OPTIONAL FORM NO. 10
5010-104
UNITED STATES GOVERNMENT

Memorandum

TO : Files

DATE: September 22, 1961

FROM : D. F. Hammer, Source and Special Nuclear Material Branch, Division of Licensing and Regulation

SUBJECT: RADIATION SAFETY EVALUATION AND PRE-LICENSING VISIT - THE CARBORUNDUM COMPANY, THE CARBORUNDUM METALS COMPANY DIVISION, PARKERSBURG PLANT, WASHINGTON, WEST VIRGINIA, DOCKET NO. 40-5001

ANALYSIS, FINDINGS AND CONCLUSIONS

An analysis and correlation of the information submitted by the Carborundum Company and the information gathered during the pre-licensing visit on September 7, 1961, has resulted in the following observations, conclusions and findings.

Conclusions:

It appears that the licensee's radiation safety program is designed to provide sufficient information for determining compliance with 10 CFR 20 and that the licensee has instituted the necessary steps in his processing facility to comply with the Commission's regulations.

Discussion and Background:

The licensee originally submitted an application dated November 27, 1959, requesting authority to extract zirconium and hafnium from Nigerian zircon ore which may contain up to 8% thorium, the thorium ending up as byproduct in the extraction process. A two stage process was proposed; the ore is first reacted with coke in an electric arc furnace to form the carbide and then exothermically chlorinated. At the present time, processing has been discontinued due to the presence of some 1% columbiam in the ore which prevents subsequent separation using the present process.

A three month license was issued on December 22, 1959, with a condition that the licensee submit a complete report of the radiation safety surveys conducted during this period for review by DL&R. During the first three months, in which only the carbiding process was conducted, a thorough radiation safety survey was conducted by consultants (Dr. G. Hoyt Wipple and associates) and results were submitted to DL&R on March 25, 1960. The license was then extended for four months in order that the chlorination process

A/31

2/16/322

could be conducted and evaluated from a health safety standpoint. Subsequently, on May 3, 1960, the licensee submitted a radiological safety evaluation made during the chlorinating process, an inspection was conducted of licensee's facility on May 31, 1960, by ORO, and a report of the radiological surveys of the entire operation including a recommended routine radiological program was submitted August 3, 1960.

The license was extended on August 9, 1960, until October 31, 1960, pending an evaluation of the aforementioned reports by DL&R. Concurrently, on January 10, 1961, additional information was requested by DL&R and the license was renewed until June 30, 1961. The requested information was submitted by the licensee on May 15, 1961.

The information submitted on May 15, 1961, the information resulting from the previous requests and the inspection findings were then correlated and thoroughly analyzed. A pre-licensing visit was then conducted on September 7, 1961, to determine that all operations had been correctly represented and that all phases of plant operations had been included in the analysis.

Findings:

1. Plant location: The plant is located at Washington, West Virginia, in a remote, lightly populated area, adjacent to the Ohio River. The nearest residence is approximately a half mile away in an easterly direction. Two large chemical plants are located one to two miles away in a northerly direction.

2. Plant security: The plant is completely enclosed by a high wire fence and a guard is on duty 24 hours each day.

3. Radiological Safety Responsibility: The licensee stated that he had very little experience in the field of radiological safety when operations first started. A consultant (Dr. Wipple and associates) has been instrumental in developing the present radiological safety program. The licensee has instituted the programs recommended by the consultant and these programs appear adequate to determine compliance with 10 CFR 20. The licensee plans to continue the consulting service until adequate experience has been gained by plant personnel to conduct the necessary radiological safety program on an independent basis. All necessary survey and monitoring equipment are presently available for conducting an adequate radiological safety monitoring program.

4. Liquid effluent: The liquid effluent from the plant appears to consist of three components. These components.combine on plant property before discharge into the Ohio River. Samples have been taken during various phases of plant production and all samples have been below present MPC values. 100 ml samples are collected weekly and analyzed for thorium content during nigerian ore processing.

5. Airborne effluent: Off site airborne radioactivity samples collected during the original carbiding operation within the stack effluent plume gave results in excess of MPC. Presently, air sampling units are used to continuously collect air samples during plant operations in four directions from the plant. Two of these sampling points are located at nearby farm houses. Samples from these locations have been well below the MPC value for unrestricted areas.

6. Plant layout and flow diagram: The licensee has submitted a flow diagram of his plant indicating areas in the process where dust is generated. He has also indicated the points where inplant airborne radioactivity surveys will be conducted. These areas were reviewed during the pre-licensing visit and the licensee's procedures appear adequate.

7. Dust collection and ventilation equipment: Dust collection and ventilation equipment have been thoroughly described by the licensee. Certain portions of this equipment have proved inadequate during initial operations. However, the licensee has instituted steps to improve his equipment whenever airborne radioactivity surveys have indicated areas in which MPC values have been exceeded. This equipment now appears to adequately control concentrations of airborne radioactivity within acceptable limits.

8. Inplant airborne radioactivity surveys: The licensee has submitted a routine air sampling schedule, with occupancy factors, for his Parkersburg Plant. This schedule appears adequate to determine compliance with 10 CFR 20. Survey frequencies and sampling locations have been determined by occupancy factors and from previous experience during initial processing. Previous surveys show that there are possibly two areas in the carbiding process that exceed present MPC values. The car pulling operation averages approximately 1.2 times MPC and the drumming process was approximately 8 times MPC during the last operation involving nigerian ore. A major improvement has since been made on the ventilation

equipment where the drumming process is conducted. It is now believed that the radioactivity airborne concentration during drumming operations will be within the limits of 10 CFR 20 during future processing. In any case, the concentration of 8 times MPC during the drumming operation did not result in exposures in excess of MPC when occupancy factors were considered. Feeding carbide, drum pulling and pulling bed residue are operations which exceed MPC values in the chlorinating process. Occupancy factors applied to air sampling data appear to reduce these exposures to well within MPC.

9. Respirator program: Mine safety Appliance Company "Comfo" filter respirators with MSA type H Ultra Filter cartridges are worn by all employees in the carbide and chlorination areas during processing. A necessary routine for the respiratory protection program consists of daily cleaning, fitting and testing each respirator. Frequent demonstrations are conducted to insure proper use and handling of respirators by employees. Enforcement of the program is vested with the Plant Manager. However, the licensee does not wish that consideration or approval be given to his respirator program. It is the desire and plan of Carborundum to reduce airborne concentration within the plant to levels which comply with Part 20 without the added safety factor of respirators.

10. Written radiological safety instructions: The licensee, at the present time has not issued written radiological safety instructions. All instructions are oral but a set of written instructions will be prepared if found necessary by the Commission. This procedure appears to be adequate.

11. Waste disposal: All waste material containing thorium is presently being transferred to an AEC license for thorium extraction.

12. Urinalysis results: Bio-assay tests have not indicated over-exposures to personnel to airborne radioactivity. Previous experience to similar processes indicates little need for continuing the urinalysis program.

13. External radiation surveys: Surveys results have indicated very low external radiation exposures. However, a schedule has been established for external radiation surveys. Film badge results indicate that there is little possibility of external exposure and the routine wearing of personnel monitoring devices has been discontinued. This program appears adequate.

14. Occupancy factors: By letter dated September 13, 1961, the licensee requested an exemption from the Section 20.103(b), 10 CFR 20. In lieu of 20.103(b), the licensee has requested permission to average airborne exposures on a 160 hour, 28 consecutive day basis rather than for a 40 hour, 7 consecutive day basis. The licensee feels that this is necessary to assign realistic occupancy factors since he conducts his operations on a continuous shift basis. Since the averaged exposures will be the same in either case, it is recommended that approval be given.

APPROVED:

Donald A. Nussbaumer

Donald A. Nussbaumer, Chief, Source & Special Nuclear Materials Branch, Division of Licensing and Regulation