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PART 70 INSPECTION

ENGELHARD INDUSTRIES, INCORPORATED  
D. E. Makepeace Division  
Attleboro, Massachusetts

Dates of Inspection: December 12 and 13, 1960 (Announced)

Persons Accompanying Inspectors:

None.

Persons Contacted:

C. A. Canham, Plant Manager  
Norton M. Weiss, Health and Safety Manager  
Chet Lis, Accountability

DETAILS

9. Background Information

A report of 11/19/59, an initial inspection of Licenses SNM-185, C-3719, C-4237 and 20-5216-1 of D. E. Makepeace Division, Engelhard Industries, was transmitted to Inspection Headquarters (M. M. Mann) on 1/18/60. A memorandum from Inspection Headquarters (M. M. Mann) to DL&R (H. L. Price), dated March 2, 1960, transmitted the inspection report with a note of concurrence as to the recommendations made by the New York Inspection Division.

On 8/22/60, a letter from DL&R (Lyll Johnson) to F. Mittendorf, General Manager, D. E. Makepeace Division, Engelhard Industries, informed the licensee that there were no items of noncompliance noted for Licenses 20-5216-1 and C-4237, and that the following items of noncompliance were found with respect to Licenses C-3719 and SNM-185:

- "1. Insufficient surveys were performed to determine compliance with the Commission's regulation 10 CFR 20, Sections 20.101, 20.102 and 20.103, as required by Section 20.201(b), 'Surveys'.
2. The entrance to the Fabrication Facility in which licensed materials are processed was not posted as required by Section 20.203(e), 'Caution signs, labels and signals'.

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- "3. Licensed material containers in the vault areas and in the pickling areas were not labeled as required by Section 20.203(f)(1), (f)(2), and (f)(4), 'Caution signs, labels and signals'.
4. Records of air sample results were not maintained in the units specified in Section 20.201(b), as required by Section 20.401(c), 'Records of surveys, radiation monitoring and disposal'.
5. A total of 59,762 pounds of depleted source material was received when License No. C-3419 authorized receipt of only 10,000 pounds, in violation of Section 40.10, 'Restriction on transfers'."

The DL&R letter stated that with respect to items 1 through 4, the licensee was requested to notify DL&R within 30 days of the steps taken or to be instituted to correct the alleged violations, and the date on which such correction will be achieved.

In a 9/16/60 letter to DL&R, the licensee (C. A. Canham) stated that the following corrective action had been instituted:

"Concerning Item 1, daily surveys of fabrication areas have been initiated as of July 29, 1960. A system has been setup to assure that every area within the fabrication section is surveyed at least once a week. When survey results so indicate, corrective action is taken to reduce personnel exposure either through shielding or removal to safe distances.

With respect to Items 2 and 3, the proper signs and labels have been procured and posted in accordance with 10 CFR 20, Sections 20.203 (a), (f)(1), (f)(2), and (f)(4). This has been in effect since December 1959.

Records of air sample results have been maintained in units specified in Section 20.201(b), as required by Section 20.401(c) as of January 1960."

On November 21, 1960, DL&R (J. C. Delaney) in a letter to the licensee (C. A. Canham, Plant Manager) stated: "With respect to Items 2 and 4 of our August 22 letter, it appears that you have taken the necessary steps to correct the deficiencies." The DL&R letter stated that with regard to Item 1, the following additional information would be required:

"In-Plant Air Surveys

1. A description of the dusty work areas that are or will be sampled.
2. The types of air samples taken (example; breathing zone, general air, etc.), and the approximate number of samples taken per day, week or month in each dusty area.
3. The type, make and volume capacity of sampling equipment used.
4. The method used to analyze air samples for radioactivity.
5. The procedure you follow in calculating the average daily and weekly exposures to airborne radioactivity for each employee who frequently or occasionally occupies areas where air concentrations exceed MPC values specified in 10 CFR 20, 20.101(b), 'Exposure of individuals in restricted areas'.

On Stack Effluent Sampling and Environmental Air Surveys

A description of the procedure you follow or will follow in determining if concentrations of radioactive materials in stack effluents discharged to unrestricted areas exceed the limits specified in 10 CFR 20, Section 20.103(b), 'Concentrations in effluents to unrestricted areas'."

The licensee was also requested to submit the above survey information to DL&R within thirty days upon receipt of this letter.

In a TWX dated July 8 to this office, the licensee, Norton M. Weiss, reported that an apparent radiation overexposure to two of their employees had been reported by their film badge supplier, Nucleonic Corporation of America. The exposures were recorded as 15 rems beta and 23 rems beta, respectively.

On July 19, 1960, a type "B" investigation was made at the licensee's facility in Attleboro. The investigation report was transmitted to L. D. Low, Division of Compliance, Headquarters, on 10/10/60. On 10/17/60, E. G. Outten, Division of Compliance, Headquarters, in a memo to DL&R (Rogers) transmitted a copy of the investigation report from the New York Compliance Division, as well as the cover memorandum of October 10. Headquarters concurred with the New York Compliance Division that the exposures were not valid, and also concurred with the citations made in their investigative report, namely 20.201(b), failure to make adequate surveys, and 20.401(c), failure to maintain radiation records and evaluations of exposure times.

No further correspondence follows.

10. Introduction

An inspection of activities related to use of special nuclear material under License SNM-185 was conducted by John R. Sears and Paul B. Klevin of NYOO Compliance Division at the facilities of D. E. Makepeace (DEM), a Division of Engelhard Industries, Inc., Attleboro, Massachusetts. The inspection consisted of a visual inspection of the plant; discussion of administrative organization, methods and procedures for criticality control, accountability and control, radiological health and safety, and fire protection; and review of records pertaining to the aforementioned.

During the tour of inspection, it was noted that the only enriched fuel which was being processed involved PRDC elements. Enriched and normal materials possessed by the licensee under contract were noted to be in storage. The Commission-owned material (contract operations) is being used for the CP-5 reactor for the Argonne National Laboratory.

With the exception of item 12 below, items 11 through 17 of the Part 70 report details will also pertain to source material possessed by the licensee under License C-5161.

11. Organization and Procedures

As noted in the prior report, DEM is a Division of Engelhard Industries, Inc., and F. Mittendorf, General Manager, is still in charge of the two Engelhard Industries divisions, one of which is the nuclear facility located in Plainville, Massachusetts. Mittendorf does not maintain his office at the nuclear plant but at the non-nuclear facility in Attleboro. He also spends time in the Newark office of Engelhard Industries, Inc.

Mr. C. A. Canham is Plant Manager, replacing G. H. Barney. Barney at present is the Engineering Manager. However, according to Canham, Barney is leaving the employ of DEM the first of the year, and A. Schulte will replace him as Engineering Manager. John W. Durant is Business Manager. Norton M. Weiss is Health and Safety Manager. Weiss reports to Canham. All of the other aforementioned individuals report to the General Manager.

Canham stated that approximately 150 to 200 people are employed at the Plainville plant. Approximately 25% of these comprise the office and technical staff.

12. Nuclear Safety

A. Criticality Control

An inspection tour was made of the manufacturing area and the inspection area by the AEC inspectors in company with Mr. Norton Weiss. Mr. Weiss is the Criticality Engineer

and Health Physicist for Engelhard, D. E. Makepeace Division. During the tour, the only fuel which was being processed was that for the PRDC elements. No items of noncompliance, involving criticality control, were noted during the inspection tour. However, a few areas were noted in which control is presently obtained by batch limit where control could be obtained by an always-safe geometry concept at fairly little expense. One of such areas that the inspectors pointed out to Weiss was the overflow trough under the power hacksaw. The PRDC extruded rods are sawed on this power hacksaw into slug lengths. The width of the hacksaw blade was noted to be approximately 1/16". Weiss stated that the amount of rod, which is sawed before the trough is emptied, has been calculated so that there would be a maximum of 350 grams of U-235 in the trough at any time. The inspectors pointed out that the trough could be redesigned so that it had only 1" high sides, and thus be always-safe.

During the tour, two unsupported gas cylinders were noted and brought to the attention of Weiss, who stated that he would see, in the future, that all such cylinders are chained to a support, lest they become an unguided missile.

The method of control for criticality is essentially the same as had been outlined in the inspection report of 11/24/59. Briefly, the system is as follows: The production engineer authors a production flow diagram and sheet. This is reviewed for critical batch limits by Weiss, and the process sheets have printed on them the batch limit of any particular process. The batch limit is on a size and shape basis, rather than a weight basis; for example, so many plates or rods, rather than a certain weight of material. Material for a job is obtained from the vault through an accountability representative. Only the accountability representative or the criticality engineer has access to the fuel storage vault. The mechanic on the job is permitted to move material to the location of the first operation which, in practically every case, is the melting furnace. This movement of material from the vault is reported to the criticality monitors, who keep a record in a ledger of material in the various stages of manufacture. The criticality monitors no longer use a map of the plant for location of material. Weiss said that this was found to be unnecessary. The ledger is sufficient for them to keep cognizant of where material is in the plant. He also said that the criticality floor monitors no longer report to him as the criticality engineer. They are now part of the production control department. He said that all the criticality floor monitors have been instructed in criticality control procedures and in the maximum batch limits for all of the various processes in making the PRDC elements.

Weiss stated that his duties had been recently increased. He is now the Security Officer of the plant, and he is also responsible for general safety. He said that the plant has recently employed Dr. Jack Cunningham of Oak Ridge as a consultant on fuel fabrication. Weiss said that there has not been any outside consultation on either health physics or criticality within the past year. Weiss said that this past summer a health physicist has been added to the staff. This new health physicist has had no practical experience or training in health physics, but he is a graduate physicist with a B.S. in Physics. A female technician is employed in this Health and Safety Department. She keeps all of the health physics records, including personnel records, survey records, and medical records. She stated that she had been absent from the job for about six weeks while she had an operation, and it was noted that during that six week absence, the records suffered considerably. The technician stated that she felt she was grossly overworked, that she often worked Saturdays, that she was grossly underpaid, and that if things didn't improve, she was going to quit. She said that she had come into this Health and Safety Department from having worked as a clerk in the Accounting Department. It was observed during the inspection that she also doubled as the First Aid Consultant. An operator came into the Health and Safety Office complaining of an ailment, and she did advise him to see his local doctor.

Weiss said that three criticality floor monitors, who, as mentioned above, also function in the Production Control Department, are on duty during the day shift. One criticality monitor is employed on the 4 to 12 shift. He said that very little work is done on the 12 to 8 shift, and that what work is done usually does not involve any movement of material. He said that when work is to be performed on the 12 to 8 shift, criticality instructions are left with the foreman of that particular operation.

B. Pickling Solutions

Weiss described the operations in the pickling bath area as follows: Only one ingot at a time is allowed in a bath. The ingot weighs approximately 56 kgs. It is weighed by accountability both before and after the acid bath. He said that it normally loses about 50 to 60 grams of material, although sometimes the loss goes up to a maximum of 100 grams. A maximum of three ingots are allowed to be pickled in one bath solution before this solution is discarded. The used solution is placed in five-gallon carboys and these five-gallon carboys are finally put into 55-gallon drums. The control here is by combination of accountability records and analysis of solution. Weiss stated that before any 5-gallon carboy is dumped into the 55-gallon drum, a sample is taken of the solution in the carboy and analyzed. The

sample is placed in a glass tube which is sealed at both ends, and this glass tube is then run through the gamma ray spectrometer. This gamma ray spectrometer is normally used for determining the isotopic composition and the homogeneity of PRDC elements. The pickle bath solution to be analyzed is placed in a glass tube which is of the same diameter as the PRDC elements and, thus, the same testing setup can be used for solution analysis. The gamma ray spectrometer then indicates on a scaler and also on a recorder. The amount of activity in the solution is due to the 1.84 mev gamma from U-235. Thus, by simple calculation, it is possible to determine the amount of enriched U-235 in the solution. Weiss stated that when carboys are dumped into the 55-gallon drum, the maximum allowable in the drum is 450 grams. He said this was in conformance with the limits in KO K-1019. Weiss said that, so far, no drums of solution have been shipped out of Makepeace's plant for recovery. He said they are presently investigating possibilities for recovery of the uranium in the solutions. He felt that they would probably send the solutions to Davison Chemical for recovery. In the meantime, the 55-gallon drums are being stored at D. E. Makepeace.

#### C. Criticality Violations

Weiss aid that in the three years that he has been Criticality Officer, he has discovered approximately 10 violations of criticality rules. He stated that in each case, he did reprimand the mechanic or operator responsible, and that he did also reprimand the guilty man's foreman. However, he said that in no case had his concern over the violation gone any higher in the management. He said that he did not feel it necessary to go higher, since the people involved in the violation always seemed cooperative and promised to see that the same violation was not repeated. He said that the violations were not hi-lighted or publicized within the plant.

#### 13. Inventory Records

Chet Lis, Accountability Representative, reported that as of December 13, 1960, the following licensed material was on hand:

PRDC (25.6%) 1019 kg U-235  
Wright Air Development contract (93.3%) 11.3 kg U-235  
WTR (93.3%) 31.4 kg U-235

The aforementioned material was stored in either of the two storage vaults or in in-process cages on the floor.

23 kg U-235 (93% enriched), which is Commission-owned or contract material, was in storage in the vault. This material was for the CP-5 reactor and was being processed for the Argonne National Laboratory under an AEC contract.

14. Facilities and Operations

The facilities of the licensee are the same as reported in the previous inspection, with the exception of an addition of a new area, which was constructed in the area adjacent to the fuel manufacturing area. This area, the PRDC area, is used only for the assembling of PRDC finished pins. This area is padlocked and is also restricted to authorized personnel. This area also contains various benches, gauges and Rockwell hardness equipment.

In the PRDC assembly area, which is known as a clean area, all receiving and finished inspection work is performed. No bare uranium is handled in this area, which consists of three rooms. The PRDC clean area consists of a PRDC non-destructive testing area, in which a gamma ray spectrometer is used to check for proper isotopic enrichment and homogeneity. This is the area where completed assemblies are made and where eddy current tests are made for voids in the sodium bonding.

Another area in the clean area is a partitioned area for the storage of fuel, PRDC core and blankets. At present, only blankets are being stored and assembled here. The area is devoted to the assembly of the final fixture.

15. Radiological Health and Safety

A. Organization

Norton M. Weiss reported that he is Criticality Engineer and Health Physics Supervisor, and that he is responsible for nuclear health, safety and criticality. Weiss added that in addition to these responsibilities, he has responsibility for security, fire and general plant safety.

Weiss stated that he has had an assistant since April, 1960. Ray Diffley, his assistant, is a 1958 graduate of Providence College, where he majored in physics. Diffley stated that he has received on-the-job training in health physics from Weiss, and that he is not involved in nuclear criticality.

Weiss reported that Hazel Bussy, a laboratory technician discussed under item 12A, is responsible for counting, and air, water and smear samples.

Ed Bolton, Health Physics Technician, works on the fabrication floor area and, according to Weiss, is responsible for taking air surveys, making ventilation system checks, conducting direct radiation surveys, monitoring, and smearing incoming and outgoing shipment containers.

Weiss also stated that under his supervision are two janitors and a laundry operator.

Weiss stated that since the previous inspection, no minors have been employed by the company.

B. Instructions

Written health safety procedures and evacuation procedures are available. Weiss reiterated, as noted in the previous inspection report, that all employees of the Nuclear Department had been given indoctrination lectures in both radiological health, safety and nuclear criticality, and that he is continuing this program of indoctrination for all new employees. He stated that the only change in operating procedures since the previous inspection is that now the guard force personnel issue and collect film badges of employees and individuals frequenting or entering the fabrication area.

C. Medical Program

Weiss stated that all employees receive a pre-employment physical in which blood, urine, and physical well being are checked and chest X-rays taken. He added that the system of conducting annual physicals applies to only those persons who receive an excess of 10% of the MPC.

The urine sampling program is still in effect at this facility. The periodicity of sampling has been changed from a six month frequency to the following schedule:

Melting Operators	- 4 times a year
Pickling Operators	- 2 times a year
Swaging Operators	- 2 times a year
Hot and Cold Rolling and Annealing Operators	- 4 times a year
Machining Operators	- 4 times a year
Foreman and Maintenance Operators	- 4 times a year

Weiss noted that since July, 1960, Controls for Radiation has been under contract to analyze urine samples for total uranium. He said that he was dissatisfied with the Nuclear Science and Engineering Company (NSE), who were previously under contract to do urinalyses, and therefore changed to Controls for Radiation.

A review of the urine sample results maintained by Weiss indicated the maximum urine sample found during March 31, 1960 (samples analyzed by NSE) to be 39 ug U per liter. This sample was found for a Mr. Hebert, Plant Foreman. A sample submitted by Hebert and analyzed September 30, 1960 showed a uranium in urine concentration of less than 1 ug U per liter.

It was noted that most of the urine samples analyzed on March 31 by NSE were much higher than those reported by Controls for Radiation in two subsequent periods, namely July 1 and September 30, 1960. For example, the melting operator, Cloutier, showed a uranium in urine concentration of 37 ug U per liter on March 31, 5 ug U per liter on July 1, and 1.2 ug U per liter on September 30. Other personnel performing the operations noted above, in which urine samples are obtained, showed similar decreases of uranium in urine concentrations from the March 31 report by NSE. The highest uranium in urine concentration found in the September 30 series, analyzed by ConRad, showed 8.6 ug U per liter. The majority of the uranium in urine concentrations for other personnel ranged between 1 to 2 ug U per liter.

#### D. Personnel Monitoring and Air Surveys

A biweekly film badge program is still in effect for all employees working in restricted areas. The total number of personnel under the film badge service has increased from 40 to 125. Weiss reported that for the period beginning December 12, 1960, he started using Controls for Radiation film badges on a biweekly basis instead of continuing the service of Nucleonic Corporation of America, Brooklyn, New York. He said he was using Controls for Radiation since they were much closer to his facility, and he did not find any fault with the previous film badge supplier.

The following discussion covers the exposure of an individual in the furnace melt area. The operations performed by the furnace melt operators involve their melting of both depleted and enriched uranium (25.6% enriched uranium).

Weiss stated that he continues to maintain 13 week, 26 week, 39 week and 52 week records of film badge totals. A review of the 1960 film badge records indicated that one employee, a melter named Everett Bodwell, received fairly high beta exposures. A record of Bodwell's film badge exposures in mrad from January 9, 1960 through November 13, 1960 follows:

Everett Bodwell - Melter - Class "B"

Date	Biweekly		Biweekly Total	Cumulative Total
	Beta	Gamma		
1/9/60	300	20	320	320
1/23/60	1100	0	1100	1420
2/6/60	1100	300	1400	2820
2/20/60	250	80	330	3150
3/5/60	440	20	460	3610
3/19/60	220	0	220	3830
4/2/60	370	0	370	4200
4/16/60	150	55	205	4405
5/1/60	150	20	170	4575
5/14/60	175	0	175	4750
5/28/60	450	35	485	5235
6/11/60	330	0	330	5565
6/25/60	130	0	130	5695
26 week total			-	5695
7/9/60	15	0	15	5710
7/23/60	10	40	50	5760
8/6/60	55	0	55	5815
8/20/60	30	0	30	5845
9/2/60	190	0	190	6035
9/16/60	0	0	0	6035
9/23/60	375	50	425	6460
39 week total			-	6460
9/30/60	375	50	425	6885
10/14/60	420	110	530	7415
10/30/60	940	0	940	8355
11/13/60	1400	0	1400	9755

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The 1959 personnel monitoring records which were reviewed during the initial inspection were reported by Weiss to be stored with other 1959 records in "dead storage". These records could not be readily made available to the inspector, and therefore, no attempt was made to review Bodwell's exposure for the 13 week period prior to 1/23/60.

The review of the above record showed that Bodwell received the following doses, which are in excess of 3000 mrem, the limit specified in Appendix A for any period of 13 weeks:

- (1) 1/9/60 through 4/2/60 - 4040 mrem
- (2) 1/23/60 through 4/16/60 - 3983 mrem
- (3) 2/6/60 through 5/1/60 - 3070 mrem
- (4) 9/2/60 through 11/13/60 - 3605 mrem

Inasmuch as a biweekly film badge program is in effect, one-half of Bodwell's biweekly dose of either the first or the seventh biweekly period was used to determine the above 13 week period overexposures. The highest excessive dose per 13 week period is noted.

On December 22, 1960, a letter from Norton M. Weiss sent to the Director, Division of Civilian Application, reported an exposure of 1400 mrem beta for the two week period of October 31, 1960 to November 14, 1960 to Everett Bodwell (age 48), a melter in their Nuclear Department. (This letter and attached report are included as Exhibit "A".) The information supplied by Weiss with regard to the overexposure to Bodwell is essentially the same as reported in his letter to DL&R dated December 22, 1960.

At the time of inspection, Weiss was asked whether or not Bodwell wore any protective glasses or whether he normally wore glasses in performing his work as a melting operator. Weiss replied that Bodwell does not wear glasses. Weiss was informed of Appendix A, "Permissible weekly dose", of the old Part 20 which contains the following: 300 mrem is the permissible weekly dose for the blood-forming organs, gonads and lense of the eye for any radiation with a half value layer greater than 1 mm of soft tissue.

When asked whether or not radiation measurements were taken of the PRDC melt operation, Weiss stated that radiation measurements had been taken. From the survey records maintained by the Health Physics Group, it was determined that such direct radiation contact measurements were made using a Juno survey meter on the floor of the furnace, on both sides of the furnace and on the top port inside of the furnace induction coil. Radiation levels on the floor ranged between 4 and 45 mrad/hr. The sides of the furnace revealed radiation levels from 10 to 120 mrad/hr. The top port inside the furnace induction coil showed the highest amount of radiation. Radiation levels ranging from 160 to 2300 mrad/hr were found here during the period of October 15 through November. The highest radiation measurement, 2300 mrad/hr found on 11/4/60, was reduced to 400 mrad/hr the following day. It was pointed out to Weiss that these levels were high and could contribute to the melter's exposure. It was also pointed out that these radiation levels could also contribute to the melter's internal exposure inasmuch as the material was not fixed contamination. Weiss agreed that this could be true.

It was pointed out to Weiss that a previous investigation had been made on July 19, 1960 by P. R. Nelson of this office regarding the overexposures which were found on two film badges worn by George Cloutier and George Walker, the melt operators. These badges showed radiation dosages of 23 rems and 15 rems of beta radiation, respectively, for

the period of June 13 to June 24, 1960. It was also pointed out to Weiss that on 1/23/60 and on 2/6/60, Bodwell received biweekly film badge exposures of 1100 mrem beta, and 300 mrem gamma, respectively. Weiss stated that he completely overlooked these reports when they were sent in by the Nucleonic Corporation of America. The inspector informed Weiss that for the period 1/9/60 through 4/2/60, he exceeded the level of 3000 mrem for a 13 week period as specified in Appendix A (old Part 20), which is contained in Section 20.101 "Exposure of individuals in restricted areas", and that he failed to limit Bodwell's weekly exposure to 10% of the permissible limit as required by Section 20.105 "Measures to be taken after excessive exposures."

When questioned as to air sampling conducted in the furnace area during the furnace operation, Weiss supplied records which indicated that the general air samples were taken with either a Gelman air sampler, flow rate 20 to 30 liters per minute, or a Gast Pump, flow rate 5 to 15 liters per minute, using Whatman 41 filter paper as the aerosol collector. The results follow:

<u>Date</u>	<u>Sample Result (uc U/ml)</u>
1/17/60	11.3 x 10 <sup>-11</sup> (2-1/2 hour sample)
8/10/60	7 x 10 <sup>-11</sup> (1-1/2 hour sample)
8/26/60	6.03 x 10 <sup>-11</sup> (1 hour sample)
10/2/60	20.88 x 10 <sup>-11</sup> (1 hour sample) - sample taken at top of furnace
10/2/60	1.95 x 10 <sup>-11</sup> - sample taken at operator's position
10/23/60	10.6 x 10 <sup>-11</sup> - Kinney furnace
10/26/60	9.3 x 10 <sup>-11</sup> - Belt sander
11/7/60	9.06 x 10 <sup>-11</sup> - Top of the greasing hood

When questioned on air sampling procedures, Weiss stated that no air sampling evaluation has been made of the furnace operation with respect to air concentrations received by the furnace operator during the performance of his job. The infrequency of air sampling was also discussed with Weiss. It was pointed out that between January 11 and August 10, 1960, no air samples were taken at the furnace operation, and that few samples were taken between the period of August 10 through November 10, 1960. A copy of the Standard Procedures for Assessing Air Contaminant Exposures by Paul B. Klevin and William B. Harris, NYOO 4644 was supplied to Weiss by the inspector.

E. Survey Programs

(1) Smears

Weiss reported that smear samples are taken over a one square foot area approximately every day at 40 different locations within the restricted and clean areas. He stated that when a high reading is obtained, Health Physics notifies the janitors to decontaminate. Weiss has set tentative contamination levels in both the restricted and clean areas. He said that he uses a level of 100 alpha dpm/ft<sup>2</sup> in the restricted areas and 10 alpha dpm/ft<sup>2</sup> for the clean areas. He reported that any smear samples taken in the aforementioned areas which exceed these tentative standards are immediately cleaned up.

A review of the records maintained on smears indicated that the smear samples in the clean area ranged from 0 to 48 alpha dpm/ft<sup>2</sup>, and that levels from 28 to 1000 alpha dpm/ft<sup>2</sup> were found in the restricted areas. The highest sample, 1000 alpha dpm, found on the floor of the abrasive wheel, was decontaminated to 24 alpha dpm/ft<sup>2</sup>. Records indicated that the highest sample was found on May 6, 1960. After decontamination, 24 alpha dpm/ft<sup>2</sup> was found on May 7.

At the vacuum annealing furnace on March 8, 1960, a smear of 912 alpha dpm/ft<sup>2</sup> was found. This was decontaminated, and on March 9, a level of 140 alpha dpm was found.

(2) Incineration and Air Surveys

Weiss reported, and records indicate, that on March 3, April 7 and 8, June 16, 23 and 30, August 22 and 26, September 8 and 14, October 14, 17, 18 and 19, and November 2, 3, 11 and 15, air samples were taken within the licensee's own enclosure approximately 100' from the stack. These samples recorded on the sample record sheet showed ranges of air sample concentrations from .07 to 1.64 x 10<sup>-11</sup> uc U/ml. According to Weiss, the waste materials (wipes, etc.) contained minute quantities of enriched uranium as well as depleted and natural uranium.

When asked what concentrations were found outside of the restricted plant grounds, Weiss replied that he had not conducted any air samples outside the restricted plant area. He agreed that no evaluation had been made or air samples collected down wind from the incinerator outside the plant grounds in order to determine the radioactive concentrations which will fall out as a result of incineration. ✓

(3) Waste Disposal

(a) Liquid Wastes

Liquid wastes from the plant are treated through a series of three hold-up tanks and are then released to a septic tank system. Weiss reiterated as he had in the previous inspection that he uses  $7 \times 10^{-6}$  uc/ml as the level to be released to the unrestricted area.

The records maintained by Weiss show the amount of gallons, total volume, the dpm per liter, uc/ml  $\times 10^{-6}$ , uc/gallon  $\times 10^{-6}$ , and total uc in a tank. From the period January 4 to December 3, 1960, a total of 11,391 uc was delivered to the tanks. Two water samples taken from the lake behind the plant to check seepage showed approximately  $.15 \times 10^{-6}$  uc U/ml.

(b) Solid Wastes

Weiss stated that no solid wastes have been disposed to date. He said that he has contacted Oak Ridge in order to ship waste materials to their burial ground. He added that waste materials should be sent to Oak Ridge by the end of the year.

16. Instrumentation

In addition to the instrumentation reported in the previous inspection, Weiss reported that a Technical Associates Juno and Cutie Pie, and an NMC P-3 proportional counter have been procured and are available for use. He also added that he has on order one Eberline alpha proportional counter and one Nuclear-Chicago 2610.

17. Fire, General Safety and Security

No change occurred since the previous inspection except that the Plainville fire chief had been visited and given literature which was supplied by Mr. J. Macnamara of the Chicago Operations Office. In addition, Weiss stated that he is setting up a fire brigade.

18. Posting and Labeling

The areas in the production facility were properly posted as were the vaults and storage areas. All containers were properly labeled in accordance with 20.203 except for the following:

1. A shipping container, holding 140 pins which contained 5 kgs U-235, although labeled with the proper caution sign and symbol, was not labeled as to the type and amount of the material. The pins were 4" diameter and on 16" centers.
2. In a storage vault, a one gallon can containing 1162 grams of enriched uranium was found not to be labeled with any "Caution - Radioactive Materials" sign or symbol. In addition, no enrichment was noted on the container. It was found that upon checking, the material contained 25% U-235.

19. Records

Records of purchase, procurement, inventory, transfer, smears, air and direct radiation surveys, disposal and film badges were reviewed.

PART 40 INSPECTION

ENGELHARD INDUSTRIES, INCORPORATED  
D. E. Makepeace Division  
Attleboro, Massachusetts

Date of Inspection: December 13, 1960 (Announced)

Persons Accompanying Inspector:

None.

Persons Contacted:

C. A. Canham, Plant Manager  
Norton M. Weiss, Health and Safety Manager  
Chet Lis, Accountability

DETAILS

9.1 License No. C-5161

Under License C-5161, Engelhard Industries, Inc. is licensed to receive 60,000 pounds of source material for research and development and fuel element fabrication in accordance with the procedures outlined in connection with their application for a special nuclear material license (docket 70-139). This license, which is the only current source material license possessed by the licensee, supersedes the previous license, C-4941, which expired on December 31, 1960.

At the time of inspection, a few operations involving source material were in progress. These involved preparing blankets for the PRDC operation. No licensed thorium and no licensed natural uranium were possessed under this license at the time of inspection. Lis reported that the only licensed material on hand was 53,000 pounds of depleted uranium. The licensee was found to possess 21 kgs of normal uranium which he designated as contract material for the CP-5 reactor.

Upon inspection of the assembly of final fixture area, it was found that there were six containers, each containing three blankets of depleted uranium (approximately 200 pounds per blanket). According to Weiss, this material was going to be shipped to PRDC by a common carrier supplied by PRDC. These containers, which were noted to be stored prior to shipment,

were not labeled with any radiation caution sign or symbol or type and amount of material. All other containers were properly labeled, and all areas were properly posted with the proper radiation caution sign and symbol.

Organization and administration, radiological health and safety, security, records and fire and safety are the same as noted under the Part 70 inspection.

Records of receipt, transfer and inventory are maintained.

PART 30 INSPECTION

ENGELHARD INDUSTRIES, INCORPORATED  
D. E. Makepeace Division  
Attleboro, Massachusetts

Date of Inspection: December 13, 1960 (Announced)

Persons Accompanying Inspector:

None.

Persons Contacted:

C. A. Canham, Plant Manager  
Norton M. Weiss, Health and Safety Manager  
Chet Lis, Accountability

DETAILS

9.2 License No. 20-5216-1

Weiss reported that he procured a 5 mc Co-60 sealed source, Tracerlab Model RG-31, on November 19, 1960 from Tracerlab, for the purpose of calibrating his instruments. He stated that to date, he has not utilized the Co-60 source, but he intends to use it in the near future.

The 5 mc Co-60 sealed source was noted to be stored in the X-ray Room in a locked container. The container was labeled with a proper radiation caution sign and symbol, and showed the type, quantity and date of assay of the material. A level of less than 5 mr/hr at one foot was measured with an NMC survey meter, #5576, calibrated November 30, 1960.

A leak test of the sealed source was made by Tracerlab, Inc. within 30 days prior to source transfer to the licensee in compliance with License Condition 16. A wipe taken of the source container by the inspector revealed no evidence of leakage or contamination.

The licensee is also licensed to possess 20 mc C-14 as contained in iron for the manufacture of iron strips. No C-14 material was possessed by the licensee at the time of the inspection. Weiss stated that the last time he manufactured iron strips containing C-14 was in 1959. As noted in the previous inspection report, sheets of iron strips containing approximately 20 mc of C-14 had been shipped to the Sunbeam Equipment Company in Meadville, Pennsylvania.