

COMPLIANCE INVESTIGATION REPORT

DIVISION OF COMPLIANCE

Region V

Subject: Wah Chang Corporation  
Albany, Oregon  
License No. STC-595

Use of licensed thorium oxide in a manner  
not authorized by the subject license.

Period of Investigation: July 18, 1962

<u>Investigator:</u>	ORIGINAL SIGNED BY H. S. NORTH	AUG 24 1962
<u>Reviewer:</u>	H. S. North ORIGINAL SIGNED BY H. E. BOOK	Date AUG 27 1962
	H. E. Book	Date

REASON FOR INVESTIGATION

A memorandum to Region V, Division of Compliance dated April 10, 1962 from Division of Compliance, Headquarters, referenced an inspection conducted by Region I, Division of Compliance, at the Wah Chang Smelting and Refining Company, Glen Cove, New York, License No. EMB-135. The inspection alleged the possible unauthorized receipt and use of source materials at the Albany Oregon plant. In a memorandum dated April 16, 1962, Region V notified Headquarters that an investigation would be conducted during July or August.

FINDINGS

At the time of the investigation it was determined that the licensee was using thorium oxide as a refractory wall lining material in the production of sintered tungsten metal products. The license authorized the possession of thorium for storage only. The licensee had requested amendment of the existing license to permit the use of thorium oxide as a refractory. The amendment had not been granted at the time of the investigation. The licensee stated that further use of licensed materials would be terminated until the amendment was issued. The subsequent issuance, on August 1, 1962, of the requested amendment was reported in the Atomic Energy Clearing House. The items of noncompliance noted during the investigation were as follows:

Source Material License EMB-135, Condition 8 - Authorized Use

The licensee used thorium oxide as a refractory wall lining material at a time when the license specified possession of thorium for storage only.

10 CFR 20.203 Caution signs, labels and signals

(f)(2) and (4) The licensee possessed numerous containers of thorium oxide which were not labeled as required by this section of the regulations.

DETAILS

A memorandum dated April 10, 1962 to R. W. Smith, Director, Region V, Division of Compliance, from Leo Dubinski, Assistant Director for Materials, Division of Compliance, Headquarters, referenced the inspection of the Wah Chang Smelting and Refining Company, Glen Cove, New York, license SMB-135. The inspection alleged the possible unauthorized receipt and use of source material at the licensee's Albany, Oregon plant. The memorandum noted that an inspection of the Glen Cove, New York facility of this licensee indicated the possibility that thorium oxide was being used as a refractory insulating material. License STC-595 which was issued to the Albany, Oregon plant authorizes possession of 2881 pounds of source material for storage only. License No. STC-595 was issued May 25, 1962. A letter dated June 11, 1962 from Wah Chang to DLR requested the amendment of License No. STC-595 to permit the use of thorium oxide as a refractory wall in furnaces for sintering metallic materials as tungsten metal.

On July 18, 1962, Mr. H. S. North, Radiation Specialist, Region V, Division of Compliance, accompanied by Mr. James Bocca, Health Physicist, Oregon State Board of Health, visited the subject licensee at the Albany, Oregon Facility. Mr. R. C. Jones, Manager of Services and Mr. John Cobb, Engineer, Separations Department, were contacted. Mr. Jones was informed that the purpose of this visit was to investigate the alleged unauthorized use of licensed material at the Albany, Oregon facility. Mr. Jones was asked if Wah Chang Corporation was using or had used thorium oxide as a refractory material, during the period they were authorized possession for storage only. He stated that thorium oxide was being used at the facility. Mr. Jones stated that it was probably due to a misunderstanding in that the renewal application did not specify the proposed use as a refractory material. He said that the initial intent had been to store the material, however, as a result of the rush order from Aerojet-General Corporation for a sintered tungsten compact, an immediate need arose and they proceeded to use the material after having filed the application. Mr. Jones described the use of the material as being a powdered or granular thorium oxide blanket between a tungsten crucible and a magnetite coated induction coil. Mr. Jones said that the material manufactured in the furnace was a tungsten compact which does not completely melt and is fabricated as a pressed tungsten powder. The final product is a porous mass of tungsten metal. The pores in this sintered compact are filled with silver metal.

Mr. Jones stated that the licensed material is received and used as thorium oxide. He stated that the use of this material is the same as approximately 4 years ago when Tantalum and Columbium were produced in vacuum furnaces. He also stated that the thorium oxide was first used as early as July, 1957. The use of thorium oxide had not been continuous since that time, but is dependent upon the type of work being done by Wah Chang. He also stated that the work presently being conducted is not performed under an AEC contract. Mr. Jones stated that the reason for the transfer of material from the Glen Cove plant to the Albany plant was that the Columbium and Tantalum work formerly done at the Glen Cove plant had been discontinued.

Mr. Jones commented that on the day of the visit, July 18, he had received a letter from Mr. D. Nussbaumer, Source and Special Nuclear Materials Branch, Division of Licensing and Regulation, which was dated July 16, 1962. In the letter Mr. Nussbaumer requested information concerning the extent of alpha contamination in the facility due to the proposed use of thorium oxide. He also requested information concerning the methods, proposed by the licensee, for the control of alpha contamination. This letter confirmed the fact that the requested license amendment had not been granted.

Mr. Jones stated that there are 350 to 400 persons employed by Wah Chang at Albany and that the facility consists of approximately 56 buildings. He noted that only nine persons are involved in the use of thorium oxide. Mr. Dan Long, Department Supervisor, Tantalum and Columbium Reduction, was then contacted since he was more familiar with the use of thorium oxides.

During the discussion with Mr. Jones, and later with Mr. Long, it was pointed out that in view of the fact that an amended license had not been issued authorizing the use of thorium oxide for any purpose other than storage, further use of thorium oxide by the licensee could constitute wilful violation of the conditions of the conditions of the license. It was also pointed out to the licensee that the inspector had no authority to issue orders or otherwise restrict the licensee use



of material. It was stated by the inspector that should continued use without a valid license come to the attention of the Commission, the Division of Licensing and Regulation could easily construe this to be willful noncompliance with the terms and conditions of the license.

Mr. Long was then requested to show the inspector the locations of storage and use of the licensed material. The licensed material was stored in a key locked storage building. The area surrounding the building is accessible to employees, however, the keys to the building are available only to the four shop foremen. The keys are located in the carpenter shop. The storage building is isolated from the other buildings and is of sturdy wood and tar paper construction. It is approximately ten feet wide and fifteen feet long. The four exterior walls of the building are posted with the conventional radiation symbol and the words "Caution Radiation Area" and "Caution Radioactive Materials". The door is posted "Danger Radiation Area".

A number of drums are located on the inside of the storage building. One of these, approximately 55 gallons inside, was said to contain approximately 700 to 1000 pounds of thorium oxide. There were also a number of three and five gallon cans sealed with metal lids and sealing rings. These cans were labeled with the actual weight of the thorium in the contained thorium oxide. The weights listed on these containers were as follows: 47 pounds, 135 pounds, 29 pounds, 131.4 pounds, 57.0 pounds. An additional can, noted as containing 80 pounds of thorium as the oxide, was identifiable as having been received from the Glen Cove plant of the Wah Chang Corporation. This can was labeled with a conventional radiation symbol, the words "Caution Radioactive Material", thorium oxide, 3.75 mc, 7-9-62". These containers with the exception of the one shipped from the Glen Cove plant, were not labeled with the isotope, the date of measurement or with the words "Caution (or "Danger") Radioactive Material" or the conventional symbol.

Immediately adjacent to the shed were two wooden pallets on which were stored approximately forty five empty 3 and 5 gallon cans and a used coil from the induction furnace. The coil was stated to be contaminated with thorium oxide powder. In use the magnesite covering of the coil had come in contact with thorium oxide in a furnace. There were also seven 55 gallon drums located on one of the pallets which had been in contact with thorium oxide. Mr. Long stated that these containers were being retained for disposal by transfer to the National Reactor Test Station, land burial site.

Mr. Long reported that the dose rate at the outside of the storage building was less than 2 mr/hr. He stated that the dose rate inside the shed was 1 mr/hr. The inspector asked if the thorium oxide was processed in any way and Mr. Long replied that some of this material required kiln drying before use. He stated that Wah Chang kiln dried this material prior to its use as a refractory.

The licensee stated that licensed material is used in building 20. Building 20 is a furnace building in which a considerable number of induction furnaces are located. Four furnaces are set aside in a separate room in this building which communicates with the main building by a single door at the second story level and with the outside by a single garage type door. Mr. Long stated that the thorium is used only in this room. It was noted on entering this room that the door to the outside was posted "Danger Radiation Area" with a radiation caution symbol. It was also noted that the second floor access to the rest of building 20 was posted "Danger Radiation Area" and showed the radiation caution symbol. At the time of the visit only one furnace was involved in the use of thorium. This furnace was posted "Danger Radiation Area" and "Caution Radioactive Material" and showed the conventional symbol. Mr. Long stated that the furnaces are connected to a system of three vacuum pumps, mechanical and oil defusion, which make it possible to operate the furnaces under vacuum. Occasionally furnaces are operated with a hydrogen purge which is vented to the atmosphere. He stated that following the previous use of thorium oxide the entire furnace vacuum system was dismantled and that no contamination appreciable above background was found when the system was surveyed.

Mr. Long and Mr. Cobb removed the loose bolt-down cover of the furnace, in which thorium was presently in use. They stated that this furnace was being prepared for a run. It is noted that the furnace was approximately 3 1/2 to 4 feet in diameter and about 5 to 6 feet high. It was essentially a large cylindrical kettle with a bolt-on lid with an "O" ring sealed closure. The vacuum pumps which are located outside the building, are attached to the bottom of the furnace by piping. The inner portion of the

furnace consists of a magnesite coated induction coil, approximately 2 feet in diameter and about 4 feet high. The coil is cylindrical and the edge of the cylinder is about 4 inches thick. This coil is mounted on spacers which support it above the bottom of the furnace. A tungsten crucible, about a foot to 18 inches in diameter, was located in the center of the induction coil. One of the three or five gallon cans of thorium oxide was located in the crucible. A hand scoop was also located in the crucible. The space between the crucible and the magnesite coated induction coil was partially filled with a finely divided white powder which was identified as thorium oxide. Mr. Long stated that the men handling thorium oxide in preparing the furnace for use, pour thorium oxide into place with the scoop, using care not to generate a dust. He stated that these men are equipped with respirators and coveralls. He stated that the material is not compacted or distributed in any way, it is merely poured in and allowed to assume its natural density.

Mr. Long stated that as nearly as he could remember, this current use of thorium oxide started early in June 1962, and that the prior use of thorium oxide had started in approximately April, 1958, and had stopped approximately at the end of December 1959.

Mr. Long stated that film badges were issued before the first use of licensed material in 1962 but that no reports had yet returned. The film badge processor was stated to be Radiation Detection Company of Palo Alto, California. He stated that they are now on their second group of film badges. The licensee's survey records record the surveys that the workmen handling thorium oxide perform when they leave at the end of the shift. Each man surveys the other and records the results of the survey on a sheet. The sheet notes the date, the shift, the person inspected, the person conducting the inspection, the reading, and remarks. These surveys consist of contamination measurement of clothing, hands, shoes, etc. From the old survey records, it was determined that a maximum exposure of 0.3 mr/hr with an average of approximately 0.01 mr/hr (many reported as zero) were the general rule for this type of survey. This type of record was being maintained by the licensee during his operations in 1962.

Mr. Long stated that no air monitoring samples had been collected during the present run. He stated that on previous runs, air monitoring samples were collected, and that the results were acceptable to the AEC and to the Oregon State Board of Health. He called particular attention to this point and stated that the Oregon State Board of Health had requested a rerun of the air samples that were collected during the previous operation because they doubted the low values indicated. The licensee has two instruments which are used during normal operations, one of these instruments is kept in the furnace room of building 20 where the thorium is actually being handled. One of the instruments is an Ore Master, Super Geiger Counter, manufactured by White Electronics, 1218 "M" Street, Sweet Home, Oregon, Model Laboratory AEC, Serial No. XXXI. This instrument was found to be operable and covers ranges of 0.02, .2, 2 and 30 mr/hr. The second instrument was manufactured by Universal Atomic, Westbury, Connecticut, Model 408, Serial No. 1498. This instrument was found to be operable and covers ranges of 0.5, 5, 50 mr/hr. Both instruments were of the Geiger-Muller type. Mr. Cobb stated that a complete set of Civil Defense Instruments and dosimeters were possessed by the licensee.

The licensee provided a copy of his operating procedures regarding radioactive materials. These procedures were dated February 13, 1959, and entitled "Memorandum to: All Radioactive Material Handlers, Subject: Safety Rules". See annex A attached. The procedures refer specifically to personal cleanliness, protective clothing and equipment, housekeeping, eating and smoking. It is noted that the Region V file on this particular licensee appears to be deficient in backup material. Inasmuch as this licensee previously used material, there is no indication in the files that such use of material was authorized under a license.

Memorandum to: ALL RADIOACTIVE MATERIAL HANDLERS

Subject: SAFETY RULES

GENERAL

There are several general factors which all personnel handling thorium oxide should understand so they can relate the safety rules which we have initiated below to the reasons why such rules are necessary.

The principal radiation hazards involved in the use and handling of thorium oxide is alpha rays or particles. Alpha rays are not particularly hazardous outside of the body because their radiation can be stopped by a thin piece of paper or even a layer of skin without penetrating to the inner layer of the skin. If, however, they are absorbed into the body through breathing, eating, smoking, drinking or even cuts, punctures or sores and produce the radiation internally they become extremely dangerous because alpha radiation is very destructive to certain tissues at a very short range.

Thus it becomes apparent that precautions must be established to combat the possible unnecessary contact with or absorption of thorium particles internally into the body. With this idea in mind, the following rules must be strictly adhered to:

A. PERSONAL CLEANLINESS

1. Each individual handling thorium or contaminated material shall shower daily at the conclusion of his work shift. He shall not be permitted to wear the protective coveralls home, but after showering shall change into street clothes. Hair, ears and creases should not be neglected when showering.

2. Hands should be washed four times a day and shall always be washed before eating, drinking coffee or other beverages, or smoking. Hands should be washed very thoroughly.

3. The face and neck shall be washed before eating or smoking.

ANNEX A.

---

4. Fingernails and cuticles shall be cleaned daily using a brush if necessary.

5. Punctures or cuts are to be avoided. All punctures or cuts received while handling or working with radioactive materials will be reported to your foreman immediately. Cuts or punctures shall be washed with large quantities of water. When washing cuts the edges of the cuts should be held open to insure complete saturation of the wound. Employees, in cases of large cuts, should then report to Dr. H. P. O'Neill for treatment of such cuts or punctures. A complete report of such accidents will be initiated and forwarded to the Personnel Office. Note: The wearing of protective gloves will normally eliminate cuts on the hands.

6. Nothing (fingers, nails, screws, etc.) should be placed in the mouth.

#### B. PROTECTIVE CLOTHING AND EQUIPMENT

1. Personnel handling radioactive material shall be provided with and required to wear protective coveralls and gloves at all times when handling such material.

2. Protective respirators shall be provided and their use required at all times when there is a possibility of inhaling radioactive dust or particles.

3. Suitable gloves (preferably rubber or plastic) shall be worn at all times when handling materials known or suspected of being radioactive. If possible gloves should be washed before they are removed. Care should be taken to keep the inner surfaces from becoming contaminated.

4. Protective coveralls should be monitored daily after use and individual records maintained of the readings made. Contaminated coveralls should be kept separate (in areas provided) from street clothes. Coveralls should be washed at least twice weekly.



### C. HOUSEKEEPING

1. Individuals working with radioactive materials shall keep their areas clean and free of dust at all times (never use an air hose to clean your area - do not stir up unnecessary dust).

2. The use of radioactive material shall be limited at all times to those areas only in which the material is required. When moving material from the storage area to the production area caution must be exercised in that material should be taken directly to the area of use using the shortest route possible. Care should be taken not to spill or track material or dust at all times.

3. Contaminated material shall be stored only in containers marked for such storage.

4. After use, hand tools and other portable equipment shall be wiped clean and returned to a cabinet or assigned storage area.

5. Hand tools, pieces of metal, or other small items must not be permitted to clutter up the work areas where they tend to collect dust. Keep all storage of tools, material and equipment neat and clean.

6. All used rags, waste, contents of vacuum cleaners, scrap material, etc. will be placed in properly marked containers.

7. Limit storage of radioactive and contaminated material in the working area to the minimum amount required for work at hand.

### D. EATING AND SMOKING

Food, chewing gum, tobacco, coffee, or other consumable food shall not be carried into the working area. Eating and smoking is prohibited in radiation material areas. The use of chewing gum, cough drops, etc. is permissible provided that they are placed to the mouth by clean hands outside the working area and are not removed from the mouth in the working area except for disposal.

William T. Walker



UNITED STATES GOVERNMENT

# Memorandum

TO : Files

FROM : R. Handler, Enforcement Branch  
Division of State and Licensee Relations

SUBJECT: COMPLIANCE INVESTIGATION REPORT FOR  
WAH CHANG CORPORATION  
HUNTSVILLE, ALABAMA  
INVESTIGATION CONDUCTED JUNE 2 - JULY 13, 1965  
RE: Possible unauthorized transfer, possession  
and use of source material

LICENSE NO. STB-665 DOCKET NO. 40-943

SLR:RH

DATE: OCT 15 1965

The subject investigation report has been reviewed and evaluate .  
This is to confirm that we do not plan to take any enforcement  
action concerning the investigation for the reasons specified in  
the report, even though the material involved would have been  
subject to license during processing.

cc: Compliance Div., HQ (2)  
OGC (2)

9007310183

STB  
665

