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Requestor J. Buddenbaum / K-25 10-24A  
Document Center (is requested to provide the following document)

Date of request 4/11/95 (4 documents) Expected receipt of document 4/28/95

Document number none Date of document 12/23/57

Title and author (if document is unnumbered) Health Protection at K-25 and Y-12  
Review of the Health Prog. at the ORGDP by the AEC Health Protection Study  
Committee (12/19/57); Copy entire folder  
Sapine to CE Center dated 12/23/57; One  
(This section to be completed by Document Center) 4/24/57

- 1) Unnumbered Memo to SR Sapine dated 10/29/57;
- 2) Unnumbered Assoc. "Notes on AEC Health Protection Study"
- 3) Unnumbered ltr from SR Sapine to CE Center dated 4/24/57
- 4) Ltr from Sapine to CE dated 4/24/57

Date request received 4/11/95

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Date document received \_\_\_\_\_

Signature \_\_\_\_\_

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*Office Memorandum* • UNITED STATES GOVERNMENT

TO : S. B. Zapiris, Manager  
Oak Ridge Operations Office

FROM : Health Protection Study Committee

SUBJECT: HEALTH PROTECTION AT K-25 AND Y-12

SYMBOL: ESH:WBH

DATE: October 29, 1957

The study committee set up by your memorandum of March 8, 1957 has continued the plant visits requested in that memo. This report covers the committee's findings regarding the existing policies and practices relating to health protection at the Oak Ridge plants K-25 and Y-12. The plants were visited on July 1, 2 and 3 by W. B. Harris, and on July 18 and 19 by Dr. T. Ely, Dr. James H. Sterner, A. A. Schoen, and D. F. Hayes. The general impressions of the committee are:

1. The committee was left with the general impression that both plants demonstrated an unusual degree of thoughtfulness concerning their respective health programs, with that at Y-12 being particularly well integrated.
2. Although the primary concern of the committee was with uranium, the potential hazards from nickel, fluorine, mercury, lithium, heat and noise were also discussed. Plant personnel, including management, supervisors, and the medical department appear to have all of these problems well in mind, and are carrying on programs of investigation toward the control of hazards in all of these fields.
3. Procedures manuals have been prepared at both places. The K-25 booklet is designated KHA-81, "Radiation Practices at the Oak Ridge Gaseous Diffusion Plant" by H.F. Henry, et al, issued under date of April 3, 1957. This booklet very well defines the operating philosophy of the health group at K-25. The Y-12 documentation is equivalently good, although not as formally assembled.
4. The housekeeping in all plant areas was excellent.
5. In general, the line of communications from management to employee, including pre-employment orientation and a continuing health education program appears to be very good.
6. Medical Department facilities and program were found to be adequate.

Union Carbide Nuclear Company, Oak Ridge Gaseous  
Diffusion Plant, Operating Contractor for the U.S.  
Atomic Energy Commission.

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to the public by:

Asst. *David B. Gilliland* 5/11/95  
Technical Information Officer Date  
Oak Ridge K-25 Site

7. The company-issued clothing policies and practices appear to be reasonable.
8. A brief analysis was made of all deaths among employees throughout the operation of the plants, and no occupational relationship could be found.
9. The use of respirators as a protective measure is in general over emphasized in these plants. Several routine operations were seen at which the operators were normally expected to wear respirators.
10. The bio-assay program is the backbone of the entire exposure evaluation program at K-25. It was the impression of the committee that both the value and the frequency of this program has been over emphasized, (even at Y-12 where the program is much more realistic).
11. Air sampling programs at these plants appear reasonable.
12. The various problems of nuclear safety which are present in the areas handling enriched material appear to be completely in hand, although the committee did not possess sufficient competence in this field for an adequate evaluation of the economics of this program.

#### RECOMMENDATIONS

1. The committee believes that it should repeat the first and second general recommendations which were made in its report of April 16. These were:
  - (1) A detailed evaluation should be made of all exposures, and engineering controls should be applied which will make it possible to eliminate many of the situations currently requiring the use of respirators. The committee strongly recommends that the use of respirators should be limited to short-term or emergency operations.
  - (2) There should be an integrated health and safety organization whose primary function is the continuous improvement in exposure conditions, and not merely evaluation of exposure. Any over-exposure (by any standard) which has been rechecked should be forwarded to management with specific recommendations for improvement. Removal of individual operators from exposure should never be used to cover inadequate controls, nor should respiratory protection be provided instead of adequate cleanup of the operation.

October 29, 1957

The committee felt an unnatural lack of coordination between the health groups in these two plants. It is believed that it would be very useful if the philosophies of operation at K-25 and Y-12 could be brought closer together through the medium of frequent interchange of technical information.

It should be pointed out that in both the plants considerable progress has been made in the direction of accomplishing the above recommendations, although this is more obvious at the Y-12 plant.

2. The value of data obtained from weekly urine samples should be seriously reviewed. It is the belief of the committee that sampling and analysis of urines more frequently than every quarter is unnecessarily costly in a uranium handling operation. This of course would not be true if the results were being collected as part of a research program, and does not preclude duplicates, or recheck samples to improve statistical control.
3. The individual external radiation record should be specifically incorporated in the medical record, at least on a cumulative annual basis.

K-25 only

1. There should be a critical reappraisal of the "maximum permissible" uranium in urine level. The committee believes that the philosophy of "no significant internal deposition" of uranium is unnecessarily costly in terms of the program required to insure it.
2. The general philosophy of classifying single individual over-exposures as injuries or accidents should be reviewed. This is especially true where fractions of the permissible level as designated by the NBS handbooks are used as the criteria.
3. The recording of daily pocket chamber meter readings appears unnecessarily costly and should be reviewed.
4. The general philosophy of operating at "values far below any known injury level for continuous exposure" and superimposing upon this value a factor of safety of from 4 to 10, and additionally using a single measurement without long term integration should be seriously reviewed. The same may be said for urine analysis, where a single verified sample which is only about 2 times background, but several orders of magnitude below the damage level results in reassignment of personnel.

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104.6 file

NOTES ON REVIEW OF THE HEALTH PROGRAM AT THE OAK RIDGE GASEOUS DIFFUSION PLANT  
BY THE AEC HEALTH PROTECTION STUDY COMMITTEE

On July 18, 1957, the Health Protection Study Committee of the Atomic Energy Commission met with personnel of the Union Carbide Nuclear Company, Oak Ridge Gaseous Diffusion Plant, to review the radiation protection practices of that installation. After discussions on the morning of July 18, the committee and other members of the group visited various plant facilities, the visits being followed by further brief discussions.

Prior to this meeting, on July 3, 1957, Mr. W. B. Harris of the AEC New York Operations Office, who is also a member of the AEC Health Protection Study Committee, visited the plant, and his discussions with Dr. H. F. Henry are outlined in attachment 1.

Those present for all or part of the discussions on July 18 were:

AEC COMMITTEE

Mr. Dan F. Hayes, Chief, Safety and Fire Protection Branch, AEC,  
Washington Office

Dr. Thomas S. Ely, Assistant Chief, Medical Branch, Division of Biology  
and Medicine, Washington Office

Dr. James H. Sterner, Medical Director, Eastman Kodak Company, Rochester 4,  
New York

Mr. Arthur A. Schoen, Health Physicist, Research and Development Division,  
Oak Ridge Operations Office

REPRESENTATIVE OF THE OAK RIDGE OPERATIONS OFFICE, AEC

Mr. N. H. Woodruff

REPRESENTATIVES OF THE UNION CARBIDE NUCLEAR COMPANY

Mr. J. C. Bailey  
Mr. A. F. Becher  
Mr. L. B. Emlet  
Dr. H. F. Henry  
Mr. A. P. Huber  
Dr. J. Lyon  
Mr. J. D. McLendon (Y-12)  
Mr. W. C. Moore (Y-12)  
Mr. W. L. Richardson  
Mr. D. L. Stoddard

Opening Remarks

At the opening of the meeting, Dr. Sterner indicated that the committee considered a review of health problems as related to uranium handling to be the

Union Carbide Nuclear Company, Oak Ridge Gaseous  
Diffusion Plant, Operating Contractor for the U.S.  
Atomic Energy Commission.

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*Arvin S. Just* 5/30/95  
Technical Information Officer Date

Oak Ridge K-25 Site

*for removal of BC marking.*

primary purpose of the committee.

In his preliminary remarks, Mr. Emlet indicated that, since UCNC attempts to keep health considerations separate from union and labor questions, it was considered unfortunate that the review was apparently initiated by letters from unions alleging inadequate health safeguards at one of the UCNC plants and at Portsmouth, and that the letter concerning UCNC might well have been for the purpose of laying the foundations for various negotiations when a new contract is negotiated in 1958.

#### Review of Radiation Protection Program

The discussions concerning the plant's radiation protection program are summarized below; the specific questions asked by the committee are indicated along with the answers in attachment 2, and materials supplied to the committee members are listed in attachment 3.

Mr. Huber reviewed ORGDP facilities and operations, mentioning the following as particular problems with which the plant has coped successfully:

1. The extensive use of hydrofluoric acid and fluorine in feed manufacturing.
2. The extensive handling of various uranium compounds in the K-1420 Recovery Building.
3. Uranium dusting in the K-1131 Feed Plant and dusting of metal powder in the K-1037 Barrier Plant.

These problems were controlled primarily by improvements in the design of the affected facilities which essentially eliminated the open handling of materials. The gaseous diffusion process is entirely enclosed, and problems encountered in the diffusion cascade buildings are associated primarily with maintenance activities.

Aside from engineering improvements, it has been and continues to be the Plant's philosophy to teach each individual that he is responsible for his own safety and that of his fellow employees, and that the primary responsibility for health and safety activities lies with the line organization. Staff groups are available for advice and help to the line organization, but it is considered that if the line organization does not understand the problem, the Plant has no real safety program.

Mr. Huber stated that one of the Plant's biggest problems, and one that was created by the Plant itself in the early days because of insufficient information, was the issue of "protective" clothing. In addition to obvious employee relations problems, the primary technical difficulty with the issuance of plant clothing is a tendency of this practice to create a false sense of security, since "protective" clothing in reality gives no direct protection from the inhalation or ingestion of uranium materials which are by far the major hazards. The present ORGDP practice is to require clothing in

those few cases where uranium materials on clothing may result in a possible inhalation problem following the actual work, and to give time within the scheduled work day for clothing changes in these cases. Other employees may wear company-issued clothing if they wish, but they change clothes on their own time. This has cured the Plant's clothing problems.

In reply to questions concerning the Plant's educational program, it was indicated by Mr. Huber and others of the ORGDP that information is given to employees primarily through the line organization, the methods including discussions at safety meetings and instructions concerning operations, the health and safety precautions being integral parts of these job instructions. In addition, meetings have been held directly with the union committeemen, and discussions in the Company-Union Safety Committee meetings include radiation protection considerations. The supervisors receive information in a number of plant publications, including the Safe Practices Procedure Manual, and through Supervisory Conferences, which are scheduled according to the needs of the plant rather than on a predetermined schedule. The orientation program for new supervisory and other plant personnel includes health and safety information as well as administrative information.

In reply to questions and comments concerning grievances and the apparent lack of any real understanding of radiation protection on the part of union personnel, it was stated that there have been no recent grievances concerning health problems other than those involving "protective" clothing, and that the apparent lack of understanding on the part of the union is typical of all negotiations. When a problem is brought up by the union, it is reduced by logic to the basic problem, and then the union starts all over again as if nothing had been said.

The plant organization was outlined, and the agenda for the review of the Plant's radiation protection program, given in attachment 4, was suggested, and was acceptable to the AEC Committee.

A. Establishment of Safe Equipment and Operating Procedures

The steps by which the Plant assures safe operations and conditions were outlined by Dr. Henry as follows:

1. The job starts with the design of a facility, and includes the development of the necessary technical information through the review of available literature, discussions with qualified consultants, and the development of experiments and theoretical data. For example, the development of sufficient data to evaluate the hazards associated with surface contamination included experiments to relate the degree of air, hand, and clothing contamination to surface contamination, and to relate the indirect inhalation of uranium to hand and clothing contamination; these studies have been reported in various plant reports and memoranda.

A number of technical reports concerning radiation problems at the K-1131 Feed Plant were cited. These ranged from preliminary studies in the design and pre-design stages through Pilot Plant Development and included the current operating manual.

2. During the evaluation of a new process, safety rules are developed by the line organization and are reviewed by the staff groups. These safety rules are included in the operating manual, which is available to supervisors, and specific rules are posted or are otherwise made available to all employees who need them. In addition, a large number of classroom-type instruction courses are held for supervisors, both during the developmental stages of processes and at subsequent periods. A study of potential hazards and of applicable safety procedures are integral parts of these courses.
3. The plant acceptable limits for radiation exposure and contamination levels are made available to all supervisors, it being considered essential that the line organization have sufficient information to evaluate health and safety conditions, since members of this organization have responsibilities for safety commensurate with their responsibilities for production.
4. Efforts are made to keep up with developments in personnel protective devices and to develop necessary information which is not available already. For example, information concerning the protection provided by the army assault mask against uranium hexafluoride, hydrogen fluoride, and fluorine could not be obtained from either the Army Chemical Corps or the Bureau of Mines, so necessary tests were performed here. The Samson Alpha Survey Meter, which is one of the most satisfactory meters of this type, was developed at ORGDP, and special high-sensitivity probes for use with the Samson in surveying the cascade for possible deposits of uranium were also developed here. The use of indium foil in security badges for determining personnel exposures to neutrons in the event of an inadvertent critical reaction, now used in several installations, was first suggested at ORGDP in 1949, and the use of such foil was instituted shortly thereafter.
5. In response to a question by Mr. Hayes concerning the possible need for an AEC testing program for respiratory-protective equipment, it was indicated that it continues to be necessary for us to perform numerous tests on this type of equipment ourselves and such a program is vitally needed.
6. Personnel who may be exposed to penetrating radiation are issued film badges, and urinalyses are routinely utilized to detect possible uranium accumulations in the body.

B. Evaluation of Environmental Conditions

1. Members of the line organization, including hourly employees, use survey meters and evaluate conditions as part of normal work. Air samples are also taken by the line organization and are counted for uranium by the Works Laboratory. The results are interpreted by the line organization and are also forwarded to the Safety and Health

Physics Section for review. All such records form a part of the permanent plant records relative to radiation and contamination.

2. The Safety and Health Physics group audits plant locations, these audits including air sampling and radiation checks for penetrating radiation and alpha contamination; the results of these audits are reported on forms which are signed by the supervisor, and a copy of the results is left with the supervisor. Where uranium presents a possible heavy-metal poisoning problem, air samples are also taken by the Industrial Hygiene Section for analysis for uranium, these analyses also being performed by the Works Laboratory.
3. Plant instruments, including radiation detection instruments, are maintained by the Instrument Maintenance Department.
- ✓4. Periodically a letter is prepared to the management of each division, this letter presenting an evaluation of the health, fire protection, and safety program and including appropriate recommendations.
5. Supervisors receive a quarterly report on film-badge exposure results for all employees under their jurisdiction who are assigned such badges.
6. Records concerning radiation conditions are presently scheduled for indefinite retention.
7. Film badges are placed in a number of plant locations to serve as "area monitors," these being processed biweekly on the same schedule as personnel badges. There are no radiation alarms except those provided to detect possible critical reactions.
8. In response to a question concerning grievances, it was indicated that there have been no grievances concerning either the failure to supply film badges or reductions in film-badge coverage. It was pointed out that requests for the institution of a film badge for an individual and the discontinuance of film badges are initiated by the supervisor, frequently on the basis of Safety and Health Physics recommendations, and that if a man wants to have a film badge, there is no reason why he cannot be assigned one.
9. In discussing the handling of over-P.A.L. film badges, of which we have 2 or 3 per quarter, it was pointed out that employees receiving such exposures are restricted with respect to their further contact with radiation until their average exposure falls within the acceptable national limits. Exposures of 25 r or over are handled in the same manner as we handle an injury, although it is not considered that an employee so exposed would necessarily have sustained an injury, and restrictions for exposures in this range are handled in the same manner as for lower over-P.A.L. exposures. Dr. Sterner noted that although there has been a lot of emphasis on the possible life-shortening effects of radiation, very little has been said or is known about the life-shortening effects of many other factors in our environment which may be a great deal more important.

C. Dissemination of Information

The primary line of communication to all employees is through the line organization.

1. Additional methods of transmitting information to supervisors include:
  - a. Operating Manuals.
  - b. Safe Practices Procedures.
  - c. Supervisory Conferences.
  - d. Plant Bulletins and other publications.
2. Safety meetings are held regularly with employees, but the primary safety information necessary is included in the job instructions.
3. In line with AEC policy, Cost-Plus-Fixed-Fee Contractors are given the same information as ORGDP personnel. Where possible, the areas involved in such jobs are cleaned to essentially zero contamination, and where this can not be done, contractor personnel are handled in the same manner as Plant personnel.
4. In connection with restrictions of employees from contact with uranium materials, it was the practice in the early days of operations to discuss the cause of the restriction and to explain the significance of possible uranalysis results with each employee so restricted. Now employees are familiar with the handling of restrictions, and few employees have any questions about them. However, the exposure history of any employee is reviewed with him upon his request.
5. Educational exhibits of samples of uranium materials depicting the maximum allowable amounts for inhalation and ingestion were shown.

D. Medical Services

1. In addition to the dispensary, which is open 24 hours a day 7 days a week, medical-aid stations in other Plant locations are visited in rotation on the day shift. Included in the Medical Department Staff are 5 physicians who are on duty during the day shift Monday through Friday. Two of the physicians are on a staggered-shift schedule to cover shift changes on these days.
2. A consulting clinical psychologist is available 1 day per week.
3. Services to employees include treatment of injuries incurred on the job, physical examinations on a schedule depending upon the age of the employee, and clinical examinations for possible exposure to toxic or radioactive materials.

4. Of approximately 5300 employees, approximately 2500 are examined on varying schedules for possible exposure to toxic or radioactive materials. In the uranalysis program, the clinical analysis is performed by the medical group, the analytical work by the Works Laboratory, and the planning is handled by the Industrial Hygiene Section. It was estimated that less than 10% of employee exposures to uranium involve enriched material. Fluorides in urine are easily detectable and are considered to represent no problem unless exceeding 8 mg./liter; the results for Plant employees usually do not exceed 2 mg./liter.
5. Techniques and limits for uranalyses were discussed briefly; the AEC Committee noted that the ORGDP limits were considerably more conservative than those of other installations, and expressed the hope that a study now being carried out by the AEC would permit the development of limits that would be applicable as AEC standards.
6. The studies concerning noise effects on employees' hearing and the heat studies in progress were discussed briefly.
7. In answer to questions concerning our handling of claims it was indicated that the Aetna Insurance Company handles the claims, although the costs are borne by the Government. There have been few serious claims, most allegations involving cases where an employee can profit compensation-wise.

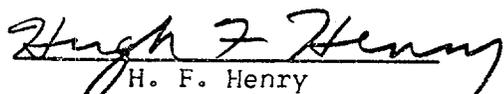
E. Review of Plant Experience

Plant experience with respect to penetrating radiation exposures and contamination of air and surfaces was discussed, and it was noted that summaries of these and related items are given in the various plant quarterly reports, and a detailed analysis of certain types of data are given in the special study prepared for the Rockefeller Foundation.

F. Committee Comments on Plant Operations and Conditions

1. The Committee indicated that the Plant appeared to be in good shape with respect to the radiation control program, and Plant conditions appeared to be satisfactory.
2. It was felt desirable that radiation exposure records be integrated with the medical records.
3. The Plant's difficulties in obtaining uranalysis results for alpha activity at the level which is considered to represent the plant acceptable limit, and the fact that this limit is considerably lower than those used at other installations were noted. It was felt that the AEC study now in progress might permit the development of suitable standards in this regard.

J.C.Bailey:lja  
12-19-57  
Attachments

  
H. F. Henry  
Safety, Fire, and Radiation Control

ATTACHMENT 1

DISCUSSIONS WITH MR. W. B. HARRIS, JULY 3, 1957

On July 3, 1957, Mr. W. B. Harris visited the ORGDP for the purpose of reviewing the radiation protection practices of this facility and discussed these with Dr. H. F. Henry. In this review, Dr. Henry outlined the basic aims of the program as follows:

1. The Plant evaluates to the greatest practicable extent the actual health problems associated with its operations, the evaluations including experimental studies, literature reviews, and consultations with various experts on the problems under consideration. Included among experimental studies at ORGDP were:
  - a. Evaluation of the inhalation problem associated with contaminated clothing.
  - b. Evaluation of air contamination resulting from various degrees of surface uranium contamination.
  - c. Evaluation of the inhalation problem associated with hand contamination.
  - d. Cross-contamination effects as related to the laundering of contaminated clothing in the same laundry equipment used for uncontaminated clothing.
2. The line organization is responsible for the radiation-protection aspects of operations to the same extent that it is responsible for production.
3. The methods utilized to assure that members of the line organization are aware of problems associated with their operations were discussed.
4. An effort is made to meet all problems realistically. In some instances, however, the methods used are recognizedly quite conservative, particularly in fields where there is a lack of sufficient information to permit an adequate evaluation of the problems concerned and where there is insufficient justification from operating viewpoints for an experimental program to resolve the difficulty. In addition, controls may be purposely conservative to facilitate administrative procedures; for example, although limits for air-borne contamination are those applicable to long-term exposure, respiratory protection is considered to be mandatory where air-borne concentrations of radioactive materials are in excess of these limits even temporarily, and it has never been considered necessary or desirable from the operating standpoint to attempt to integrate the internal exposure to an individual employee to "average" his exposure over a long period of time.

The plant limits for personnel exposure to radiation and to radioactive materials and the procedures for handling exposures to penetrating radiation and to internal emitters in excess of these limits, as indicated by film-badge results and urinalysis results, respectively, were reviewed.

Mr. Harris described some studies which indicated that the inhalation of 100 micrograms of insoluble uranium per cubic meter of air would result in the excretion of 50  $\mu\text{g.}$ /liter of urine, while the inhalation of the same concentration of soluble uranium compounds would result in the excretion of 100  $\mu\text{g.}$ /liter of urine. He also stated that the excretion of insoluble compounds, mostly finely-divided  $\text{U}_3\text{O}_8$ , were at rates with varying biological half-lives, the half-lives of recently inhaled materials being the shortest observed.

Documents given to Mr. Harris for further review were as follows:

- KSA-81 Radiation Protection Practices at the ORGDP
  - KSA-34 Clothing as Health Protection Against Alpha-Emitting Materials
  - KSA-36 Possible Inhalation from Uranium Contaminated Clothing
  - ✓ KS-307 Suggested P.A.L. for Urinary Uranium
- Henry, H. F., Effectiveness of Waterless Hand Cleaners for Removal of Uranium, 11-23-54.

ATTACHMENT 2

SUMMARY OF QUESTIONS ASKED BY THE AEC HEALTH PROTECTION STUDY COMMITTEE

<u>QUESTION</u>	<u>REPLY</u>
1. <u>Education and Training Program</u>	
a. What methods are used for instructing employees about radiation?	Information is passed through the line organization and is given to employees with job instructions, through posted safety rules, and through safety meetings. In addition, meetings have been held directly with the Union Committeemen to present the same information concerning radiation that was given to the line supervisors.
b. What is the regular channel of communication?	Through the line organization.
c. How does the supervisor get information?	Operating manuals, which include safety and radiation protection information, are used by supervisors in training and are available to them. The Plant's Standard Reference Information contains information concerning radiation protection and is available to supervisors. Safety rules are posted or otherwise made available to anyone who needs them. There are many classroom courses for both supervisors and operators, and supervisory conferences are held with plant supervision as the need arises.
d. How frequently are supervisory conferences held?	The frequency is determined by the need and by the material to be presented.
e. Are new supervisors given training in radiation safety?	Yes. The orientation program covers this as well as administrative matters.
f. Does the line supervisor know whether he is operating within the plant limits?	Yes. It is important that the line supervisor know what the limits are.

QUESTION

REPLY

2. Air Monitoring

a. Who is responsible for air analyses?

The supervisors take samples and evaluate the results, the Works Laboratory performs the analyses, and the results are reviewed by the health physics group. Samples are also taken by the health physics group as a part of their audit function and by the Industrial Hygiene Section for uranium analyses as related to a heavy-metal problem.

b. Are air samples taken on the basis of analyses by the health physics group or by reference from the supervisors?

Either of these and any of a number of other indications of possible problems may result in the initiation of air monitoring.

c. Is the Plant still without national guidance on gas-mask testing? Should the AEC establish a testing program?

There is no national testing program which will yield the type of information required. We spend a lot of money on such testing, and a national program is vitally needed.

d. Are there areas in which Industrial Hygiene and Health Physics overlap?

Yes. In general, it is not possible to correlate uranium and count analyses with assay.

3. Urinalysis Program

a. How many employees are at ORGDP and how many are given industrial health examinations on a periodic basis?

Of approximately 5300 employees, about 2500 receive industrial health examinations.

b. What is the procedure for repeat checks on employees showing some plutonium excretion?

At a sign of plutonium exposure, 24-hour samples would be collected until a negative sample was obtained.

c. Where is the laboratory work done?

Clinical lab work is done by the Medical Department and analytical work by the Works Laboratory.

d. Has an analysis of the numbers of exposures in the various categories of assay been carried out?

Probably less than 10% of exposures are due to enriched uranium.

QUESTION

REPLY

✓ e. Is there any record of anyone's being hurt by uranium materials?

In Fercleve operations there were several severe exposures, and one case where there was evidence of temporary renal damage. There have been a number of cases of pulmonary irritation.

f. What are the limits for fluorides in urine? Can fluorides be detected?

Fluorides are easily detected, and fluorides present no problem unless excretion exceeds about 8 mg./l. Exposures at ORGDP generally do not result in excretion rates greater than 2 mg./l.

4. Film-Badge Usage

a. Are film badges used to monitor areas as well as personnel?

Yes. Some badges are put at various plant locations and are developed and processed in the same manner as personnel badges.

b. Have you had any grievances on the failure to assign film badges? Any where film-badge usage was reduced?

No. If a man wants to wear a film badge there is no reason he cannot be assigned one.

c. How are badges discontinued?

Film-badge assignments and the withdrawal of film badges are requested by the line supervisor, frequently at the suggestion of the health physics group.

d. Is a man restricted in his contact with radiation if he receives an exposure of 25 r?

Yes. He would be restricted in the same manner as for other over-P.A.L. exposures, although he would receive additional medical checks.

e. How many exposures in excess of the plant acceptable limit are experienced?

2 to 3 per quarter.

f. How long are radiation records retained?

These records are held on indefinite retention. The last instruction from the AEC specified 50 years.

5. Plant Health Experience

a. Have there been any questions from employees about deaths of plant employees?

None in connection with plant operations.

QUESTION

REPLY

- b. Has there been any effort to correlate the plant death rate with metropolitan data? No.
- c. Does the plant have an insurance carrier? Insurance claims are handled by Aetna Life Insurance Company, but the Government pays the claims.
- d. How many claims do you have? Not too many serious claims, most being where an individual can profit compensation-wise.
6. Miscellaneous
- a. Who develops safety rules? Safety rules are developed by the line organization and are reviewed by the staff groups.
- b. How are contractors handled? In accord with AEC instructions, work areas are cleaned up if this is practicable. If this cannot be done, contractor personnel are handled in the same manner as Carbide personnel, and contractor supervision is given the same information as Carbide supervision.
- c. Has there been any indication of hearing loss as evidenced by the audiometer program? 2.8% of employees show some possible signs of hearing loss.

ATTACHMENT 3

MATERIAL GIVEN TO AEC HEALTH PROTECTION STUDY COMMITTEE

- K-459 Comparative Study of Hand Decontamination Agents for Uranium
- KSA-81 Radiation Protection Practices at the ORGDP
- KSA-34 Clothing as Health Protection Against Alpha-Emitting Materials
- KSA-36 Possible Inhalation from Uranium Contaminated Clothing
- K-1071 The Inhalation of Radioactive Materials as Related to Hand Contamination
- K-1088 Air-Borne Contamination Resulting from Transferable Contamination on Surfaces
- KS-307 Suggested P.A.L. for Urinary Uranium
- KSA-48 Alpha Contamination Control at the ORGDP
- Routine Survey Forms
- Emergency Manual (Current)
- Over-P.A.L. Film-Badge Exposures - Notifications and Investigations
- Alpha Contamination Control, A. P. Huber, July 5, 1956
- Joint Rockefeller Foundation - National Academy of Sciences Study, L. B. Emlet, May 29, 1956
- Quarterly Accident Control Summaries (Divisional Letters) (Samples)

ATTACHMENT 4

AGENDA FOR REVIEW OF ORGDP FACILITIES BY AEC HEALTH PROTECTION STUDY COMMITTEE

- |  |              |
|--|--------------|
| 1. Orientation   | A. P. Huber  |
| a. Plant Operations  |              |
| b. Safety Philosophy   |              |
| c. Scope of Review   |              |
| 2. Brief Review of Plant Accident Prevention Methods   | H. F. Henry  |
| 3. Review of Plant Experience  |              |
| a. Bio-Assay Results and Monitoring<br>for Nonradioactive Air Contaminants                   | J. S. Lyon   |
| b. Exposure Data and Environmental Monitoring  | H. F. Henry  |
| 4. Inspection of Facilities (to be selected by<br>committee; visits arranged by H. F. Henry) | Committee    |
| 5. Discussion and any Reinspection of Facilities   | A. P. Huber  |
| 6. Summary Meeting - Committee Comments  | A. P. Huber. |



cc: A.F. Huber, 2327  
J.P. Murray

Please work together and prepare  
reply. Let's make sure that ORNL  
and Paducah are considered on  
a general charge.  
R.G. Jordan (Infor. only)

IN REPLY REFER TO:  
OPO:BLK

Copy forwarded by  
K. W. Bahler

Oak Ridge, Tennessee  
December 23, 1957  
PL. SUP'T K25 UCAC  
APH \_\_\_\_\_ SOS  
KWB \_\_\_\_\_ FILE  
GWS \_\_\_\_\_ OTHER

1957 DEC 31 AM 9:22

Union Carbide Nuclear Company  
Post Office Box P  
Oak Ridge, Tennessee

Copy  
Forwarded By  
B. LMLEF

Attention: Mr. C. E. Center, Vice-President

cc: W. L. Richardson-H.F. Hen  
J. S. Lyon

Subject: HEALTH PROTECTION AT K-25 AND Y-12

Please review and  
then we will discuss  
our response. KWB 1/2

Gentlemen:

File

Reference is made to our letter dated July 29, 1957, to you,  
subject, "Review of Health Protection Programs at UCNC Installa-  
tions."

Enclosed herewith for your information are six copies of a  
memorandum report, subject as above, which is an appraisal  
of the K-25 and Y-12 health protection programs. This report  
is based upon the findings of the GRO Health Protection Study  
Committee who visited the K-25 and Y-12 plants during July of  
this year.

The Committee was quite impressed by the attention that both  
K-25 and Y-12 are giving to their respective health protection  
programs. There appeared to be little doubt in the minds of  
the committeemen that these programs are adequate; in fact, they  
questioned the need for the great degree of attention which certain  
measures are receiving. The Committee was particularly impressed  
with the realistic approach at Y-12.

Using the Committee's comments and recommendations, you may wish  
to review certain aspects of the Y-12 and K-25 programs. The  
Committee noted several items which you might consider in your  
review.

The bio-assay programs at both plants were critically appraised  
and the committee concluded that both the value and the frequency

Approved for Release to the Public  
by:

*Cathy G. Stachowiak*  
Cathy G. Stachowiak  
DOE K-25 Site Office

5/19/95  
Date

This document has been reviewed for  
classification and has been determined to  
be UNCLASSIFIED.

*Kevin J. Smith*  
ADC Signature

5/12/95  
Date

\*Letter only, not  
enclosure

Mr. C. E. Center

-2-

December 23, 1957

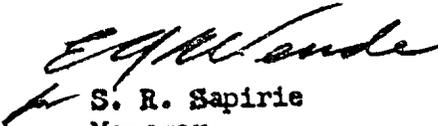
appear to be over-emphasized. The Committee recommends in the enclosed report that urine be sampled once each quarter rather than weekly. Perhaps this would not give adequate control; however, a review of the sampling rate should be made to determine the over-all value of weekly sampling as opposed to a less frequent rate (semi-monthly or monthly).

Other aspects or questions which might be considered in your review are as follows:

1. How realistic are the permissible internal deposition levels based on urinalyses?
2. What value is attached to single measurements without integration of same over a long term?
3. What can be done to make the full time use of respirators in certain operations unnecessary?
4. Would the adoption of a uniform philosophy and practice be possible for use at Y-12, K-25, and Paducah?
5. How important is the daily recording of dosimeter readings?

We would appreciate receiving your comments regarding the enclosed report and the results of any review or evaluation study which you might choose to make as a result of the Committee's findings. The thought and effort which you have given to insure health protection is greatly appreciated and we hope that the above suggestions will be helpful in planning your future health protection program.

Very truly yours,

  
S. R. Sapirie  
Manager  
Oak Ridge Operations

Enclosure:

Memo-Report dtd 10-29-57, Re: Health Protection at K-25 and Y-12

CC: Mr. R. C. Armstrong, w/o Encl.  
Dr. H. M. Roth, w/o Encl.

UNITED STATES  
ATOMIC ENERGY COMMISSION

*File*  
*232.7*  
APR 1 11:36

In Reply  
Refer to: O:NRW

Copy forwarded by  
K. W. Bahler

Oak Ridge, Tennessee  
April 24, 1957

cc: A.P. Huber  
K.G. Jordan  
J.P. Murray

Jordan: Please prepare  
a reply for Mr.  
Center's signature.

LBE

Union Carbide Nuclear Company  
Post Office Box P  
Oak Ridge, Tennessee

cc: K. W. Bahler  
J. S. Lyon  
W. L. Richardson

Attention: Mr. C. E. Center, Vice President

Subject: HEALTH PROTECTION STUDY COMMITTEE

For your information.

Gentlemen:

5/13

Reference is made to a memorandum dated March 8, 1957, entitled "Health Protection Study Committee", a copy of which was sent to you.

Enclosed is a report of the results of the Committee's review and inspection of the Paducah and Portsmouth plants. This report as you note has been marked "Official Use Only".

I am interested in having you review the contents of the report with special attention given to the recommendations therein. At an early date I would appreciate discussing with you the actions that have been taken on these recommendations as well as any other actions or suggestions which are appropriate to the report and the health physics practices and procedures currently in effect at the Paducah plant.

Although the report raises few questions as to current policies and practices, it does I think reflect the overall fine job which you and your staff are doing in the Paducah plant.

I want to express my appreciation to you and your organization for the assistance that was afforded this committee when it met at the Paducah plant. As you are aware an effort is being made to have the same committee review the policies and practices at

This document has been reviewed for classification and has been determined to be UNCLASSIFIED.  
*David B. Gilliland*  
K-25 Site Classification Office  
May 15, 1995  
Date

Approved for Release to the Public by:  
*Cathy G. Stachowiak*  
Cathy G. Stachowiak  
DOE K-25 Site Office  
5/19/95  
Date

C. E. Center

- 2 -

the Oak Ridge Gaseous Diffusion Plant and the Y-12 facility here in Oak Ridge. We have yet to find a date convenient with the committee. When this is determined we will contact you in this regard.

Very truly yours,



S. R. Sepirie  
Manager  
Oak Ridge Operations

Enclosure:  
Report (5)

CC: K. C. Brooks, w/encl.

*Office Memorandum* ~~CONFIDENTIAL~~ UNITED STATES GOVERNMENT

TO : S. L. Sapirie, Manager  
Oak Ridge Operations Office

FROM : Health Protection Study Committee

SUBJECT: HEALTH PROTECTION AT PADUCAH AND PORTSMOUTH

SYMBOL: HSH:WBB

DATE: April 16, 1957

By memorandum dated March 8, 1957 from your office, a study committee consisting of:

Dr. T. Ely, Division of Biology and Medicine, Washington  
 Mr. W. B. Harris, Chief, Industrial Hygiene Branch, NYCO  
 Dr. James H. Sterner, Medical Director, Eastman Kodak,  
 Rochester, 4, New York  
 Mr. A. A. Schoen, Biology Branch, OROO  
 Mr. D. F. Hayes, Chief, Safety and Fire Protection Branch,  
 Washington

visited the Paducah Gaseous Diffusion Plant on March 19 and 20, and the Portsmouth Gaseous Diffusion Plant on March 28 and 29 for the purpose of reviewing existing policies and practices relating to health protection at each operation.

The general reaction of the committee may be summed up as follows:

1. Plant personnel, including management, supervisory personnel, and the medical departments, appear to be well aware of the potential hazards of their operation in each plant.
2. Carefully designed and documented procedures for the investigation and control of health hazards have been compiled. These are designated KI-204 "Paducah Plant Health Physics Program", by R. G. Jordan, issued March 18, 1957; together with GAT-R-22 "The Annual Report of Health and Safety for 1956"; and two documents entitled (a) "Hazard Control Functions (October 1956)", and (b) "Standard Practice Procedures Pertaining to Health and Safety" from Portsmouth. A copy of each is attached for your information.
3. From our examination of the records, and questioning of various persons, it appears that the general practices outlined in the above mentioned manuals are carried out carefully and in detail.

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S. R. Sapirie

- 2 -

April 16, 1957

4. We were informed of a continuing series of safety meetings with supervisory and operating personnel. Prior to the plant opening, a great deal of emphasis was placed on this subject. In general, meetings appear to be beneficial, but in view of the present apprehension expressed by operating personnel at Paducah, it would appear that more effective methods are needed. At Portsmouth there are monthly meetings where each employee can have his say on safety matters.
5. The conditions of housekeeping and other health control procedures in all operating areas appeared to be very good, with the possible exception of the new metal plant at Paducah. Since this plant was just beginning operation, it was not unexpected to encounter operations giving rise to excessive amounts of dust. This was recognized by supervision who expressed the intention of bringing it into order as soon as possible.
6. The medical department personnel and facilities are excellent, although at Paducah they are somewhat superior.
7. It seemed to the committee that undue emphasis is being placed at Paducah on the technique of bio-assay for evaluating exposure to uranium. It does not appear that sufficient is known at this time to warrant placement of complete reliance on the urine analysis for uranium to the substantial exclusion of air analysis; although adequate comparative data may be available at sometime in the future. This was especially noticeable in comparison with Portsmouth. There we found a reasonably well integrated program of air sampling and bio-assay both inside and outside of the plant. One exception to this, which may or may not be important, is that there exists a strong division between health physics and industrial hygiene. Air samples which are taken for the evaluation of chemical toxicity, e.g. of uranium, are taken by the industrial hygiene personnel, while samples for the evaluation of the potential radiologic hazard (also of uranium) are taken by health physics personnel. Each of these samples is evaluated in a central laboratory, but the results are funneled to the interested group, and there does not appear to be any specific coordination of these two types of samples. Bio-assay techniques at Portsmouth are quite adequate.
8. There appeared to be certain inconsistencies in the issuance of "contamination clothing" at Paducah. Time did not permit, however, a detailed study of this program. Similar inconsistencies were not obvious at Portsmouth.

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S. R. Sapirie

- 3 -

April 16, 1957

9. There is no evidence that any individual in either plant had received an injurious exposure to radiation or radioactive materials. No occupational disease claims have been reported. There is no reason to believe that any exposures incurred could have been either a cause or an aggravation in the cases of malignancy which have been reported from the plant populations.

#### RECOMMENDATIONS

As a result of our study the committee believes that the health procedures at these plants are quite adequate to provide reasonable assurance that no one will be injured by the plant operation. There are, however, a couple of details which might tend to improve the economy and efficiency of operation. These are:

#### General

1. A detailed evaluation should be made of all exposures, and engineering controls should be applied which will make it possible to eliminate many of the situations currently requiring the use of respirators. The committee strongly recommends that the use of respirators should be limited to short-term or emergency operations.
2. There should be an integrated health and safety organization whose primary functions are:
  - a. Verification of the need for various health services, such as clothing, film badges, urine sampling, and so forth. When the lack of value of these services is demonstrated, the service should be discontinued.
  - b. Continuous improvement in exposure conditions, and not merely evaluation of exposure. Any over-exposure (by any standard) which has been rechecked should be forwarded to management with specific recommendations for improvement. Removal of individual operators from exposure should never be used to cover inadequate controls, nor should respiratory protection be provided instead of adequate cleanup of the operation.
3. In any area where films routinely average 50 mrep/week or less, the wearing of film badges could safely be extended to 2 or possibly 4 weeks prior to evaluation. This will greatly improve the accuracy of reading and reduce film processing. Where films routinely show less than a readable darkening and never exceed 50 mrep in two weeks, they can be eliminated.

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S. R. Sapirie

- 4 -

April 16, 1957

4. The Commission should publish specific health and safety standards for its contractors. These should define such things as:
  - a. Criteria for issuing and laundering clothing.
  - b. Surface contamination of hands, clothes, equipment, and buildings.
  - c. Urine analysis methods and procedures, and evaluating techniques.
  - d. Permissible concentrations of materials in the air and in bio-assay samples.
5. A uniform method should be worked out for keeping employees advised of information to which they are entitled. There should be some definition of what this information should be.
6. The medical records contained no information concerning the overall exposure to radiation or radioactive materials. It is strongly recommended that at least on a summary basis, perhaps annually, a record be made in the medical chart defining the exposure as accurately as possible in terms of radiation or absorption of radioactive materials.

Paducah Only

1. There should be a study of the procedures for issuing contamination clothing. It is to be hoped that as a result of such a study, it might be possible to eliminate some of the obvious inconsistencies which presently exist. Again, it is stressed that this is not from the standpoint of health protection, but rather to improve employee relations by clarifying the basis for issuance.
2. The criteria by which personnel clothing is laundered or replaced should be reviewed. It is to be hoped that criteria can be formulated which will permit a more accurate definition of the situation by the foreman. The effectiveness of the present foreman control in the problem of clothing contamination should be checked by specific, periodic, independent examination.
3. It appears that there can be some improvement in the channel of communication between management and employees. Although this was not clear at the time of the visit, it certainly appeared that information on the change in the radiation tolerance as defined by newly adopted Commission standards was not adequately passed on. If this be true, it can only generate questions which are difficult to resolve.

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4. Apparently there remains considerable confusion in the minds of the employees as to the rationale of the recalls because of excessive urine concentration. A more effective education should be developed.
5. Some of the communications which were seen noted the discontinuance of film badge protection in certain areas. It is believed that an adequate channel of communication would eliminate the necessity for raising such a question.
6. A critical study should be performed of the airborne dust in the operating areas. This study should be designed to provide an accurate evaluation of the average exposure of each plant individual. This approach is particularly helpful in identifying the major sources of contamination in starting up or in making major changes to operating procedures. After such an evaluation it might be possible to place more confidence in the analysis of urine for uranium. It is understood that such a survey would seriously overload the personnel at the plant. However, personnel equipped to perform such a survey are undoubtedly available within the company, possibly from one of the Oak Ridge plants. If such assistance is not available at Oak Ridge, it might be possible to have such a survey performed by the Health and Safety Laboratory of the Commission.

Portsmouth Only

1. Some effort should be made to resolve the unnatural division between the health physics and the industrial hygiene organizations. It is our belief that this could function more efficiently as a single unit. Mr. Caterson indicated that they had considered this and also lumping safety and fire protection in the same organization, but found this to be too cumbersome. It is, of course, true that a single health and safety group is the ideal situation, but a breakdown where two different groups sample the same air for different materials could certainly be improved.
2. Some of the local exhaust ventilation could be improved. It is believed that with such improvement much of the use of respirators could be eliminated. One advantage of having a uniform health and safety organization is that such an organization would be able to define not only the exposure, but control procedures. This would go far toward improving the overall efficiency of protection.

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S. R. Sapirie

-6-

April 16, 1957

DISCUSSION

PADUCAH

Discussions with Management

As soon as the committee arrived at the plant a meeting was set up which included the five members of the committee; Mr. K. C. Brooks, Area Manager; and the following Union Carbide Nuclear Corporation personnel: Dr. Hugh Henry (K-25); Dr. A. N. Ward, Medical Department Supervisor, Paducah; Mr. R. V. Maier, Superintendent, Operations Division, Paducah; Mr. R. G. Jordan, Plant Superintendent, Mr. E. C. Cain, Superintendent, Industrial Relations Division, Paducah.

At this meeting a document entitled "Paducah Plant Health Physics Program," designated KY-204 was passed out to each member of the committee. This report details all of the procedures and practices which are specified by the Company for the maintenance of an effective industrial health program. The items covered in this manual were discussed, as were many of the details of specific application of these practices. In addition, there was considerable discussion of the reactions of management to company-employee relations as they pertain to the health program. Some of the pertinent details which were derived from the discussion follow:

1. Local management stated that they have no disagreement with their operating personnel or with the union on matters of health which they believe could not be settled on a routine operating level.
2. There is a mutual agreement between the company and the union that existing health practices will not be changed. It is for this reason that contamination clothing, film badges, and other equipment supplied for health reasons have not been withdrawn from many plant areas where it has been proved that their use is not required.
3. It is the belief of local management that the union, acting as a group, is exerting every pressure to extend the issuance of clothing to operating personnel.
4. Cases do exist where operators wearing their own clothes become contaminated with processed material. When this happens, the company will wash the clothing or provide a replacement set.

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S. R. Sapirie

-7-

April 16, 1957

5. The company management, in emphasizing that the contention was over the issuance of clothing and not specifically over the degree of health hazard, pointed out that even in those areas where clothing was requested because of dust, there have been no requests for respirators.
6. The present level which is used to define contaminated clothing is "4000 d/m/100 cm<sup>2</sup>." Although management believed that there had been adequate information when the level was changed from the previous operation level of 2500 (and earlier 500), it was admitted that perhaps the safety factor in this change had not been properly emphasized. An adequate explanation might well have been accompanied by the information concerning the experimental work on clothing contamination which we fully agree justifies the more liberal level. In the current practice, clothing is checked for contamination when it contains visible material. This is at the discretion of the foreman.
7. Clothing is issued to about 500 men.

After our discussion with management personnel, we visited all of the important plant areas, in the company of the health physics supervisor. Following are our comments on the individual departments and practices as we saw them.

Cascade Plant - Housekeeping and normal operation of the cascade equipment appeared to be very good. From experiences which have been gained at K-25 one would expect very low exposures to radiation and radioactive materials in all of the areas which were visited. With the exception of some maintenance operations, it is believed that the cascade areas normally involve minimal exposure of all personnel. In the majority of operations in the cascade area, exposure is minimal. When the exposures are greater, as for example, in certain maintenance operations, more rigid control procedures are enforced.

Feed Plant - The feed plant likewise appeared to be in very good condition. Housekeeping was good; there was no noticeable odor of acid or fluorine gas in the air, although much of the glass in the plant was etched. If the conditions which we saw were representative of normal operating routine, it can safely be stated that the procedures which are in effect in the feed plant are adequate to provide complete protection for personnel. Again, no maintenance operations were seen in these areas.

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S. R. Sapirie

-8-

April 16, 1957

Decontamination Plant - From what could be seen during the time of the visit, this plant is well operated, and one would expect no unusual exposures to radiation or radioactive materials. Control equipment seemed to be adequate for the job, and housekeeping was good.

Metal Plant - There were several deficiencies noted in the health and safety practices in this plant. It appeared that both the safety program and the industrial hygiene control program could be intensified and tightened up in the process areas. For specific examples, we noted:

1. Some unguarded belts and pulleys.
2. There was a fire door opening to a roof from which there was no egress.
3. Wire brushing was done on derbies without shielding or adequate ventilation.
4. Practice of turning derbies in the scratch brush operation was inadequate.
5. Operations of bomb lining and loading, and the removal of the derby, together with derby chipping and cleaning appeared to be productive of excessive quantities of dust, although it would not be possible to define this more definitely without taking samples of the air.

Many similar examples could be stated. In general, housekeeping in the plant was inadequate, and there appeared to be much too much reliance placed on respirators as a means of control during routine operations.

#### Tails Plant

This building was being used temporarily as a purge and product building as well as for tails. Although the opportunity for accidental escape of materials is much higher in this area, the general housekeeping and cleanliness was good, and there was no evidence of previous high-level contaminations. Operating procedures to handling accidental escape of materials appeared adequate.

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It was thought that these plants would be representative of the worst conditions at Paducah.

There are certain general comments which apply throughout the operation:

Medical Department - The Medical Department is housed in the Administration Building and appears to be provided with space which is both generous and well equipped. The medical facilities are certainly equal to any situation which might be expected to be treated at the plant. The medical personnel seem competent and adequate. The assisting staff also appears to be adequate to any kind of work that might come up.

Individual employee medical records are excellent both from the standpoint of quality and of coverage. It would appear desirable to at least include a summary of the individual's radiation exposure in the medical record. This could be added on a yearly basis, providing the pertinent information to obtain as complete an estimate of diagnostic or therapeutic radiation exposure as possible, and document this in the medical record.

The program of physical examinations, including pre-employment, post-employment, and periodic examinations seems very good. It might be noted at this point that chest X-rays are taken on 14" x 17" plates, which is the best practice from the standpoint of minimizing radiation exposure.

Exposure Evaluation - In a plant of this type there are two kinds of radioactive exposure which must be evaluated. One of these is the exposure to direct radiation, or penetrating rays; and the other is to radioactive materials which might find their way inside the body.

Direct radiation is evaluated at Paducah primarily by means of film badges. The number of locations in which exposure to direct radiations may be accumulated is very limited. Therefore, the number of individuals provided with film badges is also very limited. As far as it was possible to judge, the number of film badges which is issued at this plant is quite sufficient to cover all employees who might possibly receive an exposure up to about 25% of the weekly tolerance. Any comment on the issuance of film badges which would be made by this committee, would be in the direction of reducing the number of people to whom film badges are issued rather than increasing that number. Any step in that direction, however, would have to be preceded by preparation communications with the employee group.

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S. R. Sapirie

-10-

April 16, 1957

Inhaled material is evaluated primarily by an analysis of urine samples, thus permitting the employee to be his own environmental sampler. It was the consensus of the committee that this method by itself is not completely adequate to the problems at hand. We were told that air samples are taken in some locations under certain circumstances. However, a description of the procedures which are used in taking air samples indicates that these samples are almost entirely individual samples taken for eight consecutive hours at some convenient location in a presumably dusty area, and have no real bearing on the environmental concentration to which an employee is exposed. The committee further concluded that a large mass of air sampling information should be collected before it would be acceptable to place the kind of reliance on urine samples as is done at this plant. It was thought that this would be especially true in the new metal plant where no air sample data are available.

Some discussion of the urine sampling program might be in order here. There were several ways in which this program left something to be desired. The most important of these is the lack of direct correlation of the urine concentrations with airborne exposures. It must be pointed out that at best, urine concentrations do not truly represent the exposure of any individual person. While it is true that reasonable correlations have been achieved between air concentrations and the average of a large number of urine samples, no such correlation has ever been demonstrated for a single individual.

In addition to specific correlation, urine samples might be expected to be very erratic because they are taken at random times during the work week. All urine sampling programs for the measurement of uranium which have been recorded to date demonstrate the extreme instability of the "weekday" sample, and the much greater reliability of the "Monday morning" voiding. It must be noted, however, that this instability would tend in the direction of conservatism, as the results should be high in all cases rather than low. It must further be stated that the limit of 12 micrograms of uranium per liter which is specified for restriction of activities is additionally conservative. In other words, one might sum up the procedures for obtaining and evaluating urine concentrations as being unreliable, but in a conservative direction.

There was one factor in the urine analysis program which was somewhat disturbing, but this is being corrected. Up until about a week prior to the visit all urine samples were analyzed fluorimetrically by visual observation. At about that time a fluorimeter had been installed and was in use. It will probably be another

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S. R. Sapirie

-11-

April 16, 1957

month or so before complete reliance can be placed on the fluorimeter procedure. It is to be hoped that the sensitivity of analysis will be markedly increased with the introduction of this new piece of equipment. A glance at the previous data made it obvious that the levels which had been set for removal of employees from exposure could never be detected by analytical procedure in use. The sensitivity would permit only a go-no go interpretation.

Clothing - The criteria for the issuance of work clothes appeared to cover the plant situation reasonably well. Taking a realistic approach to the problem of contamination of work clothes, it can be safely stated that no one would ever be injured by the quantity of material that could conceivably be removed from the plant on the clothes of employees who are not routinely issued contamination clothing.

There were some points in the clothing program which could possibly lead to criticism, although it is the consensus of this committee that these would never lead to injury. The most important of these are:

1. It was noted that certain operators were wearing respiratory protective equipment, but nothing to keep contamination from their clothing. This appears to be somewhat inconsistent. It can be safely stated that where a sufficient quantity of dust exists in the air to require the wearing of respiratory protection, in that same location the individual will be exposed to contamination of his clothing. Again it must be pointed out that no real health hazard is involved, but if clothing to prevent contamination is to be issued, it certainly appears that workers in locations where respiratory protection is provided should be among those supplied with clothes.
2. Several times in the brief visit it was noted that individuals wearing contamination clothing were working on the same sort of job, or together with individuals not so provided. This too appears to be an inconsistency in the program and could be subject to criticism.
3. It seems that the decision to issue clothing to an employee not normally supplied but having to do jobs requiring clothing, depends entirely on the foreman. Also the point at which an individual's personal clothing is contaminated to where it requires decontamination is entirely discretionary on the foreman. There appears to be no obvious way for the usual foreman

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S. R. Sapirie

-12-

April 16, 1957

to make a determination according to criteria which have been set down. Thus, the company claims they will replace or launder any individual's work clothes if they have become contaminated; but the only way that this determination can be made is for the foreman to decide that the clothes look dirty.

Noise - The program for the evaluation and control of noise hazards in the plant is good. Periodic audiometric examinations are given to workers in areas of greater noise hazard. There is an evaluation of the level and character of noise in those areas which appear to need such an evaluation. A program of providing personal protective devices against noise has been started and is being extended to other areas where it is needed.

Occupational Disease Experience - The occupational disease experience of the company can best be stated by saying that no occupational disease claims have ever been placed against it. There have been eight malignancies reported among employees of the plant. However, only two of these individuals were working or had worked in process areas. One of these was a case of leukemia, and the other was a cancer of the sigmoid colon. In view of the relatively short exposure to the low levels of radiation which could have been encountered, occupational factors could not have been a cause or an aggravation for any of the disease thus far encountered. Neither of the individuals who were in the operating areas of the plant had any previous occupational radiation exposure.

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PORTSMOUTH

Discussions with Management

A meeting was held with Mr. Dunbar, AEC Manager and Mr. Catterson, Chief of the Industrial Engineering Division of Goodyear. At this meeting we discussed the general health situation as it exists at the plant. Some of the pertinent details derived from this conference follow:

1. Local management believes that there is no basic disagreement with labor on matters of health at the plant. They did indicate some anxiety on the part of neighboring farmers that the plant was unduly polluting the atmosphere.
2. We were informed that negotiations have just been entered into with the local union for contract renewal. It is expected that these negotiations will last throughout April. It was the belief of management that the letter which was received from the union on the general subject of health is intended to increase pressure on management in order that the union will be in a more favorable bargaining position. It appears that the union has been asking for an extended issuance of work clothing to operating personnel ever since the inception of the plant.
3. Clothing is issued to individuals according to a determination by supervision to classify certain job assignments according to red, orange, or special designations. Jobs which are designated as red are those where radioactive materials are handled in open containers and are present in quantity. Orange jobs are those in which radioactive materials are present in innocuous quantities. Special issuance as determined by supervision are those jobs where clothing is provided for reasons other than contamination control. Reclassification of job assignment must be approved by sub-division superintendent on written submission. The designation of various areas is indicated in Standard Practice Procedure H-8 dated May 9, 1955. The system of issuing clothing on an assignment basis is a change from the original idea of designating areas as red or orange.

After our discussion we visited all of the major plant areas with Mr. Catterson. Following are our comments on the individual departments and practices.

Cascade Plant - Housekeeping and normal operation of the cascade equipment appeared to be excellent. From experience gained at K-25, one would expect very low exposures to radiation and radioactive

S. R. Sapirie

-14-

April 16, 1957

materials, with the possible exception of maintenance operation. It is believed that all procedures in force in the cascade area are adequate to insure minimal exposures of all personnel. There was a noticeable odor of fluorine in many of the cascade locations which were visited.

Feed Plant - During the time of our visit the feed plant appeared excellent from the standpoint of health and safety. There is no reason to believe that under normal circumstances there should be any exposure in this plant. Unusual circumstances, such as a broken feed line, could, however, result in extremely high contamination of materials in the plant. This is taken care of by means of emergency ventilation and cleanup.

Decontamination Plant - This plant seems to be well designed and well operated, and one would not expect more than minimal exposures to radiation or radioactive materials in this area. Housekeeping was good, and for the most part, control equipment seemed to be adequate. There were a couple of locations, however, where improved ventilation equipment could have been provided. Exposures at these locations are controlled by means of respiratory protection, whereas ventilation would be much more effective.

Product Withdrawal Area - The product withdrawal area was in very good condition. Housekeeping was excellent, and automatic air sampling equipment seemed to be adequate to warn of any product escape.

Final Product Sampling Area - There have been some over exposures reported in this area. More recently, however, local ventilation has been applied to the sample withdrawal location, and at the time of the visit this appeared to be providing adequate control.

Medical Department - The facilities are excellent. With two full-time physicians, the ratio of 1,350 employees to one physician is greater than that for the Paducah plant. This may account in part for the fact that a periodic examination program has not been carried out as thoroughly as at Paducah. A brief examination of the medical records showed less utilization of the medical department by plant employees than at Paducah.

Exposure Evaluation - Direct radiation is evaluated at Portsmouth by means of pocket dosimeters and film. Relatively few personnel in the plant are issued pocket ionization chambers. Films are issued, however, to approximately 650 operating personnel. We were informed that very few badges are found which show any significant radiation. This was pointed up by the statistics shown in the previously mentioned activities report. An average of 650

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S. R. Sanirie

-15-

April 16, 1957

persons were issued weekly badges for a total number of about 35,000. Of these 35,000 badges, only 484 were found to be irregular. It was indicated that a significant portion of these resulted from improper handling. We were not able to determine the extent of the unusual readings. It was indicated, however, that there were no overexposures, and this would be expected. The average exposure of the personnel badges was summarized at 1.5 mr/week. This is extremely low. It was suggested that films be retained for 2 or 4 weeks in order that the readings be more meaningful.

Air samples are taken on a routine basis in a large number of plant areas. According to the 1956 report some 1,500 spot samples and 10,000 to 15,000 continuous samples have been taken to evaluate airborne exposures. There is no reason to believe that this is not perfectly adequate to control the situation. Urine samples have been obtained from a large number of plant personnel. The limits which are applied to their analysis are reasonable, but the use which is made of these limits is open to some question. We do not believe that it is necessary to restrict an individual from his normal occupation merely because his excretion rate exceeds any prescribed value. Overdosage as determined by urine concentrations should initiate an improvement of the situation, but should not be used to remove an individual from his job. Urine concentrations which have been reported appear to be in the range which would be expected in this kind of an operation. This is true of urine analysis for uranium, for total alpha count, and for fluoride. The analytical program for urine seemed to be in very good shape.

Occupational Disease Experience - A detailed examination of all the known cases who have developed malignancies was made. Considering the limited exposure in quantity and in time, it is concluded that occupational factors could not have played a part in the causation or aggravation of any of the cases.

Outplant Concentrations

According to the data which were seen fluoride concentrations off the plant site are increasing to the point where it might be necessary to review the control procedures. Average concentrations approaching 30 parts per billion were reported as of December 1956. Although this is not a dangerous level, concentrations of this magnitude might be expected to cause plant damage. No other material is present in sufficient quantity to cause concern.

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