

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 030-05064/90001(DRSS)

Docket No. 030-05064

License No. 24-00188-02

Category C1

Priority 1

Licensee: St. Louis Testing Laboratories, Inc.
2810 Clark Avenue
St. Louis, MO 63103

Inspection At: 2810 Clark Avenue
St. Louis, Missouri

Inspection Conducted: December 20, 1989 through January 17, 1990

Purpose of Inspection: This was an unannounced, special safety inspection conducted to review the circumstances surrounding allegations related to the licensee's radiographic operations. The inspection also included a review of the licensee's overall radiation safety program.

Inspector: *Gary V. Shear*
Gary V. Shear
Senior Radiation Specialist

1/30/90
Date

Reviewed By: *Roy J. Caniano*
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Nuclear Materials Safety
Section 2

1/30/90
Date

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1/30/90
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Inspection Summary

Inspection from December 20, 1989 through January 17, 1990 (Report No. 030-05064/90001(DRSS))

Areas Inspected: This was an unannounced, special safety inspection conducted at the licensee's facility located in St. Louis, Missouri in response to Region III's receipt of allegations concerning the licensee's radiography operation. The inspection also included a review of the licensee's overall radiation safety program to determine compliance with the Commission's rules, regulations and License Conditions.

Results: Of the areas inspected, nine apparent violations of NRC requirements were identified: (1) failure to conduct a survey after each exposure, 10 CFR 34.43(b) (Section 4); (2) failure to send a film badge in for immediate

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processing, 10 CFR 34.33(d) (Section 4); (3) failure to report an event which may have caused or threatened to cause an exposure in excess of the limits described in 10 CFR 20.403(b)(1) (Section 4); (4) failure to conduct an adequate evaluation of the hazards associated with the exposure of an individual to a 91 curie iridium-192 sealed source, 10 CFR 20.201(b) (Section 4); (5) exposure of an individual in excess of 3 rem in a calendar quarter, 10 CFR 20.101(b) (Section 4); (6) unauthorized Radiation Safety Officer (RSO), License Condition No. 22 (Section 4); (7) failure to conduct training as required, License Condition No. 22 (Section 4); (8) failure of an individual who's dosimeter had discharged beyond its range to cease radiographic operations, License Condition No. 22 (Section 4); and (9) failure to return the sealed source to the shielded position at the conclusion of an exposure, License Condition No. 22 (Section 4).

DETAILS

1. Persons Contacted

- +*Frederick W. Wiese, President
- +*Scott Zimmer, Manager, NDT Department
- *Edward Osaben, Radiation Safety Officer
- Richard Kemlage, Manager, Mechanical Laboratory
- Ronald Sinn, Assistant Radiation Safety Officer
- Thomas Applegate, Radiographer
- R. Mark Spees, Radiographer
- William Angell, Radiographer

+Attended Exit Interview on December 21, 1989.

*Attended Enforcement Conference on January 11, 1990.

2. Licensed Program

St. Louis Testing Laboratories, Inc. (STL) is authorized by NRC License No. 24-00188-02 to use iridium-192 and cobalt-60 in the conduct of industrial radiography. The license also authorizes the use of cesium-137 for survey instrument calibration and nickel-63 for use in gas chromatograph's for sample analysis. Licensed material may be used at the licensee's facilities located at 2810 Clark Avenue, St. Louis, Missouri; and iridium-192 and cobalt-60 may be used at temporary job sites anywhere in the United States where the Nuclear Regulatory Commission maintains jurisdiction for regulating the use of licensed material.

The radiation safety program is managed by Scott Zimmer and the Radiation Safety Officer is Edward Osaben. STL currently employs eight radiographers and two radiographer assistants.

3. Inspection History

STL has been inspected three times in the past three years. Each inspection conducted in 1986 and 1987 identified one violation of NRC requirements: (1) failure to perform alarm tests as required (1986); and (2) failure to use proper shipping numbers on shipping papers (1987). An inspection conducted in 1988 did not identify any violations of NRC requirements.

4. Allegation Review

The allegor first telephoned Region III on November 30, 1989, but did not provide specifics regarding allegations. He stated he would send them in a letter.

On December 6, 1989, Region III received allegations by letter regarding the licensee's radiography program. Following is a listing of those allegations and Region III's findings.

Allegation No. 1: An individual other than the one designated in the NRC license acted as RSO.

License Condition No. 22 requires the licensee to conduct its program in accordance with statements, representations, and procedures contained in certain referenced documents.

The referenced letter dated June 26, 1984, names a specified individual as the Radiation Safety Officer (RSO) for the licensed program.

The President of St. Louis Testing telephoned Region III on December 4, 1989, and stated that he had replaced the head of the company's department which handled radiography. The President stated this replacement took place on December 1, 1989. In response to questions from NRC Region III staff, the President indicated that he understood the individual replaced was the assistant RSO and he, the President was the RSO. However, the President stated that he was concerned because he delegated everything to the individual replaced; and he (the President) did not want a lapse in the program. After determining that the President was not the RSO and the licensee was without an authorized RSO, NRC, Region III, telephoned the President on December 5, 1989. During this conversation, the President agreed to cease all licensed activities and to place all licensed material into safe storage until the NRC approved of an RSO. This agreement was confirmed in a December 6, 1989, Confirmatory Action Letter (CAL). On December 6, 1989, NRC, Region III, issued an amendment to the licensee's NRC license, which authorized a new RSO and closed out the CAL.

The licensee's failure to conduct its licensed program under the authorized RSO from December 1, 1989 to December 6, 1989 constitutes an apparent violation of License Condition No. 22.

The allegation was substantiated and one apparent violation of NRC requirements was identified.

Allegation No. 2: The licensee did not report to the NRC, an overexposure which occurred around April 1989.

Interviews conducted with STL employees regarding this allegation revealed that on April 8, 1989, a radiographer walked into the room where he was using a 91 curie iridium-192 source to radiograph welds on nozzles. The work was being performed in a room at the STL laboratory located at 2810 Clark Avenue, St. Louis, Missouri. The iridium-192 source was being used in a collimator set up as depicted in Attachment 1. The radiographer involved indicated that while the work was in progress he was interrupted by another STL employee working in the area. The radiographer stated that he walked a few feet from the job area to talk with the employee and then returned to his work. When the radiographer returned to his work, he checked the crank handle by attempting to turn it in the counter clockwise direction, and it would not turn. On the device he was using, a TechOps Model 660, turning the crank handle counter clockwise exposes the source (i.e., moves it out of the TechOps Model 660 device through a guide tube and

into a collimator). Therefore, if the handle would not turn counterclockwise, the radiographer should have realized the source was in the exposed position. However, he stated that he incorrectly assumed the source was in the shielded position inside the TechOps device. He further stated that he also did not make a radiation survey to determine that the source was safely returned to the shielded position inside the device prior to walking into the room. The radiographer then walked into the room to change the film and set up to radiograph another nozzle. To do this, his upper body portions (i.e., head) may have been as close as one foot and his hands may have been as close as two feet away from the iridium-192 source. As in Attachment 1, the source was in a collimator pointing down toward a nozzle and film which were on a table approximately 2 feet away from the source.

The radiographer stated that he was confused over the crank handle position (exposed vs. shielded) because the camera he was using at the time of the event (TechOps 660) cranks opposite that of the St. Louis Testing Laboratories devices, which had been used exclusively prior to the purchase of the TechOps devices. The radiographer stated that he was confused between the two devices, however, he had been using only the TechOps 660 for approximately one year.

Two violations were associated with the event described to this point:

- a. 10 CFR 34.43(b) requires that a survey be performed after each exposure to determine that the sealed source has returned to the shielded position.

The failure of the radiographer to conduct a survey after the exposure constitutes an apparent violation of 10 CFR 34.43(b).

- b. One of the documents referenced in License Condition No. 22 is a letter dated April 15, 1988 (with an enclosed letter and manuals). The enclosed letter, dated February 16, 1988, states that the Amersham/TechOps "Operation and Maintenance Manual" for the TechOps Model 660 exposure devices, will be incorporated into the licensee's Operating and Emergency procedures.

The TechOps 660 "Operation And Maintenance" manual states on Page 15, Item No. 7, that to return the source to the exposure device after the desired exposure time has elapsed, the user must turn the brake to OFF and rapidly turn the crank in the RETRACT (clockwise) direction until the crank will no longer move.

The failure of the radiographer to return the source to the exposure device after the desired exposure time had elapsed by turning the crank handle clockwise constitutes an apparent violation of License Condition No. 22.

When the radiographer returned to the crank handle, he realized that the source was not in the device and had been fully exposed while he was in the room. He then cranked the source back in to the shielded position and

checked his dosimeter (500 millirem) which was off-scale. He then told the assistant RSO working in the area that his dosimeter had gone off-scale and that he (the radiographer) had walked in on the exposed source. They developed the film that was being used below the nozzle on the table at the time of the event and determined, from density analysis, that it (the film) was not overexposed. They surmised from this that the radiographer also had not been overexposed. The radiographer stated that he then finished radiographing the nozzle welds, after recharging his pocket dosimeter. The radiographer was also permitted to perform radiography on April 10, 1989.

The licensee's application dated September 6, 1978 states in Item No. 6 that the Radiographer's Manual will be followed for personnel monitoring procedures. The manual states in Section 3.5 that at any time a pocket dosimeter is discharged beyond its range, the individual is to immediately cease radiographic operations.

The failure of the radiographer to cease radiographic operations after his pocket dosimeter discharged beyond its range constitutes an apparent violation of License Condition No. 22.

The assistant RSO, who was working in the laboratory at the time of the event, elected to not notify the RSO during the day, since the RSO had a death in the family. The RSO was ultimately notified of the event on the evening of April 8, 1989.

On April 10, 1989, the radiographer's film badge was submitted for processing; however, according to the film badge company it was not submitted for emergency processing. The result of the badge analysis indicated that the badge was "faultily manufactured." On December 20, 1989 the inspector contacted the film badge company to verify the badge analysis. The company representative stated that the records showed that the badge had been faultily manufactured and could not be read. The inspector asked that the badge be reanalyzed and the results called to the Region III office. On January 17, 1990, the film badge manufacturer reported to the licensee that an error had been made in the original assessment of the badge and the badge had not been faultily manufactured or completely damaged. The badge could be analyzed to determine exposure. The recent analysis of the badge revealed that the exposure to the badge was 3,770 millirem for the period March 27, 1989 to April 10, 1989. Thus, the radiographers total exposure for the first quarter of 1989 was 4,020 millirem.

10 CFR 34.33(d) requires that if an individual's pocket dosimeter is discharged beyond its range, his film badge or TLD shall be sent for immediate processing.

Contrary to the above, the licensee failed to send immediately for processing, an individual's film badge, whose dosimeter had discharged beyond its range. Specifically, the individual's film badge was not sent in for processing until at least two days after the exposure was discovered.

The failure of the licensee to send the individuals film badge in for immediate processing constitutes an apparent violation of 10 CFR 34.33(d).

10 CFR 20.101(a) limits the whole body radiation dose of an individual in a restricted area to one and one quarter rems per calendar quarter, except as provided by 10 CFR 20.101(b). Paragraph (b) allows a whole body radiation dose of three rems per calendar quarter provided specific conditions are met (a determination of an individual's accumulated occupational dose to the whole body on Form NRC-4).

Contrary to the above, an individual working in the restricted area, whose occupational dose had been determined, received a whole body radiation dose of 4.02 rem during the first calendar quarter of 1989.

The failure of the licensee to limit the exposure of an individual to three rems per calendar quarter constitutes an apparent violation of 10 CFR 20.101(b).

The event occurred on April 8, 1989, and the licensee's RSO knew on this date that the radiographer could have been exposed to greater than 5 rems whole body (head) or 75 rems to his extremities (hands), yet, the licensee did not notify the NRC of this potential exposure.

10 CFR 20.403(b)(1) requires each licensee within 24 hours of discovery of the event, to report any event involving licensed material possessed by the licensee that may have caused or threatens to cause an exposure of the whole body of any individual to 5 rems or more of radiation; exposure of the skin of the whole body of any individual to 30 rems or more of radiation; or exposure of the feet, ankles, hands, or forearms to 75 rems or more of radiation.

Contrary to the above, the licensee failed to report an event which threatened to cause or may have caused exposure to an individual in excess of the 5 rem limit described above.

The failure of the licensee to report the event described above constitutes an apparent violation of 10 CFR 20.403(b)(1).

At some point after the event (at least several days) the RSO at that time initiated an evaluation to estimate the radiographer's exposure based upon the radiographer's time estimates and explanation of how the work had been carried out. This evaluation was not discovered by the licensee until the date of this inspection and had not yet been completed. Further evaluation conducted by the licensee at the time of this inspection calculated the extremity exposure at approximately 1.5 rem and the whole body exposure at approximately 75 millirem. Based upon the NRC reenactment of the event, the radiographer could have received as high as 1.5 Rem to the extremity (hands) and from 25 millirem to 6 rem whole body (head).

10 CFR 20.201(b) requires each licensee to make or cause to be made such surveys as (1) may be necessary for the licensee to comply with the regulations in this part, and (2) are reasonable under the circumstances to evaluate the extent of radiation under a specific set of conditions.

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.

Contrary to the above, the licensee failed to conduct an adequate evaluation of the radiation hazards associated with the exposure of an individual to a 91 curie iridium-192 sealed source. Specifically, the licensee did not initiate an evaluation of the incident until at least several days after the event, and as of the date of this inspection had not yet completed that evaluation.

The failure of the licensee to conduct an adequate evaluation of the radiation hazards associated with the exposure of an individual to a 91 curie iridium-192 source constitutes an apparent violation of 10 CFR 20.201(b).

This allegation was substantiated and seven apparent violations of NRC requirements were identified.

Allegation No. 3: The licensee failed to administer periodic training for radiographers in the past twelve months.

License Condition No. 22 requires the licensee to conduct its program in accordance with statements, representations, and procedures contained in certain referenced documents.

The application dated September 6, 1978 states in Item No. 6(b) that the attached Radiographic Training Program will be followed in training radiographers and radiographer assistants. The Radiographic Training Program States in the "Periodic Training Program" section that any new equipment will be shown and demonstrated by the Radiation Safety Officer or his assistants prior to licensee staff using the equipment. The use, application, safety precautions, and all pertinent information will be thoroughly explained. In addition, a semiannual refresher course will be given to all radiographers to include rules of the Commission and the company program in regard to safety and radiation protection. A periodic training report is to be kept on file.

The inspection revealed that the licensee had not been conducting its periodic training program as required. An interview with the radiographer involved in the incident of April 8, 1989 stated that he had never been trained on the use of the TechOps 660 exposure device. A review of periodic training records showed that the latest periodic training provided by the company was in December of 1989 to one of the eight employed radiographers. Prior to that the last periodic training was provided in July of 1988 which covered the operation of the TechOps 660 exposure device. The records showed that all of the radiographers had received training on the TechOps 660 at that time, with the exception of the radiographer involved in the April 8, 1989 incident. All radiography personnel interviewed could not recall any recent formal training being provided by the company.

The failure of the licensee to provide periodic training as required constitutes an apparent violation of License Condition No. 22.

This allegation was substantiated and one apparent violation of NRC requirements was identified.

Allegation No. 4: The licensee cannot account for all the depleted uranium used for exposure devices.

According to licensee statements the licensee developed its own radiography exposure device in the early to mid-1960's. This device utilized depleted uranium (DU) as shielding. The licensee purchased DU from Eldorado Mining Company of New Hope, Ontario, Canada and the National Lead Company of Albany, New York during the 1960's and 1970's. A review of records from this time frame for both companies showed that the licensee purchased DU from both companies on numerous occasions. The licensee would receive the DU shielding and then determine if the shields had been adequately manufactured. If they did not meet specifications, they would be returned to the manufacturer. Based upon the records available, it was impossible to ascertain exactly how much DU had been purchased by the licensee over the years.

However, from discussions with an employee who worked on the development of the exposure devices, it was determined that 33 to 35 DU shields had been accepted over the years. Three exposure devices containing DU shields had been sold to a firm in North Carolina. At the time of the inspection, the licensee possessed 20 complete exposure devices with DU shields and 12 DU shields not yet assembled in devices. This accounted for a total of 35 DU shields which appeared to account for the bulk of the DU received and maintained by the licensee over the past 25 to 30 years. The licensee is authorized by License Condition No. 15 for up to 999 kilograms of DU. In addition, 10 CFR 40.25 allows the licensee as a general licensee, to possess the depleted uranium shields without specifying a location.

The allegor stated that some of the DU possessed by the licensee may be located at one of the stockholder's residences. The company president was questioned regarding this and he stated that he had gone to the residence with another STL employee on approximately December 1, 1989 to determine if any of the DU was located at this residence. He stated that they found four new cameras without sources which contained DU shielding. These cameras were utilized as demonstration devices to prospective customers and at trade shows. The president stated that the devices were retrieved from the residence and placed into storage at the STL laboratory. These units are included in the total of 35 discussed above.

During the inspection, the inspector accompanied the president to the residence discussed above to verify that no additional DU was located at this location. A search of the basement and the garage area was conducted and no additional DU or exposure devices containing DU were located.

This allegation was substantiated in that four of the exposure devices containing DU were located at the stockholder's residence and were not accounted for for a period of time, however no violations of NRC requirements were identified.

Allegation No. 5: The licensee did not notify the NRC of a change in ownership.

St. Louis Testing Laboratories, Inc. is a family owned business which was originally founded approximately 60 years ago by C. Dee Trowbridge. In addition to C. Dee Trowbridge's holdings in the company his son and daughter owned stock. This was still the situation as of the time of this inspection. There aren't and, according to licensee statements, have never been any other stockholders in the company. Although there has been some transfer of stock between family members, this transfer of stock ownership does not constitute a change in ownership of the license. The individuals discussed above are listed in the license application dated September 6, 1978, as the only stockholders in the company.

This allegation was not substantiated and no violations of NRC requirements were identified.

Allegation No. 6: The licensee did not notify the NRC of a change in Radiation Safety Officer.

Refer to allegation No. 1.

This allegation was substantiated and one apparent violation of NRC requirements was identified as detailed in Allegation No. 1.

5. Training

The licensee has established its own training program which is referenced in the September 6, 1978 license renewal application. This program is designed such that training credit is given to individuals who have prior experience or formal training. To qualify as a radiographer's assistant an individual must have received the minimum classroom instruction time, demonstrate competence (under supervision) with the use of radiographic exposure devices, sealed sources and related equipment and pass a 50 question examination. To qualify as a radiographer, an individual must have completed all requirements for an assistant radiographer, additional classroom instruction, demonstrate competence with radiographic exposure devices, sealed sources, and related equipment, pass a 130 question examination, and receive one to three months of on the job training. The licensee's training program was implemented as required with the exception of the periodic training program addressed in Section 4, Allegation No. 3.

No violations of NRC requirements were identified.

6. Internal Audits

The licensee conducts unannounced inspections of radiographic personnel at three month intervals for personnel with greater than five years of

experience, once per month for individuals with less than five years experience, and assistant radiographers every week. Records of these inspections and results are maintained. A review of internal audit records by the inspector revealed that audits are conducted and records maintained as required.

No violations of NRC requirements were identified.

7. Inspection and Maintenance of Devices, Containers and Changers

A review of exposure device inspection and maintenance records revealed that inspection and maintenance is conducted as required by 10 CFR 34.28(b).

No violations of NRC requirements were identified.

8. Utilization Logs

The licensee maintains utilization logs which show for each sealed source the make and model number of the exposure device in which the source is located, the identity of the radiographer to whom the source is assigned, and the location and date of use of the device, as required by 10 CFR 34.27.

No violations of NRC requirements were identified.

9. Inventories

The licensee conducts a quarterly inventory as required by 10 CFR 34.26 to account for all sources received and possessed under this license. The inventory includes the serial number of the source, the source strength, source type, and the exposure device in which it is located. Records of these inventories are maintained by the licensee. The inspectors review of the latest inventory indicated that possession limits were not exceeded and all sources were accounted for.

No violations of NRC requirements were identified.

10. Personnel Monitoring

The licensee utilizes a NVLAP approved film badge service with a biweekly exchange frequency. The licensee maintains an NRC Form-4 for its radiographic employees which allows up to 3 rem in a single calendar quarter. The licensee also provides each of these employees with a 0-500 milliroentgen self reading dosimeter.

A review of exposure records for the period of December 19, 1988 to November 19, 1989 revealed a maximum whole body exposure of 2,740 millirem for this entire period. One individual was missing film badge results for the period March 27, 1989 to April 10, 1989. This is discussed in Section 4, Allegation No. 2.

No violations of NRC requirements were identified.

11. Leak Tests

Leak tests are performed on all sealed sources every six months with the exception of the nickel-63 source for use in a gas chromatograph which is leak tested every three years. The licensee uses their own leak test kit to conduct the test and analyzes the wipe themselves. The licensee maintains records of leak tests results. A review of leak test records did not identify any sources with result greater than 0.005 microcuries.

No violations of NRC requirements were identified.

12. Surveys

A random review of utilization and survey records indicated that surveys are performed to determine restricted and unrestricted boundaries. Surveys of the exposure device required by 10 CFR 34.43(b) are conducted as required according to licensee representatives except as described in Section 4, Allegation No. 2.

No violations of NRC requirements were identified, except as noted.

13. Receipt and Shipment of Radioactive Materials

A review of radioactive material receipt records revealed that sources are received and surveyed as required. Shipping records indicate the sources are properly prepared, packaged, and surveyed with the appropriate shipping papers accompanying the shipment. The licensee also maintains on file their quality assurance program for packages used to transfer sources under NRC Certificate No. 0222, Revision 3.

No violations of NRC requirements were identified.

14. Instrument Calibration

The licensee is authorized to conduct calibration of its survey instruments. Instrument calibrations are performed by both the licensee and commercial calibration services. The licensee utilizes an EON Corporation Model 64-674 instrument calibrator to perform these calibrations. A review of survey meter calibration records revealed survey instruments are calibrated at intervals which do not exceed three months as required by 10 CFR 34.24.

No violations of NRC requirements were identified.

15. Exit Interview

An exit meeting was held with Frederick Wiese and Scott Zimmer on December 21, 1989. The allegations and the apparent violations were discussed in addition to the NRC Enforcement Policy. Results of the

film badge analysis for the individual involved in the April 8, 1989 incident were discussed in a telephone conversation conducted January 17, 1990 with the licensee's President. Information contained within this report was not considered proprietary.

16. Enforcement Conference

An enforcement conference was held between the licensee and representatives of the Region III staff on January 11, 1990. Licensee attendance at this conference was as indicated in Section 1 of the report. The conference was held at the Region III office in Glen Ellyn, Illinois.

The purpose of the conference was to discuss the apparent violations identified during the inspection, the NRC Enforcement Policy, and the licensee's corrective actions. The licensee generally agreed with the apparent violations as described. The licensee detailed corrective actions taken and planned in response to the apparent violations. The corrective actions included:

- a. Training all radiographers in the NRC requirements in 10 CFR 34.43(b);
- b. Training and testing the radiographer involved in the April 8, 1989 incident on the TechOps 660 exposure device;
- c. Sending a memo to all radiographers regarding the reporting requirements of 10 CFR 20.403;
- d. Amending their NRC license to authorize a new RSO;
- e. Conducting refresher training for all radiographers;
- f. Purchasing "chirpers" for radiography personnel;
- g. Hiring a new NDT Department manager to improve management oversight; and
- h. Hiring two people in a consulting capacity to augment the training program and provide added experience to the radiation safety program.

Not to Scale

Attachment 1

