Form AEC-417
(8-57)

UNITED STATES ATOMIC ENERGY COMMISSION

COMPLIANCE INSPECTION REPORT

1. Name and address of licensee or permit holder
Davison Chemical Company
Division of W. R. Grace & Co.
Baltimore 3, Maryland

2. Date of inspection
March 13 and 14, 1958
April 1, 1958

3. Type of inspection
Initial

4. 10 CFR part(s) applicable
20 and 40

5. License (or permit) number(s) and expiration date(s)

Number	*Date*	*Exp. date*	*Number*	*Date*	*Exp. date*
R-202	May 21, 1957	June 1, 1959			

6. Scope of license(s) and permit

1. Licensed to receive possession of and title to raw and refined source material without limitation as to quantity, during the term of this license, for resale both domestically and for export, and for processing.
2. Licensed to transfer and deliver possession of and title to refined source material to any person licensed by the Atomic Energy Commission, within the limits of his license.

7. Special conditions and limitations of license(s) or permit

1. This license applies to operations at Erwin, Tennessee only.
2. Each transaction which is an export from the United States, regardless of quantity, shall have prior authorization, which may be applied for on AEC-7, in accordance with the instructions on the form.
3. Required to maintain records of inventories, receipts and transfers of refined source material.

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8. Inspection findings

The use of source material within the Licensee's nuclear reactor materials plant is being accomplished in a competent manner with good control procedures and adequate facilities. A complete health physics program has been organized which includes a full-time Health Physicist, routine radiation surveys, air samples and effluent monitoring and a written procedure manual which incorporates most of the techniques in use at the Fernald, Ohio, feed materials plant. Routine personnel monitoring is conducted with a biweekly film badge service from Tracerlab and monthly urine analyses performed by the Licensee's own laboratory personnel. Adequate records reflecting the results of surveys, personnel

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9. Items of noncompliance

20.203 (a) (1) Caution signs, labels and signals. Caution signs used to identify the plant's restricted area, radiation areas, and containers were of non-regulation design. See paragraph 25 of details.

(continued on reverse side)

10. Give date of last previous inspection: None

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

Donald C. Hubbard
(Inspector)

DISTRIBUTION:

Division of Inspection
Washington, D. C.

Approved by: Leo Dubinski
Oak Ridge Operations Office
(Operations office)

May 13, 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—73314-1

DETAILS

I. GENERAL INFORMATION

12. On March 13 and March 14, 1958, a compliance inspection was made of the activities conducted by the Nuclear Reactor Materials Section of Davison Chemical Company utilizing source material obtained under License No. R-202. The inspection was conducted at the Licensee's Erwin, Tennessee, plant by Donald C. Hubbard and Jack T. Sutherland, field representatives, Inspection Division, OROO, who were accompanied by Robert H. Wolle from the Tennessee Department of Public Health.

    On April 1, 1958, a second compliance inspection visit was made to the same installation; however, this inspection was limited to only the activities utilizing special nuclear material under License No. SNM-124, as amended, and was confined to the evaluation of the program in regard to potential criticality hazards. The inspection was conducted by Dr. Peter A. Morris, Division of Inspection, Washington, and Donald C. Hubbard and William W. Peery, field representatives, Inspection Division, OROO. Radiological health and safety aspects of the special nuclear material program were covered during the previous inspection.

13. The licensee company currently holds two licenses, one for source material and one for special nuclear material, which are as follows:

    R-202 - Unlimited amount of raw and refined source material for resale both domestically and export; and for processing.

    SNM-124, as amended - 250 kilograms of contained U^{235} as UF_6, U_3O_8, or UO_2 for pelleting development and in fuel element fabrication using procedures described in applications submitted and modified on seven different occasions.

    The details of this report cover the activities being engaged in under both licenses at the time of the two above-mentioned inspection visits.

14. Licensee personnel interviewed and from whom information was obtained during the inspection were:

    T. C. Runion - General Manager of Plant and Nuclear Reactor Materials Section
    E. R. Johnson - Technical Director
    S. L. Reese - Assistant to General Manager
    C. W. Taylor - Production Superintendent
    S. H. Newell - Health Physicist
    Several Unidentified Chemical Operators

15. The reactor feed materials plant located at Erwin, Tennessee, is an enterprise of W. R. Grace & Company operated by the company's Davison Chemical Company Division. Working closely with the plant as suppliers and in research work are Davison's concentration plants in Baltimore, Maryland, and Pompton Plains, New Jersey, and the Grace Company's research center at Clarksville, Maryland, The Erwin plant is of a flexible design that will allow changing from one job order to another as is found necessary to compete for

business and still have a minimum shutdown time. At the time of the last visit the plant employed approximately seventy-six people and worked three shifts per day five days per week.

The plant is currently capable of converting thorium concentrates to oxides, nitrate, metals and alloys; and uranium from concentrates and hexafluoride to oxides, tetrafluoride, metal and alloys. Solvent extraction work began on a piece-meal basis in September, 1957; thorium metal reduction began in December, 1957; and fabrication of fuel elements (Consolidated Edison reactor) for Babcock and Wilcox began in middle of December, 1957. At the time of the first inspection only the uranium thorium pelleting process was in operation but during the second inspection the entire enriched uranium process (UF_6 to U_3O_8 to fuel rods) was in operation. Most of the equipment and process designs were copied from similar operations at the Atomic Energy Commission's feed material processing plant located at Fernald, Ohio.

II. FACILITIES

16. Plant facilities consist of three processing buildings (Chemical, Ceramics, and Metals), three storage buildings, and one combination laboratory-administration building with a storage vault attached. The plant site consists of a single 165 acre tract of land located on the bank of the Nolichuckey River approximately one mile south of Erwin, Tennessee. A large area surrounding the buildings is fenced and the gate is manned by guards around the clock.

a. The Chemical Processing Building is an extra high roofed one-story block building with a four-story addition in the rear which contains the solvent extraction columns. The operations in this building are presently confined to source grade wet chemistry processes and the building contains equipment that is said to be suitable for recovering slightly enriched uranium from scrap. Mr. R. H. Moore has primary responsibility for this building.

b. The Metals Building is a two-story block building that is used primarily as one-story except in areas surrounding high equipment where a metal grate floor is provided. The operations in this building are presently confined to source grade dry chemistry processes used to reduce thorium oxide or fluoride and uranium fluoride to metal which is then melted and cast into ingots or put into alloys. Equipment includes a reduction furnace, one vacuum induction melting furnace, ball mills, and cutting machinery. Break out stations and dust problem areas are either enclosed or else are being enclosed. Mr. W. H. Haynes is in direct charge of this operation.

c. The Ceramics Building is similar to the Metals Building in design but is somewhat smaller in over-all size. All enriched material is processed in this building beginning with the conversion of UF_6 to uranium oxide and ending with the leak testing and packaging of finished fuel element rods. Scrap recovery is carried out in this same building. The building is divided into two sections in order to separate the uranium oxide preparation areas from the blending, pelleting and fuel element loading area. Equipment consists of dry boxes, drying and ignition furnaces, three series of stainless steel hoods equipped with filters, and one fuel element leak test tank. Mr. C. W. Taylor assisted by Mr. S. L. Reese is responsible for this building's operations.

d. The Storage Vault is a one-story room (20' x 20') constructed of reinforced concrete and attached to the back of the Administration-Research Building. The floor of the vault is two feet above ground level and all walls are a minimum of eight inches thick. It is equipped with weather-proof inlets and outlets for air and electrical connections and has a double door arrangement, one a four inch standard combination lock vault door and the other a metal weather door. The room is equipped with chains and brackets that are fastened to the wall and used to secure shipping containers and "bird cages" in place. On the wall to the left as you enter the room and directly above a storage location for bird cages are twenty open-faced cubicles used for storing U_3O_8 and U_3O_8-ThO_2 samples. These cubicles were not shown on the vault blueprint included in the Licensee's original application. Vault responsibility lies primarily with Mr. Johnson who is assisted by the accountability supervisor on each shift.

III. PERSONNEL AND ORGANIZATION

17. The five key positions (Plant Manager, Technical Director, Production Superintendent, Assistant to General Manager, and General Foreman) of the plant are occupied by former employees of National Lead Company at the feed material processing center at Fernald, Ohio. The combined talents represent experience in the fields of radiological health and safety, enriched and source grade metal production, accountability, chemical operations, design engineering, criticality control, and administration. The position of Health Physicist is occupied by a mechanical engineer who is currently being supervised and trained and who will eventually assume full responsibility for this part of the plant's operation. Mr. Runion coordinates the over-all plant operation through Mr. Johnson and Mr. Reese with Mr. Reese also serving as the plant's sales engineer. Mr. Runion reports to Mr. R. Goodall, Vice-President of the Grace Company's Chemical Division. Most of the non-technical production employees have been carefully selected from a surplus labor supply created by the shut-down of a local pottery factory and are said to be better qualified people than are normally obtained for industry. Three men who have been screened as to temperament, dependability, and over-all ability have been designated Accountability Supervisors and assigned one to each shift. These men report to Mr. Johnson or his delegated alternate.

Maintenance activities are the responsibility of the Maintenance Superintendent, Mr. E. G. Taylor, who reports to Mr. Johnson.

IV. RADIOLOGICAL SAFETY PROGRAM

18. The over-all program is under the direct supervision of the Technical Director, Mr. Johnson, who directs and assists the Health Physicist, Mr. Newell, in conducting the plant's activities. A complete "Health Physics Procedure Manual" which incorporates many of the procedures currently in use at the Fernald Plant has been compiled and distributed to supervision. Safety meetings with non-technical personnel have included discussions on health physics procedures required in the plant. Reports on various aspects of the program are routinely submitted to and are reviewed by Mr. Johnson to insure that an adequate program is being maintained. Control of factors affecting criticality are not part of the routine program but are handled separately by Mr. Johnson, Mr. Reese, and Mr. Taylor with Mr. Johnson having the prime responsibility.

19. Personnel monitoring is conducted by routine use of film badges, bio-assays, and physical examination by the company's local consulting physician, Dr. A. H. Monroe. Film badges are supplied on a biweekly basis by Tracerlab and are worn by all visitors and licensee employees who have occasion to enter process areas, SS storage areas, or the laboratory facility. Approximately eighty badges are used during each two-week period. Clinical and radiological urinalyses are made once a month with a fluorimetric method being used for the latter analysis and the results reported in parts per million. Pre-employment physicals are given all employees. Film badge records were reviewed and the maximum exposure noted for any reported period was 170 mrem which was received by an operator. One report of 230 mrem was recorded but was said to be an invalid exposure since the wearer, a chemist, stated that he had left his badge in the laboratory over a week end. A badge rack in the "clean locker room" is provided for regular overnight and week end storage. Protective clothing is furnished and laundered by the company in their own laundry facility.

20. Air monitoring is conducted routinely by the Health Physicist using a Gast Air Sampler (17.5 liters/min.) containing a Millipore filter. Air samples are taken by two different schemes. In the first scheme, each of the production areas, as divided on a map by Mr. Newell, are monitored once each month while other areas are monitored once every two months; in the second scheme each operator station is monitored at breathing zone level during a period of production. The latter program is being conducted daily at the present time but after enough data have been accumulated for each station, the sampling program will be conducted on a bimonthly basis. In addition to these two systematic sampling methods, the Health Physicist makes a number of spot checks when, during the course of his daily routine inspection, he feels that a particular operation or area requires additional attention. If air activity is in excess of the limits for natural uranium and thorium as set forth in 10 CFR 20, the Health Physicist has the authority to shut down any operation until corrective action has been taken.

Routine reports on air activity measurements are prepared and distributed to the Plant Manager, Technical Director, and Department Heads. Dust-Foe Model 66 masks are worn around the neck of each operator at all times and are required for the face when handling any material even though the material may be contained within a hood or dry box. This procedure is required in an attempt to create an automatic habit that will stay with the employee during future operation which may not be entirely dust free.

Air sampling records were reviewed and the maximum result noted was 96 d/m/m^3 for an operating area. The maximum result taken at fence level was 3 d/m/m^3. It was pointed out to Mr. Johnson that 10 CFR 20 requires that all records be maintained in the same units used in the regulation. He stated that this will be done in the future and that all past records will be corrected.

21. Area monitoring of the entire plant is conducted weekly by the Health Physicist using a low level (20 mr/hr maximum) Nuclear Measurements Corporation, Model No. GS-3, G-M Beta-Gamma survey meter. In order to assure complete coverage, the same divisional area map used for air sampling is used for area monitoring. All areas with radiation levels of five mr or greater but less than 100 mr are roped off and posted as radiation areas. The plant has had no high radiation areas to date. Spot checks are made during the Health Physicist's daily tour through all production

areas. Routine reports are prepared and submitted to the Plant Manager, Technical Director, and the Supervisor of each area concerned. The maximum radiation field noted during the review of the survey records was 40 mr/hr in a thorium oxide storage area. Several areas with lesser fields were noted and found to be roped off and posted.

22. Liquid effluent monitoring of plant discharge is conducted at three points: (1) at bottom of two 5,000 gallon filtrate storage tanks prior to discharge to storm sewer; (2) at a point on the river located upstream from the plant; and (3) at a point approximately 100 yards downstream from the plant. No automatic or continuous sampling devices are in use. Tank samples are taken and analyzed prior to each discharge and the tanks can not be discharged without written approval from the Health Physicist. Approximately three tank dumps or 15,000 gallons are discharged each week. Sampling procedures on the tank do not give a true report of the concentrations discharged into the river since plant waste flows approximately 500 yards by covered storm sewer before emptying into the river and a large volume of non-process waste enters the sewer between the tank discharge point and the river. This was pointed out to Mr. Johnson who stated that adjustments were made in their calculations to include this additional volume by using figures obtained from the plant's monthly water bill. The average use to date is between one and a half million gallons and two million gallons per month. The possibility of taking routine samples in the storm sewer just prior to discharge in order to verify the calculations was discussed with Mr. Johnson who stated that this would be done in the future. Routine monthly reports are submitted to the Plant Manager, Technical Director, and the Tennessee Department of Health. The maximum single discharge from the tanks showed a concentration of 5×10^{-6} uc/ml which was adjusted down to 1×10^{-7} uc/ml using the additional factor. Complete filtering and treatment equipment is maintained in connection with the storage tanks in order that waste containing concentrates that exceed discharge tolerances may be refiltered as often as necessary prior to release.

23. Instrumentation for the radiological safety program consists of the following:

One - Nuclear Measurements Model DS-1A decade scaler used with a Nuclear Corporation proportional counter converter Model PCC-11 which is adjustable for counting alpha and beta

One - Nuclear Measurement Corporation Model GS-3 survey meter

One - Fluorimeter

24. Shipping containers are monitored (radiation survey and smear test) by the Health Physicist to assure compliance with ICC regulations and his written approval is required prior to any shipment of containers. Established smear tolerances for containers are 10 alpha d/m/ft^2 and 20 beta d/m/ft^2.

25. Posting of containers was inadequate in that the wording and symbol requirements of 10 CFR 20 were either not complied with at all or were not as set forth in the regulations. Signs attached to the fence surrounding the plant were not correct in color or wording and were not identified by the radiation symbol.

Posting deficiencies were called to Mr. Johnson's and Mr. Runion's attention during the first inspection which resulted in an order being placed for signs of the correct design. This order still had not arrived two weeks after the last inspection but was said to be expected at any time.

V. PROCESS

26. The only process currently in production involves the conversion of enriched (90%) uranium hexafluoride to ammonium diuranate cake by precipitation with ammonium hydroxide; the cake is then dried and ignited to U_3O_8 which is blended with ThO_2 and a binder material in various ratios then pellitized, sintered and loaded into fuel element rods (0.25" diameter x 4' long). The ends of the rods are welded then the elements are leak tested in hot and cold water and packaged for shipment. Scrap from the process is dissolved in hydrofluoric acid and the uranium precipitated out as ammonium diuranate and again converted to U_3O_8 for reuse or storage. Filtrate and wash water containing less than .005 grams/liter of uranium are discharged to the waste tanks.

Previously, enriched uranium was received from Babcock and Wilcox as U_3O_8 then blended and pellitized. Now the Licensee is producing the U_3O_8 from UF_6 supplied by the gaseous diffusion plant in Oak Ridge. The Babcock and Wilcox order will be finished within the next month and the plant will be shut down to complete construction and place the entire facility in operating condition. The next order to be filled will probably consist of supplying several customers with source grade uranium and thorium as alloys and pure metals.

VI. CRITICALITY

27. Scope of Inspection. The visit on April 1, 1958, was made for the specific purpose of evaluating possible criticality hazards associated with the operations then in progress and those contemplated for the future. Observations were made of all the plant facilities in addition to the process fabricating fuel rods (U_3O_8-ThO_2 pellets contained in stainless tubes) for the Consolidated Edison Reactor. Discussions were held primarily with Mr. E. R. Johnson, Technical Director, and covered procedures and practices for the control and processing of special nuclear material.

28. Plant Design. The design of the plant has incorporated from the outset the general principles widely in use in the handling of special nuclear materials. To prevent the accidental assembly of a critical mass, a storage vault is provided for storage of all material not being processed. Those materials that are being processed are transported under carefully controlled conditions and the amount of material at any one stage of the process is limited. In addition, the containers used in the process are restricted to the specific sizes and shapes listed in the company's application and amendments.

Materials in the vault are stored either in "bird cages", "receptacles", or fuel rod shipping containers, all of which are designed to give adequate spacing between safe "units" of material under the most adverse conditions; e.g., partial flooding with water. The "bird cages" are self-contained, portable devices of standard design. The cubicles are formed by the construction of available storage volumes, spaced in otherwise inaccessible regions

of a shallow, box-like structure that is securely attached to the inner walls of the vault. Each cubicle is treated as one "bird cage". The shipping containers are elongated "bird cages" with over-all dimensions of 65" x 18" x 18" while the inner container is a cylinder 5" in diameter and 51" long. The shipping containers which were designed for this one particular order hold 200 rods which contain a maximum of 20 grams of U^{235} per rod. Each receptacle, "bird cage", and shipping container is appropriately labeled with the kind and amount of material that each contains. The symbol and wording required by Section 20.203 of 10 CFR 20 were not in use on all containers. Limits are posted for the maximum amount of material that may be contained in each.

Operations in the process areas are limited to those with fixed, maximum amounts of material, the maximum amounts depending on the form of the material being processed. Each step of the process is carried out in a particular area, in a prescribed manner, using prescribed containers. The amount of material within each area and the maximum amounts allowable are posted. In general, containers are limited to cylinders with inside diameters of five inches, or less, or shallow trays. All structures and equipment, except for the wall receptacles in the vault, are as described in the Licensee's application. Mr. Johnson stated that a corrected vault diagram will be submitted in the near future.

29. Administrative Controls. Because of the relatively recent start-up of the plant, the administrative controls now in use are thought by the management to be more restrictive than will be necessary after more experience is gained. At the present time, all movements of special nuclear material must be made under the direct supervision and written approval of the accountability control supervisor, of which there is only one per shift (future operations may involve more than one such supervisor). They are not authorized to change any procedure without the approval of Mr. Johnson or some one actually present with equal authority. The accountability supervisor must determine how much of what material is present at the proposed destination, as well as how much of what material is to be transported, before any movement is made. He is also responsible for maintenance of a running inventory at all locations. With these requirements, only one movement of special nuclear material can take place anywhere in the plant at one time. The accountability supervisor must be present during the movement and operators are forbidden to make such movements without direct supervision from him. Control procedures are conducted as outlined in the Licensee's applications.

30. Transportation. All enriched UF_6 received to date has been delivered directly to the vault door by railway express under a signature service arrangement. All shipments were contained in standard 5" diameter "bird cages" that have a design limitation of 55 pounds of material and 12" minimum spacing. Enriched U_3O_8 obtained from Babcock and Wilcox was obtained at the rate of 30 kilograms of U^{235} every two weeks and was delivered in containers and by transportation provided by the shipper. Completed fuel rods are delivered in Hertz U-Drive-It trucks supplied by Babcock and Wilcox with never more than 15 containers (total of approximately 60 kg. U^{235}) shipped at one time. The truck has additional built-in wooden spacers and the driver is always said to be accompanied by one guard. Transportation procedures were as set forth in the application and amendments.

31. Process Scrap. Dry boxes, process enclosures, vacuum cleaners, and exhaust filters are periodically cleaned and all clean dry scrap is blended back into the process. Contaminated dry scrap is reprocessed and the contained uranium recovered. Rejected pellets are collected in a bottle that limits the contents to 3.4 kilograms of U_3O_8-ThO_2 mixture which will contain a maximum of 187 grams of U^{235}. Dry scrap containers are stored in locations that are not adjacent to normal processing areas. Wet scrap is contained in glass bottles which are stored in mark-off squares on the concrete floor beneath the row of hoods used for the scrap recovery process. Scrap recovery is conducted according to submitted procedures. The wet scrap storage location was discussed with Mr. Johnson who stated that he recognized the inadequacy of the location and that it would be corrected in the near future.

32. Emergency procedures have not been worked out in any detail; however, the general plan of action is to return all enriched material to the storage vault at the time of the emergency. It was pointed out that planned and discussed detailed procedures would help prevent the accidental assembly of a critical mass during the return of material to the vault. It was also pointed out that some thought should be given to the uncontrolled use of water hoses by the local fire department in the event of a fire. This latter point was discussed when Mr. Johnson stated that in the event of a fire the plant guards would probably allow fire equipment to enter the plant without the direction of supervision. He also stated that emergency procedures and controls will be drawn up and discussed with all concerned personnel.

VII. SOURCE AND SPECIAL NUCLEAR MATERIALS INVENTORY

33. A. Source Material (amounts shown are contained source material)

1. Received

Thorium

Date	Amount	Material	Received From
8-29-57	900 lbs.	ThO_2	Pompton Plains
8-29-57	1878 lbs.	$Th(OH)_4$	Pompton Plains
9-5-57	1242 lbs.	"	Pompton Plains
10-1-57	1933 lbs.	"	Pompton Plains
11-25-57	2591 lbs.	"	Pompton Plains
12-12-57	1800 lbs.	"	Pompton Plains
10-8-57	100 lbs.	ThO_2	Lindsay Chemical Company
12-5-57	200 lbs.	"	Lindsay Chemical Company
11-4-57	5500 lbs.	$Th(OH)_4$	Lindsay Chemical Company
1-24-58	200 lbs.	ThO_2	Lindsay Chemical Company
1-3-58	863 lbs.	Dry and Moist Cake	Curtis Bay Maryland Plant
1-14-58	1307 lbs.	" " " "	Curtis Bay Maryland Plant
2-14-58	2819 lbs.	" " " "	Curtis Bay Maryland Plant
2-14-58	653 lbs.	" " " "	Curtis Bay Maryland Plant
2-15-58	1715 lbs.	" " " "	Curtis Bay Maryland Plant

Uranium

7-15-57	1.75 lbs.	UO_2	Mallinckrodt
9-4-57	1.75 lbs.	"	Mallinckrodt
9-9-57	1.74 lbs.	"	Mallinckrodt
10-15-57	8.50 lbs.	U_3O_8	Mallinckrodt
10-25-57	6.17 lbs.	"	Mallinckrodt

Uranium (continued)

Date	Amount	Material	Received From
11-13-57	2.48 lbs.	U_3O_8	Mallinckrodt
11-7-57	9.97 lbs.	UF_6	Union Carbide (Oak Ridge)
12-6-57	8.76 lbs.	UO_2	Mallinckrodt
2-24-58	345 lbs.	UF_4	National Lead (Fernald)

2. Shipped

Date	Amount	Material	Receiver
10-22-57	5 lbs.	Thorium Nitrate	Grace Company
10-23-57	3 lbs.	Scrap Uranium and Thorium Pellets	Baker Company
10-24-57	200 lbs.	Th. Hardener (20% Th.)	Hills-McCanna
11-5-57	20 lbs.	Thorium Nitrate	Davison Chemical Company
11-11-57	50 lbs.	Th. Sintered Pellets	Sequoria Metal Craft Company
12-18-57	3 lbs.	Scrap U_3O_8 Pellets	Baker Company
2-12-58	1 lb.	ThO_2	St. Eloi Corporation
2-13-58	24 lbs.	Uranium Metal	General Electric
2-14-58	100 lbs.	ThO_2	Babcock and Wilcox
3-1-58	300 lbs.	ThO_2	Wah Chang Company
3-13-58	206.5 lbs.	Uranium Metal	Bridgeport Brass Company

Total thorium content in pellets sent to Babcock and Wilcox - 12,784 lbs.

3. On Hand

150 lbs. U_3O_8 and Uranium Metal
200 lbs. Thorium Metal
10,000 lbs. ThO_2

B. Special Nuclear Material (amounts shown are contained U^{235})

1. Received

Total U_3O_8 received from Babcock and Wilcox - 364,620.9 grams.
Total UF_6 (90% enrichment) received from Union Carbide (Oak Ridge) - 54.245 kg.
Grams of U^{235} contained in source grade UF_6 received from Union Carbide (Oak Ridge on 11-7-57 - 33 grams)

2. Shipped (To Babcock and Wilcox)

Fuel element rods - 349,501.045 grams
Samples 511.4 grams

3. On Hand

(a)	As UF_6, ADU, U_3O_8, pellets and rods	54.245 kg.
(b)	Babcock and Wilcox U_3O_8	14,143.7 grams
(c)	UF_6 (highly enriched)	26 kg.

4. Material Balance Uncertainty

523.1 grams

VIII. SUMMARY

34. The proposed health physics program outlined by management during the two inspection visits should prove adequate for the Licensee's nuclear reactor material plant. Modifications in posting and liquid effluent sampling procedures are necessary to bring plant activities into full compliance with 10 CFR 20. Management is aware that re-evaluation of the over-all program is necessary from time to time in order to have an effective program and stated that this will be done. Plant personnel are well equipped by previous training and experience to conduct an efficient program.

Although operations involving special nuclear materials have only recently begun, and some improvements in procedures and techniques are still planned, it appeared that operation of this plant presents negligible hazard to the health and safety of the plant employees and the general public. An exhaustive study of all design limitations in use at the Davison Plant was not made; however, it appeared that in all cases observed the design of procedures and equipment was conservative. The supervisory and managerial understanding and direction of the operations are excellent, although it is recognized that some further improvements in the construction of detailed procedures are desirable and that some additional physical limitations may be incorporated. The management, including that of the Davison Chemical Company, appears to have an active interest in, and a distinct sense of responsibility for, the safety of operations with the special nuclear materials at the plant.