UNITED STATES ATOMIC ENERGY COMMISSION

1

## DIVISION OF INSPECTION

# REPORT

TEXAS-ZINC MINERALS CORPORATION Mexican Hat, Utah

9808270084 600902 PDR ADDCK 040\*\*\*\*\* C PDR

. .

1

Form ABC-417 (4-58) UNITED STATES ATOMIC ENERGY COMMISSION

COMPLIANCE INSPECTION REPORT

	II, A-1
<ol> <li>Name and address of licensee</li> </ol>	2. Date of inspection
Texas-Zinc Minerals Corporation Mexican Hat, Utah	April 25-28, 1960
	3. Type of inspection Follow-up
	4. 10 CFR Part(s) applicable
	20 - 40

5. License number(s), issue and expiration dates, scope and conditions (including amendments)

License No. R-185 Issued: 12-31-59

Expires: 12-31-60

Scope:

"you are hereby licensed to receive possession of and title to raw and refined source material at your ore processing mill located approximately one mile south of Mexican Hat, Utah, for processing and resale.

"You are further licensed to transfer and deliver possession of and title to refined source material to any person licensed by the Atomic Energy Commission, within the limits of his license."

Conditions:

"As a condition of this license, you are required to maintain records of your inventories, receipts and transfers of refined source material.

"The issuance of this license does not constitute any agreement by the Commission to purchase ores and/or concentrates or other products from the licensee.

"This license is subject to all the provisions of the Atomic Energy Act of 1954 now or hereafter in effect and to all valid rules and regulations of the U. S. Atomic Energy (Continued)

#### 6. Inspection findings (and items of noncompliance)

During the follow-up inspection, it was noted by the inspector that the licensee has been conducting external radiation surveys, airborne radioactive material surveys, and liquid effluent analyses. Records pertaining to the above activities were exhibited to the inspector. The licensee has posted radioactive material warning signs at all the mill entrances, around the perimeter of the ore stockpiling area, and around the perimeter of the tailings ponds. The licensee has posted airborne radiation warning signs at the entrances to the yellow cake area. An additional tailings pond, to contain solid tailings, is in the process of being built. Since the initial inspection, the licensee has installed an additional rotoclone in the yellow cake area. Installation of water sprays in the sample plant has been started. None of the sprays which had been installed previously were in operation at the time of the follow-up inspection. The inspector met with Mr. K. C. Apland, Mill Superintendent, on April 28, 1960, and discussed the items of noncompliance with him.

The only items of noncompliance observed or otherwise noted during the course of the inspection are as set out below:

10 CFR 20.101 Exposures of individuals in restricted areas (b) Personnel in the yellow cake barreling area and in the sample plant were being exposed to average concentrations of uranium in air in excess of  $5 \times 10^{-11} \, \mu c/ml$ . (Par. 20)

And the restored data to the second data and the second data in the second data and the se	(Continued)
<ol> <li>Date of last previous inspection</li> <li>April 3, 1958</li> </ol>	<ol> <li>Is "Company Confidential" information contained in this report? Yes No x</li> <li>(Specify page(s) and paragraph(s))</li> </ol>
	Original stand by
DISTRIBUTION:	Clyde A. Hawley, Jr.
CO (4)	Clyde A. Hawley, JORIGII'AL SILVELLER
GJ (1)	Approved by:Donald I. Walker, Director
	Division of Licensee Inspection
	(Operations office)
	110.

(Date report prepared)

. .

If additional space is required for any numbered item above, the continuation may be extended to the reverse of this form using foot to head format, leaving sufficient margin at top for binding, identifying each item by number and noting "Continued" on the face of form under appropriate item.

RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

L. D. Low, Director, Division of Compliance, AEC Headquarters

AUG 1 8 1960

ORIGINAL SIGNED BY AEC Headquarters Donald I. Walker, Director, Division of Licensee 10 I. SIGNAL I. RALED

FOLLOW-UP INSPECTION REPORT - TEXAS-ZINC MINERALS CORPORATION, MEXICAN HAT, UTAH - SOURCE MATERIAL LICENSE NO. R-185

LICAY

Transmitted herewith are four (4) copies of subject report.

The following items of noncompliance were observed or otherwise noted during the course of the follow-up inspection:

- 10 CFR 20.101 Exposures of individuals in restricted areas (b) Personnel in the yellow cake barreling area and in the sample plant were being exposed to average concentrations of uranium in air in excess of 5 x 10-11 uc/ml.
- 10 CFR 20.103 Concentrations in effluents to unrestricted areas (b) The licensee was releasing into an unrestricted area liquid effluents containing concentrations of Radium-226 in excess of the limits specified in Appendix B, Table 2 of 10 CFR 20.
- 10 CFR 20.202 Personnel Monitoring (a)(1) The licensee has not made personnel monitoring Bee quartary devices available for personnel who were likely per cent of the limits as specified in Appendix  $A_{rep}$  or t of 9.23-60 of 10 CFR 20.
- 10 CFR 20.203 Caution signs, labels, and signals (d)(2) The licensee had not posted entrances to the sampling and crushing plants, in which there exist emounts of uranium in air in excess of the limits specified in Appendix B.

At the time of the initial inspection, the licensee's radiation safety program was practically nonexistent. As can be seen in the report details, some progress has been made toward getting the mill into compliance. The licensee has instituted satisfactory survey and analytical methods. Mr. R. E. Wakefield, who is in charge of the radiation safety program at the mill, appears to be a competent person and seems to be aware of, and interestei in, the problems involved in achieving compliance with the regulations.

As can be seen from the early data sent from the licensee to DLR, the yellow cake area was, in general, appreciably above the MPC for airborns uranium in a restricted area. This, according to Mr. Wakefield, prompted the licensee to install an additional rotoclone which evacuates and traps part of the airborne uranium from inside the Proctor-Schwartz drier. Mr. Wakefield indicated that the mill people who were in favor of installing the additional rotoclone did not meet with too much resistance from upper-level administrators.

In a letter from W. W. Peery to D. I. Walker dated February 26, 1960, Mr. Peery stated that it was his opinion that Mr. Apland, Mill Superintendent, was more interested in circumventing the regulations than in getting the mill into compliance. During the latest inspection, the inspector did not receive the same impression as Mr. Peery. Mr. Apland was courteous, free with his time, and seemed interested in actually getting the mill into compliance with the regulations. Whether Mr. Apland has had a change of heart or not, it is the inspector's opinion that the licensee has done well in establishing an adequate program to determine the existing radiation hazards in the mill and in initiating action to reduce these hazards.

The licensee has taken a firm stand on the matter of interpreting the regulations as applied to two facets of Texas-Zinc's operation at Mexican Hat. One is that the licensee considers their ore stockpiles to be in a restricted area and properly posted and, as such, no extra precautions against the unauthorized removal of the ore need be taken. The other is that the licensee maintains that the canyon which carries the liquid effluent from the release point to the San Juan River should, by reason of inaccessibility, be considered a restricted area. The licensee is sware that if this canyon is so considered the restrictions concerning the amounts of redicactive materials permitted in the effluent are considerably less stringent. These points were discussed with Mr. Apland. It is the opinion of this office that there is little possibility that anyone could or would steal ore from the stockpiles because of the location, signs, and quality of the ore. Concerning the

business of the effluent release, however, the licensee is obviously releasing concentrations of radioactive materials in excess of those specified in the regulations. The liquid effluents can be reached, if so desired, as is evidenced by the fact that inspectors from ID have done so in the past. It was pointed out to Mr. Apland that any action aimed at obtaining an exemption from the regulations would have to be initiated by Mr. Apland and reviewed by DLR. Mr. Apland was informed that a citation for violation of 10 CFR 20.103(b) would be recommended by the inspector.

- 3 -

Mr. Wakefield, during a discussion of the time and motion studies which had been applied to the mill personnel, stated that these studies had not been conducted in the crushing and sampling plant because th ..... censee's airborne survey data had shown that the concentrations uranium in air in all areas of the sampling and crushing plant were very nearly constant. In other words, a worker in the sampling and crushing plant would be exposed to very nearly the same concentrations no matter where he went in the building. However, in the licensee's first guarterly report of 1960, sent from the licensee to DLR on June 6, 1960, the licenses stated that a comprehensive time study is being undertaken to determine the exposure of personnel working in the sampling and crushing plant. Both Mr. Apland and Mr. Wakefield informed the inspector that there was no interchanging of personnel from one area of the mill to another on any sort of a routine basis. They stated that once a man was trained to do a specific job he remains in that job and his exposure to radiation is calculated on this basis.

It can be seen in the report details that the licensee has plans for a rather extensive installation of water sprays in the sampling and crushing plant and that the inspector noted that a water truck was spraying down the one yard. In the quarterly report mentioned above, the licensee has submitted to DLR more information concerning the installation of these sprays. It is the inspector's opinion that these procedures are designed more to stop ore loss through dust than to reduce the concentrations of airborne uranium, but the installation of these sprays should help to slightly reduce the airborne uranium concentrations.

Reference is made to the violation of 10 CFR 20.202 listed above. It should be noted that this office was informed by telephone by Mr. Wakefield that this item of noncompliance was rectified. During the film badge program, which was administered by ID, it was shown that a yellow cake operstor's badge had received a dosage in excess of 25 per cent of the specified limits. At the time of the inspection, it was noted that the licensee had no personnel monitoring devices in use, and the licensee was informed that

the above-mentioned violation would be reported. Mr. Wakefield called this office after the completion of the inspection and stated that the yellow cake operators are now continuously badged and that representative personnel in other areas of the facilities are now badged on an intermittent basis. This plan is contained in the licensee's most recent report to DLR, dated June 6, 1960. Inasmuch as the yellow cake operator's badge, mentioned above, exceeded the 25 per cent limit by only 12 mrem per week and for only one month, the inspector recommends that no citation be made.

It will be noted in the report details that the inspector sampled liquid effluents in three areas. The analysis of samples of the supernatants from the leaking tailings and also the regular tailings ponds indicated Radium-226 concentrations to be 330 ± 4 and 190 ± 5 x 10-9  $\mu c/ml$ , respectively, and the Thorium-230 concentrations to be 30 ± 15 and 1806 ± 4 x 10-8 µc/ml, respectively. The analyses of the alleged boiler blow-down and filter cleaning water samples, however, were high. As is pointed out in the report details, this water runs in an open, shallow ditch for about one-half mile from the mill to the point where it enters the same canyon which is used by the licensee to carry the normal liquid effluents from the release point to the San Juan River. Mr. Wakefield, at the time of sampling, informed the inspector that the liquid coming down the shallow ditch consists of water which is used to blow down the boilers in the sulfuric acid plant and to wash the filters which clean the pregnant liquor of solids before solvent extraction of uranium. Mr. Wakefield stated that the boilers are blown down once per day and the filters cleaned with water once per day and with Versene once per week. The analysis of this water by the Analysis Branch of the Health and Safety Division, ID, showed the Radium-226 concentration to be 3000  $\pm$  1 x 10<sup>-9</sup>  $\mu$ c/ml, and the Thorium-230 concentration to be 535 ± 7 x 10-8 µc/ml. Mr. Wakefield, in Mr. Apland's absence, was contacted by telephone and was made aware of these concentrations. Mr. Wakefield stated that he did not know from whence these radioactive materials were coming but that he would make the above information known to Mr. Apland and would initiate an investigation to ascertain the cause of such concentrations in water which had been believed to be nearly free from radioactive materials.

In view of the above and the information contained in the subject report, this office recommends that DLR:

 Contact Mr. <sup>N</sup>. K. Banks, President, Texas-Zinc Minerals Corporation, 1129 Colorado Avenue, Grand Junction, Colorado, and inform him of the above-mentioned items of noncompliance, with a carbon copy to Mr. K. C. Apland, Flant Superintendent, Texas-Zinc Minerals Corporation, Mexican Hat, Utah.

Jan F

- 2. Request information as to what has been done or will be done to correct the above-mentioned items of noncompliance.
- 3. Thank the licenses for the courtesies shown the inspectors during the inspection:

The above-mentioned items of noncompliance will be reviewed during the next follow-up inspection.

Enclosure: Inspection Reports (4 copies) Texas-Zinc Minerals

CC: W. B. Carlson, GJ w/1 cy encl.

## U.S. ATCHIC ENERGY COMM. WASHINGTON, D. C.

1960 AUG 22 AN 11 26

RECEIVED DIVISION OF CONPLIANCE

#### Texas-Zir~ Minerals Corporation

Item 2 (Continued)

÷

Commission, including 10 CFR 20, 'Standards for Protection Against Radiation', except that exemption is hereby granted from Sections 20.205(e)(2) and (f)(2) for areas and containers in the plant, provided that all entrances to the mill shall be con-spicuously posted with a sign or signs bearing the radiation caution symbol and the words: Caution -- Radioactive Material(s). "

Item 6 (Continued)

10 CFR 20.103 Concentrations in effluents to unrestricted areas (b) The licensee was releasing into an unrestricted area liquid effluents containing concentrations of Radium-226 in excess of the limits specified in Appendix B, Table 2 of 10 CFR 20. (Par. 24)

10 CFR 20.202 Personnel Monitoring

(a)(1) The licensee has not made personnel monitoring devices 19 19 doues of radiation in excess of 25 per cent of the limits as specified in Appendix A of 10 CFR 20. (Pars.

10 CFR 20.203 Caution signs, labels, and signals (d)(2) The licensee had not posted entrances to the sampling and crushing plant, in which there exist amounts of uranium in air in excess of the limits specified in Appendix E, Table 1, Column 1 of 10 CFR 20. (Par. 21)

4

### Texas-Eine Minerals Corporation

9. An initial, routine inspection of the uranium ore processing mill owned by Texas-Zine Minerals Corporation, Mexican Hat, Utah, was conducted on April 5, 1998, by Donald I. Walker, Director. Division of Licensee Inspection. ID. Accompanying Dr. Walker were L. C. Brown. Division of Source Material Procurement, GJ, and Calvin Sudwocks, Sanitary Engineer, Utah State Health Department. Mill personnel contacted were K. C. Apland, Plant Superintendent, and M. U. Cakes, Personnel Director. During this inspection, the following items of noncompliance were noted and subsequently reported:

10 CFR 20.201 Shaveys

- b) The licensee had not conducted a survey to determine the possible existence of hazaris incident to the processing of uranium ore.
- 10 CFR 20.205 Caution signs. labels. and signals e)(2) Areas containing assounts of uranium in excess of specified limits have not been posted.
  - (f)(2) Containers having amounts of uranium in excess of specified limits have not been marked.
- 10 CFR 20.207 Storage of licensed material No precautions have been instituted by the licensee to prevent the removal of stockpiled uranium.
- 10. Correspondence from DIR to the licensee dated July 28, 1958, indicated the deficiencies in the licensee's program which are listed above, and requested information concerning corrective action. In a letter dated September 10, 1938. Mr. K. C. Apland, Plant Superintendent, replied to DIR. In this letter Mr. Apland stated that a survey program had been established for the determination of radiation levels. airborne activity, and concentrations of radioactive materials in effluents. In a letter dated September 18, 1958, DLR requested additional information as to what would be done with regard to the remaining items of noncompliance. This information was furnished to DLR in report form dated September 22, 1958, with a supplement to the report being submitted on January 13, 1939, and a correction to the supplement being submitted on January 20, 1959. This report in general, stated that the items of noncompliance had been or would be corrected. A reply to this report was sent to Texas-Zine by DLR on December 3, 1958, in which DLR acknowledged receipt of the above-mentioned report, and included a license renewal and exemptions from 10 CFR 20.205(e)(2) and f) 2). Copies of correspondence directly connected with the initial inspection are attached as Appendix A.
- 11. On the basis of the above-mentioned items of noncompliance, it was decided by this office that a follow-up inspection would be conducted. The follow-up inspection was conducted in two parts: the first part by W. B. Johnston, Inspector, Division of Licensee Inspection, Idaho Operations Office, on May 19, 1959, and the second part by C. A. Hawley, Jr. Inspector, Division of Licensee Inspection, Idaho Operations Office, on April 25-28, 1960.
- 12. During his portion of the follow-up inspection, Mr. Johnston was accompanied by Burt Minn. Division of Source Material Procurement, Grand Junction Operations Office. Mill personnel contacted were:

1

Texas-Zine Minerals Corporation

Mr. K. C. Apland, Mill Superintendent Mr. M. U. Onkes, Personnel Director Dr. M. L. Freyberger, Chief Metallurgist Mr. R. H. Maurice, Chief Chemist Mr. R. E. Wakefield, Metallurgist

According to Mr. Aplend, Mr. Wakefield was responsible for the mill's radiation safety program. During this portion of the follow-up inspection, Mr. Johnston noted that a survey program to determine the hazards incident to the processing of uranium ore had been instituted but that no effluent analyses had been made. These items are discussed in detail in Paragraphs 14 through 25 below.

13. A team, representing the Division of Licensee Inspection. Idaho Operations Office, and consisting of R. T. Kant, Division of Licensee Inspection, ID, George Ball, Health and Safety Division, ID, and W. W. Peery, Division of Inspection, OR, collected air and water samples in and around the Texas-Zinc mill on August 24-28, 1959. One hundred and seventy-seven 177) general air dust samples were collected. Analysis of the samples by the Analysis Branch, Health and Safety Division, ID, showed the atmosphere in three areas to contain in excess of  $5 \ge 10^{-11} \ \mu c/ml$  of uranium, with the highest being 14  $\ge 10^{-11} \ \mu c/ml$ . Ten breathing zone samples were collected; three were found to be above  $5 \ge 10^{-11} \mu c/ml$ of uranium, with the highest being 92  $\ge 10^{-11} \mu c/ml$ . Six liquid effluent samples were collected and analyzed for radium and thorium. A sample was collected at the point where the tailings pond effluent flows beneath the highway, and analysis of this sample showed that the Radium-226 concentration was  $90 \pm 1.5 \times 10^{-9} \,\mu\text{c/ml}$ , and that the Thorium-230 concentration was 1283  $\times 10^{-9} \,\mu\text{c/ml}$ . At a point in the effluent stream 25 feet prior to dumping into the San Juan River, a sample was taken and the analysis of this sample showed the concentration of Radius-226 to be  $13 \pm 17 \times 10^{-9} \,\mu e/ml$ , and the concentration of Thorium-230 to be 3053 x  $10^{-8} \,\mu\text{c/ml}$ . The sampling team conducted a radiation survey and found the radiation level in three areas to be 5 mr/hr beta-gamma or above. These areas were as follows:

a. Yellow cake spots on floor of yellow cake area. - 5 mr/hr, B-,

b. Pit beneath yellow cake drum filling area - 19 mm/hr, 8-7

c. South end of yollow cake drier - 15 mm/hr, B-y

Copies of the above results were forwarded to Inspection Headquarters on February 12, 1960, and to K. C. Apland on February 15, 1960. A copy of these results is attached as Appendix B.

14. A film badge program was instituted by ID, Division of Licensee Inspection, at the Texas-Zine mill on September 5, 1939, and was completed on December 26, 1939. Results of this program were forwarded to Inspection Headquarters on March 18, 1960, and to Mr. K. C. Apland on February 13, 1960. These results indicated that only one yellow cake operator had received a dose in excess of 23 per cent of the limits specified by 10 CFR 20. Appendix A.

- 3 -

#### Texas-Sine Minerals Corporation

- 15. On Murch 25, 1960, Mr. K. C. Apland wrote to Donald I. Walker, Director, Division of Licensee Inspection, ID, and informed Dr. Walker that the results of ID's film badging program had been received. Mr. Apland stated in this letter that all the Texas-Zine mill personnel, with the exception of the yellow cake operator, had received apparent exposures well below the limits specified in Appendix A of 10 CFR 20. This was discussed with Mr. Wakefield at the time of the second portion of the follow-up inspection, and Mr. Wakefield was informed that the fullure of the licensee to provide the yellow cake operators with personnel monitoring devices constituted a violation of 10 CFR 20.202 a)(1).
- 16. On December 9, 1999, W. W. Peery, Division of Inspection, CR. checked the survey records of the Texas-Zino mill. These same records were excained by the inspector during the portion of the follow-up inspection which was conducted on April 23-28, 1960.
- 17. The remainder of this report is concerned with the second part of the follow-up inspection, the part which was conducted on April 25-28, 1960. This part of the follow-up inspection was conducted by Clyde A. Nawley. Jr., Inspector, Division of Licensee Inspection, ID. who was accompanied by R. T. Kant, and W. C. Pierce, Inspectors. Division of Licensee Inspection. ID, and Dr. Grant Winn. Utah State Public Health Department. Mill personnel contacted ware K. C. Apland, Plant Super-intendent and R. E. Wakefield who, according to Mr. Wakefield, replaced Dr. W. L. Freyberger as Chief Metallurgist.
- 18. After the initial inspection, the licensee was cited for his failure to conduct surveys to determine hazards incident to the processing of uranium ore. The licensee, according to the letter to DIR dated September 10. 1958, had began such surveys. It was noted by Mr. Johnston and later by Mr. Peery that the air sampling methods employed by the Licensee were not adequate. According to Mesers. Johnston and Peery, the licensee utilized a hand-operated air sampler which allegedly pulled one liter of air per strake through a millipore filter. The samples thus obtained, noted Mr. Johnston, were read with a Juno survey instrument.) It can be noted, in the reports from the licensee to DIR. that until April of 1939 the licensee had been reporting analytical results for rodium and radon concentrations in air. In the rep of from the licensee to DLR dated September 22, 1958, uranium concentrations in air were also reported. The correspondence from the licensee to DLR indicates that in April, 1939, they started confining their air sample analyses to the determination of uranium concentrations in air and at about that time adopted a fluorimetric method of analysis. A copy of the licensee's fluorimetric procedure is attached as Appendix C. It can also be noted in the above-mentioned reports that the licensee began in August of 1959 to utilize an electric rather than a hand-powered air pump to collect air samples. Mr. Wakefield stated to the inspectors that the method used to transport the suples from the sampled area to the analytical laboratory was to place the fresh sample in a preclemed berker, cover the beaker with Seran wrep, and carry the sample to the lab for analysis. In the lab, said Mr. Wakefield, the anaple is dissolved in this some besker.
- 19. The inspector reviewed records of external rediation surveys which Mr. Wekefield stated had been conducted by the licenses. " see records indicated that there were no areas in the mill in which t re existed rediation fields in excess of 2 mr/hr game and no rediation fields

#### Texas-Zine Minerals Corporation

in the stockpiled ore area in excess of 3 mr/hr gamma. This information is incorporated in the reports from the licensee to DLR. It should be noted in Faragraph 13, above, that the representatives of ID obtained appreciably higher readings by measuring both beta and gamma radiation and by taking contact readings, which the licensee had not been doing. The licensee took readings, according to Mr. Wakefield, at waist heights in areas where people were likely to be. The inspector noted that the licensee possessed a Frecision Radiation Instrument, Inc., Model 111-8 scintillometer, with ranges of 0 = .025, 0 = .05, 0 = .25, 0 = .5, 0 = 2.5, and 0 = 5.0 mr/hr. This instrument was checked by the inspector and was found to be in operable condition.

20. The inspector reviewed the records which, according to Mr. Wakefield, were the original sample data sheets from which the third quarterly report of 1959 was compiled. It can be noted in the third guarterly report, which was sent from the licensee to DLR, that the licensee's airborne radioactivity surveys showed the yellow cake area to be the only area in the mill in which there existed uranium in air in quantities greater than 5 x  $10^{-11}~\mu c/ml$ . Mr. Wakefield stated that the mill personnel worked a 40-hour workweek. The inspector found that the licensee's original data correlated with the data as published in the 1939 third quarterly report. As can be seen from the report, the licensee maintains that the yellow cake area averages about 10 x 10-11 µc/ml of uranium in air. The inspector collected spotcheck samples in the yellow cake area, sample bucking room, and sampling plant. Analyses of these samples showed an average of  $2.2 \times 10^{-11} \,\mu\text{c/ml}$  of uranium in the air of the sample plant and an average of  $4.9 \times 10^{-11} \,\mu\text{c/ml}$  of uranium in the air of the yellow cake area while yellow cake was being dried intermittently. A sequential sampler was used by the inspector to collect sequential one-hour samples in the yellow cake area; however, throughout the majority of the 12 hours of sampling, the yellow cake drying and barreling facility was shut down. A compilation of the results of the spot sampling is attached as Appendix D. The inspector asked Mr. Wakefield for information concerning the mill's respirator program. Mr. Wakefield stated that there was no real control of the program. He stated that respirators are issued to the mill personnel, fresh filters are made available, and the licensee's control ends there. Mr. Wakefield was informed by the inspector that the licensee's airborne activity data, reported to DLR in quarterly reports and corroborated by the data collected by ID, indicated that some of the mill personnel were being exposed to airborne radioactive material in average concentrations in excess of the limits specified in Appendix B, Table 1, of 10 CFR 20; and, therefore, the licensee was in violation of 10 CFR 20.101(b). The licensee's sirborne data for the fourth quarter of 1959 and the first quarter of 1960 were forwarded by the office to the Division of Compliance on July 21, 1960.

Lmp

21. During the initial inspection, it was noted by the inspector that areas containing amounts of uranium in excess of specified limits had not been posted. The inspector found that all entrances to the mill building had been posted with signs, each being in magents on yellow background, bearing the redistion symbol and the words "Caution -Radioactive Materials". In addition to these, the inspector noted that the access doors to the yellow cake area had been posted with signs, each bearing in magents on yellow background the redistion

#### Texas-Zinc Minerals Corporation

symbol and the words "Caution - Airborne Radioactivity Area" (Photographs 1 and 2, Appendix E). The inspector noted that none of the doors of the sample plant had been posted with warning signs of any type. According to the airborne survey date of the licensee and ID, the crushing and sampling plant, in some cases, contains airborne concentrations of uranium in excess of the arounts specified in Appendix B, Table 1, Column 1 of 10 CFR 20. Mr. Wakefield was informed that failure to post such areas of the grushing and sampling plant constituted a violation of 10 CFR 20.203 (d) 2). Mr. Wakefield assured the inspector that the doors of the crushing and ampling plant would be posted with warning signs.

- 22. During the initial inspection, it was noted by the inspector that containers having amounts of uranium in excess of specified limits had not been posted. In letter No. 40-1376 from DIR to the licensee. 6k. dated December 31, 1959, the licensee was granted exemptions to 20.205 (e) (2) and f)(2), provided that all entrances to the mill should be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words 'Caution Radioactive Materials'.
- 23. During the initial inspection it was noted by the inspector that no precautions had been instituted by the licensee to prevent the removal of stockpiled uranium ore. It was also noted and reported by the inspector that the drisss of final product were secured against unsuthorized removal. In a section of the report from the licensee to DIA dated January 13, 1939, the licensee gave five reasons see Appendix A) why the stochpiled ore area should be considered as a restricted area. The report also indicated that the licensee had taken precautions against the unsuthorized removal of the ore. There has been, to the writer's knowledge, no comment from DIR on this item of noncompliance. During the follow-up inspection, the inspector noted that the ore stockpile area had been posted with signs, each bearing in magenta on yellow background the radiation symbol and the words "Caution - Radioactive Materials" see Photograph 3). The inspector noted that these signs had been posted around the outside perimeter of the stockpile area. The inspector noted that there was no fence around this area.
- 24. The inspector, accompanied by Mr. Makefield, toured the tailings pond area. It was noted by the inspector that there are actually two tailings ponds, one being on a higher level than the other. Currently, according to Mr. Wakefield, the total liquid effluent from the mill. including the raffinate, is at least in part finding its way to the lower tailings pond. The inspector noted that the lower pond is still being built up. The inspector also noted that the tailings from the milling process are piped out to the outside perimeters of the lower tailings pond where the tailings are forced through small cyclones see Photograph 4). These cyclones separate the liquids from the slimes. The liquids are directed in toward the center of the lower pond while the near-solid alines are directed to the out. side of the lover pond wall. These slipes build up and actually form the retaining wall or dike which contains the liquids in the lower pond. The cyclones are nounted on stilts in such a manner that they may be elevated as the solids build up to them. The inspector noted that warning signs had been posted pround the outside perimeter of the tailings ponds area see Photograph 5). The inspector estimated 15 to 20 gallons per minute to be flowing directly from or from beneath

#### Texas-Zinc Minerals Corporation

below?

this built-up dike (see Photograph 6). Mr. Wakefield stated that this liquid effluent flowed down a normally dry watercourse which eventually opened into the San Juan River at a point approximately one mile (above ) Mexican Hat, Utah. Incidentally, the pumping plant, from which the Texas-Zinc facilities receive both their milling and domestic water, is located at Mexican Hat, Utah. This water, according to Mr. Wakefield, is processed before domestic use and is routinely analyzed for radioactive materials. The watercourse, which carries the leaking effluent, enters the river on the same side of the river as the pumping plant is located. Mr. Wakefield stated that he estimated the flow down this watercourse to be 10 to 15 gallons per minute and also that he thought the water was absorbed into the ground within a short distance. The inspector followed the liquid effluent downstream for approximately one mile and noticed no diminution of flow. This effluent was sampled by the inspector and the analytical results are as follows:

Redium-226 - 330 ± 4 x 10" µc/ml

Thorium-230 - 30 ± 1.5 x 10-8 uc/ml

At the time of the inspection, the inspector noted that there was a break in the upper gond dike which allowed liquid effluents to run from the upper pond into the lower pond. Mr. Wakefield explained that this is a temporary expedient to assure that the level of the liquids in the upper yond did not become to high. Mr. Wakefield showed the inspector the pump which, according to Mr. Wakefield, was used to pump the liquids, after the solids had settled out, from the upper pond through an underground pipe to the effluent release point (see Photograph 7). Mr. Wakefield said that 500-900 gallons per minute of effluent flows through this pipe. The release point is the end of the underground effluent pipe which is approximately one-half mile from the mill area. The liquid effluent drops from the end of the pipe and falls for about 20 feet into a steep-sided canyon (see Photograph 8). This canyon carries the liquid effluent for about two miles, at which time it empties into the San Juan River. The liquid effluent was sampled at the release point and the results of the analyses of these samples are as follows:

> Redium-226 - 190 ± 5 x 10<sup>-0</sup> µc/ml Thorium-230 - 180; ± 1k x 10<sup>-0</sup> µc/ml

The inspector also sampled some water running into the above-mentioned canyon which was not coming from the liquid effluent pipe (see Photograph 9). Mr. Wakefield stated that this water was used to blow down the boilers in the sulfuric acid plant and to clean the pregnant liquor filters. The analysis of this water showed the following:

> Radium-226 -  $5000 \pm 1 \times 10^{-9} \, \mu c/ml$ Thorium-230 - 535  $\pm 7 \times 10^{-8} \, \mu c/ml$

A copy of the above-mentioned analytical results are attached as Appendix D. These results were made known to Messrs. Wakefield and

- 7 -

#### Texas-Sinc Minerals Corporation

Apland by telephone. At the time of the inspection, Mr. Apland and Mr. "akefield were informed by the inspector that a citation for the violation of 10 CFR 20.105(b) would be recommended.

25. Mr. Wakefield stated that effluent samples had in the past been sent to National Spectographic Laboratories and Tracerlab, Incorporated, for analysis, and in neither case have the Texas-Zinc mill personnel felt the analyses to be dependable. Mr. Wakefield stated to the inspector that the last effluent samples had been sent to Radiation Detection Company, 4047-49 Transport Street Palo Alto. California He also stated that the mill's effluent samples will henceforth be analyzed by this company. Mr. Makefield exhibited a record of the results of the analyses for radium and thorium which was duted March 18. 1960. The results, copied verbatim from the report, are na follows:

	Re226 a activity
Arena Sampled	10/121 x 10-0
Potable water, bunkhouse	Blagd .
Upstreen river weter	0.9
Degritter overflow	1.2
Tails poud eff uent	1.00
Raffinate	121
Neutralized raffinate	15
Downstreem river, 1/2 mile	2.9

	Total Th <sup>R30</sup> a activity
Areas Sampled	µc/ml x 10 <sup>-8</sup>
Upstream river water	Bkgd .
Tails pond offluent	1400
Downstream river. 1/2 mile	Bked .

\_\_\_\_\_uc/ml x 10"B Bkgd. 1400 Bkgal

It was noted by the inspector that the analysis report from Radiation Detection Company states, These analyses were made according to the method described. 'Determination of Radium-226 and Thorium in mill Effluents'. U. S. Atomic Emergy Commission. Idaho Operations Office. Idaho Falls, Idaho.

26. The inspector was conducted on a tour of the sample plant by Mr. Dick Pehrson, Sumple Flant Foreman. Mr. Pehrson stated that plans have been mode to install several water sprays in the crushing and scepling plant. He stated that a water spray is to be installed in the bottom of the ore hopper. He also stated that this water spray will be electronically activated from the Michigan loader which is used to convey the are from the stockpiles to the hopper. The inspector noted that each time the Michigan loader operator dropped a load of ore into the hopper a cloud of dust crose. Mr. Pehrson stated that the jaw crusher. which is located beneath the cre hopper. was to have a constant water spray installed. The materials for these two spray installations have been ordered, according to Mr. Pehrson. He stated that the ore hopper area is entered only during shutdowns. The inspector noted that a spray pipe had been installed at the upper downstream) end of the Number 1 conveyor belt from the jaw crusher and that this spray was turned off. Mr. Pehrson stated that this spray was not being used because it was monually operated and when the conveyor belt stopped the sprayer scaked the ore and made a mess.

#### Texas-Zine Minerals Corporation

Mr. Pehrson temporarily turned on this spray see Photograph 10). Mr Pehrson stated that a conveyor belt-operated flow controlling valve was on order. A spray unit will be installed under the threefoot cone crusher in the bottom of the sample plant, according to Mr. Pehrson. The inspector noted that a spray unit had been installed at the end point of the conveyor belt from the three-foot cone crusher, but that it had not been connected with a water supply see Photograph 11).

- 27. The inspector noted a water truck which was spraying the ore receiving area. Mr. Pehrson stated that this area was sprayed each day when dusty conditions prevailed.
- 28. During a tour of the crushing and sampling plant, Mr. Pehrson pointed out to the inspector some modifications in the bucking room, which is in the crushing and sampling plant building. Mr. Pehrson stated that these modifications were necessary because dust from the sample plant was entering the bucking room. Mr. Pehrson stated that rubber stripping had been installed around the door between the sampling area and the bucking room (see Photograph 12), and that an air conditioning system had been installed in the bucking room see Photograph 13). Mr. Pehrson stated that these actions had materially reduced the airborne dust concentrations in the bucking room.
- 29. During a tour of the mill. Mr. Wakefield explained the workings of the copper leach circuit to the imspector. Mr. Wakefield stated that copper concentrate is a byproduct incident to the U O production. Mr. Wakefield pointed out and explained the exhaust affeten of the copper leach circuit. Mr. Wakefield stated that the copper leach process produces H<sub>p</sub>S which is vented to the outside through a venting system separate from that of the remainder of the mill. He further stated that the off-gas from the uranius leach circuit would soon also be vented through this system.

2.19

- 30. According to Mr. Makefield, about 300 tons per month of the copper concentrate is shipped to American Smelting and Refining Company, El Paso, Texas. Mr. Wakefield stated that analysis had shown that there was less than 0.05 per cent uranium in the copper concentrate. The inspector surveyed the concentrate produced radiation fields and found the maximum reading at contact with the concentrate to be 2 mr/hr bets gamma see Photograph 14). A radiation survey by the inspector throughout the copper circuit revealed no radiation level in excess of 1 mr/hr.
- 31. The inspector noted that there were several rusty 50-gallon drums in an area in the mill building. When asked about the purpose of these barrals, Mr. Wakefield stated that they had been received from Layton Brothers, Grand Junction, Colorado. Mr. Wakefield stated that this company reclaims the yellow sake from shipping containers by sandblasting. The sand and reclaimed yellow cake are then shipped to the mill where the material is run through the will circuit. Layton Brothers are licensed for this work under License No. C-4653. Mr. Wakefield stated that a shipment of 15 to 20 barrels of the sand and yellow cake mixture is received about once every six months and that the mixture contains two to three per cent yellow cake. The barrels were checked for radiation by the inspector and it was found that there were no readings, at contact with the material, in excess of 1 mr/hr  $\beta_{-7}$ . Mr. Wakefield stated that these drums are always stored inside the mill building see Photograph 15).

L

- 9 -

#### Texns-Zine Minerels Corporation

- 52. The inspector noted that since the time of the initial inspection, an additional rotoclone had been installed in the yellow cake area see Photograph 16). According to Mr. Mekefield, this machine draws the air from the inside of the Proctor-Schwartz drier, passes the air through the rotoclone, and wents the air through a stack through the roof of the mill building. The inspector noted that this rotoclone was operating at the time of the inspection. Mr. Makefield stated that a vibrator, which would be used to compact the yellow cake in the shipping containers, was on order. Currently, the yellow calm operator beats on the outside of the drum with a rubber hanner in order to settle the yellow cake into the drum, according to Mr. Whitefield. Mr. Wakefield said that he felt that this 'beating' added materially to the amount of a rborne radioactivity in the yellow cake area and that the use of the vibrator should appreciably reduce the concentrations of airborne activity. After the vibrator is in use, stated Mr. Makefield, extensive air sampling will be conducted in the area, and, if the concentrations of airborne radioactive material are still in excess of MPC, the entire yellow cake drum loading area will be enclosed in a vented cabinet.
- 33. Mr. Wakefield exhibited to the inspector a record of the proceedings of the mill's operating staff conference of April 20, 1960. Following is an excerpt from the memorandum: "C. P.", Clyde Partin, Mill Poreman) E. A. T.", (E. A. Tyler, Mn'stemance Foreman) " and R. E. W." Roger E. Wakefield, Chief Metallurgist) 'will investigate what can be done concerning the dust hazard around the cample plant and particularly the product section of the mill. The following points are being checked:
  - a. A drum vibrator will be installed in the product section after which R. E. W. will take samples for rediction. If the samples are still above MAC, a hood will be installed in this area.
  - b. E. A. T. will continue work on a dust suppression system for the sample plant."
- 34. The inspector net with K. C. Apland and R. D. Wakefield at the close of the inspection. During this meeting the items of noncompliance which had been noted by the inspector were made known to Mr. Apland. Mr. Apland quaried the inspector concerning the information which should be included in a request for an exemption to 10 CFR 20.103 b). The inspector, in general, informed Mr. Apland that any and all pertinent information would be of value in helping DLR decide if such an examption could or would be greated. Mr. Apland stated, during this meeting, that the analysis of liquid effluents which the inspector had collected would not give a true picture of the amount of activity which the mill would in the future release. Mr. Apland stated that all the liquid tailings, after the solids had settled out, would be pumped back into the mill and run through a system for reclaining copper. In addition to this, Mr. Apland stated that some unneutralized raffinate was being released but that this was not a common occurrence. Mr. Apland stated that when the mentralization system storts working properly, no unneutralized raffinate will be released to the tailings ponds. Mr. Apland stated that COO - 700 enllons per minute of clean water will be pumped into the effluent line. During this meet ng. Mr. Apland assured the inspector that the doore of the crushing and sampling plant would be posted. During this meeting. Mr. Apland also assured the inspector that he would decide what should be done about procuring personnel monitoring devices for his yellow cake operators