URECO

URANIUM REDUCTION COMPANY

Box 488 — Moab, Utah

R. F. HOLLIS
General Manager

August 10, 1959

DOCKET NO. 40-3453

Reference Code: (40-3453)

Mr. H. L. Price, Director
Division of Licensing and Regulation
United States Atomic Energy Commission
Washington, 25, D.C.

Dear Sir:

Thank you for your letter of July 13, calling our attention to the required method of compliance with provisions embodied in the "Standards of Protection Against Radiation", Part 20, Title 10, Code of Federal Regulations.

Your letter of July 13, 1959 comes as a surprise to us because, in our opinion, we have diligently pursued a program of attempting to provide proper protection against radiation at our plant by following recognized procedures in a field which is new and about which considerable confusion and lack of understanding has and still exists. As evidence of our good faith in attempting to comply with the Commission's requirements with respect to radiation protection we will mention, by way of background, our efforts to become familiar with this difficult and important program of radiation protection. We are sure you are aware that until the early part of April, 1959, a certain amount of confusion surrounded the requirements concerning radiation precautions. We were visited on December 10, 1957, by A.E.C. inspectors who informed us that they were a fact-finding body and were not empowered to suggest any course of action to us. The results of the tests made by these Inspectors were not made available to us except in Health and Safety Laboratory Report No. 40, which was a general overall report of unidentified milling operations. This report was not received until a date later than December 11. 1958.

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INSPECTION

During October 15, 16, 17, of 1958, our Plant Metallurgist, Mr. B. B. Winn, attended the A.E.C. Symposium on Health Protection Criteria for Uranium Processing held in New York City. Mr. Winn reported that his general impression, after listening to conflicting opinions, was that radiation hazards existing in uranium concentrating mills were practically negligible. No specific instructions to mill operators were given at this meeting according to Mr. Winn. Although copies of the papers presented at this meeting were promised to conferees, none have been received to date by Uranium Reduction Company.

On October 23, 1958, a meeting was held in Grand Junction, Colorado, by the A.E.C. in cooperation with "interested State Agencies". This meeting was billed as one in which the mill operators would be given definite instructions on their responsibilities concerning radiation hazards. Unfortunately, the mill operators were not noticeably enlightened. Uranium Reduction Company was represented by B. B. Winn, L. A. Painter, and R. C. Reynolds, all of whom came away with the feeling that sufficient data was still lacking to the A.E.C. upon which to set up an adequate radiation program in a new industry such as ours. Nevertheless a program was initiated.

On February 23 and 24, 1959, Dr. Walker of the A.E.C.'s Division of Licensing and Inspection visited Uranium Reduction Company and inspected our radiation records, discussed with plant personnel past surveys, both external and airborne, future plans, and interpretation of the Federal Register. Dr. Walker pointed out that his function was not to instruct mill operators how or when to make surveys or to recommend or order changes.

On April 9 and 10, 1959, the A.E.C. held, in Grand Junction, a "Technical Meeting with Mill Operators". This meeting was attended by B. B. Winn, T. F. Izzo, T. R. Downard, and R. W. Unger of Uranium Reduction Company, and proved to be both productive and informative. It was after this meeting that our staff felt that our former program needed revision, hence a new program was formulated at this time.

In reply as to how we propose to comply with Section 20.201 (b) of Title 10, CFR, we submit the following:

1. We have, on December 22, 1958, conducted a survey of mill areas which are occupied by employees for the purpose of determining concentrations of airborne radioactivity. The procedure and results of this survey are attached as Enclosure No. 1. On February 17 and 18, 1959, we conducted a general air survey which is presented as Enclosure No. 2.

On the basis of these results, it was determined that our air sampling technique and equipment were not adequate. We decided to purchase a Gast Air Pump to obtain airborne radioactive dust samples. It was also felt that additional information and training was necessary for the employee or employees conducting the airborne activity surveys.

On May 18, 1959, Uranium Reduction Company made a survey of both restricted and unrestricted areas. A custom-designed and built automatic air sampler provided by the Utah State Health Department was used for the survey of the restricted areas, and a Staplex Hi Volume air sampler was used for the survey of unrestricted areas. The results of these surveys are shown as Enclosure No. 3. We feel that the dust survey work to date has been consistent with our rate of learning of the technique and requirements. Future dust survey plans are outlined later in this letter.

2. Samples of river water and liquid effluent have been taken on February 20, 1959 for the purpose of determining the concentrations of radioactive material, including radium. The assays on these samples were made by the Raw Materials Development Laboratory at Winchester, Massachusetts and are as follows:

River Water - One Mile above Mill	14	dpm/l	Ra^{226} 6.3×10^{-9}
River Water - Five Miles below Mill	15	"	
River Water - Ten Miles below Mill	17	"	
Tailings Pond effluent	11,760	"	
Neutralization of total mill tailings with $Ca(OH)_2$ (Feb. 22, 1959)	6,897	"	

Our procedure with respect to the determination of concentrations of radioactive material discharged in liquid effluents has been to take, starting February 27, 1959, monthly samples of Colorado River water from a point one mile above the Moab Mill, a point 5 miles downstream, and another 10 miles downstream from the mill, as well as monthly samples of the tailings pond overflow into the river. These samples, up to and including June 23, 1959, have been sent to Combustion Engineering Corporation for radium analysis. The results of these tests may well be in our possession by the time you receive this letter.

It is our intention to apply for an exemption to the provisions of 20.106, relating to the radium and uranium limits in our tailings pond effluent. We believe that it is reasonable to apply for an exemption because of our isolated location and because of the large volume of water flowing past the Moab Mill in the Colorado River. However, in order to present adequate data to the United States Atomic Energy Commission with the application for exemption, we plan to gather data for one year prior to the application. In addition to the sampling program described above, we plan to inaugurate a more extensive sampling program in the near future. This sampling schedule will be made in line with suggestions of the United States Geological Survey office located in Salt Lake City. This enlarged sampling program will enhance our data. The reason for this extended test period is to be in possession of complete information to cover the large seasonal variations in river flow so that a sensible and understandable presentation can be made.

In compliance with your order to submit to you prior to August 15, 1959, full information in regard to our Radiation Control Program, the following is presented.

I On May 22, 1959, the plant radiation committee met and formulated a Radiation Control Program designed to meet the requirements as set forth in the proposed amendments to Title 10, Part 20. The program as approved is as follows:

A External Radiation

1) All employees of the Uranium Reduction Company will be film badged for one calendar quarter or 13 weeks duration. Film badges will be furnished by Tracerlab, Inc. and will be their Type "A" Twin Window Badges. The initial program will begin July 20, 1959 and terminate October 16, 1959.

2) The Metallurgical Department will be responsible for the film badge program. Badges are to be stored in a lead lined cabinet in the plant office.

3) Each supervisor will be responsible for the issuance, collection and storage of the film badges for the employees in his particular department.

4) Film badges will be read by Tracerlab, Inc. on both a weekly and quarterly basis.

5) The program for all individuals whose film badges show an average exposure of less than 50 mrem for 40 hours, or a total of 650 mrem for the 13 weeks, will be discontinued, and a mean level of exposure for that particular individual assigned. This mean level of exposure will be assigned unless some fault in the film badge reading is apparent, in which case the individual will be rebadged. The mean level of exposure for each job classification will be established and will remain the same as determined unless a process change or the duties of the particular job are changed.

6) All individuals whose film badges show an average exposure in excess of 50 mrem per 40 hours or 650 mrem per 13 weeks will be rebadged for another 13 week period.

7) All individuals whose film badges show average readings below 100 mrem per 40 hours, or a total of 2600 mrem for the 26 week period will be dropped from the survey. A mean level of exposure will be established for the individuals in these job classifications and an exemption from monitoring will

be applied for. Again the level of exposure on all jobs will remain the same unless through process changes or changes in job duties it is necessary to re-evaluate the job in question.

8) The Personnel Department will keep current records of all personnel whose average job classification exposure level is between 50 and 100 mrem per 40 hours. These records will be kept on A.E.C. form No. 20-2. Records of all employees will be preserved until December 31, 1964, or until a date five years after termination of employment, whichever is later. The Personnel Department will make an annual written report to each individual who falls within the range mentioned above. The method of reporting used will be as described in Section 20.404 of the revised statutes.

9) All personnel whose average film badge exposure shows in excess of 100 mrem per 40 hours will be continuously monitored. Personnel whose exposure is in excess of 100 mrem per 40 hours and below 230 mrem per 40 hours will not be removed from their jobs until their maximum accumulated occupational dose has been reached. The procedure for establishing their maximum permissible accumulated dose will be calculated as described in Sections 20.101 and 20.102 of the proposed revisions to CFR. Annual reports will be made to these individuals as described above in Section 8. If any employee has an exposure in excess of 230 mrem per 40 hours, the employee will be transferred to another job. Such job transfers will continue to insure that no employee receives in excess of the maximum allowable exposure.

10) The Metallurgical Department will make an extensive external radiation survey at the beginning of each calendar quarter. These surveys will be made by means of a Model SEX--11B (11B)? scintillator. The results of the scintillator survey will be compared with the mean levels of exposure for each job classification, as established by the film badge survey. All individuals whose levels, as determined by the film badges, vary from those as determined by the scintillator survey will be further investigated.

B Airborne Radiation

1) Air sampling surveys (Restricted areas). A breathing zone air sample survey will be made in those areas listed in Table I.

TABLE I

Plant Location	Dimensions of Location Ft.	Process Operations Performed at Location	Number of Employees Per Shift at Location	Number of Shifts per Week at Location	Number of Zones within Area to be Sampled*
1. Scale House	22 x 18	Weighing of Trucks	1	5	1
2.* Lot Sample Preparation Room	15 x 14	Preparation of Lot Samples	1	5	2
3. Moisture Determination Room	18 x 16	Ore Sample Moisture Determination	1	5	2
4. Ore Pad	200' dia.	Raw Ore stored and Fed to Crushing	4	10	4 — 9
A. Open Grizzly Area	27 x 24	Raw Ore Dumped into Grizzly Hopper	2		1
B. Feeder Belt Level	24 x 16	Raw Ore fed to Crusher Conveyor			1
C. Grizzly Pit	24 x 16	Raw Ore dumped by Chute onto Belt			1
D. Crusher Feed Conveyor	205 x 8	Ore Feed to Crusher Foreign Material Removed	1	10	1
5.* Crushing Plant		Raw Ore Crushed to -1 inch size	2	10	12 — 17
A. Top Deck, South	21 x 17	Conveyor Dumps Raw Ore into Jaw Crusher			1
B. Operating Deck	65 x 22	Raw Ore Crushed and Screened			1
C. Intermediate Deck, East	22 x 14	Crusher Base and Chutes			1
D. Intermediate Deck, West	20 x 17	Crusher Base and Chutes			1
E. Shuttle Conveyor Deck, Bottom	37 x 33	Crushed Ore Screened			1

Plant Location	Dimensions of Location Ft.	Process Operations Performed at Location	Number of Employees Per Shift at Location	Number of Shifts per Week at Location	Number of Zones within Area to be Sampled*
5. Crushing Plant (Cont.)					
F. Shuttle Conveyor Deck, Top	37 x 16	Conveyor transfers Crushed Ore			1
G. Top Deck, North	29 x 17	Conveyor Belt and Chutes			1
H. Transfer Tower, Bottom Deck	19 x 19	Ore Stream is Re-routed			1
I. Transfer Tower, Top Deck	19 x 10	Ore Stream is Re-routed			1
J. Transfer Conveyor Tunnel	106 x 8	Crushed Ore Conveyor Belt			1
K. Transfer Inlet Conveyor Tunnel	106 x 8	Crushed Ore Conveyor Belt			1
L. Crushing Plant Ground Floor	83 x 42	Equipment Bases and Conveyors			1
6. Sample Tower		Crushed Ore is Sampled	2	10	5
A. Ground Floor	29 x 25	Samples Prepared for Assay			1
B. 2nd Floor	29 x 25	Sample Crushed and Split			1
C. 3rd Floor	29 x 25	Sample Crushed and Split			1
D. 4th Floor	29 x 25	Ore Stream Sampled			1
E. Sample Tower Conveyor Tunnel	86 x 8	Ore Conveyed to Tower			1
7. Fine Ore Bins, Top Gallery	268 x 15	Ore Dumped into Storage Bins	1	10	1
8. Ball Mill		Crushed Ore is Pulverized and Pulped	1	21	7
A. Gallery, Top Deck	215 x 19	Ore withdrawn from Bins			1

Plant Location	Dimensions of Location Ft.	Process Operations Performed at Location	Number of Employees Per Shift at Location	Number of Shifts per Week at Location	Number of Zones within Area to be Sampled*
8. Ball Mill (Cont.)					
B. Gallery, Bottom Deck	215 x 19	Ore Distributed by Conveyors			1
C. A Side, Conveyor Tunnel	31 x 12	Ore Fed to Ball Mill			1
D. B Side, Conveyor Tunnel	31 x 12	Ore Fed to Ball Mill			1
E. Operating Deck	120 x 50	Ball Mill Control Area			1
F. A Ball Mill	60 x 50	Ore Milled and Pulped			1
G. B Ball Mill	60 x 50	Ore Milled and Pulped			1
9. Leach Section		Pulped Ore is Leached	1	21	2
A. Tank Area	110 x 83	Ore is Leached			1
B. Control Room	19 x 12	Leach Process Control			1
10. Sand-Slimes		Leached Pulp is De-sanded	1	21	3
A. Top Deck	60 x 50	Process Flow Control			1
B. Drag Deck	100 x 83	Leach Pulp is De-sanded			1
C. Bottom Deck	100 x 83	De-sanded Pulp is Pumped to Storage			1
11. Boiler Room	80 x 56	Boilers and Air Compressors	1	21	1
12. Mill Sub-Station	40 x 20	Electrical Power Distribution	Checked Periodically	21	1
13. RIP Section		Product is extracted from RIP Pulp Feed	3	21	6
A. A Side Bank Area	205 x 39	Resin Baskets are Jigged in Feed Solution			1
B. B Side Bank Area	205 x 39	Resin Baskets are Jigged in Feed Solution			1

Plant Location	Dimensions of Location Ft.	Process Operations Performed at Location	Number of Employees Per Shift at Location	Number of Shifts per Week at Location	Number of Zones within Area to be Sampled*
13. RIP Section (Cont.)					
C. A Distribution Cat Walk	205 x 10	Feed is Distributed			1
D. B Distribution Cat Walk	205 x 10	Feed is Distributed			1
E. A Control Room	12 x 9	A Circuit Control			1
F. B Control Room	12 x 9	B Circuit Control			1
14. Precipitation Section		Product is Precipitated from Preg. Liquor	1	21	3
A. Catwalk	40 x 21	Precip. Tanks are Controlled			1
B. Tank Deck, North	77 x 40	Product is Precipitated			1
C. Drum Filter Deck	60 x 40	Precipitate is Filtered and Repulped			1
15. Drying and Packaging Section		Filtered Cake is Roasted and Packaged	1	21	4
A. Yellow Cake Control Room	20 x 10	Drying Process Control			1
B. Top Hearth Deck	40 x 40	Cake Enters Dryer			1
C. Bottom Hearth Deck	19 x 15	Cake is Dried and Roasted			1
D. Packaging Deck	55 x 41	Product is Loaded into Barrels			1
16. Mill Office	20 x 20	Mill Supervisor and Shift Foremen	1	21	1
17. Analytical Laboratory	114 x 52	Assays and Tests	13	5	1
18. Fluorimetric Laboratory	14 x 8	Control Assays	1	21	1

Plant Location	Dimensions of Location Ft.	Process Operations Performed at Location	Number of Employees Per Shift at Location	Number of Shifts per Week at Location	Number of Zones within Area to be Sampled*
19. Administration Building	153 x 150	Offices and Warehouse	27	5	1
20. Water Treatment Plant Pumphouse #2	80 x 28	Water Treatment	1	21	1
21. Pumphouse #3	36 x 24	Water Pumping	Checked each Shift	21	1
22. Maintenance Shop	113 x 50	Equipment Repair	45	10	1
23. Garage	128 x 32	Automotive Repair	2	5	1
24. Paint Shop	48 x 25	Painting	9	5	1
25. Tailings Pond		Disposal of Tailings Material	1	21	5
A. Control Room	10 x 6	Valving Control			1
B. North Dike	2500 x 40	Pond Retention			1
C. South Dike	1800 x 40	Pond Retention			1
D. North Perimeter Road	2400 x 20	Access Road			1
E. South Perimeter Road	2400 x 20	Access Road			1

* All Samples to be taken in Triplicate

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The sampling technique, described later in this letter, will be the Multiple Sample Time Weighted Average Exposure. In those areas in which the air concentrations, as determined by the Multiple Sample Time Weighted Average technique are found to be above the maximum allowable concentration corrective action will be taken. Breathing zone dust surveys by the above described method will be made after each corrective step or series of steps are completed in order to evaluate the effects of the corrective actions. Surveys will continue to be made in this manner until the area in question shows airborne radioactive concentrations below the maximum allowable concentration. When this occurs the sampling schedule in this area will revert to a quarterly basis.

Quarterly breathing zone air sample surveys will be made at the beginning of each calendar quarter in those areas listed in Table I.

In addition to the previously described breathing zone air sample surveys, a general air sample survey will be conducted in the areas listed in Table I. This survey will be made simultaneously with the breathing zone air sample survey. These general air samples will be taken with an automatic air sampler obtained from the Utah State Department of Health. This sampler is designed to take a twenty-four hour sample. A description of the operation of this sampler can be found on Page Five of Enclosure 3. In the event this sampler is not available, general air samples will be taken by means of our Staplex Hi Volume Air Sampler, Type TFIA, using TFA No. 41 filter papers. Analytical results of all general air samples will be reported individually. In the event major process changes are inaugurated, equipment is redesigned, or new equipment is added which may possibly result in a change in airborne radioactive material concentrations, breathing zone air sample and general air sample surveys will be conducted immediately until the level of radioactive concentration is determined.

As a positive check on our Multiple Sample Time Weighted Average Exposure technique, we plan to monitor several of our employees by affixing a sample nozzle to a body harness. This sampling nozzle will be positioned at nose height. The sampling device will be connected to a vacuum outlet with a flowrater set for an air rate of five liters per minute. Double A, one inch diameter Millipore filters will be used in the sampling head. Each operator monitored will wear the sampling device a full eight hour shift. Analytical results of this sample will be compared with the regular breathing zone Multiple Time Weighted Average Exposure results. Due to the restrictive nature of this sampling device, these monitoring efforts will be confined to jobs in which there is little heavy manual labor and the work area is relatively small.

2) Air Sampling Surveys (Unrestricted areas). In unrestricted areas an annual general air sample survey will be conducted. These general air samples will be taken by means of our Staplex Hi Volume Air Sampler, Type TFIA using TFA No. 41 filter papers. The areas to be monitored and a description of the technique is described in Enclosure 3, Page 1.

3) Air Sampling Techniques and Analytical Procedure. General air samples in both restricted and unrestricted areas will be taken as previously described in this letter. Breathing zone samples in restricted areas will be made by using a Gast Manufacturing Company Model AD40 air pump with one inch AA Millipore filters. Sampling rate will be ten liters of air per minute. A minimum total sampling period of 20 minutes will be used. The approach used will be the Multiple Sample Time Weighted Average Exposure method as outlined in the report, Air Sample Procedures in Evaluating Exposures by H. Glauberman and W. B. Harris of the Health and Safety Laboratory, U. S. Atomic Energy Commission. The filters from individual zone samples will be composited on a working time basis and the breathing zone exposure determined. All samples will be taken in triplicate. Samples will be placed in glassine envelopes and delivered to the Analytical Laboratory.

The dust and papers will be digested in a mixture of nitric and perchloric acids and the total weight of natural uranium in the resulting solution will be determined with a Galvanek-Morrison fluorimeter in order to calculate the uranium content of the [illegible]. A description of our fluorometric procedure is attached as Enclosure No. 4. Calculation of the concentration of the daughter products of uranium in the air will be made on the assumption that the natural uranium is in secular equilibrium as has been indicated to be so for ores treated at the Moab Mill by testwork conducted by the Raw Materials Development Laboratory at Winchester, Massachusetts. Secular equilibrium of our ores will be checked twice a year by our analytical staff. A Nuclear Measurements Corporation Proportional Gas Flow counter is on order for this purpose.

On the basis of a minimum 200 liter air sample our fluorometric procedure can detect the equivalent of 1.85×10^{-11} uc/ml within an error of $\pm$ 15%. All analytical results will be calculated and reported in terms of uc/ml. Airborne radioactive concentration exposures for each job classification will be kept on file in our Personnel Department.

4) Employee Education and Instruction. All new employees, upon hiring, will be indoctrinated in general health precautions, the proper use of the respirator, what radiation is, why the standards or levels of exposure were set and by whom, and where the potential hazards of radiation exposure exist. Data for this educational program will be taken from the booklet, "Living with Radiation", Fundamentals I, published by the United States Atomic Energy Commission. Copies of this educational data will be filed in the Personnel Department.

All present employees will be instructed by their foreman in their departmental safety meetings in these same topics.

5) Pre-Planned Housekeeping Program

a. Periodic vacuum cleaning of all beams and other dust settling areas located in the Crushing Plant.

b. Periodic vacuum cleaning of all beams and dust settling areas in the Product Packaging Area.

Note: These areas are the areas that are not cleaned in the normal operating procedure.

6) Continuous General Housekeeping Program

a. The entire premises will be routinely cleaned to remove all dust from floors, equipment, etc. (For example: Tops of repulp tanks, precip. tanks, top of hearth dryer, pilings, etc.)

b. Cleaning with brooms or compressed air will be eliminated as much as possible. A vacuum hose or wet cleaning methods will be adopted wherever practicable.

c. Until all ventilation problems are corrected, personnel will wear respirators whenever working in a dusty atmosphere.

7) Crash Clean-Up Program

a. Packaging Area

1. Devise method of disposal of dried filter papers from Shriver presses. (This project has been started)

2. Installation of vacuum outlet on hearth dryer doors. (This project virtually completed)

3. Closing of the venthole on the roaster lid. (This project voided due to correction of condition by method described later in this letter)

4. Installation of a trough under the deck where the roaster-scrubber is cleaned. (This project is in the design stage. Final installation to be complete by September 1, 1959)

5. Complete paint program in the roaster and packaging area, which should include the control room hearth roaster, floors, walls, pilings, loading area, etc. It is recommended that this painting program be done during mill shut-down scheduled for July 1-13. (This program completed)

6. Removal of all equipment and pipes, etc., that can be dust collectors. (Partially completed)

B Crushing Plant

1) Investigative and corrective work by the Metallurgical and Maintenance Departments in the improvement of our present dust collecting system. These investigative and corrective measures to cover the factors recommended by the State Health Department personnel. For example: Redesigning of pick-up hoods, opening of closed off ducts, and reduction in air velocities.

2) Investigative work by the above mentioned departments in the use of sprays to supplement the dust collecting system.

3) A thorough weekly inspection of the dust collecting system by the Crushing and Maintenance Departments to discover and repair any leaks or defects in the dust collecting system immediately.

C Monthly Reports. The Plant Metallurgist will submit a monthly report to the Mill Superintendent. This report will cover the progress of all of the items described in our Radiation Control Program. This record will also be filed in the Personnel Department files and in the Plant Radiation file.

II Based on the results of the dust surveys made to date, certain areas in the Crushing and Packaging Sections were indicated to be in excess of the maximum standards.

A Additions or modifications to present facilities to correct the conditions in the above mentioned areas have either been already completed or are in the process of completion or in the planning stage.

1) A tendency of our six-foot diameter, six hearth yellow cake roaster to puff back due to temporary periods of positive internal pressure was corrected by cleaning and recalibrating the draft gauge and by instructing operating personnel to increase draft to effect positive pressures. This situation can be considered to be solved.

2) A tendency of the roaster to discharge fine U_3O_8 particles in the flue gases has been corrected by the following revisions, all now accomplished:

a. Revision of balance of air flow between the product crusher and the discharge chute.

b. Installation of stainless steel angle demisters in the scrubber box of the product roaster.

c. Installation of removable glass wool filters on the discharge side of the scrubber.

d. Revision of water spray piping and valving in the scrubber box.

3) Vacuum piping and flexible hose has been installed for vacuum cleaning of the roaster area.

4) A vacuum connected catch pan for use when opening roaster doors has been constructed, but is still being modified to improve its efficiency. Target date for completion of this modification is August 15, 1959.

5) Unbalance and inefficiencies in the Crushing Plant dust collector have been improved by:

a. Complete redesign of traveling dust collector blow-back air reversing mechanisms.

b. Installation of new dampers in dust collection pipes.

c. Optimum setting of all dampers by engineers of the Western Precipitation Company, designers of the dust collection equipment.

6) The belt conveyor leading to the jaw crusher was changed prior to the expiration of its useful life to eliminate the dust fall-off on its return cycle.

7) Fog nozzles with associated piping, valving, and filters have been installed on an experimental basis. This work is continuing but results to date have been largely inconclusive due to mechanical problems not connected to the suppression of dust.

8) To eliminate partial blockage of large air collection ducts in the crushing plant by oversize ore particles the Engineering Department of Uranium Reduction Company was instructed on July 18 to prevent the pickup of oversize particles at two critical points, one under the jaw crusher and one under the cone crusher.

Target date for Engineering plans - July 27, 1959

Target date for completion of job - August 7, 1959

9) The Metallurgical Department has been instructed to continue experimentation with water fog nozzles until such time as a successful utilization is attained or until a definite statement can be made as to the unworkability of such a system.

Target date for successful initial installation or advisement to discontinue program - September 1, 1959

10) The Engineering Department was instructed on July 18, 1959, to investigate the feasibility of installing an air balancing pipe in the discharge chute of the primary vibrating screen, in the Crushing Plant, for the purpose of eliminating positive air pressures at the discharge of this chute onto the #2 belt conveyor. If initial studies indicate the feasibility of this approach the target date for initial drawings will be July 27, 1959, and the target date for completion of the proposed change will be August 7, 1959.

B Actions taken to clean up radioactive material on floors, equipment and other surfaces in areas of the mill in which employees are routinely working are as follows:

1) The roaster and all floor areas in the vicinity of the roaster have been painted to facilitate the visual detection and removal of dust.

2) A Black & Decker industrial vacuum cleaner has been purchased for use in the lot sample preparation room.

3) Scheduled clean-up programs are being and will be carried out as outlined in our Radiation Control Program which is included in this letter.

C We are proceeding under the assumption that none of our employees will be exposed to airborne concentrations of radioactive material in excess of those specified in Section 20.101, 10 CFR 20, however, in the unlikely event that certain areas exceeding the levels for airborne radioactivity do exist, we propose to take the following steps:

1) The person or persons working in such an area will be informed by letter of the hazards involved and the safety precautions required.

2) Safety equipment such as respirators will be supplied and the supervisor in charge of such an area will be instructed to enforce the regulations concerning the use of said safety equipment.

3) The area will be posted in a clearly visible place by a printed easily-read sign containing the hazard and the safety equipment required.

4) If rotation proves to be a preferable solution to the problem, such information will be given to our Personnel Department, which will then schedule the man or men in question in such a way as to insure their safety.

III A preliminary film badge study was started on October 30, 1958. This study terminated May 5, 1959. As you have indicated in your letter, this survey showed that some personnel monitoring is necessary. Our program for personnel monitoring is outlined in the Section of this letter on our Radiation Control Program.

IV The following is a time schedule which specifies the dates when each phase of the actions we propose to take are to be completed. However, it must be pointed out that some of the actions scheduled are designed simply to improve mechanical operation of the dust collecting system and our listing of these actions does not imply that compliance with maximum radiation levels based on average readings cannot be obtained with our existing equipment without these changes.

July 20, 1959 Initiation of film badge program for all Uranium Reduction Company employees. Part of this program will last for 13 weeks and part for 26 weeks. Plans for subsequent film badging will be predicated on the results of this initial program.

July 27, 1959 Target date for Engineering plans designed to correct blockage of main dust collection ducts in the Crushing Plant.

Target date for Engineering plans designed to correct positive pressure and dusting at discharge of chute from primary vibrating screen in the Crushing Plant.

August 7, 1959 Target date for completion of changes designed to correct blockage of main dust collection ducts in the Crushing Building.

Target date for completion of changes designed to correct positive pressures and dusting at the discharge of the chute from the primary vibrating screen in the Crushing Plant.

September 1, 1959 Target date for first successful installation of water fog nozzles for dust suppression or for advisement that such a system is unworkable.

Target date for completion of collecting trough under the roaster-scrubber. Engineering on this project is about complete.

January 1, 1960 Target date for complete usage of water fog system at critical areas in the Crushing Department if initial installation has proven to be successful.

We are sure you realize that a reasonable period of time is necessary to accumulate data, try various methods of dust suppression, etc., and that, therefore, our total satisfaction with our conditions at all times and in all places can be only a goal. However, we do want to say that it is and has been our intention to comply with the radiation standards set by the Atomic Energy Commission.

We would appreciate an early reply to this letter as to whether or not the program set forth meets with your approval. We are also willing to have a personal interview with any of your staff to discuss any of the matters contained herein if in your opinion such a conference would be of material benefit to either of us.

Sincerely

R. F. Hollis

R. F. Hollis
General Manager

RFH:mw

Enclosures: 4

URECO AIRBORNE RADIATION REPORT

(General Air Samples-Restricted Area)

Date: 8-30-57 Sampler: H. B. Durrard

Sample Data	Sample #1	Sample #2	Sample #3
Department:	MILL OPERATIONS	✓	✓
Zone Description:	#1 HEARTH DECK	✓	✓
Area of Zone	40 X 40	✓	✓
Job Classification(s) Working in zone	PACKAGING OPERATOR	✓	✓
Date Sample taken	8-27-57	9-10-57	9-22-57
Time Sample taken	1:23 PM	3:23 PM	9:08 AM
Describe Zone conditions:	FLOOR BEING MOPPED, NO PAPERS ON DRYING LINES. DUST LEAK BELOW.	NORMAL	✓
Air Sampler Used	STAPLEX	✓	✓
Sampling period in minutes	30	20	20
Average air flow rate	10 CFM	20 CFM	20 CFM
Total volume of air sampled	300 CU. FT.	400 CU. FT.	400 CU. FT.
Sample assay number	R 1640	R 1840	R 1998
Date submitted to laboratory	8-28-57	9-10-57	9-22-57
Total weight of U_3O_8 in sample	1.78×10^{-3}	3.4×10^{-4}	3.67×10^{-3}
Air concentration in uc/ml	12.4×10^{-11}	$< 1.85 \times 10^{-11}$	19.3×10^{-11}

REMARKS:

AIRBORNE RADIATION REPORT

(Breathing Zone Sample - Restricted Area)

Date: 10-14-59 Sampler: L. R. Howard

Department: MILL OPERATIONS

Job Classification Involved: PACKAGING OPERATOR

Time Sample Taken: 12:76 P.M.

Describe Operating Conditions: NORMAL

Zone No.	Zone Description	Area	Minutes of Sample	Air Rate during Sample	Volume of Air Sampled
1	Y.C. CONTROL ROOM	20X10	10	10 L/min.	100 L.
2	PACKAGING AREA	55X41	10	"	100 L.
3					
4					
5					
6					
8					
9					
10					
11					
12					
13					
14					
15					

Total Number of zones Sampled: 2
Total Time Period of Sample: 20 min.
Average air flow rate: 10 L/min.
Total Volume of air sampled: 200 L.
Date sample submitted to laboratory: 10-15-59
Total Weight of U_3O_8 in Time Weighted Sample: 2.37 X 10^{-5} gm. Assay Number R 9350
Time Weighted Average Exposure: 7.68 x 10^{-11} uc/ml

Remarks:

RADIATION SURVEY

Date 8/18/59 Instrument SPX-118

Time	Location	General Conditions	Specific Observations	MREM/HR Gamma	Distance from Source	MREM/HR Exposure
	Leach	Clean, Walkways hosed down	Top of Tanks	.18 to .24	3'	.20
			Feed Splitter	.35	1'	
			Office	.10		
	Sand-Slime	Clean	Dregs	.12 to .20	3'	.15
			Top Deck	.12		
			Pumps	.12 to .18	3'	
	R.T.P. Section	Construction and Painting in Progress	"A" Banks	.12 to .22	3'	.18
			"A" Doghouse	.20		
			"B" Banks	.10 to .15	3'	.12
			"B" Doghouse	.08		
			Distributor Deck	.11 to .18		
			Stock Scrubber	.55	1'	
			Scrubber Screen	.65	1'	
	Scalehouse	Truck Traffic Normal	At Scalemen's position	.14 to .32		.22
			Sample	.38	1'	
	Moisture Determination Room	Crushing Samples	Average reading in Room	.28		
			At reject window	1.00	1'	.40
	Lot Sample Prep. Room	Clean	At Bench	.19	1'	.25
			Reject Barrel	.38	1'	
	Ore Pad	Bins mostly full	At grizzly	.75	3'	
			Ore Lots	1.20	3'	1.00
			Doghouse	.80		
	Crusher	Ore in process	MCC Deck	.18		
			#1 Belt	.25	1'	.25
			Cone Crusher	.34	3'	
	Sample Tower	Stockpile by South Wall	Average reading in tower	.60		
			Wall by Stockpile	1.75	1'	1.00
			A.E.C. Sample Bags	1.35	1'	
			Upper levels	.28		
	Fine Ore Bins	Bins almost empty	Top of Bins	.50 to .75	1'	.60
			Bottom of Bins	1.00		
	Ball Mill	Operating, Clean	Ball Mill Gallery	.30 to .50	1'	
			Ore on Belts	.30	1'	.30
			Operating Deck	.20		
			Classifiers	.46	1'	
	Filter Deck	Operating	Presses	.24	1'	
			Drum Filters	.48	1'	.36
	Mill Office	Clean	Wall by Dryer	.30	1'	.30
	Precip. Section	Operating	Operating Deck	.26	1'	
			Thickener Deck	.30	1'	.30
			Thickener Bottom	1.00		

RADIATION SURVEY

Date 8/18/59 Instrument SBX-11B

Time	Location	General Conditions	Specific Observations	MREM/HR Gamma	Distance from Source	MREM/HR Exposure
	Packaging Section	Operating, Lot in Area	Barreling Chute	.60	1'	
			Loaded barrels	1.50	1'	
			#1 Hearth	.38	1'	.60
			#5 Hearth	.27	1'	
			Y.C. Control Room	.45 Side to stockpile outside		
			Y.C. Repulp Tanks	.24	1'	
	Storage Tanks	Construction in Progress	R.I.P. Feed Tanks	.08	1'	
			Barren Tanks	.03	1'	.15
			Preg. Tanks	.36	1'	
	Boiler Room	Construction in Progress	At Boiler	.10	1'	.10
	Tailings Pond		Doghouse	.70		
			South Dike	2.00	1'	2.00
			North Dike	1.20	1'	
			Effluent Ditch	2.40		
	Office Building	Clean	Average Reading	.02		.02
	Warehouse	Clean	Average Reading	.03		.03
	Machine Shop	Clean	Average in Shop	.03		.03
	Garage	Clean	Average in Garage	.07		
			North Wall	.13	1'	.11
	Water Plant	Clean	Pumphouse #2	.06		.08
			Pumphouse #3	.10		
	Carpenter Shop		Average Reading	.11		.11
	Paint Shop	Clean	Average Reading	.10		
			Office Room	.17		.14
	Changehouse	Clean	Locker Room	.05		.05
	Lab.	Clean	Analytical	.05		
			Metallurgical	.15		.10
			Fluorimetric	.10		

RADIATION SURVEY

Date 10-12-59 Instrument SBX-11B

Time	Location	General Conditions	Specific Observations	MREM/HR Gamma	Distance from Source	MREM/HR Exposure
	ADMIN BLDG	CLEAN	OFFICES	.10		
			WAREHOUSE	.05		
			MACHINE SHOP	.5		.10
	GARAGE	CLEAN	VEHICLES BEING SERVICED	.15		.15
	WATER PLANT	CLEAN	FILTRATION #2	.11		
			FILTRATION #3	.15		.13
	CARPENTER SHOP		BY WHICH CAN	.20		.20
	PAINT SHOP	CLEAN	IN CENTER OF	.17		
			LUBE ROOM	.25		.20
	CHANGE HOUSE	VERY CLEAN	[illegible]	[illegible]		.04
	LAB. BLDG.	CLEAN	[illegible]	[illegible]		
			FLOTATION AREA	.14		
			SAMPLE STORAGE AREA	.22	1'	.12
	SCALE HOUSE	CLEAN	AT DOOR	.12	1'	
			AT SCALES WHERE LOADS ARE WEIGHED	.34	1'	.24
	LOT SAMPLE BUCKING ROOM	CLEAN	AT HOT BELT	.22	1'	
			BALL MILL	.42	1'	.25
	MOISTURE DETERMINATION ROOM	CLEAN CRUSHED SAMPLE	ON DRY TABLE	.30	1'	
			BALL MILL DOOR	1.20	1'	.50
	ORE PAD	MOST OF ORE ENTRY	AT GRIZZLY	.45	1'	
			ORE HOUSE AT WALL	.40	1'	
			ORE IN BINS	1.2/3.00	1'	.50

RADIATION SURVEY

Instrument SBX-11B

	General Conditions	Specific Observations	MREM/HR Gamma	Distance from Source	MREM/HR Exposure
	FAIRLY CLEAN	#1 CONVEYOR	.75	1'	
		AT BELT PICKER'S CHAIR	.70	1'	.75
		ORE ON CONVEYOR RAMP FLOOR	.75	1'	
		BY JAW CRUSHER	.18	1'	
		BY CONE CRUSHER	.24	1'	
		#2 & #3 SCREENS	.22	1'	
		#2 CONVEYOR	.30	1'	
		#3 VEYOR	.30	1'	
		#4 CONVEYOR	.30	1'	.30
		TRANSFER TOWER, OFF ON FLOOR	1.40	1'	
SAMPLE TOWER	CLEAN, FILLING BINS	TOP OF BINS	.40/.70	1'	
		BY #1 SAMPLER	.18	1'	
		3RD FLOOR	.30		.40
		2ND FLOOR	.30		
		1ST FLOOR, SOUTH WALL	.40	1'	
		SAMPLE IN DRYER	.40	1'	
		AT WORK BENCH	.50	1'	.60
		SAMPLE CABINET	1.20	1'	
BALL MILL	CLEAN, NEW CONSTRUCTION	GALLERY, TOP	.34	1'	
		GALLERY, BOTTOM	.22	1'	
		SHUTTLE & GATHERING CONVEYORS	.28	1'	
		OPERATING DECK	.25		.30
		CLASSIFIER	.75	1'	

RADIATION SURVEY

Date 10-17-59 Instrument SBX-11B

Time	Location	General Conditions	Specific Observations	MREM/HR Gamma	Distance from Source	MREM/HR Exposure
	LEACH SECTION	CLEAN	SIDE OF TANKS	.42	1'	
			TOP OF TANKS	.75	1'	
			IN DOGHOUSE	.06		.20
	SAND-SLIME SECTION	HOSED DOWN CATWALKS	DRAGS	.15/.27	1'	
			PUMP DECK	.15	1'	.15
	R.I.P. SECTION	CLEAN	BANK DECKS	.10	1'	
			DISTRIBUTOR DECK	.15	1'	
			SWECO SCREEN	.24	1'	
			"A" DOGHOUSE	.60		
			"B" DOGHOUSE	.09		.20
			STACK SCRUBBER	.50	1'	
			SCRUBBER SKID	.60	1'	
	STORAGE TANKS AREA	NEW CONSTRUCTION	BARREN TANKS	.08	1'	
			R.I.P. FEED	.12	1'	
			PREG. TANKS	.24	1'	.00
	FILTER DECK	FLOOR WET	DRUM FILTERS	.40	1'	
			PRESS FILTERS	.32	1'	.36
	MILL OFFICE	CLEAN	AT WALL NEAREST HEARTH DRYER	.36	1'	
			IN CENTER OF OFFICE	.24		.30
	PRECIP. SECTION	SHUT DOWN	OPERATING DECK	.20	1'	
			THICKENER, TOP	.36	1'	.30
			THICKENER, BOTTOM	1.00	1'	
	HEARTH DRYER & PACKAGING	SHUT DOWN	Y.C. CONTROL ROOM	.50		
			#1 HEARTH	.40	1'	
			#5 HEARTH	.32	1'	
			PACKAGING CHUTE	1.00	1'	.60
			LOADED BARRELS	1.50	1'	

RADIATION SURVEY

Date 10-17-57 Instrument SBX-11B

Time	Location	General Conditions	Specific Observations	MREM/HR Gamma	Distance from Source	MREM/HR Exposure
	BOILER ROOM	NEW CON-STRUCTION	CENTER OF ROOM	.05		.05
	S.X. PLATFORM	SHUT DOWN	ON CATWALK	1.20		1.20
	TAILINGS POND		DOGHOUSE	.90		1.60
			SOUTH DIKE	1.60		
			NORTH DIKE	1.80		
			EFFLUENT DITCH	2.50		
			MGM ROAD	.32		
	CRUSHED ORE STOCKPILES		URC HIGH GRADE #1	3.8/5.0	1'	
			HIGH LIME #2	1.5/3.3	1'	
			HIGH LIME #3	3.6/5.0	1'	
			HIGH LIME #5	2.2/2.9	1'	
			HIGH LIME #6	1.0/1.2	1'	

RADIUM ANALYSIS DATA *

*All samples submitted were filtered through a Whatman #42 filter paper.

Sample No.	Date Taken	Time Sample Taken	Date Submitted for Assay	Sample Location	River level on Sampling date	Estimated dpm/l	Combustion Engineering Lab Assay in dpm/l	UC/ml Ra-226
1	2-27-59	1:10 pm	6-30-59	one mile above mill	19.5 ft.	15	20.2	4.6×10^{-9}
2	2-27-59	2:00 pm	6-30-59	five miles below mill	19.5	15	23.9	10.8×10^{-9}
3	2-27-59	2:50 pm	6-30-59	Ten miles below mill	19.5	15	18.0	8.1×10^{-9}
4	3-26-59	12:50 pm	6-30-59	One mile above mill	19.5	15	28.0	12.6×10^{-9}
5	3-26-59	1:15 pm	6-30-59	Five miles below mill	19.5	15	35.5	16.0×10^{-9}
6	3-26-59	2:00 pm	6-30-59	Ten miles below mill	19.5	15	39.0	17.6×10^{-9}
7	3-26-59	3:00 pm	6-30-59	Mill tailing effluent	-	15,000	1,771	797.7×10^{-9}
8	5-1-59	1:00 pm	6-30-59	One mile above mill	18.5	15	4.5	2.0×10^{-9}
9	5-1-59	1:35 pm	6-30-59	Five miles below mill	18.5	15	36.3	16.4×10^{-9}
10	5-1-59	2:20 pm	6-30-59	Ten miles below mill	18.5	15	19.7	8.9×10^{-9}
11	5-1-59	3:00 pm	6-30-59	Tailing pond effluent	-	15,000	1,288	580.2×10^{-9}
12	5-27-59	12:45 pm	6-30-59	One mile above mill	16.5	15	9.8	4.4×10^{-9}
13	5-27-59	1:30 pm	6-30-59	Five miles below mill	16.5	15	35.0	15.8×10^{-9}
14	5-27-59	2:30 pm	6-30-59	Ten miles below mill	16.5	15	25.0	11.3×10^{-9}
15	5-27-59	3:30 pm	6-30-59	Tailings pond effluent	-	15,000	3,238	1458.6×10^{-9}

Sample No.	Date Taken	Time Sample Taken	Date Submitted for Assay	Sample Location	River level on Sampling date	Estimated dpm/l	Combustion Engineering Lab Assay in dpm/l	UC/ml Ra-226
16	6-23-59	1:05 pm	6-30-59	One mile above mill	14.5	15	14.9	6.7×10^{-9}
17	6-23-59	1:15 pm	6-30-59	Five miles below mill	14.5	15	8.4	3.8×10^{-9}
18	6-23-59	2:00 pm	6-30-59	Ten miles below mill	14.5	15	5.0	2.3×10^{-9}
19	6-23-59	2:30 pm	6-30-59	Tailings Pond effluent	-	15,000	4,582	2064×10^{-9}
20	7-28-59	1:45 pm	8-19-59	One mile above mill	19.5	15	8.9	4.0×10^{-9}
21	7-28-59	2:10 pm	8-19-59	Five miles below mill	19.5	15	11.2	5.0×10^{-9}
22	7-28-59	2:30 pm	8-19-59	Ten miles below mill	19.5	15	16.8	7.6×10^{-9}
23	7-28-59	3:20 pm	8-19-59	Tailings pond effluent		15,000	14790	illegible
24 (1)	8-12-59		8-19-59	Colo. River above junction with Dolores River		15	3.5	illegible
25 (3)	8-12-59		8-19-59	Colo. River at Dewey Bridge		15	9.4	illegible
26 (11)	8-12-59		8-19-59	Colo. River 1/2 mile below mill		15	7.2	illegible
27 (14)	8-12-59		8-19-59	Colo. River one mile below mill		15	6.5	illegible
28 (17)	8-12-59		8-19-59	Colo. River at Ralph Miller farm		15	illegible	illegible
29 (18)	8-12-59		8-19-59	Colo. River five miles below mill		15	illegible	illegible
30 (21)	8-12-59		8-19-59	Colo. River ten miles below mill		15	7.6	illegible
31 (24)	8-12-59		8-19-89	Colo. River 20 miles below mill		15	illegible	illegible
32 (26)	8-11-59		8-19-59	Colo. River 20 mi above confluence with Gress		15	illegible	illegible
(28)	8-11-59		8-19-59	Colo. River 10 mi above confluence with Gress		15	illegible	illegible

Appendix D/2

APPENDIX E

URANIUM REDUCTION COMPANY
Moab, Utah

Survey Conducted By
Licensee Inspection Division
Idaho Operations Office
August 4-7, 1959

Uranium
General Air Samples

Location	No. of Samples	uc/ml x 10^{11} Low	High	Ave.	Times MPC	Remarks
Scale house	3	< 0.1	< 0.4	< 0.2		
Lot sample preparation room	3	< 0.3	0.37	< 0.3		
Moisture sample bucking room	3	< 0.3	< 0.4	< 0.3		
Lot sample room (sample tower)	3	< 0.4	1.3	< 0.7		
Grizzly pit	1			15.0	3	High dust concentration not normal (area resampled).
Grizzly pit (resample)	1			1.7		Above exception - occurs only occasionally with very dry ore lot.
Lower end conveyor #1 ramp	1			9.7	1.9	Near grizzly pit.
Lower end conveyor #1 ramp	2	1.1	1.2	1.15		Resampled as per remarks of 5 & 6 above.
#1 conveyor ramps	5	.14	.93	.48		Excepting lower end.
#1 conveyor entrance to crusher	4	.49	.98	.70		
Main crusher building	12	.3	3.8	1.23		
Transfer tower	3	.4	2.4	1.4		
Sample tower	9	.39	2.7	1.43		
Over fine ore bins	9	.44	1.6	.84		
Grinding area	11	.15	1.6	.48		
Sand-slime area	4	.11	< .4	< .26		
RIP area	5	.05	< .4	< .26		
Distributor platform - top of RIP building	1			5.73	1.1	
Yellow cake precipitation operator's table	1			.42		
Yellow cake repulper area	1			16.1	3.2	
Yellow cake filter drum - filter press area	2	.62	1.4	1.01		
Yellow cake roaster-scrubber	1			8.18	1.6	
Top of yellow cake roaster	1			2.9		
Yellow cake packaging operator's desk	5	.63	1.5	.95		
Yellow cake packaging operator's desk	1			171.	34.	Yellow cake dust discharge chute was being unplugged by operator.
Yellow cake packaging area (foot of stair)	1			12.6	2.5	
Out Buildings and Office Spaces						
Ore pad dog house	3	.14	.47	.26		
Leach section dog house	3	.02	.1	.15		
RIP control room (Section B)	3	.04	.06	.05		
RIP control room (Section A)	3	.04	.06	.05		
Mill office area	3	.08	1.1	.45		
Yellow cake bucking room	3	.69	1.55	.99		

Radium analysis cont'd

Sample No.	Date Taken	Time Sample Taken	Date Submitted for Assay	Sample Location	River level on Sampling date	Estimated dpm/l	Combustion Engineering Lab Assay in dpm/l	UC/ml Ra-226
34 (30)	8-11-59		8-19-59	Colo. River one mile above confluence with Green		15	12.2	5.5×10^{-9}
35 (32)	8-11-59		8-19-59	Green River one mile above confluence with Colo.		15	21.5	9.7×10^{-9}
36 (34)	8-11-59		8-19-59	Colo R. one mile below confluence of Green		15	18.6	8.4×10^{-9}
37 (7)	8-12-59		8-19-59	Tailings pond effluent		15,000	9094.0	4076×10^{-9}
38 (8)	8-12-59		8-19-59	Colo. R 1/4 mi below mill		15	6.4	2.9×10^{-9}
39 (5)	8-12-59		8-19-59	Colo. R. at Bridge above mill		15	6.1	2.7×10^{-9}
40	8-12-59	[illegible]	8-19-59	[illegible]	17.9 ft	15	11.9	5.4×10^{-9}
41				[illegible]	17.9 ft	15	85.5	37.6×10^{-9}
42				[illegible]	17.9 ft	15	45.5	14.6×10^{-9}
43				Tailing pond effluent		15,550	30,594	9368×10^{-9}

Appendix D/3

Uranium Reduction Company
Moab, Utah

General Air Samples
August 4-7, 1959

Location	No. of Samples	uc/ml x 10^{11} Low	High	Ave.	Times MPC	Remarks
Tailings pond dog house	3	.04	.06	.05		
Main office building	3	.02	.14	.06		
Electrical shop	1			.13		
Machine shop	1			.09		
Garage	3	.01	.02	.01		
Tool room office	1			.04		
Warehouse	3	.02	.1	.05		
Change room	3	.01	.03	.02		
Carpenter shop	3	.39	19.4	6.75	1.3	
Metallurgical laboratory	3	.01	.03	.02		
Paint shop	3	.04	.07	.06		
Pump house #2	3	.01	.03	.02		

Uranium Reduction Company
Moab, Utah

Breathing Zone Samples
August 4-7, 1959

Location	No. of Samples	uc/ml x 10^{11} Low	High	Ave.	Times MPC	Remarks
Belt picker - 2/3 distance up #1 conveyor ramp	3	< 1	< 2	< 1.5		Well ventillated - No respirator worn
Crushing, mixing and weighing samples (moisture sample bucking room)	2	< 2	< 3	< 2.5		No respirator worn
Crushing, mixing and weighing - placing in oven (sample preparation room)	1			1		No respirator worn
Sweeping - cleaning sample bucking room	1			12.9	2.6	Respirator worn
Sample preparation	13	0.21	59	8.1	1.6	Respirator worn during dustiest operations
Sweeping and vacuuming floor SPR	3	< 1	4.9	< 3.4		No respirator worn
Removing and replacing yellow cake barrel	3	5.9	87	37.6	7.5	No respirator worn
Lidding and weighing finished product	2	11.	42.	26.5	5.3	No respirator worn
Vacuuming spill (packaging area)	1			313.	62.6	Spill resulted from unplugging discharge vent, no resp. worn.
Hosing down grizzly grate	5	< 1	< 3	< 1.5		No respirator worn
Taking moisture sample from truck	3	< 1	< 6	< 4		No respirator worn
Forcing large ore thru grate	1			< 1		No respirator worn

Uranium Reduction Company
Moab, Utah

Effluent Samples

Collected on
August 6, 1959

Location	Radium^{226} uc/ml x 10^{8}	Thorium uc/ml x 10^{8}
1/4 way out from right bank (looking downstream) 60 yds. downstream from where effluent enters Colorado River	13 ± 1.6	0.5
Midstream - 60 yds. downstream	15.6 ± 1.8	0.3
3/4 way across - 60 yds. downstream	11.6 ± 1.6	0.7
1/4 way out from right bank looking downstream, about 5 miles downstream	5.8 ± 1.1	1.3
Midstream - 5 miles down (just above where Cain Spring Wash empties)	5.4 ± 1.3	1.1
3/4 way across - 5 miles downstream	10.7 ± 1.6	0.3
2 miles downstream 1/2 to 1/4 mile below high line Utah Power and Light transmission line -- 9 samples taken, 2 analyzed.	19.4 ± 2.0 9.2 ± 1.8	0.6 0.7
1/4 way across from right bank (looking downstream) 1/2 mile below mill	7.8 ± 1.6	0.4
Midstream - 1/2 mile below mill just below fork	7.1 ± 1.3	0.4
3/4 way across from right bank looking downstream	10.5 ± 1.3	0.5
1/4 way out from right bank looking downstream 1500' up from effluent entry into Colorado River at plant water inlet and near sludge return from water plant.	9.4 ± 1.3	0.5
Midstream - 1/4 mile upstream	11 ± 1.6	0.5
3/4 way across from right bank looking downstream	17 ± 1.8	0.2
1-1/2 to 2 miles upstream (1/2 mile up from US 160 bridge)	11 ± 1.3	0.4

Uranium Reduction Company
Moab, Utah

External Radiation Survey
August 4-7, 1959

Location	mr/hr
Ore yard	0.12
Men's house	0.18
Grizzly	0.25
Moisture determination room	0.075
Sample bucking room	0.5
Belt picker	0.2
Sample tower, preparation room	0.2
Fine ore bins gallery	0.12
Sand-slime operator's desk	0.08
Sand tails	0.05
Yellow cake precipitation area, desk	0.50
Yellow cake drum	0.6
Yellow cake clarification press	0.8
Yellow cake roaster, top	0.7
Yellow cake filter press paper	5.0
Yellow cake sample room	0.3
Tailings pond	0.5

Uranium Reduction Company
Moab, Utah

EFFLUENT GRAB SAMPLES

Collected On
July 23, 1959

Location	Radium Concentration X MPC	Uranium Concentration X MPC
Colorado River, 1 mile above mill	2.75	0.001
Tailings Pond overflow to river	700.	0.16
Duplicate	4750.	0.16
Colorado River, 2.5 miles below mill	5.	0.001
Duplicate	5.	0.001
Colorado River, 5 miles below mill	22.	0.002
Duplicate	33.	0.001

Later analysis of above liquid by revised procedure

Location	Radium[226] $\mu c/ml \times 10^{8}$	Thorium $\mu c/ml \times 10^{8}$
Colorado River, 1 mile above mill	3.5 ± 0.7	---
Colorado River, 2.5 miles below mill	10. ± 2.	1.3
Colorado River, 5 miles below mill	5.8 ± 1.1	6.5

APPENDIX F

URANIUM REDUCTION COMPANY
Moab, Utah

Samples Collected During
Follow-up Inspection
October 29, 1959

Uranium
General Air Samples

Location	No. of Samples	μc/ml x 10^{11} Low	High	Ave.	Times MPC	Remarks
Grizzly pit and crusher area	8	< 0.5	1.5	< 0.6		
Sample tower	3	0.9	3.9	2.9		
Over fine ore bins	2	< 0.5	0.6	< 0.55		
Ball mill area	2	< 0.5	3.4	< 1.95		
RIP distributor platform	2	16.	29.	22.5	4.5	Seldom occupied
Yellow cake filter drum floor	1			2.5		
Over roaster-scrubber	1			6.6	1.3	
Yellow cake slurry tank area	2	< 0.5	2.8	< 1.65		
Yellow cake packaging area (by vacuum cleaning motor)	1			8.1	1.6	
Yellow cake roaster area - third level	3	8.0	58.0	28.0	5.6	
Yellow cake roaster area - second level	2	1.2	4.3	2.7		
Yellow cake roaster area - first level - packaging area	1			1.4		
Carpenter shop	2	< 0.5	< 0.5	< 0.5		Recheck of area which previously had appeared high.

Breathing Zone Samples
October 29, 1959

Ore sample preparation man	2	2.0	12.0	7.0	1.4	Preparing samples

Uranium Reduction Company
Moab, Utah

Effluent Samples

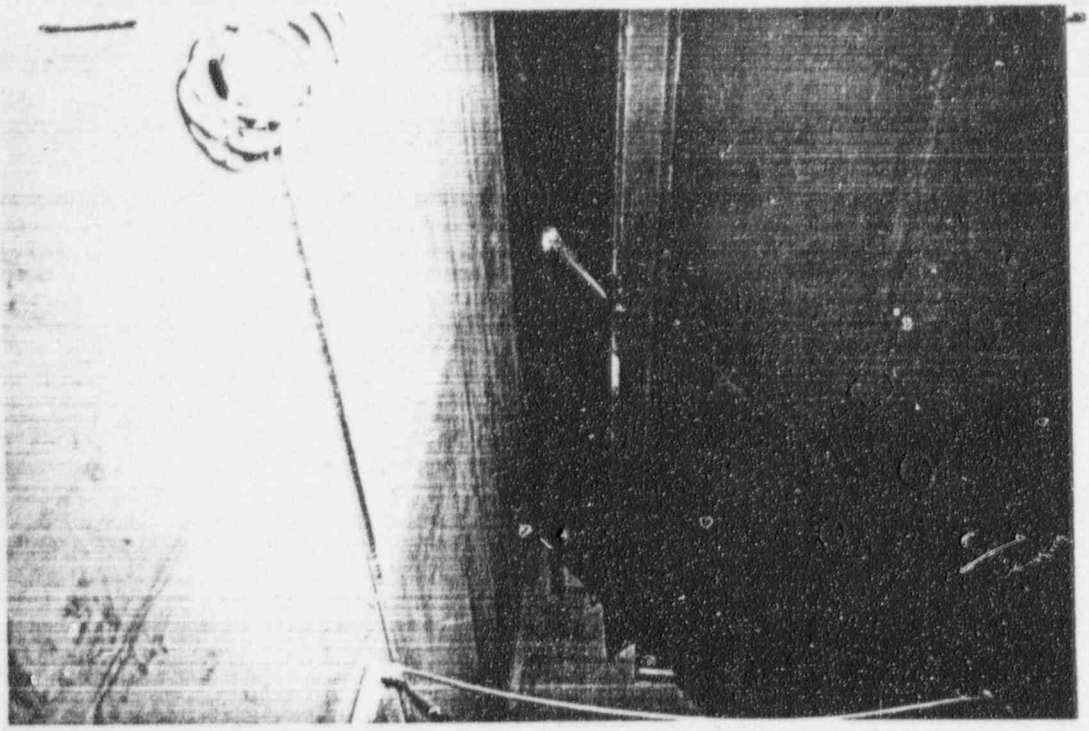
Collected on
October 27, 1959

Location	Radium^{226} $\mu c/ml \times 10^{8}$	Thorium $\mu c/ml \times 10^{8}$
Colorado River - 5 miles downstream from mill	12 ± 1.5	1.8
Colorado River - 2 miles downstream from mill	6.7 ± 1.0	1.7
Colorado River - 1/4 mile downstream from mill	15 ± 1.6	5.0
Colorado River - 150 yards below effluent entry	16 ± 1.6	2.1
Colorado River - 1/4 mile above effluent entry	< 1.1	< 0.2
Colorado River - 1-1/2 miles above mill	< 1.1	0.5
Straight effluent before it reaches Colorado River	84 ± 10	5056.

URANIUM REDUCTION COMPANY
Moab, Utah

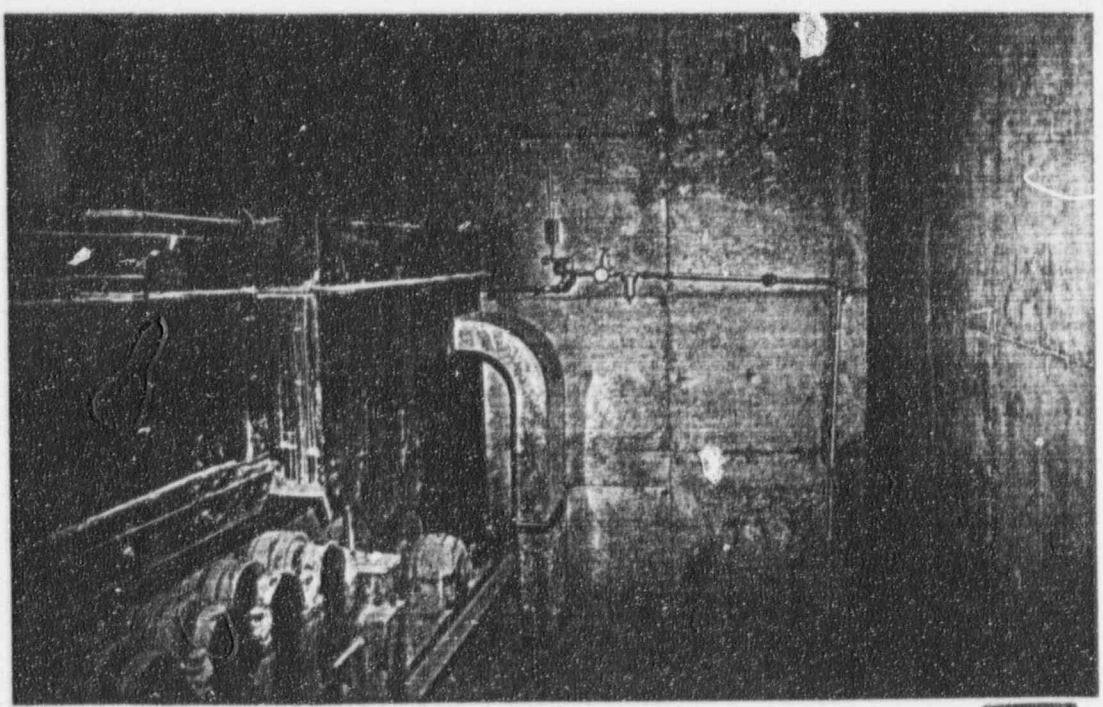
APPENDIX G

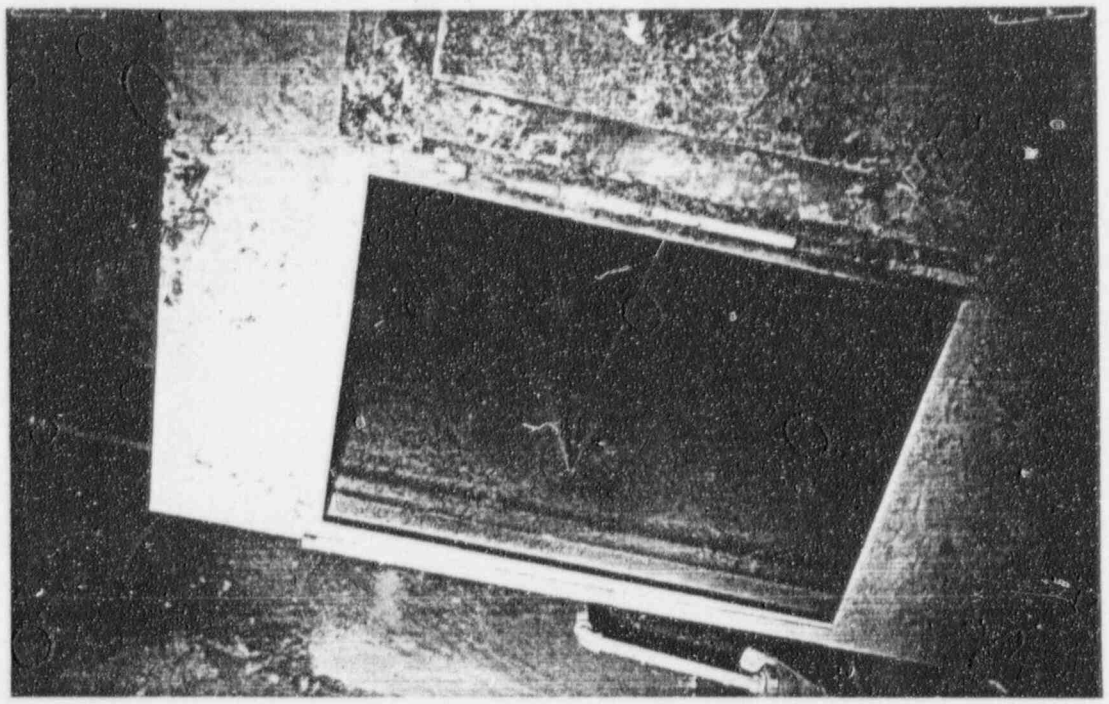
October 26-29, 1959



1. Water spray lines to the grizzly hopper, upper portion of grizzly pit.

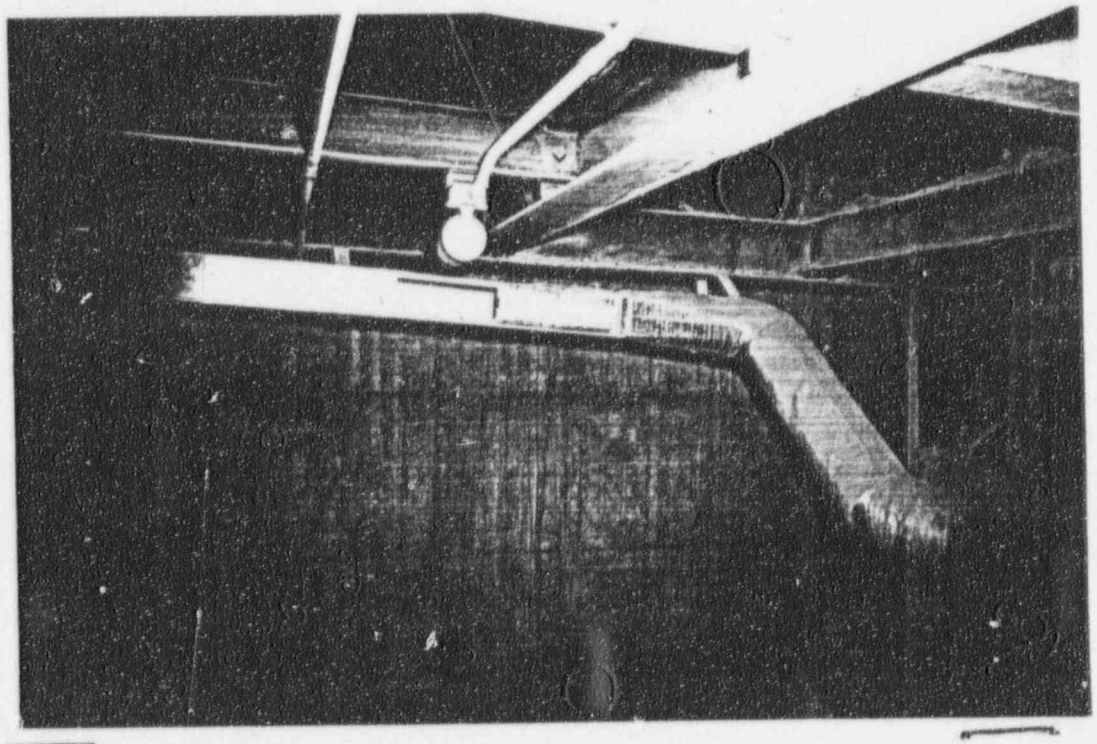
2. Water spray lines to the conveyor drop to the lower grizzly pit (note the pressure equalizer ducts also).

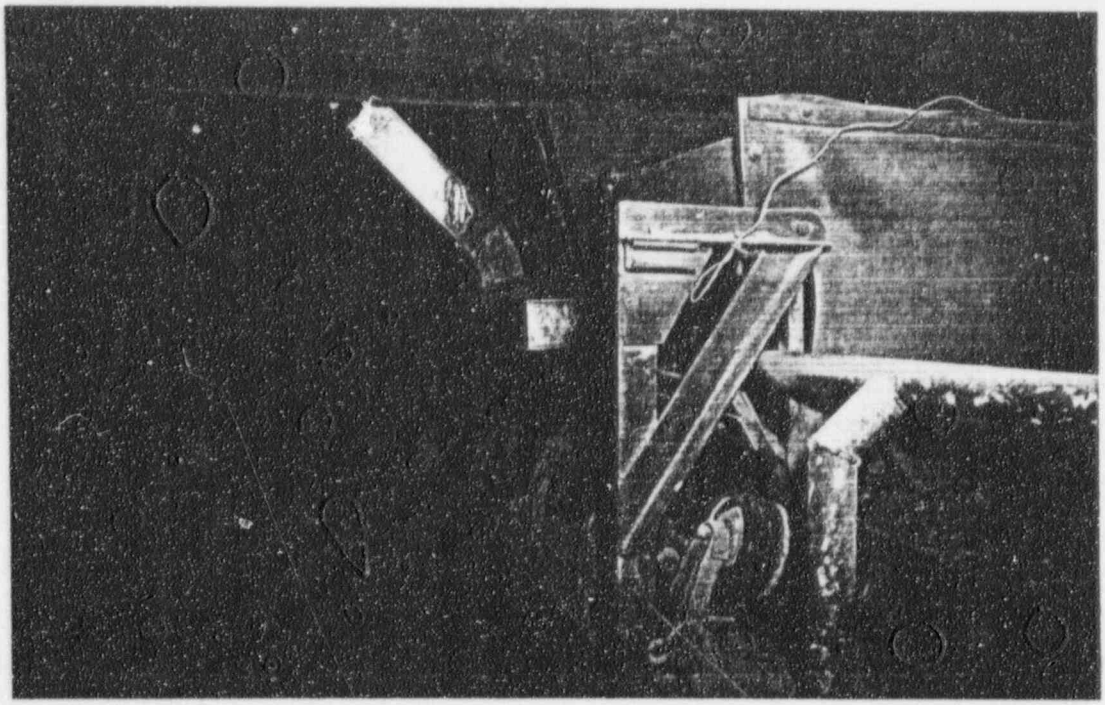




3. Fog nozzle in operation (inside pulley housing shown in Photograph 2).

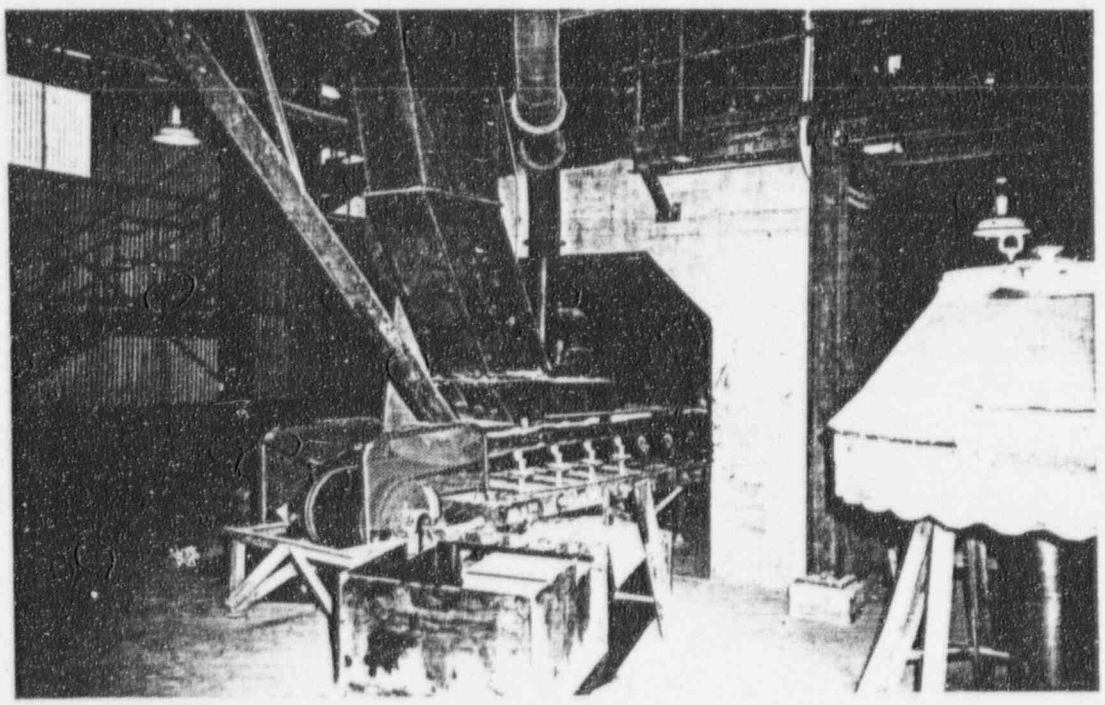
4. Dust collection ductwork in the lower grizzly pit (note collection opening in the duct behind light fixt[illegible] and the motor on the right).

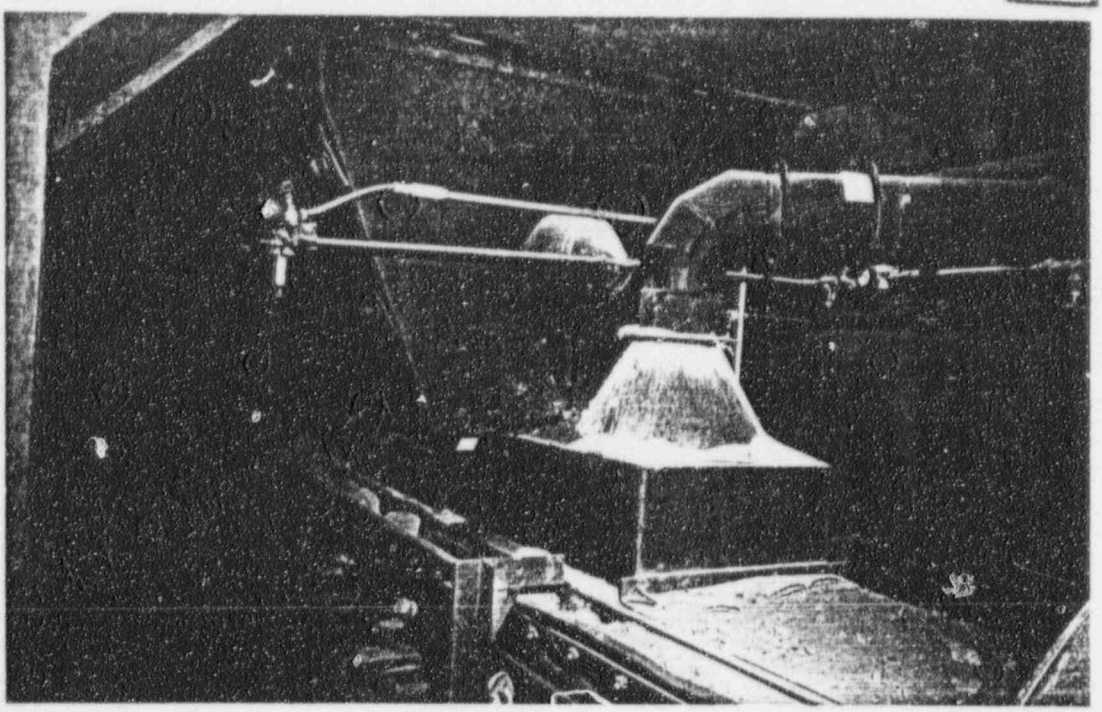




5. Looking into the lower grizzly pit from No. 1 conveyor ramp (note lower side of pressure equalization duct, upper end of which was shown in Photograph 2).

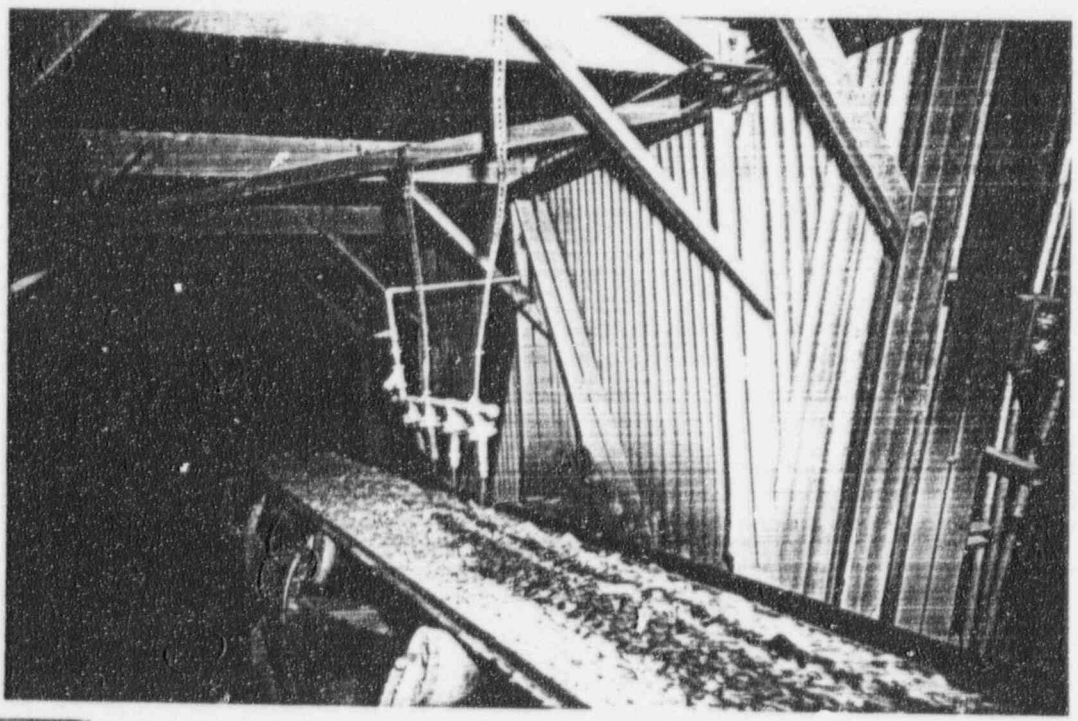
6. Lower level of the crusher building (note dust collection ducts in general and how housing in direct contact with moving ore has been heightened to prevent duct collection units from picking up larger particles).

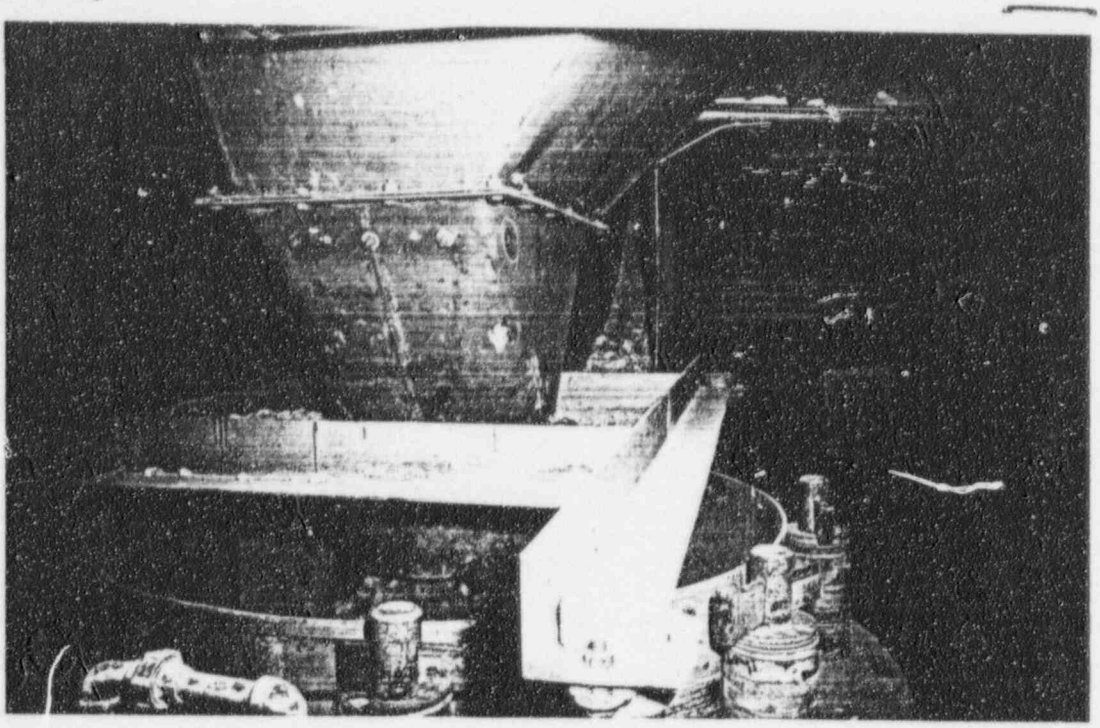




7. Lower level of the crusher building (note elevated housing mentioned in Photograph 6 and water spray units installed on hopper).

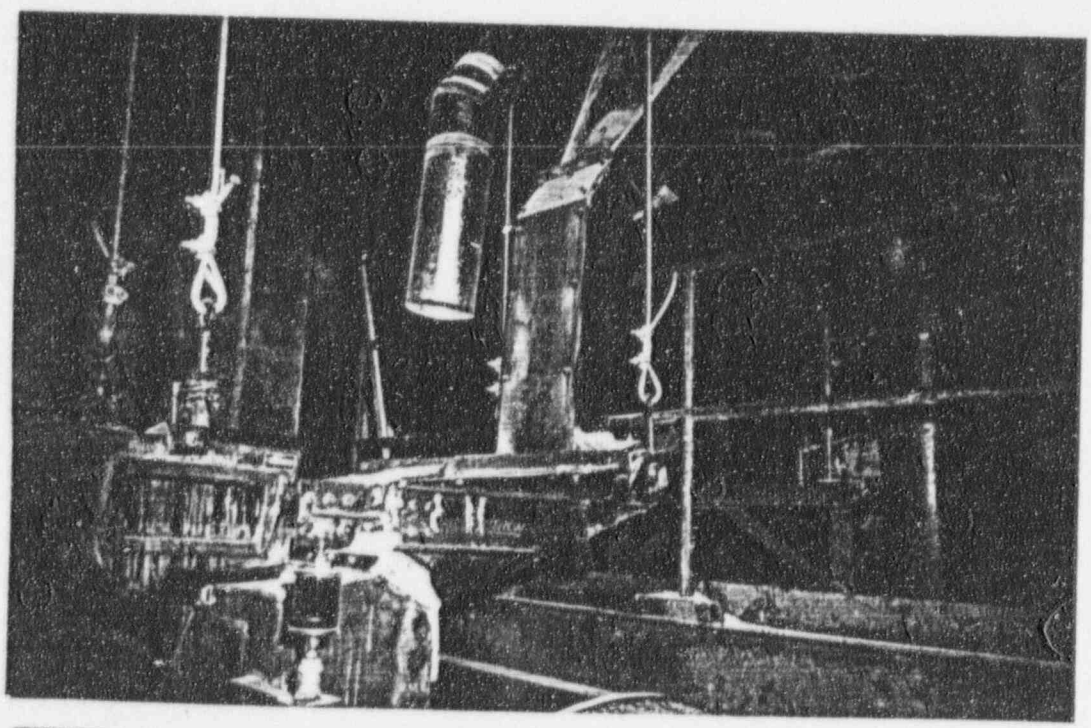
8. Ore conveyor from crusher building to transfer house showing the water sprays in operation.

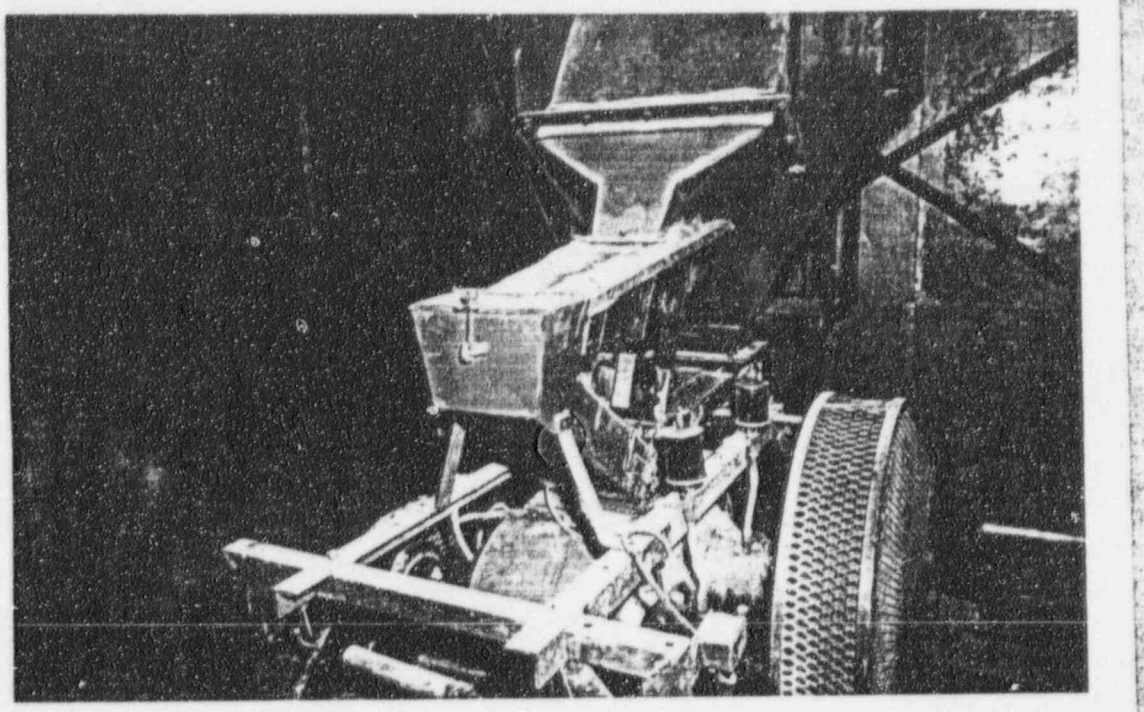




9. Cone crusher in the crusher building showing tray built to funnel ore which falls from a conveyor overhead into crusher. (Some ore is shown in the tray directly behind crusher.)

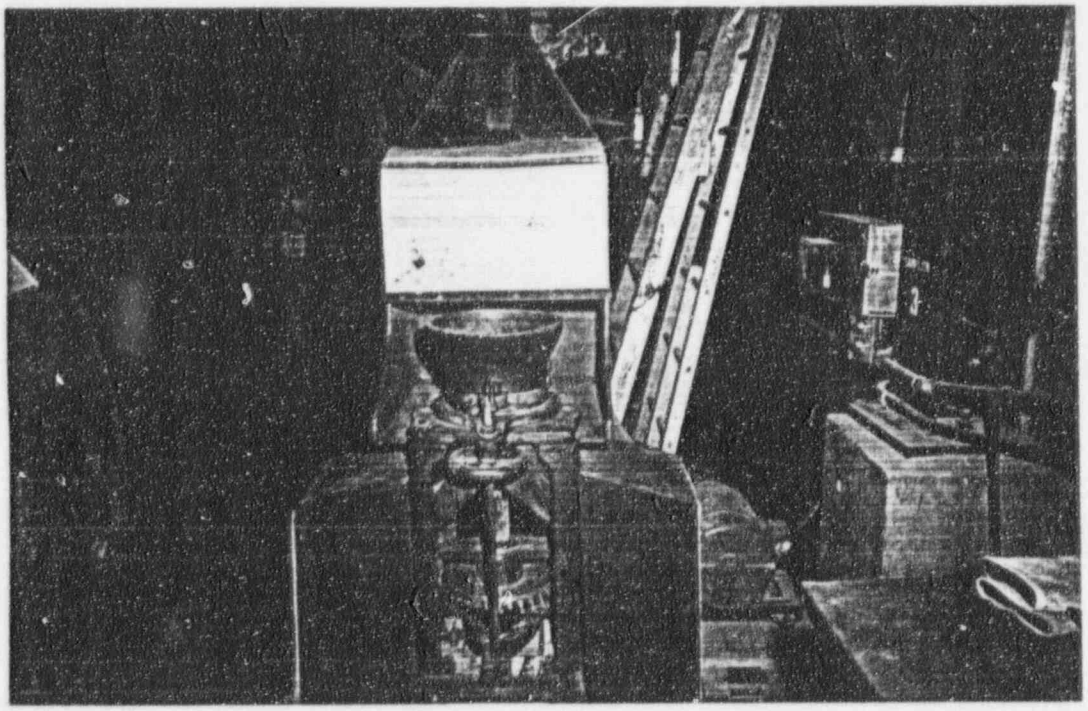
10. Sealed syntron vibrator in the sample tower (note pressure relief ductwork to prevent fines from being sucked away by vacuum venting).

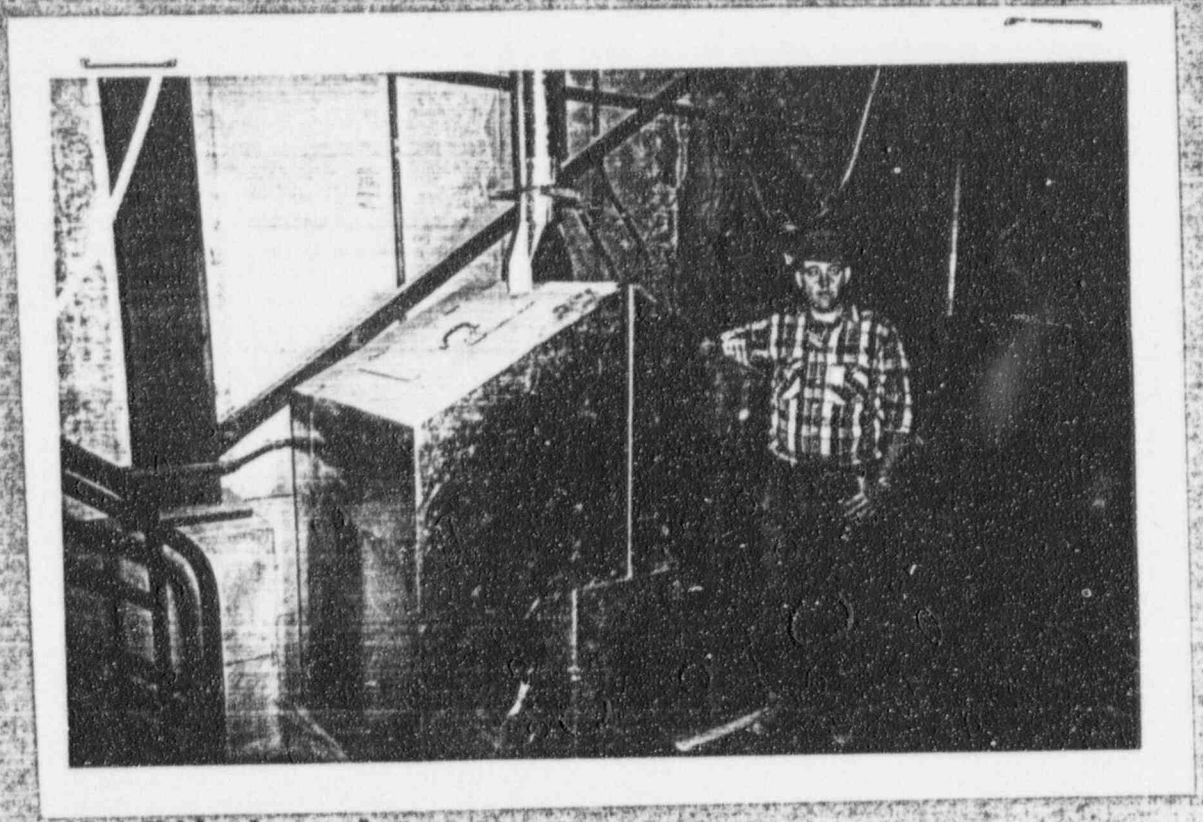




11. Rubber sealed syntron vibrator in the sample tower.

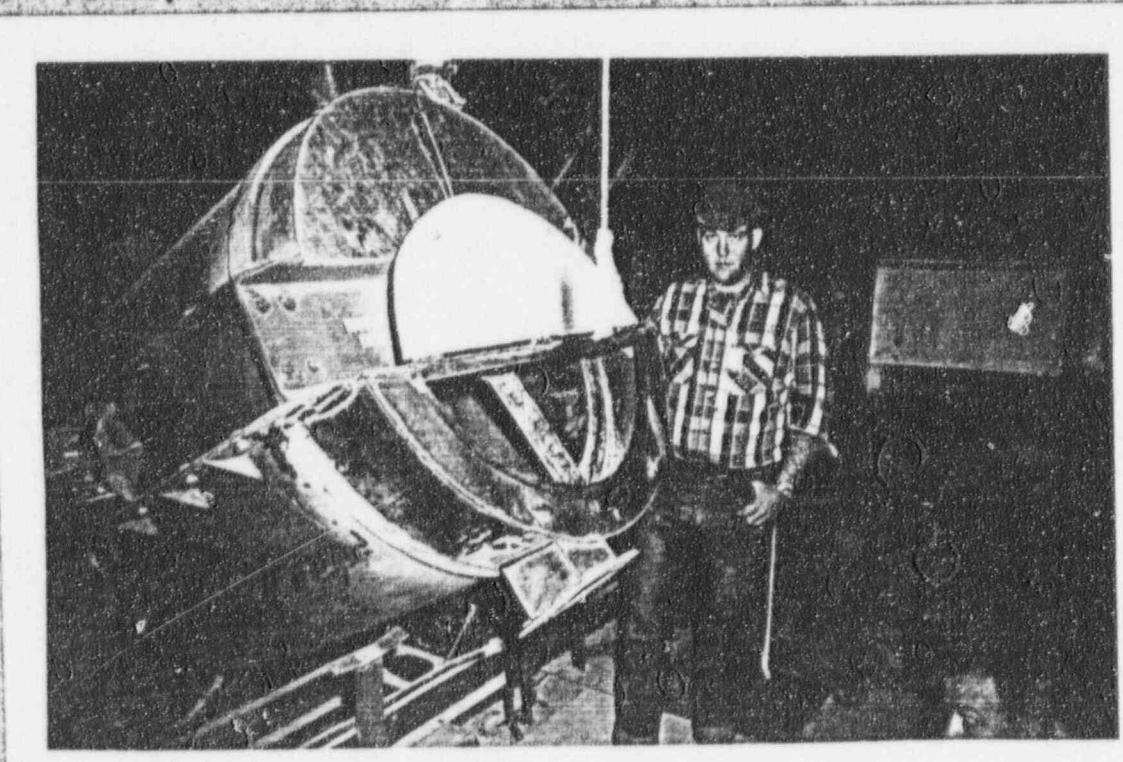
12. Coffee mill in the sample preparation room of the sample tower (note ducted enclosure).

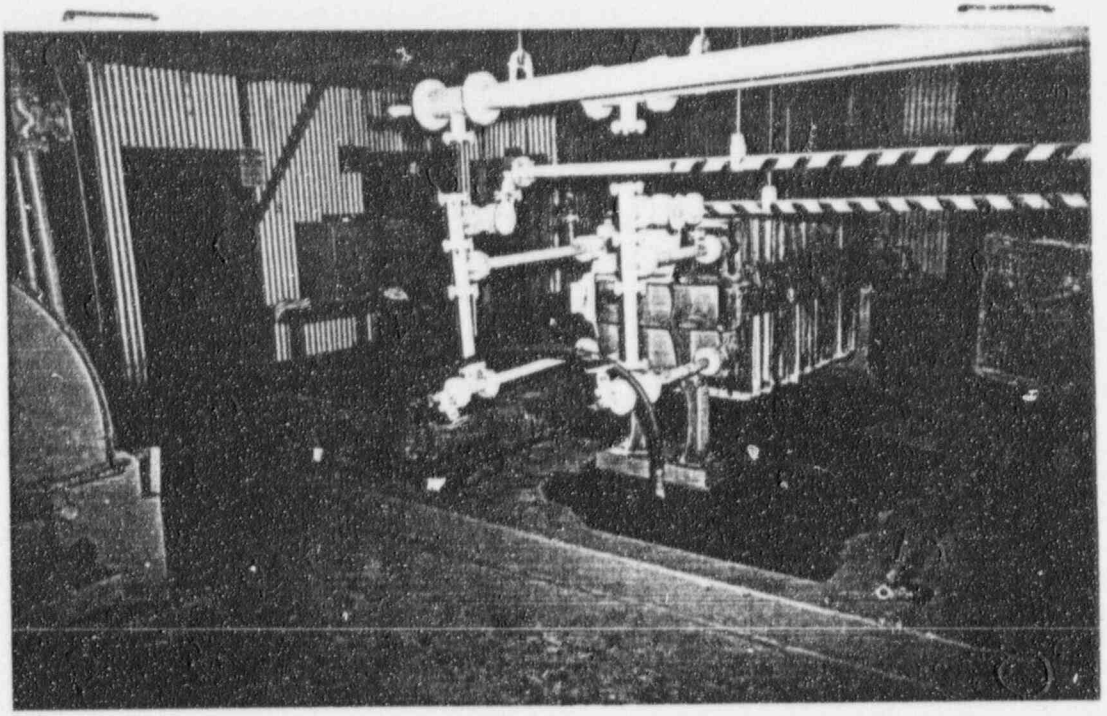




13. Y-blender enclosure.

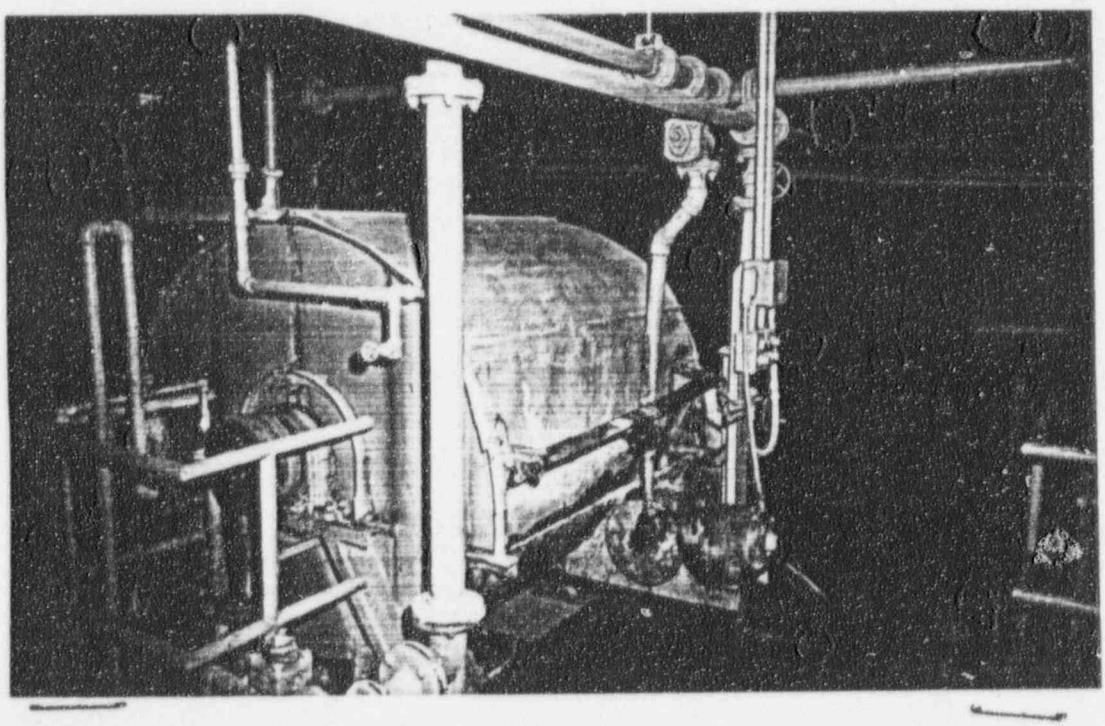
14. Rotary drier in sample preparation room (note cover for enclosing the operation and the ductwork above-note; also, the gasketed chute to which the sample bucket can be attached for emptying drier).

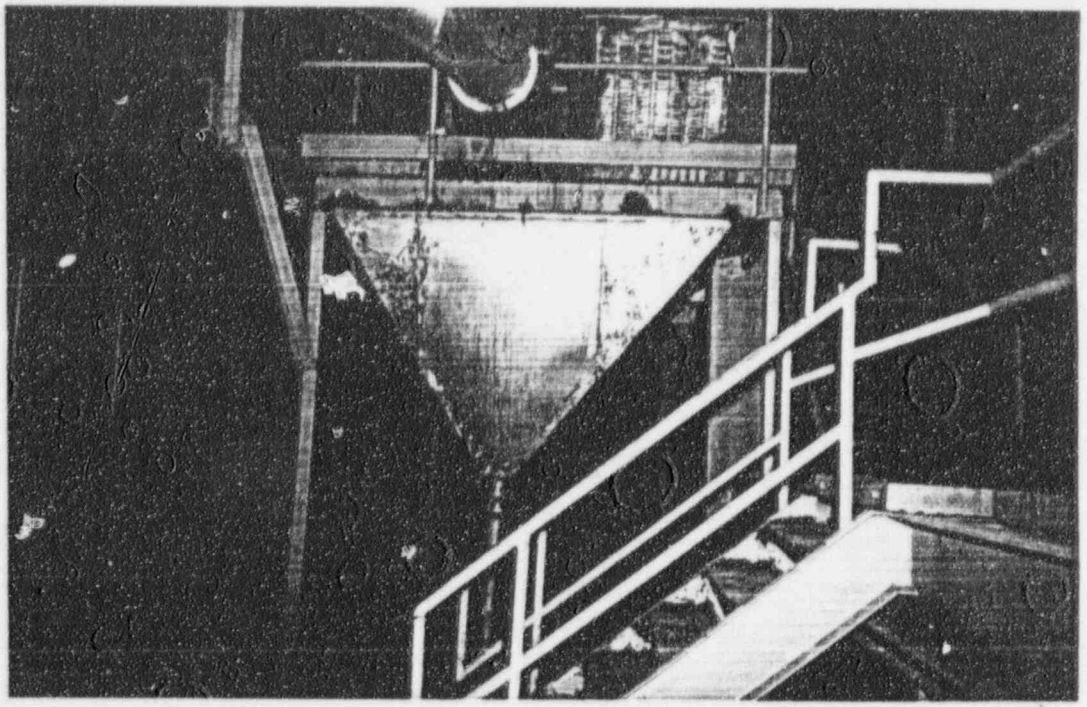




15. Yellow cake filter presses (note the receptacle on rollers to the left of the press which is utilized for the purpose of catching yellow cake when press papers are changed).

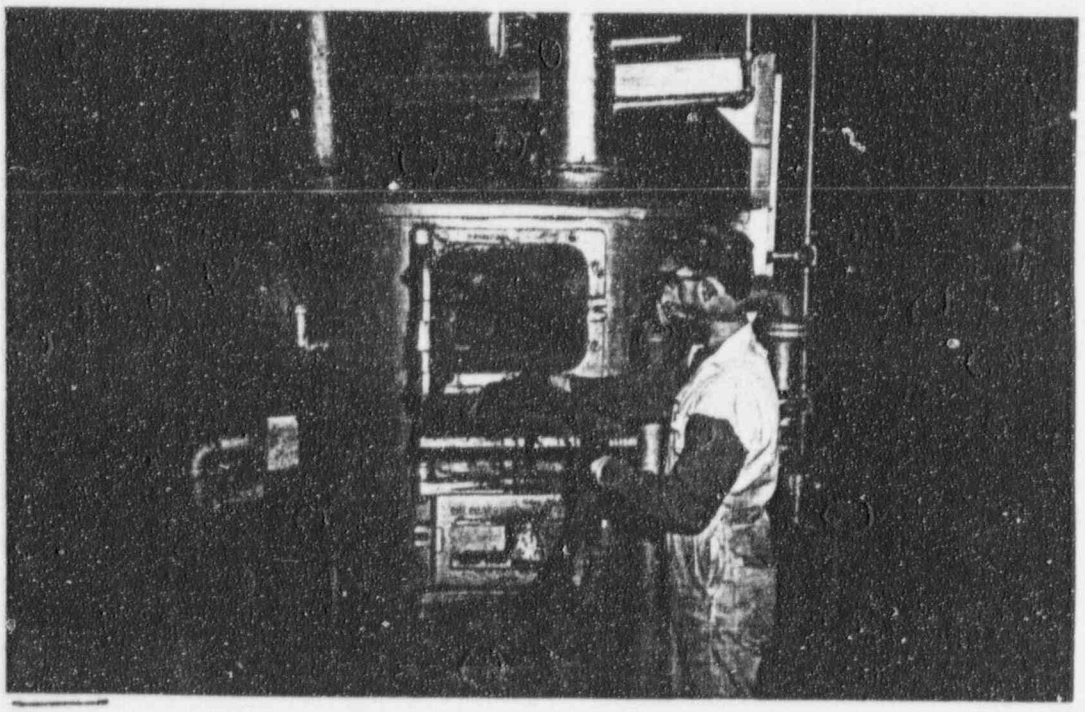
16. Yellow cake filter drums showing the rubberized canvas covers used to encase the drum.





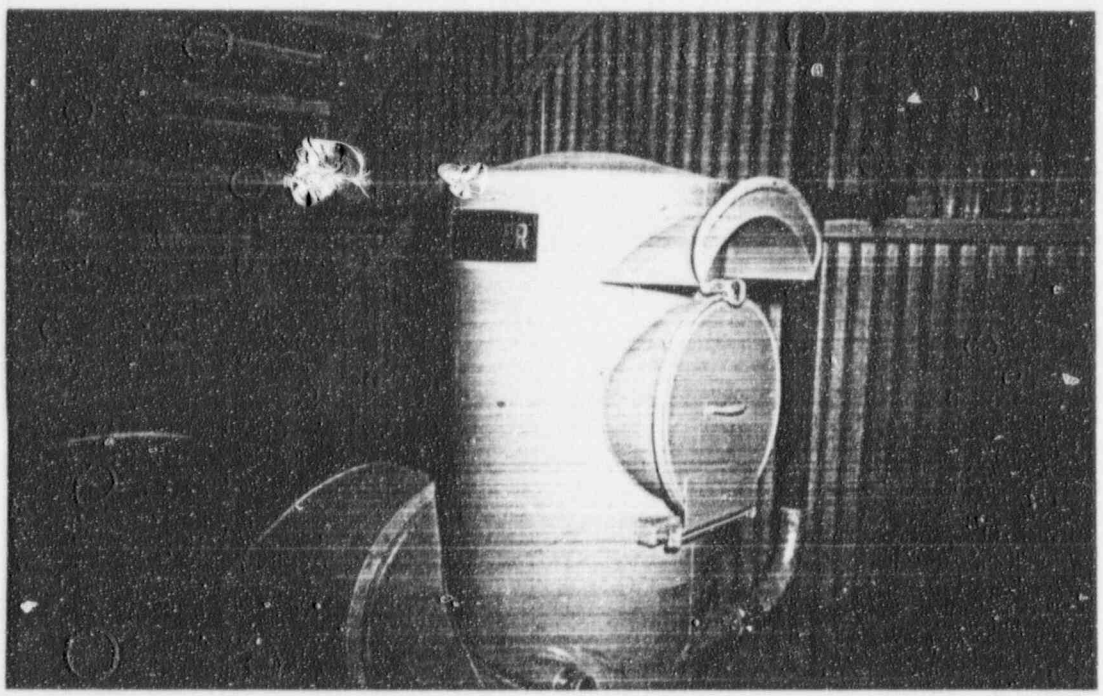
17. Stainless steel yellow cake roaster-scrubber enclosure.

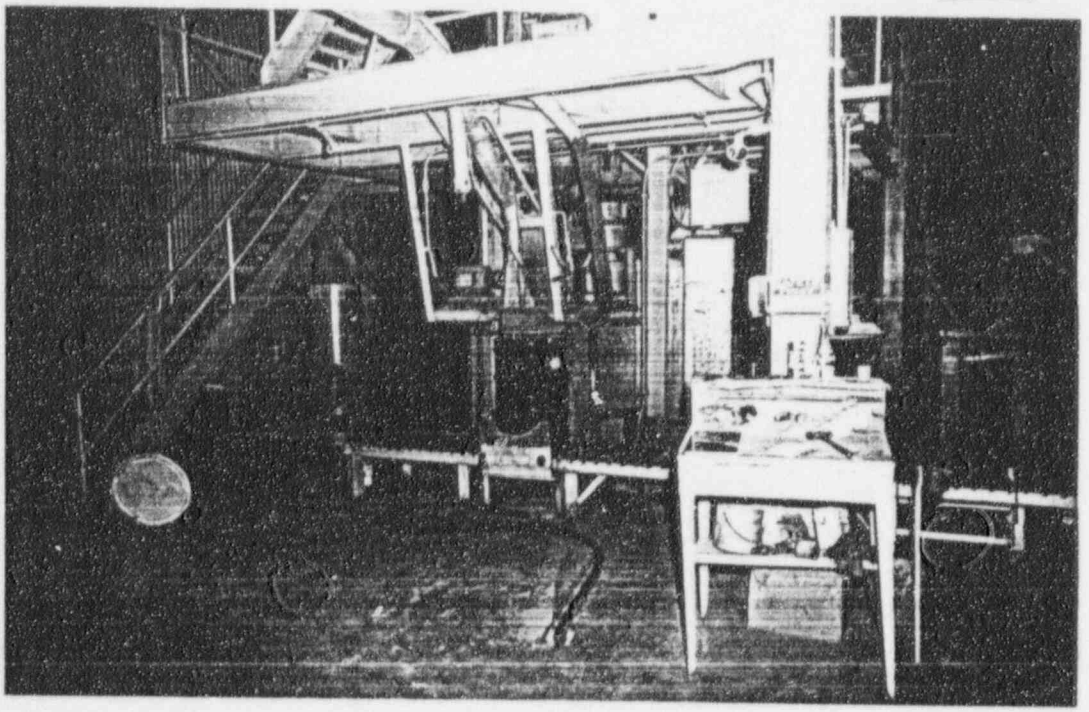
18. Vacuuming tray used to catch spill made while hearth doors of roaster are open.



19. Vacuuming yellow cake (Note tray has been removed and is laying on barrel at left.)

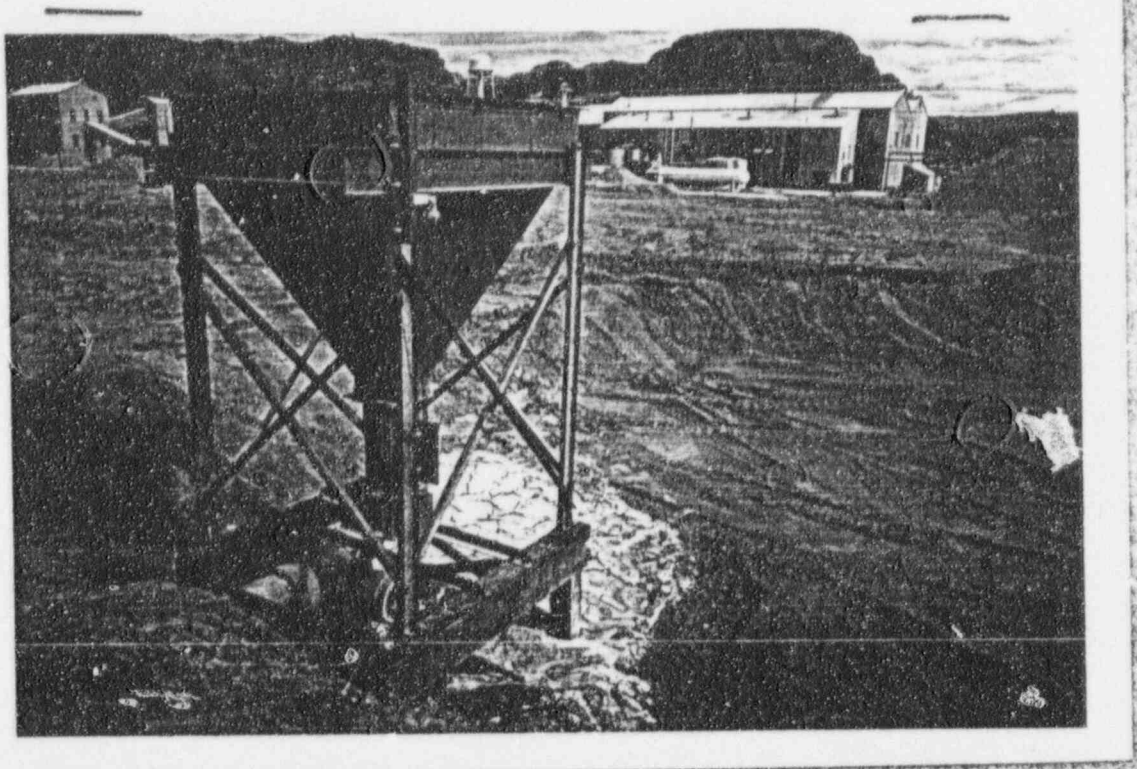
20. New Spencer vacuum to service entire yellow cake roaster and packaging area.





21. Yellow cake packaging area showing dust discharge equipment. (Note Spencer vacuum motor unit in left background.)

22. Dust collection unit utilized to vent yellow cake packaging mechanism shown in Photograph 21. (Note yellow cake recovered in enclosed barrels.)



23. Barite treatment installation in tailings area. Not in operation at the time of inspection.

24. Entrance to Uranium Reduction Company mill showing caution signs upper left and lower right of enclosure at center.