U.S. NUCLEAR REGULATORY COMMISSION
REGION I

INSPECTION REPORT

Report No. 999-90001/96-011

Docket No. 999-90001

License No. General Licensee

Licensee: Norton Materials
Saint-Gobain/Norton
Industrial Ceramics Corporation
1 New Bond Street
Worcester, Massachusetts 01615-0008

Facility Name: Norton Materials

Inspection At: 1 New Bond Street
Worcester, MA

Inspection Conducted: October 30 and 31, 1996

Inspectors: _____ December 13, 1996
C. Thor Oberg, Health Physicist — date

Approved By: _____ 12/17/96
John D. Kinneman, Chief, Chief — date
Nuclear Materials Safety Branch
Division of Nuclear Materials Safety

Inspection Summary: Special, Announced Inspection conducted October 30 and 31, 1996, of activities performed pursuant to the general license in 10 CFR 40.22 and exemption in 10 CFR 40.13(a). (Inspection Report No. 999-90001/96-011)

Areas Inspected: Organization and scope of activities; source material content in materials; and independent measurements.

Results: No violations were identified. Zirconia material, received and processed to produce products for distribution to customers who manufacture abrasives and refractory items, contains source material (uranium and thorium) in concentrations totaling less than one-twentieth of 1 percent (0.05%) of the material. Thus, the licensee is exempt from the requirements of a license and the regulations in 10 CFR 40. Radiation levels from staged alumina material indicated the presence of source materials. Licensee analyses confirm the source material concentration in this alumina to be within the limits of the exemption in 10 CFR 40.

DETAILS

1. Persons Contacted

   * Neil N. Ault, Ph.D., Technical Ceramics Consultant for Norton Materials
   Jeremy Bleecher, Applications Engineer, Norton Materials

   * Individual attended exit interview

2. Organization and Scope of Licensed Activities

   Norton Materials is owned by Saint-Gobain Industrial Ceramics Corporation, a French company (Saint-Gobain Ceramiques Industrielles). Dr. Ault and Mr. Bleecher report to Mr. Ronald K. Harmon, Vice president of Norton Materials, who reports to management personnel in France.

   The Norton Materials, Worcester, MA, plant (Norton) receives and processes various metal oxide materials for customers who use this material in the manufacture of abrasives and refractories. Among these metal oxides are zirconia (ZrO_2) and alumina (Al_2O_3).

   An inventory of about 200 to 300 tons of zirconia, received from the Norton Materials plant in Huntsville, Alabama, is presently maintained on site at Norton. In addition, about 100 metric tons of zirconia are on site from a plant in France (Saint-Gobain Ceramiques Industrielles). The zirconia is contained in one ton amounts (U.S. ton or metric tons from France), in plastic lined, nylon bags. As received, the zirconia can be of various consistencies and stabilization. The consistency ranges from "dense" to a "bubble" form (made by blowing air through the melted zirconia and cooling it) and mixtures of these. The zirconia can be unstabilized or may be stabilized by the addition of about four percent of calcium or other elements. Zirconia is processed using operations such as melting, crushing, grinding, sizing, mixing of consistencies or with other materials for abrasives, and packaging the resulting product. Norton maintains an inventory of about 100 tons of zirconia product material for distribution to customers. Any waste material generated during the processing is returned to the Huntsville, Alabama plant or to another Norton Materials plant in Chippewa, (Ontario) Canada.

   A stock-pile of alumina, a dark Al_2O_3 (possibly from brown bauxite) estimated to total about 200 tons, is staged in the Norton plant awaiting processing. This material is contained in cardboard drums (about 30 gallon size) weighing 300 pounds each.

3. Source Material Contained in Zirconia and Alumina

   The zirconia and some of the alumina contain measurable concentrations of uranium (U) and thorium (Th) (source material). The suppliers of the zirconia furnish analytical reports with the material shipment that specify the source material concentration in parts per million (ppm). During this inspection, the

inspector reviewed U and Th analytical data for the zirconia shipments received by Norton for 1996 to date. The highest concentrations of source material for each type of zirconia received is identified in the following table:

TABLE I

High U, TH, and Total Concentrations In Zirconia Receipts, 1996

Zirconia Type	Tons Received	Concentration in ppm U	Th	TOTAL
Dense, Stabilized	130	284	174	458
Dense, Stabilized	51	253	173	426
Bubble, Not Stable	19	285	177	462
Bubble, Stable/France	30	-	-	460

The analytical data for the source material showed that the total source material ranged from about 340 to 460 ppm. This meets requirements of 10 CFR 40.13(a) which states that any person is exempt from the regulations in Part 40 and from the requirements for a license to the extent that such person receives, possesses, uses, and transfers source material in any chemical mixture or compound in which the source material is by weight less than one-twentieth of 1 percent (0.05 % or 500 ppm) of the mixture or compound.

No safety issues or violations were identified.

4. Independent Measurements

During this inspection, the inspector conducted direct reading radiation surveys throughout the Norton zirconia and alumina plant using a Ludlum Measurements, Inc., Model 19, Micro R Meter (NRC No. 33512, calibrated March 14, 1996). This included several locations in which 1 ton bags of various zirconia materials and 30 gallon cardboard drums containing zirconia product materials were staged. The general background activity levels in and around the plant ranged from 10 to 20 micro rem per hour (μRem/hr).

Radiation survey levels were measured on contact with and at distances of up to a meter from staged, 1 ton bags and 30 gallon cardboard drums containing zirconia materials. The survey results are in Table II:

TABLE II

RADIATION SURVEY RESULTS FOR VARIOUS ZIRCONIA MATERIALS

Material	Survey results in μRem/hr	
	Contact	At One Meter
Bubble, Stable.	50	20-25
Bubble, Stable./France	85	50
Dense, Stable.	50	36
Dense, Product	80	30
Mixed Bubble & Dense Not Stable., Product in Drums	60	38
As Above but Stable.	60	32

The radiation survey data in Table II demonstrates that the concentration of source material in the various zirconia materials are not significantly different and that the material from France appears to contain more source material than the others.

The inspector obtained two samples of zirconia for verification of the concentration of the source material contained. The samples are about a volume of 500 cubic centimeters (cc) each in polyethylene bottles. One was a sample of the dense, non stabilized, zirconia after crushing (identified as Zirconia M by the licensee). The other sample was of the quenched bubble material that included a one percent concentration of silicon dioxide as an impurity. This material is identified as Zirconia Q-1 by the licensee. The two samples have been submitted to the NRC Region I laboratory for analysis. The results of these analyses are 369 ppm of source material for the Zirconia M and 409 ppm in the Zirconia Q-1.

During the inspection tour of the plant, the inspector noted increased radiation levels in an area where no zirconia was staged. Between structural support stanchions 14 through 22, readings in excess of 25 μRem/hr were observed with the μ-R-meter. On either side of the 10 to 12 foot wide aisle, 30 gallon , cardboard drums were observed to be sealed and stacked four to a pallet and up to four pallets high. The pallets appeared to be stacked in two rows of six pallets between the stanchions. The drums were labeled as containing 300 pounds each of alumina (aluminum oxide, Al_2O_3). The licensee representative informed the inspector that this was a dark alumina (instead of white) from bauxite. The inspector estimated the amount of alumina to be in the order of 200 tons. The area and drums were surveyed by the inspector who measured 130 μRem/hr on contact with the drums and 100 to 130 μRem/hr between, at about two feet from,

the stacks on either side of the meter. Between drums stacked on the pallets, a reading of 260 μRem/hr was obtained. Licensee personnel said they would sample and analyze some of this material to determine the cause of the radiation levels. The licensee's subsequent analyses of the source material in three samples of this alumina revealed the source material concentration to be about 300 ppm in one and below the detectability limit, 0.01 % each for U and Th, in the other two samples.

No safety issues or violations were identified.

5. Exit Interview

The inspector held an exit interview with Dr. Neil Ault on October 31, 1996, and discussed the findings of the inspection. The inspector advised Dr. Ault that, based on the review of their analyses of the zirconia plus the radiation survey results, it appears that this material contains less than 0.05% source material. Further, that a report of the inspection would be forwarded to Norton as available but may take some time depending on the analyses of the zirconia samples for source material. Dr. Ault said that he would inform NRC Region I of the analytical results of the alumina that apparently contained source material.