

COMPLIANCE INSPECTION REPORT

1. Name and address of licensee WAH CHANG SMELTING AND REFINING COMPANY 63 Herbill Road Glen Cove, New York	2. Date of inspection August 7, 1961 3. Type of inspection Announced Reinspect 4. 10 CFR Part(s) applicable 20 - 40
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5. License number(s), issue and expiration dates, scope and conditions (including amendments)

License No.	Docket No.	Date	Exp. Date
SMB-135 (Reinspection)	40-943	3/14/61	3/31/64

Scope: Twenty-five hundred (2,500) pounds of source material as an analytical reagent and in the manufacture of thoriated tungsten wire and columbite metal.

Condition: To maintain records showing the receipt, transfer, export and disposal of the above licensed source material in accordance with the provisions of Section 40.61 of 10 CFR.

6. Inspection findings (and items of noncompliance)

The Wah Chang Corporation at Glen Cove New York manufactures thoriated tungsten powder containing 1 - 2% nat. thorium. They then ship the powder to a new plant at Fairlawn, New Jersey where further processing is performed to make thoriated tungsten welding rods and wire. The Fairlawn New Jersey Plant is not licensed to perform processing with source material. Mr. Fong H. Lee, a graduate chemist is the ESO. Facilities are adequate. Film badges were used for a process involving the purification of thorium oxide used as an insulating material in the production of Columbian. This process has been transferred to the Wah Chang factory at Albany, Oregon. No personnel monitoring devices were used in the manufacture of thoriated tungsten powder. Records are maintained of receipt of materials, use, surveys, personnel monitoring and transfers. The only items of noncompliance observed or noted during the course of the inspection are as set out below:

1. 40.3: "License Requirements"
- in that the licensee transferred quantities of thoriated tungsten powder to a separate Wah Chang facility at Fairlawn, New Jersey for processing without authorization. (See items 10 and 11B of report details.)

(copy)

7. Date of last previous inspection May 22, 1957	8. Is "Company Confidential" information contained in this report? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> (Specify page(s) and paragraph(s))
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Approved by: Eugene Epstein (Inspector)
 Robert W. Kirkman, Director
 New York Compliance Area (Operations office)

September 22, 1961
 (Date report prepared)

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RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

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B/S

UNITED STATES ATOMIC ENERGY COMMISSION
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(CONT'D)

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 May 22, 1957

Is Company Confidential information contained in this report? Yes No
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Eugene Epstein
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ITEM 6 (CONT'D)

2. 20.201 "Surveys" *non-compliance, violation, license & compliance*
- (b) - in that the licensee did not make any physical survey or any evaluation of the hazards associated with the processing of thorium nitrate. (See item 13B of report details.)
 - (b) - in that the licensee made no evaluation as to the need for personnel monitoring devices by persons involved in the processing of thorium nitrate. (See item 19 of report details.)
3. 20.203 "Caution signs, labels and signals"
- (b) "Radiation Areas" *Some material storage shed not posted in main*
- in that a radiation area which exists continuously within a storage shed was not posted with a sign reading, "Caution - Radiation Area" (with symbol). (See item 18 of report details.)
 - (e) "Additional Requirements" *Storage shed in induction building*
(2) - in that neither the storage shed containing 1520 pounds of thorium oxide and 312.5 pounds of thorium nitrate nor the storage room in the induction building containing 900 pounds of thorium oxide were posted in accordance with the regulations. (See item 18 of report details.)
5. (f) "Containers"
- (2)(4) - in that a metal container within the storage shed containing 600 pounds of waste thorium oxide and three crucibles within a storage room in the induction building each containing 300 pounds thorium oxide did not have any label reading, "Caution - Radioactive Materials" with symbol or which indicated the kind, quantity and date of assay. (See item 18 of report details.)
7. 20.401 "Records of surveys, radiation monitoring and disposal"
- (b) - in that the licensee did not maintain records of air surveys performed of the thorium oxide process in the units used in the appendices to 10 CFR Part 20. (See item 13B of report details.)

PART 40 INSPECTION

WAH CHANG SMELTING AND REFINING COMPANY
63 Herbill Road
Glen Cove, New York

Date of Inspection: August 7, 1961 (Announced)

Persons Accompanying Inspector:

New York State Department of Labor notified but no representative appeared.

Persons Contacted:

Mr. Allen Lau, Treasurer
Fong H. Lee, Chief Chemist and RSO
Mr. Charles Gow, Plant Manager
James Wong, Assistant Foreman
Mr. A. Murrow, Foreman

DETAILS

9. Background Information

An initial inspection under expired License H-130 was performed on 5/22/57 by Mr. E. H. Engelken of this office, and the items of non-compliance were noted as follows:

- 20.201(b) - in that the licensee did not evaluate or make surveys of the processing of thorium nitrate.
- 20.203(f)(2) - in that the licensee did not label containers.
- 20.206 - in that the licensee did not instruct employees as to radiation hazards.

The initial inspection report was transmitted to Division of Inspection, HQ on 6/3/57 with the recommendation that the licensee be directed to make a survey of their process, particularly a physical survey to include air sampling.

The initial inspection report was forwarded by Division of Inspection, HQ on 6/6/57 to the General Manager with a recommendation that a follow-up inspection be conducted at the conclusion of licensing action.

Division of Civilian Application by letter dated 10/14/57 advised the licensee of the items of noncompliance. The licensee by letter dated 11/4/57 advised Division of Civilian Application that they had corrected the items of noncompliance and started a film badge program. Division of Civilian Application by letter dated 11/14/57 advised the licensee that the items of noncompliance would be reviewed during the next inspection.

No further correspondence follows.

10. Organization and Administration

The Wah Chang Smelting and Refining Company are manufacturers of rare metals. The main offices of the company are at 233 Broadway, New York City. Plants possessing and processing source material are located at 63 Herhill Road, Glen Cove, New York, Albany, Oregon, and at 17-01 Nevins Road, Fairlawn, New Jersey. Since January 1, 1961, the production of Columbium metal has been transferred from Glen Cove, New York to Albany, Oregon. Thorium oxide is used as an insulator in the vacuum furnaces used to produce Columbium. Since November 1, 1960, a portion of the manufacture of tungsten thoriated welding rods has been transferred to the new plant at Fairlawn, New Jersey. The plant at Fairlawn, New Jersey receives 1 - 2% thoriated tungsten powder and processes the powder into welding rods. The plant at Fairlawn, New Jersey does not have a source license according to Miss U. Brady, Division of Compliance Headquarters. License SMB-135 clearly states that the manufacture of thoriated tungsten wire will be performed at Glen Cove, New York. According to License STC-139, issued 4/1/61, the Wah Chang Corporation, Albany Oregon, now a processor of thorium oxide, has authority to only possess 2881 lbs. of source material. Miss U. Brady, Division of Compliance, Headquarters, stated the above license covered storage of material only.

Mr. Pong H. Lee, Chief Chemist, is the RSO. Pong has a BS in Chemistry and has been with the Wah Chang Corporation for twenty years. Pong stated he has studied radiation health safety by reading NBS Handbooks and the Federal Regulations.

11. Facilities and Uses of Source Material

A. Thorium Oxide

Lee stated that on January 1, 1961 the production of Columbium metal was transferred to the Wah Chang Plant at Albany Oregon. The licensee has 2420 pounds of thorium oxide in storage, 900 pounds in three discarded induction furnaces, and 1520 pounds in a storage shed. The thorium oxide had been used as an insulator in induction furnaces used in the production of Columbium metal. The preparation of thorium oxide as an insulating material prior to January 1, 1961 at Glen Cove involved the following steps:

- (1) 150 to 200 pounds of ThO_2 were sintered at 150°C in a carbide induction furnace.
- (2) The sintered material was placed in a jaw crusher.
- (3) Crushed material was then reoxidized in a burn back furnace for 24 hours.
- (4) The purified ThO_2 was then wetted and packed between the crucible and the coils of an induction furnace to act as an insulator. Each furnace required from 280 - 300 pounds of ThO_2 .

B. Thorium Nitrate

Processing of thorium nitrate ($\text{Th}(\text{NO}_3)_4$) takes place in the

reduction building at Glen Cove. Processing is done by a batch process as follows:

- (1) Approximately 40 pounds of thorium nitrate powder is mixed with metallic tungsten powder to create a 1 to 2% mixture of thorium in a mixing tank with a mixing propeller driven by an overhead motor. This mixing is done in the open at the entrance of the reduction building.
- (2) The mixed powder containing from 1 to 2% thorium nitrate is placed in a blender in the separate room in the reduction building. Water is added to create a slurry. The slurry is thoroughly blended for approximately two hours.
- (3) The slurry is placed in ceramic boats about two feet long and 8" wide.
- (4) The boats are automatically fed into a reducing furnace where a thoriated tungsten powder is produced. This process is done in a vacuum in a hydrogen atmosphere. Only furnace #4 is used for thorium. There are 11 furnaces in the reduction building.

Since November 1, 1960, the thoriated tungsten powder produced at Glen Cove is sent to the Wah Chang Plant at Fairlawn, New Jersey where the powder is melted to form billets which are then drawn to create thoriated tungsten welding rods and wire. Lee stated that the rods and wire contain from 1 to 2% thorium, and that prior to November 1, 1960 all work was performed at Glen Cove.

Lee maintained records of the processing of thorium nitrate to thoriated tungsten powder as follows:

1/19/61	34.7 lbs. thorium nitrate
1/30/61	37 lbs. " "
2/8/61	4.8 lbs. " "
2/10/61	37.53 lbs. " "
4/20/61	73.92 lbs. " "
5/26/61	40.69 lbs. " "
6/5/61	40.69 lbs. " "
6/7/61	40.69 lbs. " "
6/10/61	40.69 lbs. " "

Lee has records which show that a total of 312.5 lbs. of thorium nitrate is on hand in storage. The Fairlawn Plant possesses, according to Lee's records 430 Kg of thoriated tungsten welding rods (1 - 2% thorium) which they processed and 1000 lbs. of 1% thorium oxide and 2600 lbs. of 2% thorium oxide shipped from Glen Cove.

12. Instrumentation and Calibration

Lee had an operable Nuclear of Chicago GM survey meter with a range of 0-20 mr/hr. Lee stated he calibrates the instrument against a 1 mg Ra calibration source each time he uses the meter. Lee stated a Nuclear of Chicago binary scaler previously used at Glen Cove to monitor air samples has been sent to Fairlawn, New Jersey.

13. Radiation Safety Precautions and Procedures

A. Instructions

Lee stated that all employees of Wah Chang are orally instructed as to the presence and hazards due to radioactive materials. No printed instructions are issued.

B. Surveys

The licensee in his application of February 20, 1961 stated the following in Paragraph 3:

"At the present time we are using several instruments to check radioactivity. We are using those mentioned above, and in addition a portable Geiger Counter to check radiation wherever material is used or stored. Air samples are checked periodically with a binary laboratory scaler." Lee stated that direct radiation surveys were made and air samples taken during all stages of the purification of thorium oxide. Lee made a record of these surveys in his work book. The results of air sampling were noted as 15 cpm above background. The results of direct radiation surveys were reported in mr/hr. Lee also stated that he never made any direct radiation surveys or took air samples of the processes involving the reduction of thorium nitrate and production of thoriated tungsten wire. No processing of thorium nitrate was in process during the inspection. A direct radiation survey was taken of the storage shed and areas where material was used, using a #5675 NMC thin end window GM survey meter calibrated 7/11/61. The following radiation levels were noted:

The radiation level in the center of the storage shed where 1520 lbs. of thorium oxide, 312.5 lbs. of thorium nitrate and 600 lbs. of thorium oxide residues are stored - 10 mrad/hr.

At the outside walls of the storage shed - 1.0 mr/hr.

At the surface of the mixing tank - 0.025 mr/hr (instrument background).

At the surface of a cupola with 300 lbs. of thorium oxide as an insulating material - 4 mr/hr.

At 12" distance from the surface - 1 mr/hr.

Smear samples of the floor of the storage shed and furnace room were taken as well as air samples. The smear and air samples were analyzed by HASL NY and show the following:

Wipe of 100 cm² storage shed floor = 6×10^{-5} uc/100 cm².
Air sample within storage shed = 2.6×10^{-12} uc/ml.
Wipe of 100 cm² furnace room floor = 6.3×10^{-7} uc/100 cm.
Air sample within the furnace room = 0 uc/ml.

14. Storage and Security of Material

All materials are in storage in the storage shed. The storage shed has a concrete pit three feet deep in which old thorium oxide is stored. The storage shed is locked and only Murrow the foreman has keys. The plant is surrounded by a high chain link fence and the grounds are patrolled by security guards.

15. Procurement Procedures and Control

Mr. Allen Lau, Treasurer, is responsible for procurement of materials. Records of receipt and current inventory are maintained. 400 pounds of thorium nitrate were received in four 100 pound shipments from General Chemical from 3/23/60 to date.

16. Waste Disposal

After each operation all apparatus and furnaces were vacuumed. The vacuum dust and waste thorium oxide has been collected and amounts to 600 pounds of material. The waste material is stored in a metal drum in the storage shed. Lee stated that they would transfer the waste material to the supplier General Chemical in the near future.

17. Transfers of Material

Lee stated that Wah Chang at Glen Cove, New York shipped thoriated tungsten powder (nat. thorium 1 - 2%) to Wah Chang at Fairlawn, New Jersey for further processing by Wah Chang Fairlawn into billets and finally into welding rods and wire. Records are maintained of these transfers showing dates and amounts. The amounts transferred are as follows:

January 1961	-	1537 pounds	thoriated tungsten powder		
February 1961	-	41 pounds	"	"	"
March 1961	-	1631 pounds	"	"	"
April 1961	-	417 pounds	"	"	"
May 1961	-	2071.5 pounds	"	"	"
June 1961	-	5096.5 pounds	"	"	"

Lee stated that Fairlawn has no license to process these materials and this was an error on his part because he didn't think a license was necessary. Miss U. Brady of the Administrative Branch, Compliance Division, Headquarters verified that no licensee held by Wah Chang Fairlawn, New Jersey and no license application has been made to date.

18. Posting and Labeling

The entrance to the storage shed where 1520 pounds of thorium oxide, 312.5 pounds thorium nitrate and 600 pounds thorium wastes are stored was posted with a sign reading, "Radiation Hazard" (with symbol). Within the storage shed all containers had labels reading "Caution - Radioactive Materials" with symbol, and labels which indicated the kind, quantity and date of assay, with the exception of the metal barrel containing 600 pounds waste thorium oxide dust (88% Th²³²) which was not labeled. The storage shed which had continuous radiation levels of 10 mr/hr was not posted with any sign reading, "Caution - Radiation Area" (with symbol). A storage room within the induction building

where three crucibles were stored each containing 500 pounds thorium oxide (88% Th²³²) was posted with a sign reading, "Caution - Radiation" with the symbol indicated in blue. The crucibles themselves did not have any label reading, "Caution - Radioactive Materials" with prescribed symbol, or which indicated the kind and quantity in the Furnace Building and storage areas. Form AEC-5 was posted in the Furnace Building and storage areas.

19. Personnel Monitoring

Lee stated that biweekly film badges were used for personnel monitoring for personnel engaged in the purification of thorium oxide and those using crucibles containing the thorium oxide for production of Columbium. Lee stated that no personnel devices are ever used for personnel engaged in the making of thoriated tungsten welding rods using thorium nitrate, or in the production of thoriated tungsten powder. Lee stated he never made any evaluation to determine whether personnel monitoring devices were needed for these people. Lee stated that they have ceased using film badges since January 1961 because processing of thorium oxide has been transferred to Wah Chang at Albany, Oregon. The film badge records of the thorium oxide users supplied by the Atomic Film Badge Corporation were examined from 1957 to date and show a maximum gamma exposure of 228 mrem per quarter year for J. Druggen's production hand. Film badge records were not maintained on Form AEC-5 but were maintained in equivalent records with all the required entered.

20. Records

Records are maintained of the receipt of materials, use, personnel monitoring and transfers of materials.