U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 030-07026/83-01

Docket No. 030-07026

License No. 29-13848-01 Priority I Category E3

Licensee: International Nutronics, Inc.

U.S. Highway 46 & Schley Street

Dover, New Jersey 07801

Facility Name: International Nutronics, Inc.

Inspection At: Dover, New Jersey

Inspection Conducted: September 30, October 1, 6, 7, 21, 26, 27, November 30, December 1, 7, 14, 21, and 30, 1983.

Inspectors: Laurence F. Friedman — 6/13/84
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Senior Radiation Specialist

Jenny M. Johansen — 6/13/84
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for John E. Glenn — 6/13/84
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John E. Glenn, Ph.D., Chief date
Nuclear Materials Section B

Inspection Summary:
Special Safety Inspection Conducted September 30, October 1, 6, 7, 21, 26, 27, November 30, December 1, 7, 14, 21, and 30, 1983, (Report No. 030-07026/83-01)

Areas Inspected: Circumstances surrounding spill of contaminated water; radiation protection procedures; materials, facilities, and instruments; personnel protection - external; personnel protection - internal; notifications and reports; confirmatory measurements; and status of the facility as of December 30, 1983. The inspection involved 291 inspector hours on site by four NRC inspectors.

Results: Nine apparent violations were identified: Possession of unauthorized radioactive material, improper procedures during decontamination operations, unauthorized use of licensed material, no monitor of integrity of liquid shield, no surveys of effluents released from the facility, no surveys of airborne exposures, no surveys of releases to sewer, failure to report incident, failure to post a radiation area.

DETAI'S

1. Persons Contacted

*Bruce Thomas, Plant Manager
Larry Mayfield, Operator
Joseph Dachison, Operator
James Welch, Radiation Safety Officer

*Denotes those present at exit interview.

2. Background and Incident

International Nutronics, Inc., (INI) has operated an irradiation facility in Dover, New Jersey, since 1981, after purchasing the facility from RSA Corporation, which owned and operated the plant from 1970 to 1981. The facility consists of two buildings. A front building was used as an office and maintenance shop. The rear building included a shielded irradiator cell with a 16 foot deep storage pool for the cobalt-60 irradiation sources, storage facilities for product scheduled to be irradiated, and a counting lab for analysis of samples. All radioactive materials were to be stored and used in the rear building.

On June 11, 1974, RSA Corporation detected a leaking cobalt-60 source in the storage pool. The leaking source was reported to the AEC on July 3, 1974, following a compliance inspection on June 26, 1974. The report of July 3, 1974, indicated that the leaking source had been sealed in a stainless steel pipe and that water filtration had reduced concentrations of cobalt-60 in the pool water to acceptable limits. The report indicated that arrangements to dispose of filters had been made and that discussions on disposal of the source were in progress. Independent measurements of concentrations of cobalt-60 in pool water made by the NRC in November of 1976 revealed concentrations 20 times greater than those reported by RSA Corporation. In response to an Immediate Action Letter dated December 16, 1976, RSA Corporation tested all sources individually for leakage, removed the known leaking source to a shielded cask for dry storage, reduced the concentrations in pool water to acceptable levels, initiated surveys for removable contamination, and certified that all leaking sources had been removed f om the storage pool.

From 1976 to 1982, the NRC continued to make independent measurements of cobalt-60 in pool water during routine inspections conducted on an annual basis. These results, as well as RSA Corporation's (and later INI's) records, indicated measurable concentrations of cobalt-60 which were below the license reporting limits for a leaking source. On October 20, 1982, INI shut down irradiator operations to prepare the pool to receive additional cobalt-60 sources. On October 25, 1982, INI noted high concentrations of cobalt-60 in pool water after sediments had been disturbed. These results were reported to Region I by telephone on October 25, 1982.

As confirmed by letter dated October 29, 1982, INI agreed to delay the loading of new sources until pool concentrations were reduced below license limits and the absence of leaking sources was verified, to arrange for a contractor to decontaminate the pool, to leave contaminated equipment in the pool until arrangements were made to properly dispose of the equipment, and to keep the NRC informed of all actions to resolve the problem.

In November 1982, Chem-Nuclear Corporation of Barnwell, South Carolina, performed cleanup operations of the licensee's contaminated source storage pool. A second leaking cobalt-60 source was identified by the licensee and reported to the NRC in December of 1982. The cleanup operation was conducted under the licensee's license, by special condition added to that license. This condition incorporated, by reference, the procedures that would be used by Chem-Nuclear during the cleanup. The Chem-Nuclear operation included hydrovaccing the pool using filters contained in 55-gallon drums shielded with concrete. One of the operations involved dewatering the filters after use by blowing air back through the filter. The licensee's procedures required that the exit hose from the filter be at least 10 feet below the surface of the source pool during dewatering operations. Licensee representatives stated that, because of turbulence created in the pool during this operation, the operation was actually conducted with the exit hose above the surface of the pool. This produced a fine mist which appears to have spread contamination throughout the interior of the irradiator cell.

On September 30, 1983, Region I was informed by an INI employee that INI had suffered a water filter system malfunction in December 1982 that resulted in water being pumped from the source storage pool onto the facility floor. The spill water reportedly contaminated portions of the concrete block building walls and some soil external to the facility.

During the inspection, licensee representatives confirmed, and licensee records showed that, on December 4, 1982, the licensee was conducting a hydrovaccing operation using an auxiliary pump and filter system. The system was permitted to run overnight. The discharge line from the pump became detached, and most of the contaminated water in the source shielding pool was pumped out onto the floor of the facility. The extent of the spill is evidenced by licensee records showing the floor surface that was covered with water, and notations that ozone was detectable in the facility. This would indicate that the sources were exposed to air.

NRC inspectors detected radiation levels along the inside of the walls of the facility as high as 5 milliRoentgen per hour and outside the facility as high as 1.2 milliRoentgen per hour at contact. Subsequent NRC surveys outside the facility showed soil contamination as high as 270 picocuries per gram, and contamination under the floor of the facility as high as 3,800 picocuries per gram of soil. The licensee drilled four test wells outside his facility. No significant evidence of ground water contamination has been detected by the licensee, by the NRC or by an NRC consultant. Licensee representatives stated that no attempt was made by the licensee to quantify the extent of the releases resulting from the spill prior to being ordered to do so by the NRC.

Licensee representatives stated that, during the cleanup effort following the spill, the licensee poured some of the cleanup water into a stall shower located in the office building in the front of his facility. NRC surveys detected radiation levels of 1 milliRoentgen per hour (mR/hr) above the shower drain. The drain trap was removed and disposed of as radioactive waste. Licensee representatives stated that no attempt was made by the licensee to estimate the amount of radioactive material that was discharged to the sewer.

The finding that dewatering of filters had been conducted with the exit hose from the filter above the surface of the pool is an apparent violation of License Condition 20.

The finding that no surveys were made to quantify releases of radioactive material to the environment is an apparent violation of 10 CFR 20.201(b).

The finding that the licensee discharged radioactive material to the sewer without quantifying the amount of material being released is an apparent violation of 10 CFR 20.201(b).

3. Radiation Protection Procedures

During a survey of the facility roof during the last week in November 1983, the licensee discovered an area where radiation levels of 13 mR/hr existed at the surface of the roof. The roof was not posted as a radiation area but was not accessible to the public, except by using a ladder. This condition was reported to an NRC inspector on December 7, 1983, at which time the area was posted as a rad ation area at the inspector's request. The condition apparently had existed since October 17, 1983, when parts of the radiation shield surrounding the old irradiator were rearranged. On December 30, 1983, the licensee moved shielding block to reduce radiation levels on the roof to acceptable levels.

The finding that radiation levels of 13 mR/hr existed for more than one hour on the roof of the licensee's facility, without posting as a radiation area, is an apparent violation of 10 CFR 20.203(b).

4. Materials, Facilities and Instruments

Licensee representatives stated, and licensee records showed, that during cleanup operations in November 1982, two truck oil filters were discovered in the pool which read approximately 1 Roentgen per hour at one foot. Licensee representatives stated that these filters appeared to be left over from cleanup operations conducted following the 1974 source rupture. The filters may contain mini-pellets from the ruptured source, and other loose cobalt-60. The filters were removed from the pool and placed in 55-gallon drums shielded with concrete.

Licensee records showed that, from December 27, 1982, to January 2, 1983, the licensee irradiated product for customers using sealed sources supported in a bail assembly. The sources are normally mounted in a special

source rack during irradiations. During the period when these irradiations were conducted, the NRC believed, as a result of information provided by the licensee, that the facility had been shut down to permit decontamination operations to proceed.

Since September 1983, the licensee has ceased conducting irradiations at this facility.

In 1982 the licensee had ordered additional cobalt-60 sources in order to expand irradiation operations. Following discovery of the further pool water contaminatin on October 25, 1982, and subsequent difficulties in reducing the contamination to acceptable levels, the licensee sought permission from the NRC to construct a new source storage pool and irradiator cell in order to utilize the additional sources. Permission was granted and, in February 1983, construction of the new cell adjacent to the old cell was completed.

Licensee representatives stated that, at the time the new irradiator was constructed, the vacuum switch which had provided the low water level alarm for the old irradiator pool was disconnected and used for the water level alarm in the new cell. Consequently, from February 1983 to December 30, 1983, there had not been any system that would automatically detect and alarm a low water condition in the old pool, in which sources were still stored. A new low water level indicator for the old irradiator pool was installed on December 30, 1983. At that time, a few gallons of water were spilled while the pool was being filled to make up for evaporative losses. A Region I inspector verified the minor nature of the spill and its successful cleanup.

The finding that the licensee stored cobalt-60 in unsealed form in filters at the bottom of the pool is an apparent violation of 10 CFR 30.34(c) and License Conditions 6, 7, and 9.

The finding that the licensee conducted irradiations with the sources supported in a bail assembly is an apparent violation of License Condition 19.

The finding that the source pool, in which sources were and are stored, was not monitored by a low water level alarm is an apparent violation of 10 CFR 20.203(c)(6)(iii).

5. Personnel Protection - External

Whole body exposures to three licensee personnel for 1983 were 305, 800, and 935 millirem.

The licensee maintains a form NRC-4 for each employee, permitting exposures up to 3 rem a quarter. These forms were reviewed and found to be in order.

No violations of NRC rules, regulations, or license conditions were identified.

6. Personnel Protection - Internal

Licensee records showed that, in June 1983, the licensee began systematic surveys for removable contamination in his facility. These surveys disclosed significant removable contamination, which reappeared within two weeks of cleaning. This eventually led licensee personnel to suspect a significant airborne contamination problem, and air sampling was begun on August 29, 1983. These surveys revealed elevated airborne contamination levels, but below the maximum permissible concentration for a restricted area. The licensee enclosed the old irradiator cell area, the suspected source of the contamination, in plastic, and began a systematic cleanup of the rest of the facility to remove loose contamination from all surfaces, including beams and rafters. After the NRC inspection on September 30, 1983, the licensee also conducted whole body counting of all personnel who worked in the facility during the period from November 1982 through September 1983. Licensee records showed that the maximum body burden detected in any one person was estimated to result from 19 hours exposure to cobalt-60 at the concentration listed in Part 20, Appendix B, Table I, Column 1.

Licensee personnel informed the NRC that evidence of airborne contamination was recognized by the previous owner of the facility (RSA Corporation) as early as 1976, but no steps were taken until August 1983 to quantify the extent of the airborne contamination problem.

The finding that no surveys were done to quantify airborne contamination from 1976 until late August 1983 is an apparent violation of 10 CFR 20.201(b).

7. Notifications and Reports

Licensee representatives stated that a management decision was made following the December 4, 1982, spill not to report the spill to the NRC on the grounds that the event was not reportable. It is apparent, however, that the spill has caused the loss of use of the facility for more than 24 hours, and that the cleanup expenses will exceed $2,000.

The finding that the licensee failed to report, within 24 hours, an incident which caused a loss of use of his facility for more than 24 hours and caused property damage in excess of $2,000 is an apparent violation of 10 CFR 20.403(b).

8. Confirmatory Measurements

On September 30 and October 1, 1983, extensive radiation and contamination surveys of the rear building were made. Radiation levels exceeding 5 milliRoentgen per hour (mR/hr) were measured along the north wall at the floor line using a Ludlum micro R meter. Levels closer to the old irradiator dropped to 0.6 mR/hr, indicating that the radiation originated

in the vicinity of the wall, and was not shine from the irradiator. Levels up to 3.0 mR/hr were measured along the west wall. Wipes were taken at 10 points inside the building and analyzed in a low background gas flow proportional counter at the Region I laboratory. No removable contamination above 40 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) was detected. Surveys outside the building were also made. Radiation levels up to 1.2 mR/hr were measured along the north and west walls.

On September 30 and October 3 and 4, 1983, surveys outside the rear building were made by a team from the Region I Environmental Radiation Protection Section. Eight test borings were made, to a depth of 4 feet. Concentrations of cobalt-60 in soil as high as 2×10^{-4} microcuries per gram were found at a depth of 4 feet. The localized pattern of contamination indicated that the cobalt-60 was not very mobile. No cobalt-60 was found in ground water.

On October 7, 1983, a radiation survey of the roof of the rear building was performed using a Ludlum micro R meter. The maximum level measured was 3.3 mR/hr. Levels above 2.0 mR/hr were measured over a fairly large area of the roof. Wipes of the roof and vent pipes were also taken. No significant removable contamination was found on the roof except in the vent pipe from the irradiator, where 2×10^{-2} microcuries of cobalt-60 was found on a wipe. An extensive survey was also made of the front building. Low level contamination was found on most of the equipment, floors, and walls in the shop area. Radiation levels of 1 mR/hr were measured on contact with the drain pipe in the shower.

During the period November 30 to December 2, 1983, a team from Oak Ridge Associated Universities, working under contract to the NRC, performed surveys at the licensee's facility. Eleven holes were drilled in the floor of the rear building, to a maximum depth of 190 cm, depending on soil conditions. Samples were taken at approximately 50 cm intervals, and analyzed for cobalt-60 at Oak Ridge. A maximum concentration of 3850 picocuries of cobalt-60 per gram (pCi/g) was detected along the west wall at a depth of 5-15 cm. Oak Ridge also analyzed samples taken from test wells drilled by the licensee outside the facility. The highest concentration was 274 pCi/g outside the west wall at a depth of 60-120 cm.

On December 14, 1933, air samples were taken in the rear building. The levels were approximately 10^{-13} microcuries of cobalt-60 per milliliter, below that which would require posting as an airborne radioactivity area.

No violations of NRC rules, regulations or license conditions were identified.

9. Status of Facility as of December 30, 1983

As of December 30, 1983, approximately 59,000 curies of cobalt-60 was stored in the pool. Of this amount, one leaking source was stored on the pool bottom in a length of pipe. Nine sources were jammed in a source

carrier which was resting against the side of the pool. This carrier had been damaged when it was dropped in 1974, and the condition of the sources in it is unknown.

The top six feet of the tank forming the source pool was corroded. The licensee stated that, at one time, rust had been scraped off this part of the tank.

The old cell was draped in a plastic sheet hung from a wooden supporting structure. There was no ventilation or air purification system for either the old cell or the building. The licensee had committed to provide a filtered ventilation system.

Radioactive waste, with some of the drums reading 1 R/hr at the surface, was stored in the labyrinth of the new cell. Entry into the cell required a key, and the radiation monitor and flashing red light were operating properly. A shipment of this waste to the low-level burial ground in Barnwell, South Carolina, which was scheduled for October 1983, was not made because of financial problems.

Water in the old storage pool was contaminated with cobalt-60 to at least 10^{-4} microcuries per milliliter. Concentrations may be considerably higher at the bottom of the pool. Pool water was being circulated through filters, but past experience indicates that the filters will only remove a fraction of the cobalt-60 in the water.

The NRC continues to monitor licensee effort to decontaminate and decommission the facility.

10. Exit Interview

The results of the inspection were discussed with the licensee representatives denoted in section 1.

During the inspection the results of certain analyses made by the NRC were transmitted to the licensee by letter dated December 27, 1983. No other written information was given to the licensee during the inspection.