U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 70-572/83-01(DRMSP)

Docket No. 070-00572

License No. SNM-567, Priority I, Category B

Licensee: Monsanto Research Corporation
Dayton Laboratory
1515 Nicholas Road
Dayton, OH 45407

Type of Licensee: Manufacturer and Distributor

Type of Inspection: Announced Routine

Inspection Conducted: August 15-19, 1983

Inspectors: S.R. Fasuk for W. J. Slawinski, Radiation Specialist — 10-6-83 Date

R. Caniano, Radiation Specialist — 10-6-83 Date

Approved By: S.R. Fasuk for D. J. Sreniawski, Chief, Materials Radiation Protection Section 2 — 10-6-83 Date

Inspection Summary

Inspection on August 15-19, 1983 (Report No. 70-572/83-01(DRMSP))
Areas Inspected: Routine, announced inspection of radiation protection program of a nuclear source production and distribution facility which included the following areas: organizational structure; radiation protection procedures; internal audits; training; facilities; equipment; personnel radiation protection - external; personnel radiation protection - internal; surveys; posting, access, and material control; receipt and transfer of materials; inventory; sealed source leak tests; radioactive effluent to unrestricted areas; radioactive waste; notifications and reports; radiological contingency plan; confirmatory measurements; and independent inspection effort. The inspection involved 54 inspector-hours onsite by two NRC inspectors.
Results: Two apparent items of noncompliance were identified. (1) License Condition No. 16 - failure to perform adequate personnel surveys (Section 10); (2) License Condition No. 16 - fire extinguishers not contained in each glove box (Section 18).

DETAILS

1. Persons Contacted

R. L. Schimmel, Manager, Engineered Products Department
*E. F. Janzow,Manager of Operations, Engineered Products Department
H. L. Coleman, Manager of Nuclear Manufacturing
*S. D. Hoadley, Health Physicist/Radiation Safety Officer (RSO)
T. Caldarea, Health Physics Technician and Assistant Radiation Safety Officer Trainee
E. Harrison, Health Physics Technician
R. A. Booker, Health Physics Technician Trainee
W. Neff, Health Physics Technician Trainee
L. Walker, Monsanto Site Guard
J. Hutcherson, Contractor Site Guard
**B. Wilmoth, Radiological Health Program, Ohio Department of Health

*Denotes those who attended the exit interview.
**Contacted on August 12, 1983. Did not accompany NRC inspectors during this inspection.

2. Organizational Structure

The licensee's organizational responsibilities are described in the License Specifications, Part 5.2, dated March 1978.

The current Monsanto Research Corporation organizational structure is as follows:

R. Mahoney, President and Chief Executive Officer (St. Louis, MO)
L. Fernandez, Chairman, Board of Directors (St. Louis, MO)
H. Schneiderman, Senior Vice President, Research and Development (St. Louis,MO)
H. Williams, Director, Technology Strategy (St. Louis, MO)
R. Scott, Site Director, Dayton Laboratory
W. Witmer, Associate Site Director, Dayton Laboratory
R. L. Schimmel, Manager, Engineered Products Department
E. F. Janzow, Manager of Operations, Engineered Products Department
H. L. Coleman, Manager of Nuclear Manufacturing
J. Booth, Manager, Engineering and Quality Assurance
S. D. Hoadley, Health Physicist/Radiation Safety Officer
H. A. Malson, Assistant Radiation Safety Officer
T. Caldarea, Assistant Radiation Safety Officer Trainee

Mr. Caldarea is currently in training to replace Mr. Malson as the Assistant Radiation Safety Officer.

No items of noncompliance were identified.

3. Radiation Protection Procedures

License No. SNM-567 was last amended in its entirety on May 25, 1978 and partially amended on February 27, 1979, June 24, 1980, March 29, 1982, February 10, 1983 and March 4, 1983. The March 29, 1982, amendment (Amendment No. 10) incorporated the licensee's Radiological Contingency Plan to improve their ability to protect against, respond to, and mitigate the consequences of an accident involving radioactive materials. The February 10 and March 4, 1983, amendments increased the licensee's possession limits on specified radionuclides.

License Specifications, submitted with the May 25, 1978, amendment, describe the program which is conducted under this license. An Operations Manual contains procedures to be followed in implementing the requirements in the License Specifications. Changes in the License Specifications are approved by the Commission before implementation by the licensee. Occasional Operations Manual modifications are made by the licensee, as needed, with approved changes in the License Specifications. No changes have been made to the License Specifications or Operations Manual since the last inspection.

License No. SNM-567 expiration date was May 31, 1983. The licensee filed a timely renewal application to NRC Headquarters, Material Licensing Branch. The licensee is required to adhere to the statements, representations, and procedures specified in the recently expired license until final action is taken on their renewal application.

No items of noncompliance were identified.

4. Internal Audits

Internal audits of the radiation safety program are performed by individual(s) who are outside the area of Engineered Products but have a knowledge of radiation safety. The auditor(s) are typically recommended by the Engineered Products Health Physics Staff and approved by the Dayton Laboratory Director.

The inspectors reviewed the report of the licensee's annual Health Physics audit last conducted on August 5, 1982, by Messrs. D. G. Draper and W. A. Bigler from Health Physics Operations at Monsanto's Mound Laboratory. The audit covered the period September 17, 1981, to August 5, 1982, and included: training program, facilities and equipment, personnel radiation protection - external and internal, area surveys, effluent and waste control, stack effluent monitoring, and environmental sampling. The Radiological Contingency Plan was not included in this audit but will be reviewed during the next audit scheduled for September 1983.

A written report of the audit is given to the Engineered Products Operations Manager for his review and action.

The licensee has a Radiation Safety Committee comprised of the Engineered Products Department Manager, Operations Manager, and the Radiation Safety Officer. The purpose of the Committee is to review the general operations of the Engineered Products Department and implement changes or remedial actions when required. The Committee typically meets biweekly to discuss any problem areas, review personnel exposures, assign health physics duties, and review operational compliance with regulations. Minutes of Radiation Safety Committee meetings, held on the following dates, were reviewed by the NRC inspectors: 1982 - June 4, June 11, June 17, July 19, August 26, September 10, September 16, October 27, November 18, December 3 and 1983 - February 9, March 15, April 6, June 1 and July 7. The licensee also maintains a "Health Physics Log" describing any abnormal occurrences or noteworthy events. The following log entries were reviewed by the inspectors.

Date	
May 18, 1982:	Glove loss in Room 8 during glove box trash pull. After routine trash pull it was found that one glove was contaminated and that this glove needed to be replaced. During glove change, using "bag out" method, the old glove slipped off its ring and activity was released into the room. Contamination was detected on the two technicians performing the operation. Air samples showed a maximum concentration of 1.8×10^{-10} uCi/ml for eight hours or, 14.4 MPC (based on 1×10^{-10} uCi/ml for insoluble Am-241, as shown in Appendix B, Table I, Column I in 10 CFR Part 20). All individuals working in the room were assigned the maximum potential exposure of 14.4 MPC-HRS. The primary cause of the glove loss was the use of two inexperienced individuals performing this particular type of glove change. A third experienced person was nearby to supervise but could not adequately observe the details of the operation. The two technicians performing the glove change submitted urine samples and were whole body counted. No internal depositions were detected. (See Report Section 9 for bioassay details.) Appropriate corrective actions were taken to remedy the incident and prevent recurrence.
August 26, 1982:	Licensee received shipment of four Sr-90 sources (9 uCi each) and twelve Cs-137 sources (0.5 millicuries each) from a vendor on August 20, 1982. The shipment was mislabeled and the shipper's certificate did not contain all the required information. The NRC and vendor were notified. No radiation safety hazard existed.

*August 23, 1982:	Uncontained AmBe pellet found behind shield barrier in Room 7. (See Report Section 9 for bioassay and Section 13 for incident details.)
January 20, 1983:	Licensee received 2.4 millicurie shipment of thorium-228 in normal form in a Type A container. Type A quantity limit for normal form Th-228 was .001 curies. The NRC and vendor were notified.
March 19, 1983:	Lithium fire in Room 8 glove box. Fire occurred while cutting open a PuLi source and weighing its contents. Small fire was allowed to burn itself out. No damage noted.
*April 25, 1983	Health Physics Technician contamination. (See Report Section 10 for incident details.)
May 26, 1983	Monsanto source shipment to vendor mislabeled. (See Report Section 12 for details.)

No items of noncompliance were identified.

*Items of noncompliance or areas of concern identified for these particular entries are described, as noted, in other sections of this report.

5. Training

Training of new employees who work in the controlled areas and refresher training for all personnel who are involved in handling radioactive material is outlined in Section 5.7 of the Specifications and 4.7 of the Operations Manual. New employees are given an apprenticeship type training under the supervision of an experienced technician for a period of at least two months. As they are trained they are "work certified" for various operations by the Manager of Nuclear Manufacturing and/or the Radiation Safety Officer.

One new employee has been hired to work in the controlled area since the last inspection. This new employee and another employee who was formerly considered a trainee were interviewed by the inspectors. Records of work certifications were also reviewed for these employees. The training of these two individuals has been as specified in the applicable sections of the Specifications and Manual. The new employee, who received initial indoctrination in May 1983, has thus far received limited training and only works in the controlled support area.

Refresher training sessions are held at least quarterly. The purpose of these sessions is to review the techniques and methods of handling radioactive material, review regulatory requirements, and update the workers on new information. A review of group training records showed the following sessions were held:

Date	Topic
June 30, 1982	NRC Regulatory Guide 8.29 "Instruction Concerning Risks From Occupational Radiation Exposure" was reviewed. A videotape was shown to supplement this Regulatory Guide.
August 16, 1982	Use of in-cell isotope storage safes.
July 21, 1982	Movie "Shop Safety" was shown.
September 2, 1982	Reviewed packaging procedures for transferring radioactive material. Reviewed incident involving uncontained AmBe pellet found behind Room 7 shield barrier.
September 24, 1982	Reviewed procedure for the transfer of unencapsulated material.
January 10, 1983	Movie "Medical Management of Radiation Accidents" was shown.
February 25, 1983	Demonstrated testing of respirators.
March 4, 1983	Reviewed posting procedures. Introduced interim transfer log procedures.
March 20, 1983	Reviewed Section 10 of Operations Manual. Reviewed requirements for wearing hand, eye and clothing protection.
May 5, 1983	Personnel survey methods and requirements.
July 21, 1983	Waste packaging procedures. Included written quiz on this matter.

No items of noncompliance were identified.

6. Facilities

The nuclear process area is located in the north wing of Building 2 with the north six rooms, Rooms No. 6, 7, 7A, 7B, 8, and 9, being used for processing material (with the exception of Room 7B which houses the trash compactor) and Rooms No. 3, 4, 10, 11, 13, and 14 comprising the support area. These latter rooms involve facilities for counting and leak testing equipment, certain machine operations, QA storage, packaging and receiving of material. Diagrams and descriptions of the facility are contained in Section 7.3 of the licensee's Operations Manual and Section 1.0 of their Radiological Contingency Plan.

The licensee controls access to support and process areas by using an electronic interlock system and by enclosing the outside of these areas with a chain-link type fence. The controlled area is padlocked during off-shift hours.

The roof over Rooms 6, 8, and 9 is flat and constructed of four inch wide 18 gauge steel panels, wood sheating and built-up roofing. The roof over the other rooms are flat and constructed of more conventional type wood and/or steel frame, insulation board, etc. Last year, a wood-truss peaked roof was constructed over the existing flat roof of the north wing of Building 2.

The peaked roof permits better water/snow drainage. The licensee's stack exhaust system is atop the peaked roof. The accessible periphery of the flat roof is still enclosed with a fence and posted as a high radiation area. Access to the peaked roof is controlled by the licensee.

Radioactive waste material is stored in Building 7 which is a poured, reinforced, concrete bunker built into an incline on the east side of Building 2. The door to Building 7 is within the fenced restricted access area and is kept locked.

An in-plant laundry for protective clothing used in the process area is available in a portion of the emergency shower facility. The laundry water, decontamination sink, and emergency shower drain into a 600 gallon retention tank.

A portion of the flat roof over Room 6 is raised several feet to aid in removal of remote box manipulators for servicing. In July 1983, overhead cranes were installed in Room 6 to further facilitate manipulator removal. During crane installation, Rooms 6 and 7 were completely shut down. These areas were deconned and the floor was painted with a rubberized strippable coating. Areas the workers frequented during the installation showed removable contamination levels averaging less than 5 pCi/100 cm^2 and direct radiation levels averaging less than 5 mrem/hr Other adjacent areas were roped and posted to restrict access. Workmen were issued film badges and adequate precautions were taken to minimize exposure.

A perimeter fence surrounds the laboratory site and guards man the entrance to this site continuously.

No items of noncompliance were identified.

7. Equipment

The licensee utilizes glove boxes, remote boxes, hoods, hot cells and a "canyon" in the process area for the production and handling of radioactive encapsulated and unencapsulated material in a manner and within those systems which are described in Section 10 of the licensee's Operation Manual.

The exhaust system for the rooms has a back-up provision so that if the primary unit fails, the back-up fan switches on automatically. The final HEPA filter bank and exhaust fans for this system are located outside of the north wing of Building 2, but within the fenced restricted area. These filters have not been changed as yet but a "bag-out" filter change procedure will be followed when this becomes necessary.

Portable survey instruments are calibrated by the licensee or by the manufacturer, after repairs. Calibration records provided the following information regarding survey meters currently in use or available.

Beta-Gamma Survey Meters: Three Eberline Model RO-2, and one Victoreen Model CP, were last calibrated in May or June 1983. The Victoreen Model CP is currently maintained in the guard house. These meters are typically calibrated quarterly using a cesium-137 NBS traceable source.

Neutron Survey Meters: Two Eberline Model PNR-4 and one FN-1A fast neutron counter, located in the guard house, were last calibrated in May or August 1983. These meters are typically calibrated quarterly using a PuBe NBS traceable source.

Alpha Survey Meters: Operational checks are conducted daily on the six Eberline Model RM-15 meters using a Thorium or Americium check source.

Additional equipment is outlined in Sections 1.0 and 6.0 of the licensee's Radiological Contingency Plan.

No items of noncompliance were identified.

8. Personnel Radiation Protection - External

The licensee's program for external exposure control consists of exposure rate measurements, pre-job manrem estimation, whole body and extremity wrist badges and self-reading pocket dosimeters. Film badges are exchanged on a weekly basis and pocket dosimeters are read daily. Film badge results are received from R. S. Landauer by telephone the week after badges are submitted for processing; Landauer's formal report arrives approximately two weeks later. Pocket dosimeters are direct reading 0-200 mR, manufactured by Dosimeter Corporation of America.

Personnel monitoring records were examined for the second, third, and fourth quarters of 1982 and the first and second quarters of 1983. As a result of an evaluation made in 1976, the licensee assigns hand exposures as twice the wrist film badge results. In an attempt at ALARA, the licensee has an action level for whole body exposures of 450 mrem per quarter. A trial program is currently in effect to reduce the action level to 350 mrem per quarter. Exposures exceeding action levels are evaluated; corrective actions are taken if reasonably achievable. Quarterly exposures were as follows:

		2nd Qtr. 1982	3rd Qtr. 1982	4th Qtr. 1982
Whole Body	(maximum)	480 mrem	290 mrem	290 mrem
	(average)	300 mrem	200 mrem	100 mrem
Extremity	(maximum)	2500 mrem	1600 mrem	2280 mrem
	(average)	1000 mrem	1000 mrem	1000 mrem

		1st Qtr. 1983	2nd Qtr. 1983
Whole Body	(maximum)	460 mrem	420 mrem
	(average)	200 mrem	200 mrem
Extremity	(maximum)	4340 mrem	3340 mrem
	(average)	2000 mrem	2000 mrem

Twelve individuals are currently badged. Varies depending on workload.

Personnel monitoring and termination reports were submitted to the Commission as required.

No items of noncompliance were identified.

9. Personnel Radiation Protection - Internal

The licensee's program for internal exposure control consists of surface contamination surveys, airborne radioactivity monitoring, urine samples, and in vivo counting when necessary.

Daily air samples are taken in each room of the process area and also in several locations of the support area. Air sampler locations are shown on Page 1-37-A of the Radiological Contingency Plan and Section 7.3 of the Operations Manual. The samples are located so as to be representative of the breathing zone concentrations. All of these fixed station samples are collected at the rate of 20 liters per minute for periods of eight hours at a time to coincide with the work shift. Multiple counts are required on each sample due to natural airborne activity. In addition, the licensee has a constant air monitor operating in each of the six rooms in the process area.

An air sampler is also operating continuously in Building 7; the samples are removed and counted at the end of each week, normally Friday afternoon.

A review of in-plant air sample records was made for the period May 10, 1982, through August 10, 1983. Above MPC airborne concentrations were recorded for seven occasions in 1982 and seven occasions in 1983. The maximum quarterly MPC-HRS assigned to an individual was 19.0 MPC-HRS during the second quarter of 1982. The highest airborne concentrations were due to the glove loss and AmBe pellet incident detailed in Section 4 and 13 of this report respectively. Other above normal concentrations were due primarily to pass box and trash pull related operations. The MPC-HRS calculations for exposure to in-plant air concentrations is based on a comparison with insoluble Am-241 (1×10^{-10} uCi/ml) or insoluble Pu-238 (3×10^{-11} uCi/ml) limits.

The licensee has established a bioassay program for all personnel who handle, process, or are exposed to radioactive materials within their controlled areas. Routine bioassay samples consist of 24-hour urine voids for all employees involved in isotope work. Urine samples are collected on a monthly basis for all employees who routinely work with isotopes. Supervisors and other personnel who frequently enter controlled areas but do not actually perform operations with unsealed forms of materials, submit urine samples once per quarter. All urine voids are collected off-site between midnight Saturday and midnight Sunday of the designated weekend. Routine samples are analyzed for americium-241 and plutonium-238 by Controls for Environmental Pollution,Inc., Santa Fe, NM. Special 24-hour urine samples, analyzed for the isotope in question, are collected if internal deposition is suspect. The licensee's action levels are specified in License Specification 7.9.3(5) for resampling and investigation actions. Urine sample records were reviewed for the period March 5, 1982, through June 24, 1983. Sample maximums were 0.08 ± 0.05 dpm/sample alpha (Pu-238) and (Am-241).

Special bioassay are employed to evaluate possible deposition from known or suspected accidental exposure. In addition to special urinalysis, fecal and/or lung counting is performed by the Mound Laboratory, especially if evidence indicates that the exposure may have been to relatively insoluble forms of radioactive materials. Special bioassays were performed on May 19 and 20, 1982, for the two individuals involved in the May 18 glove loss incident. These bioassays consisted of whole body counts and urine samples. The individuals were whole body counted on May 20 for americium-241, and were found to have less than the minimum detectable level (0.516 nCi) for this counting system. Two 24-hour urine samples were collected from each individual and showed no americium-241 or plutonium-238 detected. Another special bioassay (whole body count) was performed August 30, 1982, on the individual involved in the August 23 AmBe pellet incident. No americium-241 was detected in this individual.

Half face mask respirators are provided for personnel in the process area to use whenever there is a possibility for airborne contamination, e.g., during pass box and trash pull operations involving unencapsulated material. However, the licensee takes no credit for a respirator program. The respirators are periodically subjected to a smoke test by the RSO to check their operability. The licensee has recently purchased two Scott Air-Pak units for emergency use but have not put them into service due to a manufacturer's recall of the compressed gas cylinders.

No items of noncompliance were identified.

10. Surveys

The licensee performs direct radiation level measurements in and around the north wing of Building 2 and Building 7 plus measurements to determine surface and personnel contamination levels. Personnel surveys are

performed using Eberline Model RM-15 meters located at change lines before entering the controlled support and process areas. Area Radiation Survey Reports include facility room diagrams to identify surveyed areas. Routine area surveys are conducted and documented at least twice each month. Spot radiation surveys are conducted several times a week. In addition, the RSO for any reason and frequency deemed appropriate, conducts contamination and direct surveys. Surveys are periodically conducted outside Building 2, in unrestricted areas, depending on weather conditions and/or suspicion of above normal radiation levels. A selective review of survey reports was made covering the period May 1, 1982, to August 5, 1983. Records of smear surveys in controlled areas showed contaminated surfaces were promptly cleaned and resurveyed until the levels were below the limits of 225 pCi/100 cm^2 alpha in process areas and 50 pCi/100 cm^2 in support areas. Contamination limits for items leaving the controlled area is shown in Section 7.7.2 of the License Specifications.

On April 25, 1983, Health Physics was informed that a technician had a contaminated forearm and clothing. Surveys showed 20,000 pCi direct and 1750 pCi removable on the individual's right forearm. The individual was decontaminated in the licensee's decon facility and his clothes were disposed of in the hot trash. The contaminated individual was cleaning a boxline in Room 8 on the morning of April 25 and shortly thereafter left the facility and returned home for his lunch break. Later that afternoon the individual checked himself for contamination, as is routinely done, and found contamination on his right forearm and shirt sleeve. Apparently the right glove on the boxline had a hole or other breach, contaminating his arm during boxline cleanup. The individual stated that prior to leaving the controlled area for lunch, he surveyed his hands but failed to survey his arms or other parts of his body. Section 6.0 of the licensee's Operations Manual, Subsection 6.2, entitled "Radiation Monitoring and Contamination Control" states "As a matter of routine, operating personnel are required to conduct appropriate radiation surveys prior to, during, and at completion of individual work assignment involving the handling of radioactive material." However, on April 25, 1983 after cleaning a glove box containing americium-241, a Technician failed to properly survey himself prior to leaving the controlled area for lunch. This is an item of noncompliance against License Condition No. 16 which references the licensee's Operations Manual.

This incident was identified by the licensee in a letter to the NRC, Region III, dated May 6, 1983 (see Attachment I). Action was taken to preclude a recurrence of this incident by conducting a special training meeting with all Health Physics staff members emphasizing the importance of personnel surveys and the proper methods for performing such. Also, signs were installed at frisking stations to remind personnel that adequate personnel surveys are required. Accordingly, this matter is considered closed and no further licensee action is required.

One item of noncompliance was identified.

11. Posting, Access and Material Control

During tours of the facility, the inspectors noted that areas in which radioactive materials were stored and/or handled appeared to be properly posted and controlled. Contaminated material and equipment appeared to be properly contained and labeled. No problems were noted with movement of contaminated materials or equipment within the facility. High radiation areas are posted and control of such areas is established in accordance with 10 CFR 20.203(c)(4).

All visitors and employees not associated with the Engineered Products Department are limited entry to the restricted areas under the direct supervision of one of the Department employees. These visitors are issued a film badge, protective clothing, and are instructed as to the procedures of the area in which they are visiting.

No items of noncompliance were identified.

12. Receipt and Transfer of Materials

Incoming shipments of radioactive material are surveyed for direct radiation and surface contamination as required. Further checks are typically performed for contamination during the various unpackaging stages. If the final sealed container is reached without detecting excessive contamination, it is then assayed by neutron, gamma counting or calorimetry to determine the isotope content and assure that possession limits are not exceeded.

The licensee received approximately 56 shipments of licensed material and 151 empty containers during the period May 10, 1982, to August 9, 1983. Smear surveys of the shipping containers showed less than 50×10^{-6} uCi of removable contamination.

The inspectors reviewed records of outgoing shipments of licensed material for the period May 1982 to August 1983. Records of nine shipments were reviewed after being chosen at random from the "outgoing shipment" log, they were:

Shipping Date	Customer	Source Identification	Shipping Container Type	Total Activity (Curies)	Transport Index
6/2/82	Texas Nuclear	MRC # Pu/Be 497	B	45 Ci	3.6
7/2/82	Canberra	MRC # Am/Be 4064	B	44.2	2.0
12/17/82	Campbell Pacific	CP # Am 890	B	.091	0.5

1/21/83	Kay Ray	MRC # Am/Be 5694-5703	A	6.0	3.8
2/16/83	Mason & Hangar	MRC # CF 243	A	.0031	2.0
4/1/83	Ohmart	Am 1574-1579	A	4.0	0.2
5/27/83	Kay Ray	MRC # Am/Be 4103-4107	A	2.4	2.0
7/11/83	Union Electronics	MRC # Am/Be 4108	A	4.9	3.6
6/24/83	Westinghouse	MRC # Am/Be 4091-4092	B	0.11	0.5

The NRC inspectors verified the licensee had copies of the customers' licenses or written certifications which authorized possession of the material ordered. The sources were leak tested prior to shipment. Direct radiation surveys were made and recorded and shipping labels were as required. Container surface contamination was less than 9×10^{-6} uCi.

On April 1, 1983, the licensee shipped eight special form Am-241 sources to Ohmart Corporation in Cincinnati, Ohio. The sources were destined for use in Ohmart density or level measurement gauges. The sources were partially mismarked as 1000 uCi rather than 1000 mCi each. The sources had two sets of markings (engraved print on source capsule), one set contained the uCi marking and the other had the correct mCi marking. The marking with the correct information was on the side of the source and the incorrect marking was on the back of the source capsules. All other documentation had the proper information including the shipping papers. The possibility of mismarking was discovered by Monsanto Quality Control during final inspection of two additional sources from the same lot but which had not left Monsanto. The work order for the engraved markings was not clearly marked as mCi. Apparently Quality Control inspection failed to notice the error initially. No radiation safety hazard existed as a result of this occurrence.

The customer was notified by phone and in writing of this occurrence. The customer indicated they preferred not to return the sources since they would only be handled by Ohmart personnel, fastened into their properly marked source holders/gauges, and sold to their customers. The sources would not be handled by personnel other than Ohmart's.

The NRC Region III office was notified by Monsanto of this occurrence in letter dated June 20, 1983 (see Attachment II). The licensee has taken corrective actions to preclude recurrence by modifying their

Quality Control inspection procedure. The new procedure requires that the markings on a source be recorded on the inspection form instead of using a checkmark to indicate that the markings had been inspected. The inspection form itself will be revised to include a note that the actual markings on the source are to be copied on to the inspection form. The corrective action appears adequate and therefore the matter is considered closed with no further licensee action required.

No items of noncompliance were identified.

13. Inventory

The licensee's Quality Assurance Program includes responsibility for conducting periodic inventories of licensed material. Inventories are typically updated when a particular isotope is received, if finished sources are sold to customers and/or approximately monthly. Inventories do not indicate location of licensed material. The most recent inventory showed the licensee possessed the following as of August 1983: Cf-252, Sr-90, Am-241, Pu-238, Co-60, and Cs-137. All quantities were within the license possession limits stated in their latest amendment (Amendment #12).

On August 23, 1982, an uncontained AmBe pellet was found behind the shield barrier in Room 7 of the controlled process area. The pellet was found by a Health Physics Technician while cleaning and changing the setup behind the barrier in Room 7. The pellet was a pressed-powder type cylinder, black in color, approximately one-half inch diameter and one-half inch in height. Pulse height analysis, neutron counting and calorimetry showed the pellet to contain 2.8 Ci Am-241. The Technician, using 18 inch forceps, picked up the pellet off the floor and placed it on a furnace next to him. The "help needed" alarm was then tripped.

Surveys of the Technician showed no contamination except on the bottom of his shoe covers. The pellet was remotely placed in a glass vial and transferred to the Room 6 cell. Wipe tests on the pellet indicated removable contamination as high as 10,000 pCi (approximately 22,000 dpm). Wipe surveys outside the shield barrier in Room 7, using Eberline Model RM-15 meters, indicated some tracking with spots up to 500 cpm. The meter was off scale (greater than 500,000 cpm) at the spot the pellet was found and approximately 10,000 cpm on floor surfaces a couple feet away. Air samples indicated 1.9 X 10^{-11} uCi/ml or 1.5 MPC-HR Am-241 at the outside of the shield barrier, about 15 to 20 feet from where the pellet was found. Based on area survey results, the licensee estimated that the airborne concentration on the inside of the barrier where the pellet was found was no more than ten times greater, or 15 MPC. The room air system mixes air from both sides of the barrier.

It is not known how the pellet arrived at this location. The licensee stated the most probable theory was that the pellet had been transferred to Room 8 boxline for density measurements approximately a

year ago. Transfer of the pellet back to the cell would require it to be placed in a glass vial inside a paper carton. For unknown reasons the vial apparently was placed in the floor storage well behind the Room 7 barrier instead of being placed in the remote cell. During a Cf-252 inventory on August 6, 1982, the vial may have been jolted out of its storage tube and the pellet fell behind the storage well where it could not be seen from outside the shield barrier. The storage of an uncontained pellet in a storage well rather than in a glove box or remote cell violates the licensee's internal procedure.

A radioactive transfer log was instituted on a trial basis to improve control over the movement of licensed material within the facility. Personnel were required to notify the RSO, or alternate, prior to transferring material. The transfer was then to be logged indicating the packaging and destination. However, use of this transfer log was discontinued due to notification problems. The NRC was notified of this event in a letter to the Region III office.

One item of concern was identified.

14. Leak Tests

Eleven sealed sources used by the licensee for calibration and reference purposes were last leak tested on June 27, 1983, within the required six month interval. Test results showed less than 0.005 uCi of alpha and beta-gamma removable contamination.

No items of noncompliance were identified.

15. Radioactive Effluent to Unrestricted Areas

All glove boxes and hot cells are exhausted through HEPA filters and into a common HEPA filter in a single 50 foot high stack. This exhaust system runs continuously at the rate of 360 cubic feet per minute at a static pressure of 4.5 inches. Stack sampling is conducted on a continuous basis, samples are collected and analyzed weekly covering the previous week (168 hours).

Air flow through glove boxes is minimal and results from in-leakage only when the box is closed. Atmosphere within the box is vented through a closed air filtration system designed for an air flow of 50 cubic feet per minute through an 8 inch glove port, should the port be opened. Box pressure differential (1.0 inches water) is produced by a fan on the roof that exhausts into the 50 foot high stack.

D. O. P. tests were performed on the six final HEPA filters on October 28, 1982. All filters were 99.99% efficient. The tested filters are; one for the compactor room (Room 7B), one for the boxlines, and four in the controlled area rooms exhaust system. Filter acceptance efficiency is 99.95%.

A review of stack air sample results since the previous inspection showed a maximum stack release of 1 4 MPC-HRS on May 18, 1982, which is based on the insoluble americium-241 limit (4 X 10^{-12} uCi/ml) shown in Appendix B, Table II, Column I in 10 CFR Part 20.

No items of noncompliance were identified.

16. Radioactive Waste

With the exception of radioactive liquid which goes into an underground retention tank from the emergency shower, laundry, and decontamination sink, all radioactive liquid wastes are mixed with cement or other solidifying media and disposed of as solid radioactive waste. Retention tank waste is drained into the sanitary sewer only if concentrations are below that listed for insoluble plutonium-238 (3 X 10^{-5} uCi/ml) in Appendix B, Table II,Column 2, in 10 CFR Part 20. There were three transfers of liquid from the retention tank to the sanitary sewer during the period May 10, 1982, through August 19, 1983. Samples of the liquid, prior to release, showed a maximum concentration of 2 X 10^{-6} uCi/ml. Records also show total activity and number of gallons released to the sewer system during these transfers.

Solid radioactive waste is transferred from the process area to the Building 7 bunker where it is stored in Spec 17H 55-gallon drums pending transfer to a disposal firm. Each drum is identified by a number which is cross referenced in a log book. The log indicates the radioisotope, waste description, estimated activity, date placed in storage and direct and removable radiation/contamination levels. There is currently 87 drums of TRU (transuranic waste) and 23 drums of LSA (low specific activity) waste in the storage bunker. The LSA waste consists primarily of miscellaneous bench and table trash.

No waste shipments have been made since December 28, 1980. The transuranic waste is currently being stored pending notification that a burial site will accept such wastes from private industry. The licensee stated that LSA waste is currently being accepted at the Richland, Washington burial site provided the waste is placed in a plastic liner of a specified thickness. The licensee intends on disposing of their drums that qualify as LSA as soon as possible.

No items of noncompliance were identified.

17. Notifications and Reports

There have been no incidents requiring notification pursuant to 10 CFR Part 20.403 since our last inspection in May 1982. However, the licensee has reported other incidents as detailed in various sections of this report.

No items of noncompliance were identified.

18. Radiological Contingency Plan

In accordance with a Commission Order dated February 11, 1981, the licensee submitted a Radiological Contingency Plan dated August 1981, revised October 27, 1981 and December 24, 1981. The Radiological Contingency Plan describes the licensee's emergency response organization, description and analysis of potential accidents including natural phenomena, and descriptions of the equipment, plans/procedures to protect against, respond to, and mitigate the consequences of an accident involving radioactive materials. This plan was incorporated into license No. SNM-567 by Amendment No. 10, dated March 29, 1982. The licensee has 90 days from the date of this amendment to fully implement the plan.

The Contingency Plan describes the licensee's facility and activities and addresses topics such as: Process/support systems available for responding to abnormal operations; classifies various radiological contingencies; organizational control; availability of equipment; assessments, corrective, and protective actions; training given to on-site and off-site personnel.

Radiological contingencies are classified initially by the Health Physics staff. Official classification is announced by the Monsanto Site Director in Dayton, Ohio or the Monsanto Director in St. Louis, Missouri. The classifications are, from lowest to highest category by degree of hazard to the public:

a. Notification of Unusual Event

b. Alert

c. Site Area Emergency

d. General Emergency

Letters of agreement between the licensee and off-site support facilities were reviewed (Dayton Fire Department, Dayton Fire Department Paramedics, and St. Elizabeth Medical Center). Representatives from these agencies have toured the Engineered Products Department and are aware of the quantities and kinds of radioactive materials which are possessed.

The inspectors reviewed the availability of radiological emergency equipment which included the contents of the emergency cabinet located in Building 1 and the monitoring equipment located in the guard house. This equipment is checked quarterly to assure availability in the event of an emergency. The inspectors also checked the emergency call list posted in the guard house and questioned the guard on notification procedures. Pages 2-1.6 and 2-5 of the plan state that each glove box contains manually operated hand-held fire extinguishers containing halon gas. However, on the days of this inspection, the inspectors

noted that not all glove boxes which are used for processing radioactive materials contained fire extinguishers. Glove boxes No. 1, 2, and 3 in Room No. 8 and two boxes in Room No. 9 did not contain the required fire extinguishers. These glove boxes are currently used for processing radioactive materials in unencapsulated forms. The RSO stated that the fire extinguishers lost gas and were removed from the boxes about one month ago. This constitutes noncompliance with the Radiological Contingency Plan which is referenced in License Condition No. 16.

No specific training program has been implemented by the licensee for off-site support personnel. Discussions with these organizations are held periodically. The Fire Department Paramedics have had generic training in transporting radioactively contaminated injured. The licensee assists the Fire Department and hospital staff in training by providing instructions regarding the type of isotopes and emergency conditions that might be expected. Licensee training given to off-site organizations is primarily that of informing the personnel of the radiological hazards and what is expected of them in the event of a radiological emergency. If needed, trained personnel are available from the Monsanto Mound Laboratory in nearby Miamisburg, Ohio.

Radiological emergency training for on-site radiation workers (i.e. Technicians) is part of the standard radiation safety training that is given to workers on at least a quarterly basis. Training of on-site security, fire brigade, first aid and rescue personnel is the responsibility of the Monsanto site Safety Department and is not a part of the Contingency Plan.

Periodic testing of the site-wide evacuation plan, for all types of emergencies, is accomplished by activating audible evacuation alarms. Practice evacuations for Zone 2 (i.e. areas surrounding Building 2) are held quarterly and recorded in the licensee's Health Physics log.

At least once every two years, the licensee is required to have an exercise which simulates a radiological emergency condition on-site. Such a simulated emergency, classified as an "Unusual Event," was conducted on July 14, 1982. The scenario was as follows: Two Health Physics Technicians were performing a routine remote cell manipulator pull in Room 6 of the controlled process area. During the pull, one manipulator disconnected or broke off its hinge and lodged in a Technician's chest causing severe injury. Pictures taken by the licensee showed how realistic the accident appeared including fabricated wounds, pseudo blood, etc. The radioactive effluent levels in the room were assumed to be 3.8 MPC-HRS Am-241. The manipulator was assumed contaminated and a mock fire was started on the flat portion of the Engineered Products Department (EPD) roof using smoke bombs. Personnel involved in the emergency were as noted below:

On-Site	Off-Site
EPD Staff	*Dayton Fire Department
*Fire Brigade	*Dayton Fire Department Paramedics
*First Aid Team	*St. Elizabeth Medical Center
*Maintenance Department	
*Site Guard	
Site Staff Physician	

*Personnel not aware emergency was a simulation (except Fire Chief and Heads of various emergency teams).

The licensee was quite pleased with the expeditious manner in which on-site and off-site personnel responded. The Dayton Fire Department and Paramedics were at the scene within 15 minutes of notification. On-site emergency team members indicated they needed more training specific to their duties. Specifically, First Aid Team members needed more training in regards to treating and handling contaminated injured. Both the Dayton Paramedics and Monsanto First Aid Team needed additional protective clothing (e.g. respirators, hard hats, coveralls). Training and providing the necessary equipment for on-site emergency teams are areas that the Monsanto Site Safety Department and Engineered Products Department should coordinate jointly. The NRC inspectors were unable to directly contact the various on-site and off-site emergency teams regarding their response efforts. The inspectors' critique only involved discussions with the Radiation Safety Officer and Engineered Products Department Operations Manager.

An independent audit of the plan will be conducted by individuals outside the Engineered Products Department during the licensee's next internal radiation safety audit scheduled for September 1983.

One item of noncompliance was identified.

19. Confirmatory Measurements

On August 18, 1983, the inspectors measured radiation levels of direct alpha, gamma and neutrons in the controlled support and process areas in and around Building 2, and along the fenced restricted area outside Building 2. Alpha measurements were made using Region III's Eberline PAC-1 SAGA, NRC No. 007304, last calibrated May 14, 1983. Gamma measurements were made using Region III's Eberline Model Pic-6A, NRC No. 000712, last calibrated June 15, 1983. Neutron measurements were made using the licensee's Eberline Model PNR-4, Serial No. 2236, last calibrated August 17, 1983. Levels obtained in selected areas were found to be consistent with posted levels and those shown in the licensee's records of past surveys. Twenty smears were also taken from floor areas and equipment in the support and process areas including the floor of the storage bunker. The smears were initially counted by the licensee and then in the NRC Region III laboratory.

The licensee currently participates, since December 1982 in the U. S. EPA Intercomparison Study. The licensee was within the specified tolerances during the last study in March 1983.

No items of noncompliance were identified.

20. Independent Inspection Effort

The inspectors checked the response of alpha survey meters at the shoe cover change lines, observed a demonstration of the boxline exhaust stack alarm, and observed techniques and postings during escorted tours of the facility. Licensee representatives described the various operations that are conducted in each room.

No items of noncompliance were identified.

21. Exit Interview

The inspectors discussed the findings of the inspection, including the apparent items of noncompliance, with the licensee representatives identified in Section 1 of this report on August 19, 1983. The licensee representatives agreed with the inspector's findings and indicated that corrective actions, if not already implemented, would be taken as soon as possible.