



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report No. 52-19438-01/93-02

License No. 52-19438-01

Docket No. 030-17711

Licensee: NDT Services, Inc.
Caguas, Puerto Rico

Inspection Conducted: December 16-17 and 29-30, 1993

Inspector: C. M. Hosey 2/4/94
H. Bermúdez, Sr. Radiation Specialist Date Signed

Approved By: C. M. Hosey 2/4/94
C. Hosey, Chief Date Signed
Nuclear Materials Inspection Section
Nuclear Materials Safety and Safeguards Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This special, announced inspection of activities conducted under NRC License No. 52-19438-01 was conducted to review the circumstances surrounding an incident involving the failure of a radiography source to retract to the safe position. Areas inspected included a review of the organization and administration of the licensed program, radiation safety training, personnel radiation protection, and transportation of radioactive materials.

Results:

Significant weaknesses were identified in the licensed program. The failures to perform required radiation safety activities and to take effective corrective action to prevent the recurrence of a previously identified violation appear to result from inadequate involvement of licensee management in the oversight of the program. Of particular concern were the conduct of licensed activities by technically unqualified individuals and the failure to perform adequate radiation surveys during the recovery of the radioactive source.

Within the scope of the inspection, the following apparent violations were identified:

- Use of licensed material by individuals who had not been trained in the provisions of 10 CFR 34.31 and as specified in the license application dated December 3, 1991.

- Failure to conduct adequate radiation surveys to assure compliance with the applicable parts of 10 CFR 20.101 that limit the radiation exposure to the whole body and the extremities.
- Failure to maintain emergency procedures to include the handling of sealed sources, methods and occasions for conducting radiation surveys, the use of personnel monitoring equipment, and minimizing the exposure of persons in the event of an accident involving the inability to retract a sealed source to its safe position.
- Failure to require that individuals disclose occupational radiation exposures received from sources of radiation controlled by other persons during the calendar quarter in which the licensee allowed access into the licensee's restricted area.
- Failure to maintain an approved quality assurance program for the transport of Type B packages, a repeat finding from an inspection conducted on June 16, 1993.

Report Details

1. Persons Contacted

T. Crossland, Owner
@J. de Arce, Industrial Hygienist, Puerto Rico Sun Oil Co.
*M. Jenson, President
*J. Osorio, Radiation Safety Officer
C. Pizarro, Radiographer
+D. Vigne, Radiation Safety Officer, National Inspection
Consultants, Inc., Fort Myers, Florida

* Attended exit interview

@ By telephone on December 30, 1993

+ By telephone on December 29, 1993

2. Program Scope and Licensee Organization

License No. 52-19438-01 was originally issued on August 21, 1980, and was most recently renewed on February 26, 1992. The license allows the possession and use of cobalt-60 and iridium-192 sealed sources in industrial radiography at temporary job sites. The licensee, NDT Services, Inc., was owned by Crossland Boiler Sales & Service, Inc., a manufacturer of tanks and boilers. At the time of the inspection the licensee's Radiation Safety Officer (RSO) was the lead radiographer, supervised three additional radiographers and reported to the company president. In addition to radiography, the licensee performed other types of non-destructive inspections. Radiographic operations were a small portion of the licensee's activities.

3. Sequence of Events Surrounding the Incident

Through review of records, a re-enactment of the incident and interviews with licensee representatives and other individuals related to the incident the inspector determined the following:

The licensee was asked by a refinery subcontractor to provide radiography services during a refinery outage which required more manpower than the licensee had available. The licensee committed to provide the services relying on another radiography company from the mainland to provide the needed manpower. The licensee's president contacted a colleague at the other company and requested the company supplied two individuals to cover the job. Believing that the licensee was going to train the two individuals per the licensee's specific license requirements and properly qualify them as radiographers, the company supplied the two individuals. The two supplied individuals were not qualified as radiographers or radiographer's assistants per the supplying company's license and approved training program, nor were they authorized to conduct licensed

activities under the company's license. Believing that the individuals were qualified radiographers, on September 3, 1993, the licensee's RSO gave the individuals a demonstration on how to use the radiography equipment, allowed them to handle the equipment, and qualified them as radiographers with no further training or examinations.

On the morning of September 4, 1993, the individuals arrived at the refinery and began setting up the equipment at the designated work location. While setting up the equipment, one of the individuals failed to connect the "pig tail" (to which the radioactive source is attached) to the cable used to expose and retract the source (the drive cable); the individual only connected the drive cable conduit (through which the drive cable travels) to the exposure device. During the first exposure, the drive cable pushed the 75-curie iridium-192 source to the end of the source guide tube, exposing the source, but was unable to retract the source because the source was not connected to the drive cable. After several unsuccessful attempts to retract the source to the shielded position, the individuals contacted a licensee radiographer who was at a different location in the refinery, who contacted the licensee's president, who in turn contacted the RSO. The radiographer and refinery safety personnel extended the restricted area boundary lines to where radiation levels measured two millirems per hour and ensured that all personnel within the newly defined restricted area had been evacuated. Licensee and refinery safety personnel maintained control of the restricted area for the duration of the event.

Due to the remote location of the refinery relative to the location of the RSO when the RSO was notified of the problem, it took him approximately three hours to arrive at the site with the necessary equipment. The RSO noted that, as he made his first approach to the area where the source was located, radiation levels were such that they caused his survey instrument reading to go off-scale and caused his alarming ratemeter to alarm. The RSO did not evaluate the extent of radiation hazards that were present prior to attempting the source recovery even though he knew that radiation levels were higher than what he was able to measure. In a series of approximately seven entries to the immediate vicinity of the source, and with the use of a remote-handling tool on one occasion, the RSO freed the source guide tube containing the source, forced the source to the opposite end of the guide tube exposing the source "pig tail," connected the "pig tail" to the drive cable and retracted the source to the shielded position. The RSO was wearing his film badge on his shirt pocket and, during several steps of the recovery, the film badge was shielded by other parts of his body which were closer to the source.

The RSO did not evaluate the exposure rate at the "pig tail" prior to connecting the "pig tail" to the drive cable, nor did he evaluate the exposure his hands received while making the connection. Also, the RSO did not check his pocket dosimeter until the end of the source recovery, when he noted it was off-scale. The licensee immediately sent the film badges of all personnel involved in the incident for processing by its dosimetry vendor.

4. Consequences

The radiation exposures of the licensee individuals not directly involved in the source recovery were well within regulatory requirements. The highest recorded exposure of the licensee individuals was 190 millirems. The RSO's recorded exposure was also 190 millirems. However, based on a re-enactment of the incident and discussions with the RSO, the inspector determined that unmonitored parts of the RSO's whole body received exposures of up to 500 millirems. The estimated highest exposure of the RSO during the incident added to other occupational exposures received by the RSO during the third quarter of 1993 was 550 millirems, which was below the regulatory limit of 1250 millirems per quarter. Based on discussions with licensee representatives and personnel from the refinery's health and safety staff who responded to the event, the inspector determined that no refinery personnel or other members of the public received any measurable radiation exposure as a result of the incident.

5. Licensee Response to the Event and Corrective Actions

As noted above, after realizing that the source was not retracting to the shielded position, the individuals warned people in their immediate area and notified a licensee radiographer who was in another area of the refinery. The licensee radiographer unsuccessfully attempted to retract the source and notified the subcontractor, who notified refinery safety personnel of the problem. The radiographer also notified licensee management. The licensee's president notified the RSO, who gathered the necessary equipment and responded to the event. Although the RSO reacted promptly to the event, for reasons beyond his control he did not arrive at the refinery until three hours after the incident began. During that time, refinery safety personnel assumed the lead for extending the boundaries of the restricted area and controlling the area. The use of remote-handling tools during the source retrieval was a major contributor to the relatively low radiation exposure received by the RSO. The two individuals involved in the incident were instructed to return to the mainland. The licensee submitted the required incident report to the NRC within the required time frame.

6. Regulatory Issues Associated With the Incident

Condition 12 of License No. 52-19438-01 requires that licensed material be used by, or under the supervision and in the physical presence of, individuals who have been trained as specified in the application dated December 3, 1991 and the provisions of 10 CFR 34.31. 10 CFR 34.31(a) requires, in part, that the licensee not permit any individual to act as a radiographer until such individual: has been instructed in the subjects outlined in Appendix A of 10 CFR Part 34; has received copies of and instructions in NRC regulations contained in 10 CFR Part 34 and in the applicable sections of 10 CFR Parts 19 and 20, NRC license under which the radiographer will perform radiography and the licensee's operating and emergency procedures; and has demonstrated understanding of the instructions in this paragraph by successful completion of a written test on the subjects covered. The failure to train two individuals as specified in the licensee's approved training program submitted in the application dated December 3, 1991, and allowing the individuals to act as radiographers using licensed material without receiving the training specified in 10 CFR 34.31 was identified as an apparent violation of Condition 12 of License No. 52-19438-01.

10 CFR 20.201(b) requires that the licensee make such surveys as may be necessary to comply with the requirements of Part 20 and which may be reasonable under the circumstances to evaluate the extent of radiation hazards which may be present. As defined in 10 CFR 20.201(a), "survey" means an evaluation of the radiation hazards incident to the production, use, release, disposal or presence of radioactive materials or other sources of radiation under a specific set of conditions. As discussed in Section 3 above, the licensee did not make surveys to assure compliance with the applicable parts of 10 CFR 20.101 that limit the radiation exposure to the whole body and the extremities. Specifically, (1) During a source retrieval event on September 4, 1993, the licensee's Radiation Safety Officer (RSO) knew that his survey instrument indicated that radiation levels were above the instrument's range and his alarm ratemeter, preset at 500 millirems per hour, was alarming during his first approach to the event area and failed to evaluate the radiation levels to which his whole body and extremities were to be exposed; (2) As of December 17, 1993, the licensee had not evaluated the exposure to the extremities of the RSO as a result of the source retrieval event; (3) As of December 17, 1993, the licensee's evaluation of the RSO's exposure to the whole body was inadequate in that the film badge used to assess the RSO's exposure was worn in such a way that it was shielded by parts of the body during the retrieval event, and the RSO

failed to wear the film badge in that portion of the whole body likely to receive the highest exposure. These three issues were identified as three examples of an apparent violation of 10 CFR 20.201(b).

10 CFR 34.32 requires, in part, that the licensee retain a copy of current operating and emergency procedures which include instructions in, among others, the handling of sealed sources such that no person is likely to be exposed to radiation doses in excess of the limits established in 10 CFR 20, methods and occasions for conducting radiation surveys, the use of personnel monitoring equipment, and minimizing exposure of persons in the event of an accident. While reviewing the implementation of the licensee's program as it applied to the incident the inspector determined that, as of December 17, 1993, the licensee's emergency procedures did not include instructions in the handling of sealed sources, methods and occasions for conducting radiation surveys, the use of personnel monitoring equipment and minimizing exposure of persons in the event of an accident involving the inability to retrieve a sealed source to its safe position. The failure to have written procedures on how to perform a source retrieval addressing the above areas was identified as an apparent violation of 10 CFR 34.32.

7. Other Regulatory Issues

10 CFR 20.102(a) requires, in part, that the licensee require any individual, prior to first entry into the licensee's restricted area during each employment or work assignment under such circumstances that the individual is likely to receive in any period of one calendar quarter an occupational dose in excess 25 percent of the applicable standards specified in 10 CFR 20.101(a), to disclose a written, signed statement indicating either: (1) That the individual had no prior occupational dose during the current calendar quarter, or (2) the nature and amount of any occupational dose which the individual may have received during that specifically identified current calendar quarter from sources of radiation possessed or controlled by other persons. While reviewing the incident, the inspector determined that, on September 4, 1993, the licensee allowed the two individuals involved in the event to perform radiographic operations under circumstances that the individuals were likely to receive occupational doses in excess of 25 percent of the applicable standards specified in 10 CFR 20.101(a) in a calendar quarter without requiring that the individuals disclose the required written statement indicating the nature of any occupational exposures received during the quarter. The failure to require the individuals to disclose the written statement specified above was identified as an apparent violation of 10 CFR 20.102(a).

10 CFR 71.12 states, in part, that a general license to transport licensed material, or to deliver licensed material to a carrier for transport, applies only to a licensee who has a quality assurance program approved by the Commission as satisfying the provisions of Subpart H of 10 CFR Part 71. While reviewing the licensee's program the inspector determined that, as of December 17, 1993, the licensee routinely transported licensed material under the general license pursuant to 10 CFR 71.12, and the licensee did not have a quality assurance program approved by the Commission. Specifically, the licensee's quality assurance program expired in 1989. The licensee was cited for failing to meet the stated requirement during an NRC inspection conducted on June 16, 1993. Licensee management indicated that the failure to submit for NRC approval a quality assurance program for their transportation packages satisfying the provisions on Subpart H of 10 CFR 71 was due to a misunderstanding of the requirement, and that they will expedite the submittal of the required program for NRC approval. The failure to maintain an approved quality assurance program to satisfy the provisions of Subpart H of 10 CFR 71 was identified as an apparent repeat violation of 10 CFR 71.12.

8. Exit Interview

The inspection scope and results were summarized in an exit interview with those individuals identified in Section 1 of this report. The inspector reviewed the program areas inspected and discussed in detail the inspection findings. The NRC's enforcement policy was reviewed with licensee representatives. The inspector reminded licensee management that the NRC expects licensee management to be ultimately responsible for all activities conducted under the NRC license. Licensee management acknowledged the NRC's concerns regarding the need for better oversight of licensed activities. Licensee representatives did not provide dissenting comments relative to the apparent violations discussed in this report. Proprietary information is not contained in this report.

In addition, the results of this inspection were discussed in a telephone conversation between Mr. Mark Jenson of NDT Services, Inc. and Mr. Douglas Collins of this office on December 30, 1993. The initial corrective actions to the inspection findings, discussed during this call, were documented in a Confirmatory Action Letter dated December 30, 1993.