fluoride analyses	8
Air samples for uranium analyses	8
Cement samples for uranium analyses	8
Cement samples for alpha activity	8
Wipe tests for fluoride	8
Wipe tests for uranium	8

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TABLE II

SPECIAL CHEMICAL AND PHYSICAL URINE ANALYSES

DECEMBER, 1947

Uranium Analyses

Total number of samples	195
Number of samples containing 0.00 mg. U/liter	194
Number of samples containing greater than 0.00 mg. U/liter	1*

* Action to assure no further exposure of this patient has been taken.

Mercury Analyses

Total number of samples	49
Number of samples containing 0.0 mg. Hg./liter	43
Number of samples containing 0.1 and 0.2 mg. Hg./liter	6*

* Corrective action has been and is being taken by the supervisors concerned with follow up by the Safety and Inspection Division.

Fluoride Analyses

Total number of samples	6
Number of samples containing 0.3 to 0.6 mg. F/liter	6

Alpha Count

Total number of samples	5
Number of samples below "tolerance"	4
Number of samples above "tolerance"	1*

* Action to assure no further exposure of this patient has been taken. The "tolerance" level for alpha activity in the urine specimens is based upon the best present knowledge. As larger numbers of specimens are counted in the future, correlation with other clinical findings may be possible and will be included in the established Medical Department reports.

Discussion:

Arrangements are in progress in cooperation with the Radiation Hazards Department, Health Physics Section, for increasing the number of selected personnel upon whom urinary alpha counting will be performed at periodic intervals. Representative personnel from plant areas where enriched material is regularly handled are to be included in this study.

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Starting in January, 1948, inclusion of urine analyses for beryllium in the medical examination of personnel working with beryllium compounds will be possible. However, at present, it is not anticipated that any appreciable volume of beryllium compounds will be handled in the K-25 or K-27 Plants.

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Appendix (Part 1)
to Report of Health
Physics Activities
for December, 1947

Water Survey Program

December, 1947

Plot Plan Reference Number	Location	Date Sampled	Uranium Conc. P.P.B.	Fluoride Conc. P.P.M.	Activity Alpha Counts Per min. per 100 ml.	Beta Counts per min. per 100 ml.
13 D	Clinch River, Effluent from K-25	12-1-47	0	Less than 0.2	Less than 0.5	
		12-2-47	0	Less than 0.2	1	
		12-3-47	0	Less than 0.2	Less than 0.5	
		12-4-47	0	Less than 0.2	1	
		12-5-47	0	Less than 0.2	1	
		12-8-47	0	Less than 0.2	1	
		12-9-47	0	Less than 0.2	1	
		12-10-47	0	Less than 0.2	1	
		12-11-47	0	Less than 0.2	2	
		12-12-47	0	Less than 0.2	0.5 ± 0.7	
		12-15-47	0	Less than 0.2	0.3 ± 0.8	
		12-16-47	0	Less than 0.2	0.2 ± 0.8	
		12-17-47	0	Less than 0.2	0.6 ± 0.7	
		12-18-47	0	Less than 0.2	1.4 ± 0.9	
		12-19-47	0	Less than 0.2	1.5 ± 0.6	
		12-22-47	0	Less than 0.2	1.3 ± 0.9	
		12-23-47	0	Less than 0.2	0.5 ± 0.7	
		12-24-47	0	Less than 0.2	1.3 ± 0.7	
		12-26-47	0	Less than 0.2	0.5 ± 0.7	
		12-29-47	0	Less than 0.2	0.4 ± 0.7	
12-30-47	0	Less than 0.2	0.4 ± 0.7			
12-31-47	0	Less than 0.2	0.2 ± 0.6			

Plot Plan Reference Number	Location	Date Sampled	Uranium Conc. P.P.B.	Fluoride Conc. P.P.M.	Activity Alpha Counts Per min. per 100 ml.	Beta Counts per min. per 100 ml.
24 D	Effluent Water from K-25 Water Purification Plant	12-1-47	0	-	Less than 0.5	0
		12-2-47	0	-	1	0
		12-3-47	0	-	1	
		12-4-47	0	-	Less than 0.5	
		12-5-47	0	-	1	0
		12-8-47	0	-	1	0.26
		12-9-47	0	-	1	1.47
		12-10-47	0	-	1	0.84
		12-11-47	0	-	2	1.18

Plot Plan Reference Number Date Sampled Location Uranium Conc. P.P.b. Fluoride Conc. P.P.M. Activity Alpha Counts per min. per 100 ml. Beta Counts Per min. per 100 ml.

24 D Effluent Water from K-25 Water Purification Plant

12-12-47	0	-	2	1.05	0
12-15-47	0	-	1	0	0
12-16-47	0	-	Less than 0.5	0	0
12-17-47	0	-	0.9 ± 0.5	0	0
12-18-47	0	-	0.4 ± 0.7	1.25	0
12-19-47	0	-	1.3 ± 0.9	0	0
12-22-47	0	-	1.6 ± 0.9	0	0
12-23-47	0	-	0.6 ± 0.7	0	0
12-24-47	0	-	1.6 ± 0.8	0	0
12-26-47	0	-	0.3 ± 0.6	0	0
12-29-47	0	-	0.3 ± 0.7	0	0
12-30-47	0	-	1.0 ± 0.7	0	0
12-31-47	0	-	0.2 ± 0.6	0	0

Y-12 Potable Water

Bldg. 9212, Wing A	*	-	1	0.5	0
Bldg. 9212, S. Main Corridor	*	-	1	0.5	0
Bldg. 9212, N. Main Corridor	*	-	Less than 0.5	0.5	0
Bldg. 9735, N. Corridor	*	-	Less than 0.5	0.5	0
Bldg. 9203, S. Main Corridor	*	-	1	0.5	0
Bldg. 9711-5	*	-	1	0.5	0
Bldg. 9712	*	-	Less than 0.5	0.5	0
Bldg. 9737	*	-	Less than 0.5	0.5	0
No Location	*	-	0.4 ± 0.8	0.7	0
Bldg. 9720-2	*	-	0.3 ± 0.7	0.7	0
Bldg. 9723-4	*	-	1.2 ± 0.7	0.7	0
Clear Well #1	*	-	1.1 ± 0.7	0.7	0
Clear Well #2	*	-	0.7 ± 0.7	0.7	0

* Sampling Date was not given

12 W Clinch River Influent to K-25

12-1-47	0	Less than 0.2	Less than 0.5	0.5	0
12-10-47	0	Less than 0.2	Less than 0.5	0.5	0
12-16-47	0	0.3	0.7 ± 0.7	0.7	0
12-22-47	0	Less than 0.2	1.0 ± 0.7	0.7	0
12-29-47	0	Less than 0.2	0.3 ± 0.7	0.7	0

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-3-

Beta Counts Per min. per 100 ml.

Activity Alpha Counts per min. per 100 ml.

Fluoride Conc. p.p.m.

Uranium Conc. p.p.b.

Date Sampled

Location

Plot Plan Reference Number

Plot Plan Reference Number	Location	Date Sampled	Uranium Conc. p.p.b.	Fluoride Conc. p.p.m.	Activity Alpha Counts per min. per 100 ml.	Beta Counts Per min. per 100 ml.
16 W	K-25 and K-27 Drinking Water Garage Area K-27 Bldg. K-1024, Rm. 7 Bldg. K-1001	12-2-47	0	Less than 0.2	2	
		12-10-47	0	Less than 0.2	2	
		12-17-47	0	Less than 0.2	1.1 ± 0.9	
		12-22-47	0	Less than 0.2	0.3 ± 0.6	
10 W	Clinch River immediately below S-50 Sewer Outfall	12-1-47	0	Less than 0.2	Less than 0.5	
		12-10-47	0	Less than 0.2	2	
		12-16-47	0	Less than 0.2	0.6 ± 0.7	
		12-22-47	0	Less than 0.2	0.2 ± 0.6	
		12-29-47	0	Less than 0.2	0.7 ± 0.7	
21 W	S-50 Sewer Outfall	12-1-47	80	0.2	-	
		12-10-47	80	0.5	-	
		12-16-47	170	Less than 0.2	-	
		12-22-47	40	0.3	-	
		12-29-47	40	0.2	-	
14 W	Influent to Sewage Disposal Plant	12-1-47	1	-	-	
		12-10-47	12	-	-	
		12-16-47	4	-	-	
		12-22-47	1	-	-	
		12-29-47	4	-	-	
15 W	Effluent from Sewage Disposal Plant	12-1-47	0	-	-	
		12-10-47	0	-	-	
		12-16-47	4	-	-	
		12-22-47	0	-	-	
		12-29-47	0	-	-	
6 W	K-131 Drainage into Poplar Creek	12-3-47	8	-	-	
		12-9-47	8	-	-	
		12-19-47	4	-	-	
		12-26-47	6	-	-	

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Plot Plan Reference Number	Location	Date Sampled	Uranium Conc. p.p.b.	Fluoride Conc. p.p.m.	Activity	
					Alpha Counts per min. per 100 ml.	Beta Counts Per min. per 100 ml.
14 W	Poplar Creek, influent to K-25	12-1-47	0	Less than 0.2	1	
		12-9-47	0	Less than 0.2	1	
		12-16-47	0	Less than 0.2	0.8 ± 0.7	
		12-22-47	0	Less than 0.2	0.7 ± 0.7	
		12-29-47	0	Less than 0.2	1.6 ± 0.8	
17 W	Recirculating Water K-27	12-1-47	0	-	1	
		12-10-47	0	-	1	
		12-16-47	0	-	Less than 0.5	
		12-22-47	0	-	0.9 ± 0.7	
		12-29-47	0	-	0.8 ± 0.7	
22 W	Poplar Creek immediately before junction with Clinch River	12-1-47	0	Less than 0.2	1	
		12-9-47	0	Less than 0.2	1	
		12-16-47	0	Less than 0.2	2.5 ± 0.8	
		12-22-47	0	Less than 0.2	2.4 ± 1.0	
		12-29-47	0	Less than 0.2	0.4 ± 0.7	
1 W	Poplar Creek inlet, N.E. of K-303-8	12-1-47	0	-	-	
		12-10-47	12	-	-	
		12-16-47	4	-	-	
		12-22-47	2	-	-	
		12-29-47	2	-	-	
20 W	Cafeteria Cooking Water	12-3-47	0	Less than 0.2	1	
		12-12-47	0	Less than 0.2	1.3 ± 0.9	
		12-17-47	0	Less than 0.2	0.9 ± 0.7	
		12-23-47	0	Less than 0.2	0.2 ± 0.6	
		12-29-47	0	Less than 0.2	0.1 ± 0.6	
2 M	Drainage from Pond S.W. of Garage Area into Poplar Creek	12-2-47	2	-	-	

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Appendix (Item 2)
to Report of Health
Physics Activities
for December, 1947

Industrial Hygiene Section

N. H. Ketcham

E. B. Olszewski

IH-3 Mask Testing O. B. Young

During the month of December, five M5-11-7 canisters were exposed to the hydrolysis products of uranium hexafluoride. These canisters were exposed continuously until they either plugged or passed uranium. During exposure samples of the influent and effluent atmospheres were taken at thirty-minute intervals. All of these samples were analyzed for uranium and the samples of the effluent atmosphere were also analyzed for fluoride. The pressure drop across the canisters was also recorded at frequent intervals.

Tables 2 through 5 summarize the results obtained on the canisters tested. Each table represents a different canister. The canister represented in Table 3 is the only one which passed uranium, but here hydrogen fluoride was also passed. Since the hydrogen fluoride concentration is approximately 50 times higher than the theoretical, it is evident that the uranium hexafluoride saturator contained either water or free hydrogen fluoride and the last four results obtained in Table 3 should be discarded. The same impurity was also evident in Table 4. Tables 1 and 5 gave results which were expected. From the data obtained in these tests it can be assumed that the M5-11-7 canisters will stop the hydrolysis products of uranium hexafluoride for fairly long periods of time, but they will not stop hydrogen fluoride when it is present in high concentrations.

Results have also been obtained from the analysis of the material in the twenty canisters which were given 15-minute exposures. These results show that all the uranium is retained by the paper filter while the fluoride is distributed throughout the canister.

Tests are being continued and in the very near future tests will be made to find whether the M5-11-7 canister will pass any radiation.

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TABLE 1

<u>Exposure Time in Minutes</u>	<u>U Conc. of the In- fluent Atmosphere mg / cu meter</u>	<u>U Conc. of the Ef- fluent Atmosphere mg / cu meter</u>	<u>Fluoride Conc. Ef- fluent Atmosphere PPM</u>	<u>Pressure Drop in Inches of Water Column</u>
10	65	0.0	0.07	3.00
50	65	0.0	0.02	3.60
90	75	0.0	0.18	4.00
130	67	0.0	0.09	5.00
170	67	0.0	0.11	8.00
210	70	0.0	0.20	11.00
250	67	0.0	0.19	13.00
290	84	0.0	0.05	16.00

TABLE 2

10	4.2	0.0	0.09	2.00
50	14.0	0.0	0.09	2.60
151	41.0	0.0	0.03	2.60

TABLE 3

30	350	0.0	2.18	3.00
70	350	0.0	0.60	3.20
110	164	0.0	0.70	3.80
150	322	0.0	79.2	4.00
190	252	0.0	3744.	4.00
230	322	0.0	2810.	4.00
270	70	1.75	4134.	4.00
310	63	3.5	3922.	4.00

TABLE 4

10	105	0.0	0.88	2.0
60	105	0.0	0.33	2.0
100	105	0.0	0.49	3.00
140	98	0.0	0.35	3.00
180	98	7.0	1.3	3.00
220	4.6	0.0	150.	3.00
260	4.6	0.0	1794.	3.40
300	4.6	0.0	2964.	4.00
340	4.6	0.0	2886.	4.60
380	4.6	0.0	3588.	4.80
420	3.5	0.0	2652.	5.00
460	3.5	0.0	1503.8	6.00
500	3.8	0.0	1840.8	7.00
540	3.5	0.0	1899.3	7.20
580	3.5	0.0	2030.0	9.00
620	3.8	0.0	2083.0	9.20
660	5.2	0.0	2246.4	14.0

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TABLE 5

<u>Exposure Time in Minutes</u>	<u>U Conc. of the In- fluent Atmosphere mg / cu meter</u>	<u>U Conc. of the Ef- fluent Atmosphere mg / cu meter</u>	<u>Fluoride Conc. Ef- fluent Atmosphere PPM</u>	<u>Pressure Drop in Inches of Water Column</u>
10	3.5	0.0	179.4	3.00
50	3.5	3.5	1.58	3.00
90	3.5	0.0	3.34	3.00
130	1.75	0.0	1.50	3.00
170	14.0	0.0	0.88	3.00
210	1.75	0.0	0.88	3.00
250	1.75	0.0	0.70	3.20
290	3.50	0.0	0.74	3.20
330	1.75	0.0	0.47	3.20
370	0.70	0.0	0.40	3.20
410	3.50	0.0	0.46	3.40
450	0.60	0.0	0.44	3.40
490	1.75	0.0	0.28	3.40
530	6.0	0.0	0.88	3.40
570	0.7	0.0	0.33	3.40
610	1.4	0.0	0.32	3.40
650	0.7	0.0	0.46	3.40
690	3.5	0.0	0.40	3.40
730	7.0	0.0	0.35	3.40
770	0.7	0.0	0.22	3.40
810	1.4	0.0	0.44	3.40
850	0.35	0.0	0.13	3.60
890	0.70	0.0	0.21	3.60
1010	0.28	0.0	0.18	3.60
1050	0.40	0.0	0.46	3.60
1090	0.35	0.0	0.28	3.60
1130	0.70	0.0	0.26	3.60
1170	15.7	0.0	0.30	3.60

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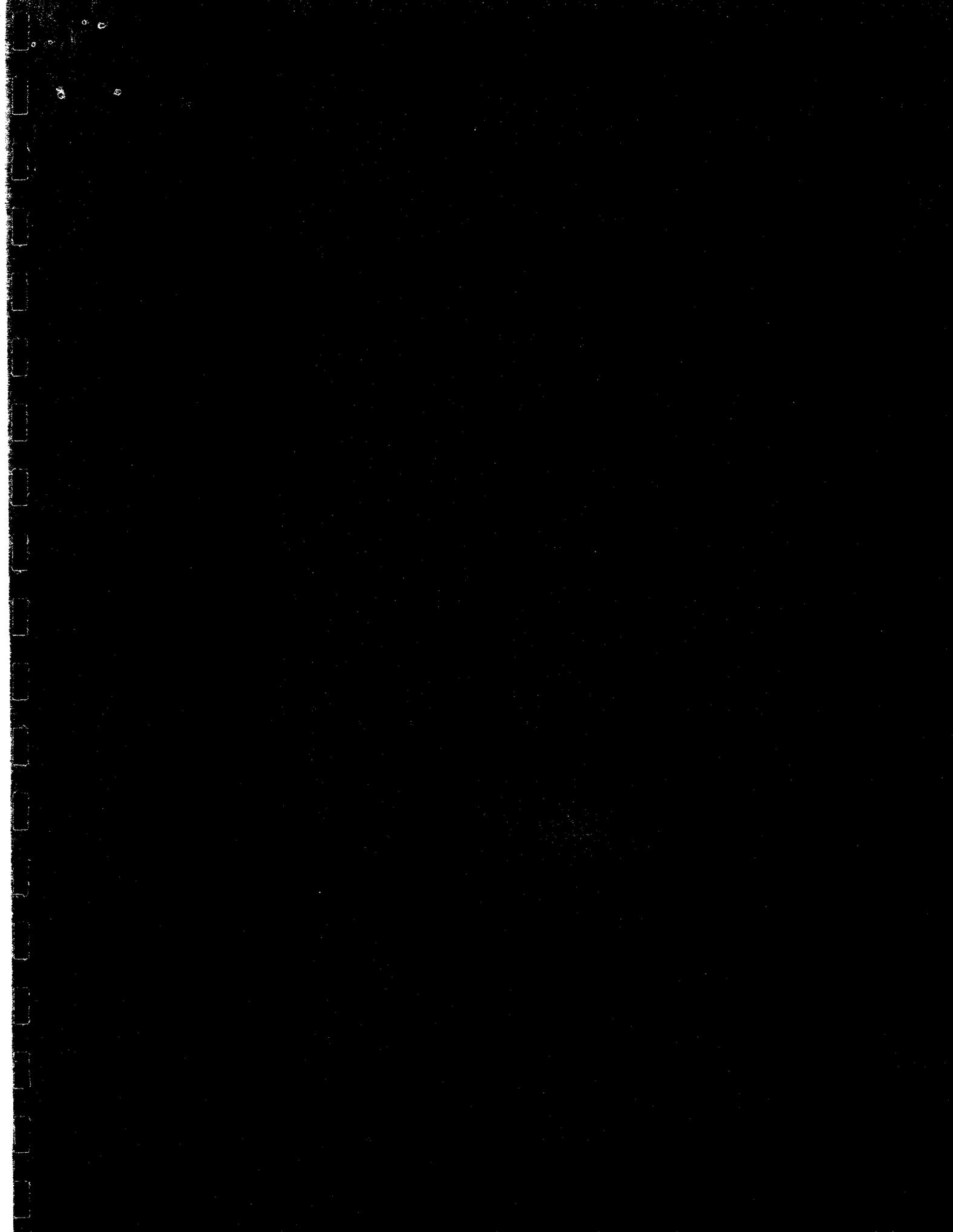
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Report number: K-178, Part XII
File number: _____
Date of issue: January 15, 1949

Title: Report of Health Physics
Activities at K-25 Plant
for December, 1948
Authors: S. Wisner
C. L. Gritzner

CARBIDE AND CARBON CHEMICALS CORPORATION
K-25 PLANT
Oak Ridge, Tennessee

A B S T R A C T

Herein are reported Health Physics activities in the K-25 Plant for the month of December, 1948. The results of area and personnel monitoring, water surveys, and investigations of special problems are included. Tables of Health Physics Inspection Section spot surveys, reported routine surveys, and a three-month summary of water analyses are also included.

Hereafter, the Health Physics activities will be reported on a quarterly basis starting with the January, February, March 1949 quarter. The next report will be issued April 15, 1949.

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I. SUMMARY

The following tables are a summary of reported routine surveys made by operating groups and of spot audits made by the Health Physics Inspection Section in various locations throughout the plant. A comparison of these tables with the table for November indicates a slight increase in the area of working locations found contaminated and approximately the same levels of contamination intensity. A decided increase in the number of routine reports submitted by operating groups is also notable. Eighty-six (86) locations throughout the plant are listed in the summary tables. Results of job surveys are not included in the following tables, but are to be found in Section IV of this report along with more detailed information of locations where notable changes in contamination levels have occurred.

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Approved For Issue By: A. P. Dunlap

Date of Issue: January 15, 1949

This document consists of 39 pages,
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Report Number: K-178, Part XIII

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CARBIDE AND CARBON CHEMICALS CORPORATION

K-25 PLANT

Safety and Inspection Division
Oak Ridge, Tennessee

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HEALTH PHYSICS ACTIVITIES FOR DECEMBER, 1948

Compiled by S. Visner and C. L. Gritzner

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II. INTRODUCTION

The health physics program of area and personnel monitoring was continued in the plant during the month, and no significant changes in radiation or contamination levels were reported. All reported long-term air samples taken during the month revealed below tolerance activities. Pocket chambers, film rings, and film badges during the month revealed no above tolerance exposures with the exception of one film badge exposure which was found by investigation not to be significant.

The water sampling program during the month revealed two locations where noticeable rises in activity occurred. These rises were near or below previously reported values, and remain well below accepted tolerance values.

The monthly radium source inspection indicated leakage in a one gram radium neutron source. A subsequent investigation verified this finding. This source has been sealed, packaged and sent to the U. S. Atomic Energy Commission, New York, New York.

A quarterly survey of radiation detection instruments in the plant was completed during the month. Two (2) types of alpha survey meters and a two-fold hand counter are in various stages of development and field testing.

Absorption measurements on 50 ml of waste supernate were made in order to specify shielding requirements for this type of material.

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III. ORGANIZATION

The plant organization in regard to administering the policies pertaining to the protection of employees from potential radiation hazards remains essentially unaltered. The responsibilities and duties of the various groups concerned are set forth in the report for October, 1947.

IV. RADIATION SURVEYS

The Health Physics Inspection Section conducted spot surveys during the month. The results of particularly noteworthy surveys are summarized as follows:

K-101 C-816 Stripping Building

Surveys made in this location during the month revealed high alpha contamination on the housing of a J-pump. Readings greater than 20,000 surface alpha c/m (3,000 c/m wipe) were found. This contamination covered approximately four square feet of floor area and was primarily due to leakage of contaminated oil from an oil line which had been broken during the removal of this pump. A later survey made after this location had been decontaminated revealed surface contamination of 5600 alpha c/m (600 c/m wipe) still remaining on the housing. This housing will be removed and sent to salvage as soon as it is possible to do so without interrupting operation. Alpha contamination of 5600 c/m (725 c/m wipe) was found on the floor beneath a rotometer connection, as well as on a chair and a metal step ladder. In the sampling room, contamination was found on the floor, platform scales and at the sampling points. All measurements rang from tolerance (800 alpha c/m) to 1200 c/m (zero wipe).

Beta-gamma measurements taken in this location revealed over tolerance beta readings of 144 mrep/8 hr. at open lines where a J-pump had been removed; and 160 mrep/8 hr., one (1) inch from an open line where a rotometer had been removed. An air sample taken two (2) inches from this line gave an air count of 98.5 cm/ft.³ Adequate ventilation however reduced the air activity to normal background four (4) feet from the open line. This open line was temporarily covered with paper at the time of the survey and later sealed with a metal cap. The above tolerance contamination revealed by these surveys is of a temporary nature and is a direct result of maintenance work. Areas are surveyed and decontaminated at the conclusion of maintenance jobs.

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K-131 Feed Purification Building

Fresh Feed Room

Four (4) spot surveys were conducted in this location during the month. A survey conducted early in the month revealed that approximately twenty square feet (20 ft.²) of floor area in the feed room was contaminated. The highest surface reading found on this survey was 6,000 alpha c/m (940 c/m wipe). On three (3) later surveys the maximum surface contamination found was 2,400 alpha c/m (250 c/m wipe). However, this material covered a much smaller area and indicates that effective decontamination had been carried out.

Beta-gamma surveys conducted in the feed room revealed no above tolerance radiation at the surfaces of feed cylinders. A gamma radiation, however, of 96 mr/8 hrs. at the surface of an empty cylinder was near the 24 hour tolerance figure.

Furnace Room

Three (3) spot surveys were conducted in the furnace room during the month. The first survey revealed visible material on the floor between the No. 1 and No. 2 Furnaces. A survey made in the furnace room after a material release revealed floor contamination in the center and west end of the room as high as 2,800 alpha c/m (700 c/m wipe). These spots had been unsuccessfully decontaminated.

Beta-gamma surveys conducted in the furnace room during the month revealed above tolerance radiation on Cylinder No. A-2818. This cylinder was found to have 123.2 mr/8 hrs. of gamma radiation at the surface. Air samples taken in the furnace room approximately 3 hours after the material release revealed below tolerance air contamination.

A survey was made of the steps, platform, and ground outside the building, and of the roof after the material release on December 21.

The maximum surface reading found on the platform outside the door to the furnace room was 700 alpha c/m (250 c/m wipe). A survey of the roof around the ventilators revealed surface contamination of 3,200 alpha c/m. Material was visible on the roof and ventilators.

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K-631 Waste Disposal Building

Three (3) spot surveys were conducted in this building during the month. On the first survey, made early in the month, approximately 180 ft.² of floor area in the carbon trap room was above tolerance with a maximum surface reading of 6,000 alpha c/m (1350 c/m wipe). This material resulted from carbon trap maintenance work and fall-out of contaminated carbon on the floor. On the second survey, made at a later date, only one square foot of floor was found to have above tolerance contamination. 1,120 alpha c/m (280 c/m wipe) was found on the floor under the carbon trap, indicating that decontamination had been carried out. Readings up to 2660 c/m surface (250 c/m wipe) were found on the floor under No. 2 sample point and on scale platform in the shipping room. On the third survey made, only four square feet of floor area was found with above tolerance surface contamination. The floor around a leaking Welch Pump was found to have 6,400 alpha c/m (550 c/m wipe).

Beta-gamma surveys conducted in the carbon trap room with a 2610 survey meter revealed no above tolerance radiation, the maximum reading being 40 mr/8 hrs. Beta-gamma surveys conducted in the shipping room revealed only background radiation. Air samples taken in this building during the month revealed no above tolerance air contamination.

K-306-7 Product Withdrawal Area

Three spot audits were made in this area during the month. The later surveys revealed an area of two square feet of the defrosting unit here to be contaminated to 3700 alpha c/m (1200 c/m wipe). Contamination of 2500 c/m (300 c/m wipe) was found on the floor beneath this unit. A later survey indicated that decontamination work had been accomplished, although the defrosting unit still exhibited over tolerance alpha activity of 900 c/m (600 c/m wipe). On this later survey the scale table was found to be contaminated to 2250 alpha c/m (300 c/m wipe).

Much of the contamination reported above can be attributed to material releases from product cylinders. Such releases had occurred earlier in the month.

Personnel monitoring following material releases revealed some above tolerance hand and shoe contamination. This was immediately brought to below tolerance levels.

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One long-term air sample in this location revealed above tolerance air activity of 843 c/m/ft.³ This high activity resulted from several material releases in this location during the period in which the sample was being taken. Gas masks were worn by personnel during all material releases and during periods following releases when above tolerance air activity was suspected.

Gloves are worn by operating personnel in this location, and hands are checked for alpha contamination upon leaving the area.

Maintenance Shops

Spot surveys conducted in the process maintenance shops during the month found alpha contamination in the K-302-5 and K-305-12 Shops. Tools, floor, work tables, and seal pans were found to be contaminated with visible alpha emitting material.

Shop contamination is often traceable to the return, after seal change jobs, of seal pans containing alpha emitting material. This has been pointed out to maintenance supervision as a source of personnel contamination and steps have been taken to clean all seal pans before reuse.

Maintenance Jobs

Spot surveys were made of seventeen (17) separate maintenance field jobs during the month. On most of these jobs it was found that rules governing the use of protective clothing and equipment were being complied with by all personnel. On one maintenance field job surveyed during the month, sight glasses on the reflux still and tower in the K-1401 building were changed. Several undesirable conditions were noted and reported to supervision. A few cases of personal shoes being worn without shoe covers were noted. The shoes were checked on these jobs and found to be below the established tolerance value.

Field Electronic Instrument Shops

Spot surveys of these shops during the month located surface and transferable alpha contamination in the K-305-9 Shop. Readings as high as 25000 c/m were found on the floor and equipment. Supervision was notified of the condition of this shop and it was decontaminated. A survey taken after the shop had been decontaminated found one above tolerance

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Tool Rooms - K-1401 and K-303-4

A survey of tool rooms during the month found no contamination in the K-1401 Room. In K-303-4 Tool Room, one (1) vacuum cleaner bag was found to read 1,950 c/m (800 c/m wipe) and a putty knife read 1300 c/m (zero wipe).

The hand counting program now in effect at this location, together with a projected routine tool monitoring program, should free this area of all contamination hazards.

K-1004-J Radio-Chemical Laboratory

Spot audits of operations in the Radio-Chemical Laboratory during the month revealed above tolerance beta-gamma radiation in several locations during the course of experiments being carried out. Radiation exposure of high levels is intermittent in this location since samples are exposed for short periods of time during experiments.

During an early survey of this location during the month, gamma radiation of 800 mrep/8 hrs. was measured at the opening of Hood "D" during short periods when a ruthenium sample here was exposed. The sample was handled by tongs and kept shielded when not in actual use. With the sample shielded, radiation at the hood opening ranged from 160 to 320 mrep/8 hrs. Subsequent to this survey, shielding at Hood "D" opening was increased, and later surveys revealed that radiation levels here had been substantially reduced. Beta-gamma radiation of 160 mrep/8 hrs. was measured at the surface of a cylindrical stainless steel supernate container north of the wet chemistry hood. A reading of 40 mrep/8 hrs. was taken at a distance of one (1) foot from the lucite shielding of the wet chemistry hood while an experiment was in progress. Radiation of 20 and 30 mrep/8 hrs. was measured at the openings of Hoods "A" and "C", respectively.

A later survey revealed beta-gamma radiation of 240 mrep/8 hrs. at a distance of one-half inch (1/2") from piping and absorbent paper in a stainless steel tray on the floor south of the wet chemistry hood. Radiation was at plant tolerance intensity (100 mrep/8 hrs.) eight inches (8") above the surface of the tray. A reading of 100 mrep/8 hrs. was taken at the entrance of Hood "B" during one phase of an experiment where high radiation levels were expected. This high level of radiation intensity was of short duration (less than fifteen minutes). A wooden dolly, used for hauling samples, was found contaminated with beta emitting material to 64 mrep/8 hrs.

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reading. This was cleaned immediately. A work table and a section of the floor in the supply room at the K-402-9 Shop was found to be contaminated in a small area; 1500 c/m (240 c/m wipe) was found. This has been decontaminated.

The air activity in these shops did not exceed normal background.

K-1024 Electronic Instrument Shop

Two spot surveys of this shop during the month found four (4) above tolerance readings. The highest reading found was 4,800 c/m at a floor drain in the west side of the shop; supervision was notified of this contamination. Air samples taken showed the air activity to be at normal background levels.

K-306-7 Line Recorder Station

A survey of a line recorder maintenance job at K-306-7 on December 7 found alpha contamination throughout the station. Readings as high as 25,000 c/m (7,200 c/m wipe) were reported.

It was noted that Line Recorder Maintenance employees were not fully complying with personnel protection regulations and supervision was notified of the observed departures from safe practices.

K-305-12 Product Cylinder Head Repair Shop

Four (4) spot surveys conducted in this shop during the month found alpha contamination on the floor, work table, tools, and equipment; readings as high as 37,000 c/m (6,000 c/m wipe) were found. Similar conditions were found on all surveys during the month. One long-term air sample of 390 minutes and two (2) spot samples of 30 minutes each showed the air activity to be below tolerance in this shop. The supervision has been informed of the contaminated areas located in this shop.

Maintenance Vehicles

In a spot survey of twenty-eight (28) maintenance vehicles made during the month, two (2) flat-bed dollies and one (1) motor truck were found contaminated. Supervision was notified.

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It was tentatively agreed that tags would be used to identify highly active samples when exposed and it was suggested that daily tolerance boundaries about permanent radiation sources be marked by tags. It was agreed that wooden dollies would be covered with sheet metal for greater ease in decontamination.

K-1004-D, Room 20 (Wet Chemistry)

Spot audits of this location during the month revealed maximum alpha contamination of 2100 c/m (2100 c/m wipe) on a work bench near Hood No. 5. Two (2) hot plates at the north end of No. 2 Work Bench were found to be contaminated to 840 c/m (140 c/m wipe).

Samples stacked in glass petri dishes in a cabinet beneath Hood No. 4 were found to have a maximum beta-gamma radiation intensity of 144 mrep/8 hrs. with the wooden cabinet door open. Outside the cabinet door with the door shut a reading of 48 mrep/8 hrs. was obtained. The breakage hazard involved and the radiation intensities found were pointed out to supervision, and more suitable storage facilities were recommended. A "sample storage" cabinet had been ordered but had not yet arrived.

One (1) air sample taken in this location revealed air activity to be below tolerance.

K-1004-A Sampling Section

Two (2) audit surveys were conducted in this section during the month. The first survey revealed a high level of surface and transferable contamination. A maximum count of 11,000 alpha c/m (2200 c/m wipe) was found on a product sample cylinder. Floor contamination was found to be as high as 4400 alpha c/m (300 c/m wipe). Contamination as high as 5500 alpha c/m (500 c/m wipe) was located on work benches and equipment. Clothing was found slightly contaminated (200 alpha c/m) here, and spot hand checks revealed maximum hand contamination of 200 alpha c/m. Personal shoes were found to be contaminated to a below tolerance value of 300 alpha c/m. A maximum beta-gamma radiation reading of 8 mrep/8 hrs. was detected at the surface of a sample cylinder. Two (2) air samples taken here showed no above tolerance air contamination. A later survey revealed about the same condition as those reported above.

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The majority of this contamination results from the repair of contaminated sample cylinder and the moving of cylinder parts to different sections of the room.

Two (2) spot checks were made of the operation of a transfer unit in this location. Surface contamination detected on the floor showed a maximum activity of 1300 alpha c/m (300 c/m wipe). An above tolerance air sample of 2.3 alpha c/m/ft.³ was taken near the unit during a sample counting operation. A later check showed air contamination of 2.6 alpha c/m/ft.³ during removal of P-10 sample tubes from the unit. These samples were taken in the normal work location of the operator. A mask has been recommended for use during this operation until the installation can be removed or revised so as to reduce the hazard. Supervision was immediately informed of existing conditions and floor decontamination recommended.

K-1095 Critical Mass Building

A survey conducted December 15, 1948 showed high surface and wipe alpha activity. In Room 10-A, which is used for equipment storage, readings of greater than 38,000 alpha c/m (19,000 c/m wipe) were found on cylinders and contamination of 11,750 alpha c/m (1,225 c/m wipe) was detected on a fire extinguisher. Floor contamination ranged up to 1,225 alpha c/m (175 c/m wipe). Equipment contamination ranged as high as 13,230 alpha c/m (3,500 c/m wipe). This activity was found on a micromax unit. An air sample showed no alpha airborne activity above background levels. A maximum beta-gamma reading of 120 mr/8 hrs. was detected at the surface of a lead pot containing a radium source.

A high level of surface and transferable alpha contamination was found in a survey of Room 10. This room is used for laboratory work. Floor contamination of 875 alpha c/m (350 c/m wipe) was detected. Counts of greater than 38,000 alpha c/m (9,450 c/m wipe) were taken on metal trays located inside hoods where active materials are handled. Other above tolerance contamination was found on such equipment as a micromax unit, hot plates, and sponges in hoods and work benches. 9,450 alpha c/m (9,450 c/m wipe) was found on a fire extinguisher here. No beta-gamma radiation above background was detected. Two air samples taken in this location revealed below tolerance air activity.

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Spot audits of Rooms 1, 2, 4, 5, 7, and 9 in the K-1405 Building also revealed some above tolerance contamination. Some of this contamination may be attributable to previous operations carried out in this building.

Supervision was notified of the survey findings and recognized the hazards involved. A complete decontamination of the building was commenced and further safety precautions were instituted.

K-1004-D Fluorocarbon

On a spot survey during the month, radium sources were located in Rooms 010 and 5A. The sources were enclosed in glass containers and were positioned inside balance sets being used to neutralize electrostatic charge while weighing. Plant tolerance gamma radiation was detected at five inches (5") from the containers. Supervision recognized the hazard of breakage of containers and above tolerance radiation at operating position. Steps are being taken to eliminate the breakage hazard and to reduce the radiation at operating positions.

K-1004-D Analytical Research

A survey in this section during the month revealed a radium source, similar to those found in Rooms 5 and 010 (see above), in a balance set in Room 04. Procedures for eliminating the hazards are being followed as stated for the sources in the Fluorocarbon Section.

Audits of Rooms 17 and 19 during the month revealed a maximum floor contamination of 1400 alpha c/m (280 c/m wipe). A maximum wipe test reading of 6600 alpha c/m was obtained from the inside of a waste basket not identified as a receptacle for contaminated waste. Beta-gamma radiation of 160 mrep/8 hrs. was read two inches (2") above an open container of normal uranium material. Since this radiation was composed almost entirely of beta radiation, readings at the surface of the container were below plant tolerance for eight hours. A spot survey of hand contamination revealed maximum contamination of 140 alpha c/m. An air sample showed background air activity only. Supervision agreed that laboratory coats be worn, waste containers would be properly identified, and that a hand counting program would be put into effect in this location.

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Cascade Service Jobs

Carbon Trap Servicing

Spot surveys were made of servicing operations at several carbon trap installations. It was found that all the regulations covering the hazards involved were being followed and successful contamination control has been effected. Proper protective equipment is in use and respiratory protection worn. A need for the continued use of this protection was demonstrated by air counts up to 6.06 c/m/ft.³ taken at these operations.

Field Decontamination

The field decontamination jobs checked this month were satisfactory from all points of view. The work was carried out successfully in each instance checked, proper protective equipment was used, and no hazards to the personnel performing the work were observed to be present. One important exception occurred when one employee not wearing a head cover was checked and found to have 1,000 c/m on his hair. His supervisor was notified and agreed to have the man wash and recount his hair before leaving the plant. All other employees were wearing head covers as required.

K-1031 Carbon Storage and Sampling

One (1) survey was made in this building during the month.

A maximum reading of 12,800 c/m with material visible was found covering an area of approximately ten square feet (10 ft.²) around the carbon sampler. The floor in the remainder of this building ranged from 500 c/m to 1,000 c/m (600 c/m wipe).

Coded Chemicals Carbon Sampling Job (K-1031)

One (1) contaminated carbon sampling job performed by Coded Chemicals operators was checked this month.

Visible carbon dust on the floor around carbon sampler in an area of approximately one hundred square feet (100 ft.²) showed an average activity of 7,900 alpha c/m.

Operators wore protective coveralls, gloves, head covers, issued shoes, and assault masks. Coveralls were found to be contaminated, with readings as high as 1,050 alpha c/m.

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A short-duration air sample taken in the building shortly after the job had been completed and the operators had removed their masks, showed air activity of 10.3 alpha c/m ft.³ which is approximately five (5) times the tolerance level. Supervision was notified of this situation.

K-1212 and K-1213 Shipping and Receiving

Two (2) pieces of contaminated equipment were found in this section during the month. Both were pipe fittings which were found in the drawer of a file cabinet that had been used by operating personnel in the process area. Wipe tests made on these items gave a maximum reading of 360 alpha c/m. Both items were transferred to the Salvage Section after discovery.

K-1301 C-216 Generation and Oxide Conversion Building

Spot surveys, of which four (4) were conducted in this area during the month, continued to reveal high surface contamination.

A survey made early in the month found surface contamination in the oxide weighing and grinding rooms to be greater than 30,000 alpha c/m. Wipe tests in the grinding room were also greater than 30,000 alpha c/m. The maximum wipe test made in the weighing room was 4,500 alpha c/m. A maximum surface reading of 18,000 alpha c/m (7,500 c/m wipe) was found on the floor in the conversion room in the early part of the month.

As a result of changes made in the oxide grinding room the latter part of the month, the problem of high air contamination that formerly resulted from oxide grinding operations has been diminished considerably. This was the result of an installation of a rod mill to replace a Brown Pulverizer Unit. The rod mill is equipped with a valve through which the ground oxide material is transferred with a minimum of air contamination. In some cases, the succeeding fluorination operation is accomplished in the mill itself, thus eliminating an additional transfer operation.

A table which was moved into the hallway from the grinding room was found to have activity up to 30,000 alpha c/m (15,000 c/m wipe). On a survey made later in the month this table was found to have a surface count of 8,000 c/m (1,500 c/m wipe).

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A survey conducted early in the month in the conversion room revealed contamination of up to 18,000 alpha c/m (7,500 c/m wipe). On a later survey a maximum surface reading of 4,000 alpha c/m, (2,400 c/m wipe) was found, thus indicating that some decontamination had been carried out during the month.

Approximately four hundred and fifty square feet (450 ft.²) of floor in the hallway was found to have above tolerance alpha contamination ranging from 500 c/m to 1,500 c/m (1,000 c/m wipe). A contaminated waste can has been placed in the hallway during the month. This can is the step-on type, painted yellow with black letters, and its use should help to decrease the spread of contamination.

Surveys conducted in the K-1301 Laboratory revealed maximum surface contamination of 2,400 c/m (500 c/m wipe).

Beta-gamma surveys throughout the building revealed above tolerance radiation in the oxide grinding and weighing room. Surface material on the grinder and floor showed activity up to 160 mrep/8 hrs. which was almost entirely composed of beta radiation.

Air samples taken in the grind, weigh, and laboratory rooms while no operations were in progress, and in the reactor room and hallway during normal operations, and including long-term samples now being taken, revealed below tolerance air contamination. The highest count was 0.9 c/m/ft.³

Visitor control signs are now posted on the doors leading to the oxide grind, weigh, and conversion rooms. Operators in these locations wear protective coveralls, issued shoes, masks, head covers, and gloves when working with oxide materials. Hand counts are taken at lunch time and at the end of each shift. Working time is limited in the oxide grind, weigh, and transfer rooms in order to minimize the hazards to which the operators are exposed.

K-1303 Decontamination Building

Six (6) spot surveys were conducted in this building during the month. Three (3) of these, conducted early in the month, revealed surface contamination covering a total floor area of three hundred and fifty square feet (350 ft.²) in Cubicles No. 11 and No. 12 and in the converter decontamination area to have a count of more than 30,000 c/m (22,500 c/m wipe).

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A later survey revealed a decrease to fifty square feet (50 ft.²) of floor area having above tolerance contamination in the converter decontamination location. This area showed with a maximum surface reading of 2,350 c/m (<100 c/m wipe), indicating that effective decontamination had been accomplished. On a survey conducted here later in the month, surface contamination was found to have again increased. An area of approximately four hundred square feet (400 ft.²), having a maximum of >16,000 c/m (12,000 c/m wipe), was found.

Beta-gamma surveys conducted in the decontamination room with a 2610 Meter revealed only background beta-gamma radiation.

Air samples taken in this area during the month found satisfactory conditions, with the exception of a sample taken while the face of a flange on a converter shell was being buffed with a portable electric buffer. This sample showed air activity of 4.88 c/m/ft.³, but the operator was wearing a respirator during this operation and no serious hazards were presented.

Surveys conducted in the K-1303 cubicles revealed high alpha contamination, particularly in Cubicles 7, 10, 11, and 12, where the measured activity was > 30,000 c/m (22,500 c/m wipe).

Beta-gamma surveys conducted in these cubicles found no above tolerance radiation. All operators in this building wear protective coveralls, issued shoes, or shoe covers and gloves. Hand counts are taken before lunch and at the end of each shift.

Fifteen (15) spot surveys made on processed equipment during the month found some of the equipment checked to be incompletely decontaminated. All such equipment found was re-run and again monitored before being released.

K-1401 Building

Vacuum Pump Shop

Of four (4) surveys conducted in this location, two (2) revealed over tolerance alpha surface contamination on the work table, floor, and tools. This contamination ranged from 2700 alpha c/m to 6,600 (675 to 6,600 c/m wipe). This contamination was cleaned up and the tools were decontaminated.

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Over tolerance radiation was found at Beach-Russ "Y" and "J" Pumps which were in the shop for repairs. A high measurement of 160 mrep/8 hrs. was taken eight inches (8") from pump parts, and measurements were also found on the work table, floor, and oil in container of 160 mrep/8 hrs. at the surface, using an IDL Model 2610 Meter. These pumps are dismantled in this shop and then sent to K-1410 for decontamination.

Men working in the shop wear protective clothing in the form of coveralls, issued shoes, and neoprene gloves, and use film badges and ring pads. At the completion of each job their clothes are checked and exchanged for clean clothes, if found contaminated. Their hands are checked on the completion of each job, in addition to routine checks at lunch time and at the end of the shift. Air samples taken in this location revealed no background alpha air activity.

A.C. Pump and Seal Shop

In two (2) of four (4) surveys conducted in this shop above tolerance alpha contamination up to 3,000 alpha c/m was found on the etching table covering approximately one square foot (1 ft.²). One (1) pair of leather gloves which were used to handle seals gave a count of 4,020 alpha c/m and a small area on the floor in front of a lapping table revealed a count of 1,110 alpha c/m (0 c/m wipe).

Personnel working in this location wear protective coveralls and gloves.

Seals are decontaminated in metal containers on a stainless steel top table and the contaminated solution is put in "always-safe" containers. Seals requiring buffing are buffed in an enclosure containing a large filtered vacuum cleaner suction in order to prevent spread of contamination.

Hands are checked at least twice daily, before lunch and at the end of the shift, and if contaminated they are washed until free of contamination.

Air samples taken in this location revealed no above background alpha air activity.

K-1401 Converter Retubing Section

Converter heads, shells, tube bundles, and parts sent to K-1401 from K-1303 after decontamination are checked in the

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K-1401 cleaning area for surface and wipe activity. Any item showing a positive wipe test is returned to K-1303 for decontamination. Of thirty-eight (38) shells checked only six (6) were returned this month. While only four (4) heads were returned for wipe test activity, high surface contamination was found on burnt edges of several converter heads. Checks on the floor in this location revealed no above tolerance locations.

Safety & Inspection Test Shop

Heads found free from transferable material are sent to the Safety & Inspection Test Shop where the coolant system in the head is pressure tested. These heads are checked again for contamination. Spot checks on five (5) heads in this shop revealed no transferable material.

Head Build-Up and Machine Shop

Two (2) surveys of heads in the machine shop and head build-up operation revealed no transferable material on twenty-four (24) heads which were checked. Checks on the floor and equipment in these locations showed no surface contamination.

Retubing Room

Of twenty-two (22) heads and shells which were checked in the retubing room only one (1) gave a positive wipe test. This one was identified to the supervisor.

Spot checks made on the tube grinding operation revealed only one (1) over tolerance location on some scrap and sweepings in a barrell. Other surveys of the floor, boxes, stands, and tube bundles revealed no surface contamination. Tube sections which have passed through the grinder are enclosed while dropping from the grinder to a storage barrell. A vacuum cleaner suction near the grinder discharge also aids in keeping air contamination to low levels. Consequently, air samples taken in this location were at normal background activity. Men working on this job wear coveralls, gloves, and dust respirators.

Ferrule Removal Stand

The highest reading reported from surveys of this location during the month was one (1) over tolerance location on Stand No. 2. An alpha count of 875 c/m (250 c/m wipe) was found at

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the No. 2 Stand. This location is decontaminated weekly. Air samples taken in this location were at normal background levels. Continuous air monitoring was started in this location at the same time as those at the tube grinding operation.

Converter Head Cutting

The converter head cutting stand, which was formerly located in the center of the cleaning area, has been relocated in a fenced enclosure at an isolated section of the building. This will help to prevent widespread floor contamination and the possibility of shoe contamination from dust, slag, and melted metal. The floor area where this stand formerly stood has been decontaminated and gives consistent negative wipe tests although an over tolerance surface alpha count still remains in a small area of approximately two square feet (2 ft.²). Continuous air monitoring has been set up in the new location.

K-1410 Decontamination and Storage

Four (4) spot surveys were conducted in this building during the month. All surveys revealed above tolerance contamination on approximately 85% of floor area up to $> 30,000$ c/m (6,000 c/m wipe). On one (1) survey, a spot of visible material on the floor had a surface and wipe count of $> 30,000$ c/m.

Beta-gamma surveys conducted in this building with a 2610 Meter found readings of 160 mrep/8 hrs. on several A.C. Pump casings and impellers, and on a Beach-Russ Pump rotor brought in for decontamination.

All air activity samples taken in this building were below tolerance with the exception of one (1) sample taken on December 17 while the floor was being swept. This sample showed an alpha air count of 2.2 c/m/ft.³ Though it is understood that this is not a continuous condition, it was recommended that mopping or wet sweeping be employed.

A decontamination facility for process equipment, employing hot sodium carbonate solution as a decontaminating agent, was initiated in this location during the month. A stainless steel spray chamber for decontamination and a spray chamber are employed. These chambers are designed so as to be "always-safe".

Hot Salvage Yard

Cast iron, scrap iron, tin, aluminum, monel wire, sheet metal, and lead are now being monitored at the Hot Salvage Yard, and uncontaminated material is being sent from the yard to the Roane-Anderson Salvage Department at an average rate of four (4) 6,000-ton loads per week. Each piece of metal is monitored with a Victoreen Model 356 (Zuto) for alpha, and with a Victoreen 263 for beta-gamma. No alpha or beta-gamma contamination of material shipped from the Hot Salvage Yard is allowed.

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V. PERSONNEL MONITORING

Personnel monitoring in the form of hand and foot checks for alpha contamination continues where personnel are subject to contamination. There were approximately four hundred and forty (440) employees monitored both routinely and intermittently during December. Although initial checks revealed hand contamination in eleven (11) instances, this contamination was reduced to acceptable levels by means of washing in all cases except one, which was reported below tolerance on a check made the following day.

<u>Location</u>	<u>Apprx. No. Monitored Daily</u>	<u>Type Of Monitoring</u>	<u>Minimum Frequency</u>	<u>Number Of Above Tolerance Readings</u>	<u>Final Above Tolerance Readings</u>
K-300 Coded Chemical Vault 16-A	7	Alpha, Hand.	Twice daily.	-	0
K-302-2 Change House (Maint. Personnel).	27	Alpha, Hand.	Twice daily.	2	0
K-303-4 Tool Room.	8	Alpha, Hand.	Twice daily.	3	0
K-303-7 Change House.	27	Alpha, Hand-Shoe.	Twice daily.	1	0
K-305-9 RR Area Operating Personnel.	44	Alpha, Hand.	Twice daily.	1	0
SS Area	6	Alpha, Hand.	Twice daily.	1	0
RR Area Maintenance Personnel.	65	Alpha, Hand.	Twice daily.	2	0
K-1004-J, Radio-Chem. Lab., Regular Personnel.	12	Alpha, Hand. Beta-gamma, hand & foot.	Twice daily.	-	0
Visitors to K-1004-J.	20	Beta-gamma, Hand & Foot.	On leaving.	-	0

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<u>Location</u>	<u>Apprx. No. Monitored Daily</u>	<u>Type Of Monitoring</u>	<u>Minimum Frequency</u>	<u>Number Of Above Tolerance Readings</u>	<u>Final Above Tolerance Readings</u>
K-1004-D, Rm. 20, Wet Chem. Section	7	Alpha, Hand. Beta-gamma, Hand & Foot.	Twice daily.	-	0
K-1004-B, Rm. 150, Counting Section.	6	Alpha, Hand. Beta-gamma, Hand & Foot.	Twice daily.	-	0
K-1004 Lab. Sampling.	11	Alpha, Hand.	Twice daily.	-	0
K-1004-B Uranium Analysis.	20	Alpha, Hand.	Twice daily.	-	0
K-1004-B, Electronics.	5	Alpha, Hand.	Twice daily.	-	0
K-1004-B Lab., Counting.	18	Alpha, Hand.	Twice daily.	-	0
K-1004-C Lab. Spectrometer.	49	Alpha, Hand.	Twice daily.	-	0
K-1024 Electronic Instrument Shop.	9	Alpha, Hand & Shoe.	Twice daily.	0	0
K-1024 Pneumatic Instrument Shop.	5	Alpha, Hand.	Twice daily.	0	0
K-1301 & K-1303 Oxide Conversion & Decontamination.	45	Alpha, Hand.	Twice daily.	1	1

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<u>Location</u>	<u>Apprx. No. Monitored Daily</u>	<u>Type Of Monitoring</u>	<u>Minimum Frequency</u>	<u>Number Of Above Tolerance Readings</u>	<u>Final Above Tolerance Readings</u>
K-1401 A.C. Pump & Seal Shop.	7	Alpha, Hand & Shoe.	Twice daily.	0	0
K-1401 Vacuum Pump Shop.	28	Alpha, Hand.	Twice daily.	0	0
K-1401 S&I Test Shop.	7	Alpha, Hand	Twice daily.	0	0
K-1401 Valve Shop.	7	Alpha, Hand.	Twice daily.	0	0

In addition to the above locations where formal records are kept, hand monitoring is performed at the K-301-4 Field Electronics Shop, K-1401 Conditioning Laboratory, K-1405 Process Design and Development Laboratory, and the K-305-9 Field Electronics Shop.

Film Badges

Thirty-three (33) badges were issued weekly for use by visitors in the Laboratory Division and the Critical Mass Laboratory.

There was one exposure reported during the month which was due to X-Ray received during a medical examination after a process material release. All other badges were reported as being below tolerance levels.

An average of three hundred and thirty-seven (337) film badges was used throughout the K-25 Plant during the period of November 26 to December 24. Use of badges was divided as follows:

<u>Location</u>	<u>Stationary</u>	<u>Personnel</u>
Critical Mass Laboratory (including visitors)	4	9
Emergency Monitoring	16	0
Engineering Development	3	0

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<u>Location</u>	<u>Stationary</u>	<u>Personnel</u>
Health Physics Inspection Section	11	13
Instrument Development Section	0	4
Laboratory Division (Including visitors)	5	98
Process Division	42	74
Plant Protection Division	0	22
Electronic Instrument Division	0	3
Maintenance Division	<u>0</u>	<u>2</u>
Total	81	225

Film Rings

An average of thirty-three (33) film rings per week was used during the month by the Laboratory, Maintenance, and Health Physics personnel. No above tolerance exposures were noted during the month.

Pocket Chambers

Pocket chambers were worn daily by personnel working in, or visiting the following locations:

<u>Location</u>	<u>Number Of Users</u>	<u>Number Pairs Used</u>	<u>Number Exposures Between 5+ 100 mr/day</u>	<u>Number Above Tolerance 100 mr/day</u>
K-1004-A, Room 22, Electrochemical Section.	4	26	9	0
K-1004-J, Radio-Chemical Laboratory.				
Visitors	20	25	0	0
Regular Personnel	17	211	25	0
K-1004-D, Room 20, Wet Chemistry Section.	8	145	2	0

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<u>Location</u>	<u>Number Of Users</u>	<u>Number Pairs Used</u>	<u>Number Exposures Between 54 100 mr/day</u>	<u>Number Above Tolerance 100 mr/day</u>
K-1004-D, Physical & Inorganic Chemistry.	4	73	2	0
K-1004-B, Counting Section.	2	28	10	0
K-1005, X-Ray and Electron Diffraction.	4	20	6	0
K-1034, Health Physics Section.	9	28	5	0

VI. RADIOACTIVE MATERIAL RELEASES

K-402-5 Line Recorder Station - December 6, 1948

Prior to the removal of a faulty valve from a line recorder manifold, the system was pressured with G-74, causing a small amount of C-816 vapor to escape to the atmosphere through a leaking bellows. The amount of leakage was too small to permit any estimate of material quantity involved, but alpha surface and air measurements made immediately following the release found no resulting contamination, indicating that the amount released was small. Two employees were sent to the Dispensary for supervisory examinations.

K-306-7 Product Withdrawal Station - December 6, 1948

Several material releases occurred at this location on this and the following day, due to the same cause. The collection of non-condensable contaminants in product cylinders caused leakage at the gaskets after the cylinders had warmed to room temperature. Eight cylinders, in all, were involved and while the actual amounts of leakage were small the nature of the material caused the resulting alpha contamination to be relatively high. Surface alpha counts up to 20,700 were observed immediately afterward and air contamination was measured up to 357.8 counts per minute per cubic foot. Employees do not regularly wear protective clothing other than gloves, but assault masks which are available were worn during these releases as well as during the initial phases of decontamination. This area has stainless

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steel flooring, equipment, and work surfaces wherever possible, thus decontamination was effected simply and completely. Surveys showed that no contamination remained after cleaning. The same two employees were sent to the Dispensary on each of the successive days for supervisory examinations.

K-131 Fresh Feed Room - December 7, 1948

An escape of C-616 vapor occurred for about one minute due to a faulty Kerotest Valve on a feed cylinder during normal feeding operations. The emergency freeze-out device operated satisfactorily to stop the leak, and no appreciable quantity of material was permitted to escape. Alpha surface and airborne checks made immediately following the release found no above tolerance contamination; however, three (3) employees working in the room were sent to the Dispensary.

K-402-9 Cell Floor - December 15, 1948

A residual amount of process gas in a purge header was allowed to escape to the atmosphere when an operator opened a valve to release G-74 being used to actuate the blowout preventer on a stage pump. The release was of only five seconds duration, since the material involved was not normally contained in the equipment but had found its way there by misoperation. One employee, who had been wearing no protective equipment was within range, and he was sent to the Dispensary. No detectable contamination was found in a subsequent survey.

K-131 Furnace Room - December 21, 1948

C-616 was allowed to escape when a bellows ruptured on a feed valve during operations regularly carried out in this room. All adjacent valves were closed, isolating the faulty one, and escape of material to the atmosphere was kept to a relatively small quantity. Three employees, wearing coveralls, gloves, and assault masks entered the room to isolate the equipment and vent the remaining vapor to speed decontamination, and were afterwards sent to the Dispensary.

VII. WATER MONITORING PROGRAM

Consistent heavy rains throughout the month of December made sampling of drainage waters somewhat less informative than usual. Streams, without exception, were sufficiently swollen throughout the month to introduce a serious dilution effect. Perhaps the most marked example of this occurred in the sanitary water plant sample which is taken by allowing the accumulation of a small continuous fraction of the treated water effluent and sampling this fraction every other day.

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Results of beta counts on the sample during December were lower and more constant than the average of previous months to date. Varying from 9 ± 8 to 38 ± 21 the beta count of these samples averaged 27. All results are in disintegrations per minute per 100 ml. Alpha counts and uranium and fluoride determinations on these samples were consistently negative.

Of the other samples made during the month, on a weekly and monthly basis, no other significant results appeared. Two samples, the results of which were above normal, though not unduly high, were reported; one from the K-27 ground drainage lines for which no immediate explanation was discovered, and the second from the holding pond outlet flume which is probably explained by the increased and changing operations in the decontamination and recovery building. Neither of these points reached previously reported peaks, nor did they approach the accepted tolerance value for uranium in water.

VIII. SPECIAL STUDIES

Audit and Study of HL-45 Operations

An audit and study of Health Physics aspects of Project HL-45 operations was completed during the month and submitted in letter form to the directors of the Laboratory Division.¹ Recommendations for work being carried out in the Radio-Chemical Laboratory (K-1004-J) included the provision of laboratory coats for visitors and laboratory employees working for short periods of time, the identification of contaminated equipment upon its discovery, the confinement of radiating sources and contaminated equipment to specified locations, and the more wide-spread use of film rings or pads. It was also recommended that shielding for containers be improved, that time spent in high radiation fields be scrupulously limited and recorded, that equipment design and arrangement be improved so that active materials could be handled with less exposure, that transportation of chemical or source containers be revised so as to limit and confine spills, and that personnel engaged in HL-45 work become more thoroughly acquainted with the radioactivity hazards of their jobs.

Radiation Properties of 700-Day Supernate

A 50 cc sample of 700-day-old waste supernate was used as a source to test shielding properties of lead with respect to supernate. The results of this test were submitted in letter form.² Similar tests of shielding properties are planned for other materials.

¹ Letter to Drs. C. K. Beck and F. W. Hurd, dated December 13, 1948.

² Letter to S. Visner, dated December 30, 1948.

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Analysis of Health Physics Data

A procedure was worked out, in cooperation with the Central Statistical Laboratory and the Laboratory Division, on the installation of an IBM electric card system for recording and analyzing Health Physics data.

Disposition of Leaking Radium Source

The monthly routine inspection of radium sources in the Plant revealed a leak in the one gram radium-beryllium source capsule used in the pilot plant "Little Gene" fission counter.

Confirmation of the leakage was established when a decay curve, obtained from a nickel counting plate which had been exposed to the source, proved to be identical with a standard radon decay curve.

The source was returned to the Atomic Energy Commission, New York, New York in a specially designed lead walled container with an oil seal to prevent escape of radon.

Radium Source Breakage Hazard

During spot surveys of the laboratories during the month, three (3) small radium sources enclosed in glass capsules were discovered in different laboratory balance sets. Due to the danger of breakage of these capsules, it was recommended that these sources be further enclosed so as to reduce the breakage hazard. An order for lead containers was submitted.

IX. EDUCATIONAL PROGRAM

Training of the plant emergency squads in radiation hazards phases of the emergency program was completed during the month. Eight (8) squads, a total of seventy (70) persons, received training in basic radiation theory, protective devices and procedures, and instrument operation.

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A P P E N D I X

The October, November, and December, 1948 Quarterly Analysis Summary of the Water Survey program is included in the following tables.

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WATER SURVEY PROGRAM SUMMARY

QUARTERLY SUMMARY OF ANALYSIS RESULTS - OCT., NOV., DEC., - 1948

SAMPLE NUMBER	LOCATION	URANIUM ANALYSIS RESULTS, OCT. THROUGH DEC.				FREQUENCY	ANALYSIS	REMARKS
		TOTAL SAMPLES	LESS THAN FIVE PPB	FIVE THRU TWENTY PPB	OVER TWENTY PPB			
24-A	K-25 Water Purification Plant Effluent	46	46	0	0	Alternate days	Uranium, Fluoride, Alpha, Beta, pH.	Fluorides all negative, Alpha consistently at background, several beta peaks. 420 d/m on Nov.
13-W	Clinch River, 5 miles downstream of last K-25 Effluent.	13	13	0	0	Weekly, * Mud sample monthly.	U, F, Q pH.	All results negative or background.
16-W	Drinking water Spot Sample.	13	13	0	0	Weekly	U, F, Q pH.	All results negative or background.
10-W	Clinch River below S-50 Sewer Outfall.	13	13	0	0	Weekly, Mud Sample Monthly	U, F, Q	All results negative or background.
12-W	Clinch River Upstream of K-25.	5	5	0	0	Weekly	U, F, Q pH.	F - negative, background, low beta peaks.
14-W	Sewage Disposal Plant Influent.	13	12	1	0	Weekly	U Only	
6-W	K-27 Storm Sewer (Ground drainage)	13	11	2	0	Weekly	U Only.	
11-W	Poplar Creek Upstream of K-25.	13	13	0	0	Weekly	U, Q , Q , pH	All counts at background value.
* Mud sample results reported separately at end of table.								

URANIUM ANALYSIS RESULTS, OCT. THROUGH DEC.

SAMPLE NUMBER	LOCATION	URANIUM ANALYSIS RESULTS, OCT. THROUGH DEC.			FREQUENCY	ANALYSIS	REMARKS
		TOTAL SAMPLES	LESS THAN FIVE PPB	FIVE THRU TWENTY PPB			
22-W	Mouth of Poplar Creek at Clinch River.	13	13	0	0	Weekly	U, ∞ , ϕ , pH. All counts at background value.
1-W	Poplar Creek Inlet N.E. of K-303-8.	11	9	2	0	Changed to Semi-monthly.	U, ∞ . Counts at background.
29-W	Outlet Flume at West end of Holding Pond.	11	1	10	0	Changed to Semi-monthly.	U, ∞ . This point has been showing a steady increase.
20-W	Cafeteria Cooking Water.	13	13	0	0	Weekly.	U, F, ∞ , ϕ , pH. Results consistently negative or background.
8-M	Drainage from Hot Scrap Yard.	3	3	0	0	Monthly	U, ∞ . Alpha counts at background.
9-M	Clinch River W. of Jones Scrap Yard.	3	3	0	0	Monthly	U, ∞ . Alpha counts at background.
17-Y-25	K-25 Recirculating Water.	3	3	0	0	Changed to Yearly.	U, ∞ . Alpha count at background.
17-Y-27	K-27 Recirculating Water.	3	3	0	0	Changed to Yearly.	U, ∞ . Alpha count at background.
15-M	Sewage Disposal Plant Effluent	1	1	0	0	Monthly.	U only. Schedule rearrangement caused this sample to be omitted in Oct. and Nov.
21-M	S-50 Storm Sewer Outfall.	3	0	2	1	Monthly	U only. First October rains brought U content Up to 50 PPB.

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QUARTERLY SUMMARY OF MUD SAMPLING RESULTS

SAMPLE NUMBER	LOCATION	URANIUM CONTENT IN PPB, AND BETA COUNT IN C/M/GM DRY WEIGHT			ANALYSIS	REMARKS
		OCTOBER	NOVEMBER	DECEMBER		
10-M-E	Bottom mud at S-50 Storm Sewer Outfall Sample Location.	No sample	No sample	440 2.5 ± 0.3 Alpha Count	U, F, α.	High water prevented Nov. sample. Oct. temporarily discontinued; this sample not beta counted.
13-M-E	Bottom mud five miles downstream.	0 9.0 ± 1.5 Alpha count	160 6.1 ± 1.0 Alpha count	290 3.3 ± 0.4	U, F, α.	Fluoride content 61.4, 42.6 and 59.4 PPM respectively.
24-M-E	Settling basin sludge from Sanitary Water Plant.	2500 1041 c/m	10000 3058 c/m	875 13674 c/m	U, α, β.	All alpha counts slightly above background. Granular mud particles have the property of strongly adsorbing most beta emitting heavy elements, thus offering a natural water purification mechanism.
139-M-E	Surface soil composite sample from drainage area of Hot Scrap Yard, used for supply source of topsoil for K-25 landscaping.	-	440 PPB of uranium.			This special sample was taken to check on described operation.
15-M-E	Sewage Disposal Plant Sludge.	Now sampled only on removal of a fresh batch from the Imhoff tanks. This operation not carried out during the subject quarter.				

NOTE: Special count of mud from Clinch River three miles above Elza, to determine background values for soil of this locality gave: Uranium 380 PPB, Fluoride 82.2 PPM; Alpha 0.1 c/m; Beta 11 ± 17 c/m.

SAMPLE NUMBER	LOCATION	URANIUM ANALYSIS RESULTS, OCT. THROUGH DEC.				FREQUENCY	ANALYSIS	REMARKS
		TOTAL SAMPLES	LESS THAN FIVE PPB	FIVE THRU TWENTY PPB	OVER TWENTY PPB			
23-M	Ground water from test drilling at Sludge Pit.	1	1	0	0	Monthly	U only. Oct. and Nov. sample omitted in schedule changes.	
25-Y	Clinch River Above Elza.	1	1	0	0	Yearly.	U, F, α . Background value reference sample.	
26 & 27-M	Drainage from A, B, C & D.	1	1	0	0	Monthly	U, α . Slight alpha peak in Dec., Oct., & Nov. omitted.	
28-M	BoarCreek at Oak Ridge Turnpike.	2	2	0	0	Monthly	U, α , β . Counting results at background value.	

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CARBIDE AND CARBON CHEMICALS CORPORATION
K-25 PLANT
Safety and Inspection Division
Oak Ridge, Tennessee

HEALTH PHYSICS ACTIVITIES FOR MAY, 1948

Compiled by S. Visner

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File number: _____ Activities at K-25 Plant
Date of issue: JUN 25 1948 for May, 1948
Author: S. Visner

CARBIDE AND CARBON CHEMICALS CORPORATION
K-25 PLANT
Oak Ridge, Tennessee

A B S T R A C T

Herein are reported the Health Physies Activities for May, 1948, in the K-25 Plant. In addition to the results of radiation surveys, area and personnel monitoring, air sampling, and water survey program, a Health Physies Summary of reported routine and spot area surveys is presented in tabular form. This form of reporting will make possible a means to compare locations and also will indicate the general trend of Health Physies activities on a month to month basis. In the Appendix is presented in tabular form the results of air analyses for chemical contaminants.

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SUMMARY

The following Health Physics Summary of reported routine surveys by the operating groups and spot area surveys by the Radiation Hazards Department are presented in tabular form. The relevant information on air and surface contamination and penetrating radiation is presented according to location along with the number of personnel normally present and size of work area.

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II. INTRODUCTION

The following are the highlights of the Health Physics activities in the K-25 plant for May, 1948.

The program was continued of locating and removing radioactive contamination throughout the plant. The locations which are found contaminated are being decontaminated, and special consideration is being given to modification of procedure and equipment, to prevent the spread of radioactive contamination. A study has been started of the problem encountered in the Stores Department. Surveys are being made of the extent of contamination on equipment and also methods of proper control.

Due to the fact that converter changes in the Cascade reveal significant improvements in personnel protection and monitoring, it was decided that a new fundamental approach was in order. In place of blanket regulations on the use of certain types of protective equipment, the supervisor now specifies the specific equipment needed for each phase of the operation, in light of the contamination hazards present. It is recognized that a dust respirator is probably sufficient protection for radioactive dusts on such operations. However, the hazard from HF cannot be neglected at certain phases of the work.

The installation of new decontamination facilities has started. It is anticipated that contaminated equipment will in most cases be brought down within tolerance specifications.

The health problems arising in the Electronic Instrument Shop were studied. Decisions were made on the disposition of equipment entering the shop, the designation of contaminated areas, proper protective clothing, and adequate personnel monitoring.

With respect to the operation of the Radio-Chemical Laboratory the following developments are noted. Rules and regulations on safe practices, concerning radioactivity hazards, were formulated for this installation. A tolerance figure of 5 mrep per day has been set. Arrangements were made for decontamination of protective clothing at another installation on the area. Construction prints of the laboratory were reviewed for adequate health protection. Personnel monitoring has been extended in the form of beta-gamma hand counts and pocket chambers.

A container for transporting radioactive material was designed and tested for proper shielding.

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Field checking of radiation detection instruments was initiated for the purpose of determining that proper personnel monitoring techniques prevailed.

The water survey program continues to show no change in the previously reported low contamination results. Progress is being made in mud sampling. A meeting was held with representatives of Oak Ridge National Laboratories and the Tennessee Valley Authority for the purpose of coordinating the water survey program on the Oak Ridge area.

III. ORGANIZATION

The plant organization with respect to administering the policies pertaining to the protection of personnel from potential radiation hazards remains essentially unaltered. The responsibilities and duties of the various groups concerned with the problems are listed in the report for October, 1947.

IV. RADIATION SURVEYS

In accordance with its responsibilities, the Health Physics Section conducted spot surveys on an irregular schedule.

The results of these audits are summarized for each location involved:

K-101 C-816 Stripping Building

Two (2) surveys that were conducted in this locale during May revealed above tolerance surface activity in a 4 ft² area located directly beneath the sample take off point. It was possible to transfer 450 c/m of this material by the wipe test. Other above tolerance surface contamination was found on the sample line connection. However, material may be expected to be found at this point and does not necessarily constitute a hazard, providing gloves and gas masks are worn during connecting and disconnecting operations. Decontamination operations generally accompany surveys by the operating group. Succeeding surveys indicate this to be true. At the present time formally recorded hand counts are not taken of persons working in this area.

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K-131 Feed Purification Building

Fresh Feed Room

A total of two spot surveys were conducted in this room. The first survey revealed only one above tolerance surface contamination located on the floor near the "D" bath. It was possible to transfer 1400 alpha c/m of this material by the wipe test. Boga gamma measurements taken of feed cylinders revealed a maximum reading of 9.2 μ rcp per 8 hours. A second survey revealed a considerable greater quantity of surface alpha contamination. A maximum activity of 1800 alpha c/m was found in a 3 ft² area on the floor beneath the "A" carbon trap. It was possible to transfer 155 alpha c/m of this material by the wipe test. The insulation on a water line located at "D" bath also revealed a spot contamination of 1800 alpha c/m. A wipe test of a feed cylinder valve showed 465 alpha c/m of material transferable.

Furnace Room

Two surveys were conducted in this room resulting in above tolerance contamination within a metal supply cabinet. In both surveys a wipe test indicated this material to be transferable. Floor contamination in a 4 ft² area was also present, having a possible transfer of 600 c/m. At the time of the first survey, floors were being decontaminated. However, the second survey pointed out that contamination still existed in this area.

K-631 Waste Disposal Building

Shipping Room

Two surveys were conducted in this room. The first survey revealed contamination in a 2 ft² area located on the floor near the cylinder door. It was possible to transfer 300 alpha c/m of this material. An activity of 5000 alpha c/m was found on insulation around the evacuation valve to J-635 pump. A second survey again revealed contamination near the cylinder door in an approximate 2 ft² area. It was possible to transfer 300 alpha c/m of this material. Other above tolerance spots were found on the floor beneath the sample

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points. Protective equipment in the form of gloves, coveralls and masks continue to be used as previously reported.

Carbon Trap Room

Two surveys conducted in this area, May 14th and 24th, revealed the same above tolerance contaminated areas, having wipe activity of 450 alpha c/m. This material was found on the outside surface of carbon trap No. T-210. In addition to the activity found on the carbon trap, the May 24th survey revealed an average count of 1000 alpha c/m in a 6 ft² on the floor, it being possible to transfer 150 alpha c/m of this material. Contamination in this room is undoubtedly the result of carbon trap servicing operations.

A and B Waste Pump Rooms

Two surveys conducted in this room indicated no above tolerance activity in the "A" pump room and a single spot of 3400 alpha c/m on the housing at the manhole cover on the accumulator during the first survey. A second survey revealed 2200 alpha c/m of material still remaining on the manhole cover and housing as revealed by the first survey. It was possible to transfer 150 c/m of this material.

K-300 Coded Chemical Vaults

Vault 1-X

Surface activity as high as 19,000 c/m was found on cylinder flanges stored in this vault. A product cylinder had a surface activity of 8000 c/m, 320 c/m of this material being transferable as shown by the wipe test. All above tolerance contamination located in this vault was found on cylinders and jars in storage.

Vault 8-A

Above tolerance surface contamination was revealed on a shipment of uranium material received by express. High wipe activity was found on the outside of the shipping cartons. Beta gamma measurements taken of this material where it was placed upon being unloaded from the coded chemicals truck revealed above tolerance beta gamma at the surface of the shipping containers.

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To reduce the radiation hazard this material was divided up into small quantities. A second radiation check revealed no above tolerance beta gamma emission. Gloves and coveralls were worn by operators during the handling of this coded material.

Vault 15-A

Spot surveys conducted on May 10th and 24th revealed above tolerance activity of 21,000 c/m on the outside surface of a storage drum. It was possible to transfer 1500 c/m of this material. Contamination is generally found on the floor as a result of spilling of contaminated solutions or carbon. Hand counts of operators working in this locale are not taken. Protective equipment in the form of coveralls and gloves are used, however, by persons working in this area.

Vault 16-A

Two (2) spot surveys were conducted during the month. A survey on May 10th revealed above tolerance contamination in an area of approximately 434 square feet of floor in the northeast end of the vault. Alpha activity ranged from 2400 c/m to 10920 c/m. 1440 c/m of this material could be transferred as shown by wipe test. Second survey May 24th showed the same contamination as the first survey. No decontamination work had been done between the first survey and the second survey.

The above tolerance floor area is a result of storage of radioactive material in this location. A Poppy has been installed for hand counting before lunch and at the end of shift. The Poppy has been out of order, so the hand counting program has not yet been started. Protective equipment in the form of coveralls, gloves and shoe covers is used by personnel in this location.

Vault 17-A

Two (2) spot surveys were conducted during the month. The first survey was conducted May 10th. It revealed six (6) above tolerance readings. A maximum count of 2160 alpha c/m was found on an area of two (2) square feet of floor space in a small room in the southeast end of the vault. The tops of ten (10) storage drums showed counts ranging from 720 c/m to 2400 c/m. None of the above tolerance counts were transferable. The second survey

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on May 24th, revealed the same contamination existing as during the first survey. No decontamination had been accomplished. Personnel working in this vault wear protective equipment in the form of coveralls, gloves and shoe covers.

All vaults are usually locked and entry restricted to limited personnel.

K-402-1 - K-402-9 Cascade Buildings

A survey conducted May 19th in the line recorder stations revealed only two (2) above tolerance contaminated spots. The highest activity, measuring 930 alpha c/m, was found on a desk pad located on a crew leader's desk in Building K-402-9. A survey in the pipe gallery of K-402-4 revealed a maximum count of 1240 c/m, which was found on a vacuum pump located at the sample manifold. It was possible to transfer 465 alpha c/m of this material. In a 2 ft² area on the floor of the portable feed unit, activity of 3000 alpha c/m was found. Transferable material measuring 465 alpha c/m was found by the wipe test. All above tolerance locations were brought to the attention of supervision and action was immediately taken toward their decontamination.

K-311-1 - K-301-5 Cascade Buildings

One survey conducted of approximately 50 locations in the line recorder floor and equipment revealed no above tolerance surface contamination. In a laboratory located in K-311-1, surface activity of 5800 c/m, having 350 c/m transferable material, was found on a metal soda-lime trap. Decontamination of the soda-lime trap was accomplished immediately.

K-302-1 - K-303-10 Cascade Buildings

A survey of line recorder floor and equipment, and purge and product room floors and equipment, revealed one spot above tolerance. This contamination was found on a wall in the purge and product room. The material was visible. This condition was called to the attention of the operating supervisor.

K-304-1 - K-305-11 Cascade Buildings

Five (5) above tolerance locations were found in a survey

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conducted on the operating floor. A maximum activity of 3100 c/m was found on the base of a rough pump in the K-305-6 line recorder station. It was possible to transfer 177 c/m of this material by the wipe test. Above tolerance locations were reported to the operating supervisor.

K-305-12 through K-312-3 Cascade Buildings - Area V

One (1) survey was conducted during the month with only three (3) above tolerance conditions noted. A count of 2010 c/m was found on floor of Line Recorder station in K-306-2. A reading of 1390 c/m was found on table in K-306-7 Line Recorder station. No transferable material was found. A count of 23,952 c/m was found on the floor of the wall office in K-306-7. This is believed to have been caused by a contaminated cylinder. These locations were immediately decontaminated.

K-305-12 Cylinder Head Repair Shop

A total of four (4) surveys were conducted in this locale. Twenty-two (22) above tolerance counts were found, highest being 7490 c/m located on the east end of steel top table. 288 c/m of this material was transferable.

The majority of contamination was found on tables with occasional high counts recorded on the floor under the drain board.

Contamination in this shop can be attributed to work done on contaminated heads returned from Y-12. A program for more careful handling of the head has been started.

K-306-6 Product Cylinder Assembly Shop

Four (4) surveys were made in this shop during the month. Thirteen (13) above tolerance locations were noted, highest being 7490 c/m found on a tightening block. No transferable material as shown by the wipe test was found. Although a certain amount of activity will be expected due to contaminated heads returning from Y-12, a decided decrease in contamination was noted in the last survey.

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K-306-7 Product Withdrawal Area

A total of four (4) surveys were made during the month. Fourteen (14) above tolerance surface counts were found, highest being 31,020 c/m. 6204 c/m of this material was transferable. Highest activity is consistently found on a tightening block, defroster unit, floor and dry boxes of the withdrawal stands.

It is believed that insufficient purging of line before removing cylinder is responsible for the greater part of contamination in the dry boxes. In the future a longer purge cycle will be used.

K-312 Basement

Three (3) surveys were conducted in this locale. Twelve (12) locations were found to be above tolerance. Highest count observed was 1497 c/m located on #1 pump base, Cell 9, K-312-1. The majority of the above tolerance contamination was found on the floor and on pumps of Cells 7 and 9 in K-312-1. As previously reported, carbon seals continue to be responsible for the majority of contamination found in this area. Supervision has issued an order for the enclosure of carbon type seals but no work has been done to date.

The contaminated table in K-312-3 previously mentioned has been decontaminated. A highly contaminated four-wheel buggy has also been disposed of.

K-312 Cold Trap

Only one (1) above tolerance count of 2952 c/m located on the sample take off flange in K-312-3 was noted. No transferable activity was indicated.

K-306-1 Equipment Portal

One (1) survey was made during the month. This portal was found to be very clean. A seal pan was found to be active to 10,479 c/m. This contamination was not transferable.

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K-300 and K-400 Line Recorder Maintenance Shops

One (1) spot survey of all Line Recorder Maintenance Shops on May 25th revealed one (1) above tolerance spot on the floor in K-305-9 shop. This material was not transferable as shown by the wipe test.

K-300 and K-400 Process Maintenance Shops

A spot survey on May 12th of Maintenance Shops K-311-1, K-310-1, K-309-3, K-301-5, K-302-5 and K-402-9 resulted in only two (2) above tolerance alpha readings. A seal puller in the K-302-5 shop read 3260 c/m. As shown by the wipe test, 489 c/m of this material could be transferred. A reading of 815 c/m was obtained on a flexible hose in Shop K-402-9. It was not possible to transfer any of this material.

Maintenance Jobs

A total of four (4) converter change jobs were surveyed. These included K-305-3, Cell 1, K-305-3, Cell 5, K-306-7, Cell 10 and K-306-6, Cell 14. No above tolerance surface activity was found in K-305-3. Two (2) above tolerance counts were found in K-306-7, Cell 10, highest being 31,152 c/m located on ledge directly in front of cell door. Four (4) above tolerance counts were found in K-306-6, Cell 14. Highest noted here was 1550 c/m. All of this contamination was found on the floor. This above tolerance activity was immediately decontaminated.

Twenty (20) airborne samples were taken on these four surveys. One (1) of these was found to be above tolerance, this being 11.55 c/m/ft³ taken at #5 outlet, K-305-3, Cell 5, while converter was being removed.

A pressure below atmosphere was retained on process piping during the entire job. This is believed to be greatly responsible for keeping alpha contamination to a minimum.

K-1004 Laboratories A, B, C and D

Sampling Section (Rooms 19-A, 20-A, 215-C, Outdoor Storage Cages.)

Some slightly increased contamination readings were found in

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the rooms of this section, giving possible indication of a lack of proper follow-up to last months excellent decontamination and surface coating program. A general downward trend, however, brought ultimate contamination levels at months end considerably lower than last months, and although a few small area high spots in such easily accessible locations as a cold trap platform (1750), a sink edge (1250), a dewar stand (11500), edge of a manifold (1141) and other localized points appeared, promise of easy contamination control by frequent local decontamination was clear. Other conditions throughout this section were good, and no unusual situations arose during May.

Radiation Section

While the amount of alpha contamination in this section has been slight since regular surveying was started, there was improvement shown in the conditions reported this month. The placing of rubber floor mats on the "heavy traffic" floor areas of Room 18 has helped to reduce readings as well as to prevent the accidental removal of apparently surface bonded active material. A persistent spot on the composition floor in front of the hood in Room 23 still shows an average activity of 4000 c/m, but no transferable activity appeared anywhere in this section, and the general improvement was better than average.

Uranium Analysis

A few individual focal points of contamination began to appear in this section toward the end of this month, but no indication of specific cause other than routine operations between decontamination was evident. A particularly low average maximum reading attests to the thoroughness of the regular decontamination program. Points such as a sink edge (1630), hood floor (1956), storage shelf (1250), sample tube box (2500) and other similar small areas were located at each survey and decontaminated. Survey results, both from routine surveys and spot checks, show that contamination levels are gradually decreasing as regular decontamination continues. No indications of any serious radiation problems were found.

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Counting Section

A downward trend in contamination averages appeared in the compilation of this section's survey results this month. The highest reading reported by the Health Physics Inspection spot checks was 4965 surface alpha c/m on a hot plate in Room 122. For the first time, this month two (2) surveys were made in which no above tolerance surface alpha activity was found in any room of the section. Only three (3) points, two (2) in Room 108 and one (1) in Room 122, where above tolerance alpha wipe activity was found, were reported during the month and in each case the offending area was decontaminated as soon as reported. A moderate amount of recontamination appeared, but for the most part contamination control was far better than any observed to date.

Metallurgy Section

Emphasis in this section during May was placed on efforts to decontaminate the hood in Room 2-D to complete below tolerance conditions. Previous operations had this hood badly contaminated and initial decontaminations last month had not fully removed all residual contamination. This was effected during May, however, and at the end of the month no above tolerance activity was found throughout this section.

Spectrometer Section

More frequent decontamination this month kept the rooms of this section free of large activity deposits. Those which did appear from time to time were removed more quickly than in the past and in general recontaminated areas reached lower activity levels than had first been reported. Some exceptions still appeared in areas where regular spattering or slight spillage is virtually unavoidable. Rooms 59, 63, 207, 209, 211, 213 and 217 were free of above tolerance activity in two (2) surveys during the month and the highest reading found in any room was 9000 c/m. Only eight (8) instances of above tolerance wipe activity were reported, and all were decontaminated.

Spectrometer Standards Section

Three (3) small areas of above tolerance surface alpha activity were reported from this section during the month and no transferable

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activity was found. Decontamination of the located active areas was carried out promptly on discovery, but was unsuccessful on the bench top reported last month. Although all transferable activity on this work bench has been removed, surface readings are still found, with one point as high as 13,500 c/m being reported. No other activity hazards were found.

Analytical Research Section - Rooms Q₁-D, 17-D, 19-D, 8-D

Activity levels in the rooms of this section varied throughout the month with no marked tendency toward improvement. Although Rooms Q₁, 8-A, 17 and 19-A were free of above tolerance, contamination at different times during the month, and again after a general decontamination at the months end, surface activity up to 8100 c/m was found at other times and while it was removed, along with associated transferable material, regular recontamination occurred. Rooms 8 and 19 showed some areas of contamination throughout the month, though activity levels were lowered considerably by the last general decontamination.

Special Analysis Section - Rooms O₁₁-D, O₁₁-A-D, 11-D, 11-A-D

Several general area decontaminations in Room 11 this month brought the activity levels considerably lower than those reported previously. Amount of contamination was also reduced to a few localized areas where frequent recontamination prevents permanent removal. A spot on a vacuum equipment bench has proved difficult to decontaminate, but it has been reduced from 16200 c/m to 3500 c/m surface alpha activity and continued effort is being made to remove the remainder. All transferable activity had disappeared by the end of May and it is felt that Room 11, the only room in this section which has a contamination problem, can be kept safe by frequent decontamination.

Molecular Spectroscopy Section - Rooms O₅-D, 212-C

Because the handling of active material in this section is slight it has been possible to keep it free of all above tolerance contamination. No surface, wipe or airborne alpha activity was found this month and future control should be a simple matter.

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Physical Chemistry Section - Rooms 05-D, 09-D, 21-D

The contamination levels in this section were reduced this month, with several rooms remaining below tolerance throughout the month. The most serious problem seemed to be the prevalence of transferable activity. No immediate explanation for the cause of the rise in number and level of wipe test readings could be found, but after thorough decontamination removed this material the problem did not recur. In the last two (2) surveys of the month only one (1) point was found to have transferable activity. This point, on the floor in front of a hood showed wipe test activity up to 165 c/m, and was the result of a fresh spill. This was immediately removed. No other activity hazards appeared in this section.

Barrier Research Section - Lab. X and Associated Office

The fact that most of the active material handled in this section is in closed systems makes contamination control a simple matter. Scheduled routine surveying, however, prevents a possible tendency to overlook the problem entirely, and several points where equipment repairs or additions had allowed material to escape were found this month. In each instance decontamination followed discovery and it is felt that this section's installations were free of contamination throughout most of the month of May.

Conditioning Section - Rooms 19, 21, 25, 28, 30, 32, 34, 36, 38 and Store Room

The spot check results during May completely prove the effectiveness of the plastic coatings applied in this section last month. Only two (2) locations were found in this section where above tolerance activity appeared. In both instances it was uncoated surfaces which held the contamination. No wipe test activity was found throughout the section by Health Physics inspectors and the entire section made a showing better than in any other month thus far. While the goal of a completely below tolerance survey was not reached, it is felt that regular checks and decontaminations will keep the rooms of this section comparatively free of contamination and no serious problems are anticipated.

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K-102, Instrument Building

Electronic Instrument Shop

A single spot survey conducted in this area revealed two (2) above tolerance contaminated locations. A work bench located in the southwest corner of Room 13 was contaminated with 825 c/m of material. A sink used in decontamination operations was contaminated with 1200 c/m of material. No transferable material could be found by the wipe test. A spot air sample taken at the south end of Room 13 was reported to be at normal background activity.

Contamination in this locale results from disassembling operations of contaminated equipment to be repaired in this shop. In order to reduce the number of persons that may be exposed to contaminated equipment, entry into the area where disassembling operations of contaminated equipment occurs, is restricted. Persons working in this area wear protective clothing in the form of coveralls and gloves and upon leaving hand checks are made. (See personnel monitoring section.) At present, entry is restricted into two (2) other rooms unless coveralls are worn. In both cases contaminated equipment is present within these rooms.

Pneumatic Instrument Shop

Approximately fifty (50) checks throughout this shop were made during a single survey. No above tolerance contamination was found. Contamination in this area results from decontamination operations on instrument bellows. Rubber gloves are normally worn and the work area is cleaned at the conclusion of each operation. Routine surveys are now being conducted by the shop personnel and a hand counting program will be started next month.

K-1301 - 216 Generation and Oxide Conversion Building

Two (2) spot surveys conducted in this area again revealed floor contamination in the unrestricted hallway between the oxide grinding, weighing and conversion rooms. Contamination ranging between 3000 and 5000 alpha c/m was found in a 6 ft² area on the floor in the hallway as the result of material being tracked

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from the Grinding and Weighing rooms. Material contaminating the hallway floor is transferable to the extent of 3000 alpha c/m activity, shown by the wipe test. Air activity in this hallway near the weighing and grinding rooms was reported to be 1.3 alpha c/m/ft³ as shown by a sample taken on May 11th. Although this is below the air tolerance of 2.0 c/m/ft³ attention has been called to this condition. Surveys in the three (3) above mentioned rooms indicated high contamination levels on the floor and equipment. As indicated in previous reports protective clothing in the form of assault masks, coveralls, head covers, gloves and special shoes are worn by persons working in these rooms. Posted signs serve as a reminder that protective equipment must be worn when entering these rooms.

K-1303 Decontamination Building

As previously reported the installation of new converter decontaminating equipment is in progress. Where floor breaking operations are required in the setting of the new equipment, respirators are worn as protection against air contamination that may result from the previously contaminated floors. A check of a waste water drain trough located outside of the Decontamination Building revealed an activity of 13,000 alpha c/m. Visible pieces of green salt material were found on the gravel walk-way and porch as a result of a filter press operation connected with the recovery of T material. This was immediately called to the attention of the operating supervisor.

K-1401 Building

Salvage Scrap Enclosure

One (1) spot survey was made in this location. Readings were taken on the floor, equipment and clothing. Leather gloves to be salvaged were found to have greater than tolerance alpha activity. No process material was being handled at the time of this survey.

Seal Cleaning Area

Three (3) separate spot monitorings of this location, on the 7th, 12th and 25th of the month, revealed above tolerance alpha radiation conditions on a hot plate, old seals stored on

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trucks in the south end of the room, a steel work bench and the top of the seal container. On the first survey a pair of leather gloves showing a surface count of 31,020 alpha c/m and wipe test count of 5528 alpha c/m was discovered and disposed of. Conditions in this area are, in general, good, and some improvement was noted during the period over which the surveys were made.

Vacuum Pump Shop

Spot checks of radiation levels at this location were made on the 5th, 11th and 19th of the month. These surveys revealed above tolerance alpha activity in the following locations within the shop: the cleaning table (top); the floor under the cleaning table, next to the storage table, and between the work bench and storage bin; the inside of the storage bin on the west side of the shop; a test table on the north side of the shop; the unloading table; the storage table; and on various pumps and pump parts throughout the shop. Wipe tests on the western test table, inside the storage bin, on the test table and on the floor under the cleaning table showed significant results.

Contamination in this location originates from the pumps upon which work is being done. Men working in this shop wear protective clothing (coveralls and shoes) and use the hand counter (Poppy) before lunch and at the end of the working day. A subsequent survey revealed that the contamination had, as yet, not been removed.

A. C. Pump and Seal Shop

Three (3) spot surveys on the Pump and Seal Shop during the month revealed the Seal Shop to be in very good condition as far as radiation levels are concerned. Routine surveys are made here every other day. Above tolerance readings were recorded on trucks and old seals stored on them, spots on the floor near these trucks (near the wall on the west side of the room), the pump shaft on the work bench, and on the inductance heating table and the stool at this table in the A. C. Pump Shop. The floor, tables and equipment were surveyed. Hand counts are taken at least twice daily. The seals stowed on them were awaiting decontamination. Gloves are worn by personnel working in this area.

Valve Shop

Spot surveys were taken in the Valve Shop on the 7th, 11th

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and 25th of the month. The only above tolerance readings found were on a Kerotest valve manifold being repaired at the time of the first spot survey. Gloves and coveralls are worn as protective clothing in this shop, and hand counts are made by personnel upon leaving the shop. Approximately 200 readings were taken on the floor, work benches, and equipment during the three surveys.

K-1401 Pilot Plant

Spot surveys of the Pilot Plant were made on the 12th and 25th of the month. The top of a work bench, A P. W. trap, and a work bench were found to be above alpha tolerance level. A radium source located here showed a 15 mr/hr beta gamma reading at a distance of one foot, but personnel remain at a much greater distance from it. Table tops which are above tolerance are to be disposed of. Other readings taken showed floor and sample connections to have less than 100 c/m.

K-1410 Carbon and Alumina Separation

Contamination continues to be found throughout this area as a result of carbon sampling operations. A spot survey conducted on May 13th revealed fifteen (15) above tolerance locations on equipment and floors. A maximum activity of 15,000 alpha c/m was found on the carbon alumina separator, 800 c/m of this material was transferable as shown by the wipe test. This building is locked during periods when the sampler is not in operation; therefore, it is possible to control the entry of persons into this contaminated area. Protective clothing and respirators are worn during sampling operations. No form of personnel monitoring is effected upon leaving this area.

V. PERSONNEL MONITORING

Hand Counts

K-306-7 Product Withdrawal Area

Hands of approximately seven (7) regular operators and other personnel working in this area are checked daily, before lunch and at the end of each shift. No above tolerance count was recorded. Hands are washed before a check is made.

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K-305-9 Change House

No hand monitoring was reported from this area.

K-1004 Laboratories

Hand counting throughout the Laboratory was continued on the same basis as previous months. The importance of proper use of hand counters is regularly stressed and several observations by the Health Physics Section indicated that counting techniques were satisfactory. No foot counting is regularly scheduled for Lab personnel.

Alpha hand counting was carried out this month and formally reported according to the following schedule:

<u>Section</u>	<u>Number of Employees Counted</u>	<u>Minimum Frequency</u>
Sampling	12	Twice/shift
Uranium Analysis	19	"
Counting	20	"
Electronics	5	"
Spectrometer	51	"
Critical Mass	10	"

Counters are in readily accessible locations and are used by other laboratory employees, without formal reporting, whenever it seems necessary.

Results:

Fourteen (14) cases of above tolerance counts appeared in this month's reports, but in every instance the material was successfully removed. No count was higher than 50% above the allowable maximum. It is felt that no hazards were presented by hand contamination during May.

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Radio-Chemical Laboratory

Hand counts were taken here as follows:

<u>Section</u>	<u>Number of Employees Counted</u>	<u>Type of Count</u>	<u>Minimum Frequency</u>
Tracer Lab	9	Beta-gamma	Daily
X-ray & Diffraction	6	Beta-gamma	Daily
Electrochemical	3	Beta-gamma	Daily
Counting	3	Beta-gamma	Twice/shift
Tracer	10	Beta-gamma	Twice/shift
	9	Alpha	

Details are shown in Tables I and II

K-1024 Electronic Shop

No above tolerance counts were reported from hand counts taken twice per shift on thirty-one (31) persons employed in this area.

K-1300 Area Change House

Checks were made daily, before lunch and at the end of shift, on fourteen (14) employees working in Buildings K-1301 and K-1303. No counts above one hundred (100) per minute were recorded.

K-1401 A. C. Pump and Seal Shop

Reports of alpha hand counts taken on six (6) employees in this area daily revealed no above tolerance readings.

K-1401 Vacuum Pump Shop

Three (3) above tolerance hand counts were reported during May from checks made twice daily on twenty-seven (27) employees in this department. The above tolerance activity was reduced to normal after hands were thoroughly washed.

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K-1401 Valve Shop

Eight (8) employees checked hands twice daily in this area. No above tolerance counts were recorded. A Zuto meter is used to check hands in this area.

Process Maintenance Jobs

Approximately sixty (60) maintenance men were reported monitored at the completion of seal and pump jobs. Gloves, coveralls, shoes and hands were monitored. Above tolerance activity on gloves as high as 32,000 alpha c/m were reported. Coverall contamination ranged to 2800 c/m, and shoe contamination from 200 c/m to 9061 c/m. Contaminated equipment is exchanged for clean equipment at the conclusion of each job or at the end of each shift. Hand counts taken at the conclusion of each job before washing, revealed activities as high as 10,500 c/m. No final hand counts before lunch and at the end of shift are recorded.

K-1405 Chemical Engineering Building

No above tolerance hand counts were found in checks made daily before lunch and at end of shift, on sixteen (16) persons working in this department.

Film Badges

An average of 231 film badges per week were issued throughout K-25 during the month of May, an increase of twenty-four (24) badges over the month of April. Their use was divided between personnel and stationary monitoring as follows:

	<u>Stationary</u>	<u>Personnel</u>
Critical Mass Laboratory	6	10
Emergency Monitoring	14	0
Engineering Development	3	0
Health Physics Inspection Section	0	8
Instrument Development Section	0	4
Laboratory Division	4	65
Process Division	43	39
Plant Protection Division	0	30
Electronic Instrument Division	0	3
Maintenance Division	0	2
Total	70	161

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In addition two (2) neutron films were used each week in stationary positions in the Critical Mass Laboratory.

A total of forty-two (42) film pads were used each week by the Laboratory Division for hand monitoring.

Results:

Film badges and pads indicate no above tolerance exposures during the month.

Pocket Chambers

Eighteen (18) persons were monitored daily with pocket chambers in the Tracer, X-ray and Electrochemical Laboratories. No readings above 16 mr per 8 hours were recorded.

VI. PROCESS MATERIAL RELEASES

K-131 - Feed Purification Building Furnace Room - May 7, 1948

A material release of eight (8) minutes duration occurred when a PDF feed valve was opened. The line from the cylinder was open allowing C-616 material to escape.

Highest surface reading reported was 12,045 alpha c/m. Highest reported air activity in the vicinity of the release was 0.70 alpha c/m per cubic foot. Surfaces showing above tolerance activity were decontaminated upon the conclusion of the survey. One man present reported to the dispensary.

K-631 - Waste Disposal Building - Basement - May 17, 1948

A material release of approximately two (2) minutes duration occurred when sodium fluoride pellets spilled from a sodium fluoride trap.

An air sample taken two (2) hours and forty-five minutes after the release indicated an air activity of 0.88 alpha c/m per cubic foot. No surface readings were reported. One person reported to the dispensary.

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K-311-1 - Line Recorder - Operating Floor - May 7, 1948

A five (5) minute release occurred when a hose connection on a rough pump developed a leak. Two (2) men present reported to the dispensary.

Highest surface alpha activity as a result of the release was 2577 c/m. An air sample taken after the release was reported as 1.29 c/m per cubic foot. The area affected by the release was immediately decontaminated.

K-306-7 - Cylinder Assembly Shop - May 6, 1948

A release of two (2) minutes duration was caused by vaporization from a gasket removed from a full P. W. cylinder. Three (3) men involved reported to the dispensary. No surface alpha contamination was found. The highest air count was found to be 0.19 c/m per cubic foot.

K-306-7 - Line Recorder Station - May 1, 1948

A release of approximately five (5) seconds duration occurred. It was caused by the opening of a valve during a purge gas sampling operation. One (1) man reported to the dispensary. No surface alpha contamination was found. No air sample was taken.

K-306-7 Wall Office - May 17, 1948

A release of three (3) minutes duration was caused by escaping vapor from an inventory sample. No surface alpha contamination was found. No air sample was taken. One (1) man reported to the dispensary.

K-301-5 - Line Recorder Station - May 1, 1948

A material release of ten (10) minutes duration occurred when a tube valve failed to close completely at the conclusion of a sampling operation. The leak was first noticed ten (10) minutes after the sample had been taken. All surface readings taken after the release were below tolerance level. The air activity was at background. No one was sent to the dispensary.

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K-301-5 - Line Recorder Station - May 5, 1948

Ten (10) minutes after a sample was taken at this location, oxide corrosion appeared on the outside of a sample tube as a result of a faulty valve. No visible gas was noticed. The highest surface reading found was four hundred (400) c/m. Air activity was below tolerance. No one was sent to the dispensary.

K-1004-A, Room 19 - May 10, 1948

During an operation in which process material was drawn through a trap approximately one (1) gram did not condense and was passed out through the pump discharge. Visible vapors partially filled the room and all four (4) employees working there were sent to the dispensary for supervisory examinations. The trap was adequate for the purpose and it is felt that excessive pumping speed, which could have been avoided, is responsible for the release. Area checks after the release showed no contamination of room or equipment surfaces had occurred.

K-1004-A, Rooms 19, 68 and 72 - May 11, 1948

A sample cylinder gasket blew out during a transfer operation releasing approximately seventy-five (75) grams of process material in Room 19. Vapors passed through a floor grille into Rooms 68 and 72 immediately below. Seven (7) employees, several of whom failed to recognize the vapors and entered these rooms to locate the source, were sent to the dispensary.

Since the type gasket involved is ordinarily adequate in this operation it is felt that no absolute control over incidents of this type can be effected unless a method of locating gasket flaws can be discovered. The area was decontaminated as soon as room had been ventilated, and no contamination above tolerance was found in a subsequent survey.

K-1004-A, Room 19 - May 21, 1948

About one (1) gram of process material was released during a transfer operation due to an operational error. The only employee who was present at the time was sent to the dispensary for a supervisory examination and no area contamination was found.

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K-1024 Electronics Shop - May 18, 1948

A material release occurred when a Henry valve and "U" tube were being removed from a leak detector. As a result, alpha contamination occurred as follows:

L. D. Henry valve and "U" tube	100,000 c/m
L. D. Trap	70,000 c/m
L. D. - D. P. Chimney	1,000 c/m

A material deposit about the size of a marble found in the Henry valve showed an 0.2 mr reading with a Victoreen type 263 meter and over 10^5 alpha c/m with a Poppy. This deposit was turned in for reclamation in K-1024.

The employee handling the leak detector had over 10,000 alpha c/m on his trousers. He was given a change of coveralls. No one was reported sent to the dispensary.

K-1405 - April 26, 1948

A release of approximately fifteen (15) minutes duration occurred when a carbon trap failed, allowing C-616 tails material to pass through the trap. The C-616 material entered the building through an open window. Three (3) men in the building reported to the dispensary. No surface or air contamination was reported.

VII. WATER SAMPLE PROGRAM

Water sampling was continued during May on the same schedule as that followed during the two month preceeding, with the exception of the relocated follow-up samples in the K-1300 Area. Results on mud samples taken during the month were also made available, but the present lack of adequate control samples leaves the data somewhat inconclusive.

Results from all the regular area water samples remained at the previously reported low levels. Both K-25 drainage points and Clinch River and Poplar Creek check points remained free of contamination throughout May. The only significant finding of all sampling this month was a rise in beta count of the Clinch River water above K-25 as shown by sampling at the Sanitary Water Plant. Beta counts rose

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to approximately three times normal value on May 6th and remained, with considerable fluctuation, above normal until May 19th. According to verbal information from X-10, there was no significant deviation from normal in their waste discharge. Since the highest reported count, which was 9.7 ± 3.5 beta counts per minute per 100 cc, is less than one-hundredth of the estimated tolerance value for I^{131} , it was felt that the reported figures presented no cause for alarm.

Final results on the follow-up samples were satisfactory and the program has not been renewed for June. Sample point 1-W follow-up results were completely negative, indicating that the local contamination responsible for the earlier high results has been cleared up. Sample point 6-W remained zero also, and it is felt that the several spills in K-131 at the time of the original high results may have been responsible. This check also has been considered complete. The third check, in the Sanitary Sewage System was readjusted during May to indicate which of the buildings were contributing the contamination found in the branch line serving them. Analysis results definitely established K-1405 as the source. No further routine sampling has been planned for this point but special samples will be taken from time to time to check improvement.

Evaluation of the presently available analysis results on samples of river bottom mud are now awaiting a laboratory project to improve the analytical method and establish limits of precision for reported results. The first samples, taken during May, based on the possibility of Uranium precipitation due to the calcium content of area waters, gave indications of Uranium concentrations up to one part per million based on dry weight of sample. Lack of information, however, on normal composition of soil in this area, on precision of analysis, or stream currents which might cause local accumulation makes interpretation of these results infensible at present. Further investigation is continuing.

The laboratory division has, however, established a precision of fifty per cent on analyses of sewage sludge samples. Sludge in being sampled because of previous results or sewage water which consistently indicated a higher Uranium content in the influent to the sewage disposal plant than the effluent. First reports give results which may be interpreted as 60 ± 30 , and 100 ± 50 , parts per million based on dry weight of sludge. These figures, in conjunction with an estimated sludge volume output point to an approximate

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accumulation of 360 grams of Uranium per month in Sewage Plant sludge, which is in good agreement with an estimated input figure of 300 grams per month, based on difference in concentration of influent and effluent sewage and average flow rate. Since influent concentrations are presently below the detectable limits, results of latest sludge samples are expected to show a corresponding decrease. Old sludge with high Uranium content is being held pending decisions on its disposal.

To coordinate the water contamination control program a meeting was held at K-25 on May 28th which was attended by Messrs. Bahler, Clossey, Ketcham, Murray, Olszewski and Visner of K-25, Messrs. Cottrell and Ray of X-10, Messrs. Clarke, Kittrell and Setter of TVA and Mr. Placak of the U. S. Public Health Service. A discussion of the requirements of and available facilities for an adequate contamination control program was carried on at some length and suggestions were advanced toward solution of the problems involved. The following tentative listing of the contaminants in which the program should be interested was agreed upon.

<u>Material</u>	<u>Remarks</u>
Radioactive	Background measurements throughout this area should be made and this figure might be a guide to the maximum allowable due to Oak Ridge dumping operations.
Uranium (Considered a toxic chemical)	It was felt that the Uranium concentration in the Clinch River, Poplar Creek, or drinking water should not be allowed to exceed approximately 0.01 parts per million (ten parts per billion). However, it was recognized that concentrations considerably in excess of this figure would be required before evidence of toxic effect would be expected.
Acids and Bases	It was stated that the state law sets allowable pH limits which specify that the waters shall not be allowed to be lowered or raised outside the range of 6.5 to 8.8.
Plutonium	It was suggested that both chemical and physical analyses be required to assure absence of plutonium.

The inclusion (in this listing) of fission products was considered, but since all have short half-lives, no long-lived daughters are produced, and the amounts involved are small, it was decided not to be concerned with their chemical toxicity.

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In considering sampling responsibility it was suggested that operating contractors might assume responsibility for waters on their premises, TVA might assume responsibility for river waters, and analyses might be performed cooperatively by the contractors on the basis of available facilities.

The meeting was closed with the selection of a sub-committee consisting of Mr. Plack for U. S. Public Health, Mr. Ray for X-10, Dr. Setter for TVA and Mr. Visner for K-25, to finally determine important contaminants and proper tolerance levels for them. Minutes of the meeting were issued June 8, 1948.

VIII. SPECIAL PROBLEMS

The Radio-Chemical Laboratory - Shielding Test on Shipping Container

A lead-lined container with three (3) inch walls was tested for flaws through which radiation leaks might occur. The test was made by exposing 14 x 17 inch X-ray film to radiation from a one-gram radium source filtered through the lead walls. No significant flaws were detected. Details of this test were reported to Mr. Visner in a letter dated June 7, 1948. This container was to be used for the transportation of radio-active sludge.

Personnel Monitoring

A conference was held with X-10 personnel on the subject of personnel monitoring in which the merits of various systems and forms were discussed in the light of K-25 objectives as compared to X-10 experience. Other meetings are planned in the near future.

Mr. W. H. Ray, K-25 consultant on Health Physics, spent all day May 21, 1948, reviewing the procedures in operation here. He made several suggestions on the solution of some problems, the principal one being the design of an instrument to monitor the stack gases from the Radio-Chemical Laboratory.

Film Strip

The test of the film strip, to be used in training plant personnel in the hazards of radiation and the precautions to be taken, was turned over to the Safety Department for production.

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Plant III Converter Changing Operations

An audit of converter changing operations in Plant III indicated an exceptionally well handled operation in respect to the observance of good Health Physics practices. A preliminary set of instructions was issued by Plant III personnel. These instructions cover: (1) the use of protective equipment, (2) special precautions to be observed in the closing of open ends of process pipe and converters with paper, and (3) smoking and eating regulations. Included are provisions for a "smoking and eating" area equipped with a hand counter, and a personnel monitoring check off system employing a pass slip showing the results of a hand and clothing check upon leaving the roped off area in the immediate vicinity of the converter change operation. To further reduce surface and air contamination, a negative pressure was maintained on the process piping.

Results of the audit revealed no surface contamination and only one (1) above tolerance airborne alpha count.

Respiratory equipment was worn during all operations previously set out as being responsible for above tolerance air activity. All above tolerance surface activities were decontaminated immediately upon being found during continuous surveys conducted by the operating group.

Usage of Respiratory Equipment

A meeting held for the purpose of clarifying the use of respiratory equipment during converter changing operations in Plant III was attended by representatives of the Process, Maintenance and Safety and Inspection Divisions. It was pointed out that there still may exist an HF hazard in addition to the alpha problem and that the removal of respiratory equipment should not be governed solely by below tolerance airborne alpha activities. It was also revealed that preliminary tests of a Comfo-type respirator equipped with a 2133 filter is ample protection against airborne alpha emitting dusts accompanying typical seal change jobs and on the basis of this data, it is believed that this respirator is also effective for dust encountered during converter changes.

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Converter Decontamination Facilities in K-1303 Building

Work is continuing on the installation of new converter decontamination and recovery equipment in the K-1303 Building. Circulating loop lines, storage and mix tanks are essentially completed with the exception of insulation. Dismantling booths and spray booths are in place. Installation of the mono rails and tracks have been started, recirculating pumps are set and connected. Installation of the accompanying recovery equipment has not been started.

Protective Measures Covering Health Hazards in the K-1024 Building

A meeting was held to discuss problems arising in a program to apply rules and regulations covering Health Physics activities in the K-1024 Building and field shops in the Instrument Division. The meeting was attended by representatives of the Instrument and Safety and Inspection Divisions. Four main issues were discussed covering, (1) disposition of equipment entering the K-1024 Building, (2) designation of hot areas, (3) prescribed protective clothing, and (4) a study by the Radiation Hazards Department to be made of maintenance operations in the field for the purpose of determining what protective clothing should be worn during the various types of line recorder maintenance jobs.

Radiation Instrument Development

A circuit employing the new Raytheon tube, the CK571AX, was designed for the Zuto to which the long, narrow probe is to be connected.

It was decided that the K-25 constructed Zuto cover cases should be cadmium sprayed and varnished since the plated covers tended to show up minor defects in the material of the cover.

Noise level tests were made on the Tornado air sampler with the unit running at full and at reduced speeds. Reducing the speed of the motor decreased the quantity of air flow but did not appreciably reduce the noise. Further investigation is being made to determine if the noise level will be reduced to an acceptable degree by placing the sampler in a box of sound absorbing material when being used for continuous air monitoring.

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The experimental model hand alpha counter placed in service more than two (2) months ago is continuing to operate satisfactorily. Testing of the component parts of the second unit is now in progress.

Tests were completed on the characteristics of a long Poppy probe for clothes monitoring. The unit is satisfactory and work will be started on applying this unit to the monitoring of clothes before and after washing. The results obtained on field tests of the 3-wire Poppy surface probe were favorable; this unit has not required the maintenance common to the single wire type probe.

A Poppy pre-amplifier housing to contain the miniature printed circuits is being fabricated in the Machine Shop. An extremely light weight portable electronic high voltage supply is being designed for powering a Poppy probe. It is planned that this circuit comprise a relaxation oscillator, amplifier, and rectifier.

Surface Coatings

A preliminary study was started to determine past experience throughout the project in the use of surface coatings to cover not readily decontaminated alpha active surfaces and to render such surfaces impervious to recontamination or easy to decontaminate. When considerable investigation showed that no data existed in this field beyond chance reference, or personal recollection, attempts were made to start such a formal study. Samples of a number of different coatings were obtained, as well as samples of plastic or synthetic tiles or linoleum-like materials. These samples were distributed among several groups in the laboratories and the development section. No attempt was made to coordinate testing, that uniform comparative results might be obtained, beyond the preparation by the development section of several test strips and several coats of peelable materials on wall board.

Experiences with these coatings will be followed.

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APPENDIX

The following table summarizes the results of air analyses for chemical contaminants made by the Industrial Hygiene Section of the Laboratory Division for the month of May. Routine sampling is scheduled following a review of work areas within the plant by the responsible supervisor, the Medical and Safety Departments. In addition to routine sampling, special surveys are requested to cover special conditions, check operations, etc. Certain other routine analyses are performed by: a) Process Division for maintenance work in the Process Area; b) Safety and Inspection Division for detection of combustible gases.

The items listed in a and b, above, are not contained in the summary for the month of May. Future reports may include this information.

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AIR ANALYSES FOR CHEMICAL CONTAMINANTS

May 1948

Location	Contaminant	Maximum Allowable Concentration	Sampling Schedule	Number of Samples	Average Concentration	Number over Tolerance	Remarks
K-1024, West Wing	Mercury	0.1 mg/cu m	Monthly	6	0.01 mg/ cu m	None	Janitor's closet in front hall of K-1024 discontinued at request of R.M. Williams
K-1024, East Wing	Mercury	0.1 mg/ cu m	Monthly	4	0	None	
K-1037, Barrier Test Room	Mercury	0.1 mg/ cu m	Weekly	6	0	None	
K-1004-D, Room 3	Mercury	0.1 mg/ cu m	Monthly	3	0	None	
K-1004-D, Room 4	Mercury	0.1 mg/ cu m	Monthly	2	0	None	
K-1004-D, Room 005	Mercury	0.1 mg/ cu m	Special	3	0	None	Reman spectrograph machine in operation.
K-1030, Cleaning Rm.	Carbon Tetrachloride	100 ppm	Monthly	4	100 ppm approximate	1	300-400 ppm carbon tet around equipment taken from degreaser. Rapidly dissipated
K-1401, Cleaning Area, Degreaser	Trichlor-ethylene	200 ppm	Monthly	6	100 ppm approximate	2	These two reported as "300 - 500 ppm occasional"
K-1401, Vacuum Pump Shop, Degreaser	Trichlor-ethylene	200 ppm	Monthly	2	100 ppm approximate	None	

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