Form AEC-417 (4-48)

UNITED STATES ATOMIC ENERGY COMMISSION

COMPLIANCE INSPECTION REPORT

1. Name and address of licensee	2. Date of inspection
Wah Chang Corporation Albany, Oregon Attention: Mr. Stephen Yih	October 16, 1958
	3. Type of inspection Follow-up
	4. 10 CFR Part(s) applicable Parts 20 and 40

5. License number(s), issue and expiration dates, scope and conditions (including amendments)
C-3966 Jan. 23, 1958 Jan. 31, 1959

6. Inspection findings (and items of noncompliance)
Deficiencies noted in the last previous inspection were found to have been corrected as indicated below:

1. No surveys were made of air contamination (see Section 20.201)

   An air sampler had been purchased and a survey of air contamination had been made.

2. The storage room containing the bulk of the thorium oxide was not posted as required by Section 20.203(b)

   The storage room was found to be posted with the yellow and magenta radiation symbol and warning sign.

3. The room containing the six electric induction furnaces was not posted as required by Section 20.203(e)(2).

   The area of the building containing the electric induction furnaces was found to have the yellow and magenta symbol and radiation caution signs conspicuously posted.

(continued)

7. Date of last previous inspection	8. Is "Company Confidential" information contained in this report? Yes ☐ No ☒ (Specify page(s) and paragraph(s))
March 27, 1958	

DISTRIBUTION:
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Arthur Brunsted
Arthur Brunsted (Inspector)

Approved by: Carl N. Langer
Carl N. Langer, Director
Inspection Division
Hanford Operations Office (Operations office)

November 17, 1958 (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.

16—73714-5 U. S. GOVERNMENT PRINTING OFFICE

RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

Form AEC-617
(6-57)

UNITED STATES ATOMIC ENERGY COMMISSION

COMPLIANCE INSPECTION REPORT

1. Name and address of licensee or permit holder

Weh Chang Corporation
Albany, Oregon

2. Date of inspection

March 7th, 1958

3. Type of inspection

Initial

4. 10 CFR part(s) applicable

Parts 20 and 40

5. License (or permit) number(s) and expiration date(s), scope and conditions;

Number	Date	Exp. date
C-3966	1-23-58	1-31-59

Scope: Thorium Oxide, 2500 pounds per was as an analytical reagent and in the manufacture of thoriated tungsten wire and columbite and tantalum metal.

Conditions; #1-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, withis the limits of his license. #2-is a condition of this license, you are required to maintain records of your inventories, receipts and transfers of refined source material. #3-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 Commission, including 10 CFR-20, "Standards for Protection Against Radiation." #4-Neither this license nor any right under this license shall be assigned or otherwise transferred in iolation of the provisions of the Atomic Energy Act of 1954.

6. Inspection findings and items of noncompliance;

The licensee is using powdered thorium oxide solely as a refractory (liner) in the electric induction vacuum furnace used in the manufactu of columbium metal. A layer of this material (ca. 160 pounds) is loaded into each furnace and may not have to be removed until it becomes necessary to tear the furnace down for parts replacement. Impure columbium pellets (CbO_2 and CbC) are loaded into the tungsten crucible. After the load is baked at 2000° C for a period of time the pure columbium metal is removed. It would appear that the highest personnal dose rates are obtained at the time the furnaces are loaded with ThO_2. Experience at the Glen Cove, New York plant indicated that operators loading the furnaces at that plant received 20 mr/week. Surveys made by Mr. Jones, assistant manager of manufacturing, (see paragraph No. 13 "Details") indicated operators would be exposed to hand dose rates of about 8 mr/hr at the open furnace and about 8 mr/hr over the open storage drum during the loading operation. The whole body dose rate during

(continued)

10. Give date of last previous inspection: HOO has no record of any previous inspection.

11. Is "Company Confidential" information contained in this report? No
(Specify page(s) and paragraph(s))

DISTRIBUTION:
1 - 2 - Division of Inspection, Washington
3 - Inspection Division, HOO

R. J. Woodley
(Inspector)

Approved by: Earl M. Jongeward

Hanford Operations Office
(Operations office)

April 16, 1958
(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

U. S. GOVERNMENT PRINTING OFFICE 16—73514-2

6. Inspection findings and items of noncompliance (continued):

this operation would be less than 2 mr/hr. Although personnel are not receiving 25% of their permissible weekly exposure, Mr. Stephen Yih, plant manager, plans to start using film badges for the legal protection of the plant. There are now about 1213 lbs of ThO_2 in storage in steel drums located in a steel cabinet in a small storeroom in the plant. The dose rate at the surface (over a large area) of this cabinet is 7.5 mr/hr. This cabinet is posted with a sign reading "Danger Radioactive". The furnaces are operated under a vacuum produced by two pumps in series which vent into the room proper. Although GM instrument readings have indicated negative results when the end of the vent line was surveyed during furnace operation, the airborne contamination status has never been evaluated. The licensee plans to evaluate the airborne radiation status within the next month. Additional piping has been ordered and Mr. Jones plans to extent these lines outside sometime in April 1958. The only items of noncompliance observed or otherwise noted are as set out below:

10-CFR-20.201 - Surveys

No surveys of airborne radiation have been conducted. These furnaces are heated to 2000° C and vented to a room where personnel are working 40 hours per week.

10-CFR-20.203 - Caution Signs, Labels, and Signals

(b) - Radiation area not posted. See paragraphs 11 and 16 of report.
(e)(2) - Room in which 4 furnaces containing 656 lbs of ThO_2 is located is not posted.
(f)(2) - Each of the furnaces holding about 160 lbs each of ThO_2 is not posted.

DETAILS

9. R. T. Woolsey of the Hanford Operations Office, accompanied by Messrs. David Wagstaff and William Applegate, industrial hygienist and industrial hygiene engineer, respectively, of the Oregon State Board of Health, visited the Wah Chang Administrative Building in West Albany and the Columbium Processing Plant in North Albany on March 27, 1958. The inspection party met Mr. Stephen Yih, General Manager of the Albany Branch and Mr. Bob Jones, Assistant Manager of Manufacturing, in the Administration Building. After discussing the license and reviewing Title 10-CFR-20, the inspection party spent the remainder of the day inspecting the columbium processing building plant with Mr. Bob Jones. Mr. Bill Walker, Personnel Manager (duties include safety engineering) was also present during the inspection.

Organization and Procedures

10. Thorium oxide is being used as a furnace liner at the North Albany (Wah Chang owned) Columbium plant because of its very desirable insulating characteristics and high melting point. This material is not being used in any other manner. There are six electric induction furnaces at the Albany plant. Four of these are now in operation producing Columbium metal. After the ThO_2 is calcined to remove the H_2O SO_3 etc, about 160 pounds of ThO_2 (in the form of a white powder) was added to each of these furnaces (see attached sketch). The source material was transferred manually from a steel drum to the furnace by an operator using a hand trowel. The first furnace was placed in operation about July 1957, using ThO_2 procured under the license assigned to the Wah Chang plant at Glen Cove, Long Island, New York. (License No. D-607). It has not been necessary, to date, to tear a furnace down.

Radiological Safety Procedures and Precautions

11. About 1200 pounds of ThO_2 is being stored in steel drums (3 and 5 gallon sizes) inside a steel cabinet in one of the adjoining rooms. This cabinet is padlocked. No radiation surveys had been made to date of this storage facility. Mr. Jones measured the activity at the surface of the steel door in the presence of the inspector and found a dose rate of 7½ mr/hr. (Oremaster Super Geiger Counter, White Electronics, Sweet Home, Oregon, ranges .2, 2, 20 mr/hr). This area is used for storage purposes. The steel cabinet is presently posted with a regulation sign reading "Danger Radioactive". This precautionary measure does not comply with the specification in 20.203(b). At present, personnel could theoretically receive a dose of 7.5 mr in any hour or 300 mr in any five consecutive days (7.5 x 40). Either the entire room should be posted as a radiation area or a portion of this room should be established as a radiation area in such a manner that personnel in the remainder of this room could not receive a dose in excess of 150 mr in any five consecutive days. Mr. Jones agreed to comply.

12. About 656 pounds of ThO_2 has been placed in four furnaces. Mr. Jones stated that personnel loading the furnaces wear rubber gloves, coveralls and respirators. The respirators are manufactured by the American Optical Company (model 503) and contain their R-57 model cartridge which is intended for dust particles. Mr. Jones stated the experience at the Glen Cove plant had indicated that a man engaged full-time at loading furnaces had received 80 mr/wk (measured with pencil dosimeters). The cover of one of the loaded furnaces was removed and a dose rate of 8 mr/hr was measured at a distance of about ten inches with the gamma window open. This distance is about the closest approach the hand makes in filling the annulus of the furnace. The maximum dose rate through the side of the furnace was 0.75 mr/hr. This would be the maximum whole body dose rate experienced by an operator filling a furnace.

13. A top was removed from one of the 12' diameter, 5-gallon steel drums containing ThO_2 and the following measurements obtained:

At 4" from the surface of ThO_2 - 6½ mr/hr, window closed, gamma only
8 mr/hr, window open, beta and gamma

Maximum dose rate through the side of the drum at contact - 8 mr/hr; at 18" - 2 mr/hr.

The inspector asked Mr. Jones how he calibrated this instrument. He stated he had never formally calibrated the instrument but he had been getting fairly consistent readings ever since he procured the instrument. Mr. Walker stated he would procure a calibration source for this instrument.

Although it is very apparent that personnel are receiving considerably less than 25% of the permissible weekly dose, Mr. Jones stated the company plans to begin using film badge dosimeters within the next month, chiefly for the legal protection of the firm.

14. These furnaces all operate under low vacuum produced by an oil diffusion pump and a Kinney mechanical pump in series. The licensee has not made any measurements relative to flow rate through this system. The reactant pellets are chemically in the form of $ThCl_4$ - ThO_2. The furnace operating at a temperature of 2000° C reduces these pellets to pure columbium and produces some CO which must be vented off. Mr. Jones stated ThO_2 has no measurable vapor pressure at 2000° C. (38th Edition Handbook of Chemistry and Physics, page 614, ThO_2 - melting point 3050° C). All of the furnaces are vented directly into the furnace room at present. Mr. Jones stated their plans call for running these lines outside sometime in April. He is aware that the airborne contamination status in this building is in question and plans to have a study completed within the next month.

15. Mr. Jones stated that all coveralls sent out for laundering are first checked with the GM meter. No detectable contamination has been found to date. He also stated he had checked the purified columbium metal with the GM meter and found no detectable contamination.

Records

16. The following information on receipts of material was given to the inspector orally by Mr. Jones from several of his written records:

Date	Supplier	Pounds
6-26-57	Maywood Chemical Company	150
12-12-57	Transferred from Glen Cove	150
1-1-58	Transferred from Glen Cove	100
1-2-58	Lindau Chemical Company	500
2-1-58	Lindsay Chemical Company	1000
		1900 pounds

All of the material was ordered under license No. D-607 issued to the Wah Chang plant at Glen Cove, New York.

An inventory was made on March 25, 1958 as follows:

1. All material in storage was physically weighed.
2. The sum in item 1 was added to the amounts added to the furnaces during the year as shown in the manufacturing department ledger.

1212.9 lbs - In storage
656.0 lbs - In four columbium plant furnaces
11.0 lbs - In a furnace presently in an Albany warehouse
1879.9 lbs

1900.0 lbs
1879.9 lbs
20.1 lbs (deficit)

The following explanation was given for this deficit by Mr. Jones: All thorium suppliers specify not more than 1% impurities in the form of H_2O, SO_3, etc. Wah Chang's analyses have indicated from 0.5 to 1% impurities. Therefore, the 1.05% loss should be within an acceptable inventory standard.

Posting

16. The large room containing the six electric induction furnaces is not posted in any manner. The latest inventory records show that four of these furnaces contain 656 pounds of Thorium Oxide. This is the main processing room of the Columbium plant. Personnel are working in this room 40 hours per week setting up new process equipment (they plan to produce Tantalum later). The room and each one of the furnaces should be posted "Caution Radioactive Material", in order to comply with section 20.203(a)(2) and (f)(2).

17. The electric furnaces are about 3' in diameter and about 4' high. The dose rate at the surface of the side of the container is 0.75 mr/hr. The radiation level, at the side of each of the furnaces, is 0.75 mr/hr, 60 minutes of each hour, 7 days a week. In five consecutive days the personnal could receive 30 millirem, hence the area need not be posted as a radiation area but must be considered a restricted area since if personnal were continously present they could receive a dose of 126 millirem in 7 consecutive days.

18. The area used to store ThO_2 (presently contains 1213 pounds) should be posted as a Radiation Area (see paragraph 12 for details).

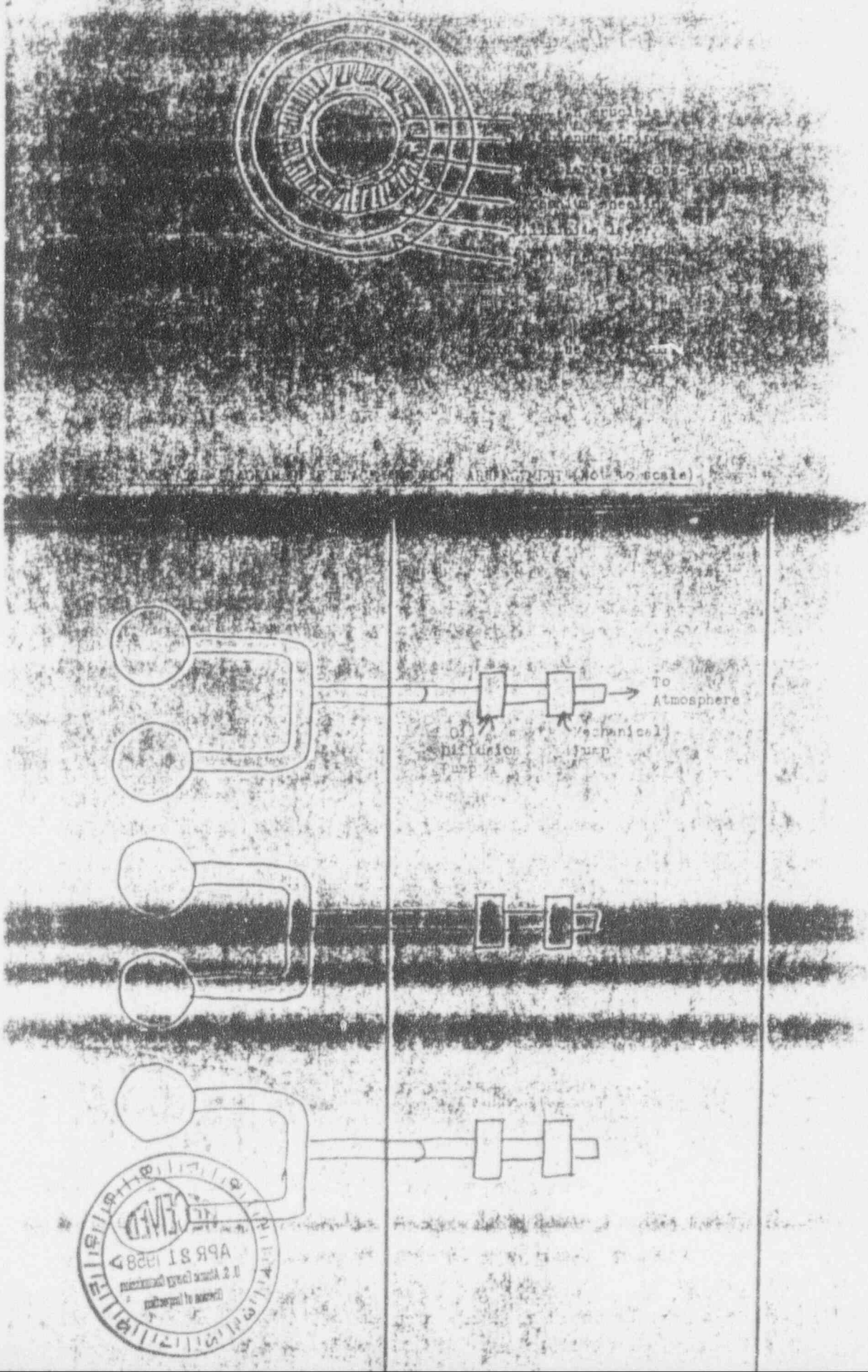
Posting

16. The large room containing the six electric induction furnaces is not posted in any manner. The latest inventory records show that four of these furnaces contain 656 pounds of Thorium Oxide. This is the main processing room of the Columbium plant. Personnel are working in this room 40 hours per week setting up new process equipment (they plan to produce Tantalum later). The room and each one of the furnaces should be posted "Caution Radioactive Material" in order to comply with section 20.203(f)(2) and (f)(3).

17. The electric furnaces are about 3' in diameter and about 4' high. The dose rate at the surface of the side of the container is 0.75 mr/hr. The radiation level, at the side of each of the furnaces, is 0.75 mr/hr, 60 minutes of each hour, 7 days a week. In five consecutive days the personnel could receive 30 millirem, hence the area need not be posted as a radiation area but must be considered a restricted area since if personnel were continously present they could receive a dose of 126 millirem in 7 consecutive days.

18. The area used to store ThO_2 (presently contains 1210 pounds) should be posted as a Radiation Area (see paragraph 12 for details).

SCHEMATIC DIAGRAM OF FURNACE INTERIOR



SCHEMATIC DIAGRAM OF FURNACE INTERIOR