NOTICE OF VIOLATION

Glitsch Field Services/NDE, Inc.
North Canton, Ohio

Docket No. 030-07682
License No. 34-14071-01
EA 89-173

During an inspection conducted on August 4-15, 1989, violations of NRC requirements were identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR Part 2, Appendix C (1989), the violations are listed below:

I. Violations Related to the Event

A. 10 CFR 20.101(a) limits the whole body occupational dose of an individual in a restricted area to 1.25 rems in any period of one calendar quarter from radioactive material and other sources of radiation, except as provided in 10 CFR 20.101(b). Paragraph (b) permits a whole body dose of 3.0 rems during any calendar quarter provided certain specified conditions are met.

Contrary to the above, during the third calendar quarter of 1989, an individual working in a restricted area received a whole body occupational dose of 93.48 rems.

B. 10 CFR 34.22(a) requires that, during radiographic operations, the sealed source assembly be secured in the shielded position each time the source is returned to that position.

License Condition No. 18 requires that the licensee conduct its program in accordance with the statements, representations, and procedures contained in referenced documents, including listed enclosures.

The referenced application, dated January 15, 1987, included, as a listed enclosure, the licensee's Radiographic Operations Manual. Section I-II, Procedure 6, Paragraph 4.6.5 of this manual requires that, after each radiographic exposure, the source be returned to the shielded position and the projector's selector ring be rotated to the "Lock" position.

Contrary to the above, on August 2, 1989, the selector ring of a Technical Operations Model 660 Gamma Ray Projector was not secured in the shielded "Lock" position on one occasion when an 87 curie iridium-192 sealed source was returned to that position following a radiographic exposure.

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

License Condition No. 18 requires that the licensee conduct its program in accordance with the statements, representations, and procedures contained in referenced documents, including any listed enclosures.

The referenced application, dated January 15, 1987, included, as a listed enclosure, the licensee's Radiographic Operations Manual. Section I-II, Procedure 1, Paragraph 4.7 of this manual requires that in the event a dosimeter goes off scale during a work day, work will be stopped and the Assistant RSO notified immediately.

Contrary to the above, on August 2, 1989, when a radiographer discovered his dosimeter was discharged beyond its range, he did not stop work or immediately notify the Assistant RSO, nor was his TLD sent for immediate processing. Instead, the individual made seven additional radiographic exposures before terminating work, notifying the Assistant RSO, and sending his TLD for processing.

Collectively, these violations have been categorized as a Severity Level I problem (Supplements IV and VI).

II. Other Violations

License Condition No. 18 requires that the licensee conduct its program in accordance with the statements, representations, and procedures contained in referenced documents, including listed enclosures.

The referenced application dated January 15, 1987, included, as a listed enclosure, the licensee's Radiographic Operations Manual. Section I-II, Procedure 51, Paragraphs 6.1 and 6.3 of this manual require that a Radiographer Performance Audit be conducted for each radiographer and assistant radiographer who used radioactive sources, at intervals not to exceed three months, and that Branch Office operations be audited on an annual basis.

Contrary to the above, performance audits were not, in all cases, conducted at intervals not to exceed three months for radiographers and assistant radiographers who used radioactive sources. Specifically, between February 22, 1988, and January 22, 1989, three radiographers (none of whom was the individual involved in Violations A., B., or C. in Section I) each conducted several radiographic procedures 4-10 months after their last performance audit. In addition, an audit of Branch Office operations was not conducted during the period December 1987 through August 15, 1989.

This is a Severity Level IV violation (Supplement VI).

Pursuant to the provisions of 10 CFR 2.201, Glitsch Field Services/NDE, Inc. (Licensee) is hereby required to submit a written statement or explanation to U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555 with a copy to the Regional Administrator, Region III, within 30 days of the date of this Notice. This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each alleged violation: (1) the reason for the violation if admitted, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Where good cause is shown, consideration will be given to extending the response time. If an adequate reply is not received within the time specified in this Notice, an order may be issued to show cause why the license should not be modified, suspended, or revoked or why such other action as may be proper should not be taken.

FOR THE NUCLEAR REGULATORY COMMISSION

A Bert Davis

A. Bert Davis
Regional Administrator

Dated at Glen Ellyn, Illinois
this 27th day of December 1989

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 030-07682/89001(DRSS)

Docket No. 030-07682

License No. 34-14071-01 Category C(1) Priority 1

Licensee: Glitsch Field Services/NDE, Inc.
North Canton, OH 44720

Event Reenactment/Inspection At: Glitsch Field Services/NDE, Inc.
1720 Greengarden Blvd.
Erie, Pennsylvania

and

Zurn Industries, Inc.
1422 East Avenue
Erie, Pennsylvania

Event Reenactment/Inspection Conducted: August 4, 1989

Routine Program Inspection At: Glitsch Field Services/NDE, Inc.
5250 Mayfair Road
North Canton, Ohio

Routine Program Inspection Conducted: August 14-15, 1989

Inspector: Wayne Slawinski
Wayne Slawinski
Senior Radiation Specialist

8-31-89
Date

Accompanying Personnel: Ken Lambert
Radiation Specialist

Reviewed By: Bruce S. Mallett Jr.
D. J. Sreniawski, Chief
Nuclear Materials Safety
Section 1

8-31-89
Date

Approved By: Bruce S. Mallett
Bruce S. Mallett, Ph.D., Chief
Nuclear Materials Safety Branch

8-31-89
Date

Inspection Summary

Inspection on August 4 and 14-15, 1989 (Report No. 030-07682/89001(DRSS))
Areas Inspected: Special announced safety inspection to review and reenact the circumstances surrounding a reported overexposure to a licensee radiographer and to review the overall routine licensed program. In addition to the event reenactment, the inspection included a review of the licensee's organization and management controls; radiographic training program; internal audit program; source inventory/leak tests; inspection and maintenance of devices; utilization logs; radiation survey instruments and calibration; personnel external exposure monitoring; surveys, posting and labeling; material receipt, transfer and transportation program; and notifications and reports.
Results: The overall licensed program generally appears to be properly developed, implemented, and managed; one violation was identified for failure to perform internal audits at required frequencies (Section 6). However, Commission reenactment/review of an August 2, 1989 exposure event revealed that a reported 93.48 rem whole body exposure appears to be valid. Three apparent violations of NRC regulatory requirements related to this event were identified and consist of (1) a 93.48 rem whole body overexposure (Section 4); (2) failure to secure the sealed source assembly in the shielded position after each radiograph; and (3) failure to perform required actions/ notifications immediately after discovery that a worker's dosimeter was discharged beyond its range (Section 4).

DETAILS

1. Persons Contacted

Licensee

J. Fletcher, Radiographer
J. Harris, Radiographer/Radiaiion Safety Secretary
*A. Magno, Radiation Safety Director
*J. McArdle, President
K. Ramsier, Radiographer/Assistant Erie Office Manager
R. Roush, Assistant Radiation Safety Officer, Erie Office
C. Schrickel, Assistant Radiographer
R. Wolfe, Radiographer

Non-Licensee

+R. Knuth, Technical Services, Tech/Ops Landauer, Inc.
T. Kunik, Manager, Quality Control and Weld Engineering, Zurn Industries, Inc.
+C. Roughan, Radiation Safety Officer, Amersham Corporation
+J. Serrato, Technical Services, Tech/Ops Landauer, Inc.

*Denotes those present at the site exit meeting on August 15, 1989.

+Denotes telephone contacts only.

The inspectors also contacted medical personnel involved in the event followup.

2. Purpose of Inspection

Special inspections were conducted to reenact and review the circumstances of an apparent overexposure to a licensee radiographer that occurred during field operations in Erie, Pennsylvania on August 2, 1989 and subsequently to review the overall routine licensed program. The event review and reenactment was conducted at a licensee customer field site in Erie, Pennsylvania and at the licensee's office in Erie. The routine program review was conducted at the licensee's main office in North Canton, Ohio.

3. Summary of Licensed Program

a. Program Overview

The initial license was issued in 1971, authorizing the possession of cobalt-60 and iridium-192 sealed sources (up to 50 and 100 curies per source respectively) incident to industrial radiography at temporary job sites anywhere the NRC maintains jurisdiction, and at

the licensee's facility in Canton, Ohio. Use at a branch office in Erie, Pennsylvania was authorized in 1982. The license currently authorizes industrial radiography using cobalt-60 and ytterbium-169 sealed sources up to 100 curies per source, iridium-192 to 200 curies per source; and 125-225 millicuries of cesium-137 per source for instrument calibrations and in pipeline x-ray crawler stopping devices. Ytterbium is used rarely for specialty radiography of soft metals and other low density materials. The license was renewed in its entirety in February 1987 and expires in April 1994.

The licensee offers non-destructive examination (NDE) services including ultrasonic testing, magnetic particle, eddy current, and specialized test services in addition to X and gamma ray radiography. The gamma radiography operations constitute about 10% of the licensee's overall work; the majority of NDE work is comprised of ultrasonic and eddy current testing. This is a fairly large scale radiography program employing about 30 full time radiographic personnel, performing industrial radiography primarily at temporary job sites in Ohio and Pennsylvania. The licensee possesses about 45 radiographic exposure devices, about 75% of which are currently in storage and do not house sources. In a typical month, radiographic operations are conducted on a near daily basis either at field sites or the licensee's fixed facilities in Canton, Ohio and Erie, Pennsylvania.

All sources and devices currently possessed by the licensee are authorized; no problems were noted in this area.

b. Organization and Management Controls

The licensee's organizational structure is delineated in Section I-I of their Radiographic Operations Manual and basically consists of the company President, Radiation Safety Director, Assistant Radiation Safety Officers for their Erie, Pennsylvania and North Canton, Ohio offices, a Training Director, and about 30 radiographic personnel. The Radiation Safety Director (Radiation Safety Officer) reports directly to the company President and has overall responsibility to administer radiographic operations conducted under the NRC license. This individual also retains other managerial and technical responsibilities including Canton, Ohio Operations Manager and for oversight of the radiographic training program. The licensee has designated an Assistant Radiation Safety Officer (ARSO) for their Erie office and one for their Canton operations. The ARSOs report to the Radiation Safety Director and are responsible for day-to-day facility operations and office management including material procurement and inventory, device and facility maintenance and radiographic personnel performance audits. Radiographers and assistants report directly to their respective office ARSO.

The licensee's organizational structure is properly developed, responsibilities are clearly defined, and management support for the radiation safety program is evident. Although radiographic personnel performance audit and branch office operation audit

problems were identified (Section 6), the licensee's organization and management controls appear generally good.

c. Facility Descriptions

The licensee maintains fixed (permanent) radiographic installations at both their Erie, Pennsylvania and North Canton, Ohio offices. According to the licensee, about 10% of Erie radiographic operations and 40% of Canton operations are performed in the respective permanent exposure cells.

The licensee's Canton, Ohio facility is a single floor warehouse building comprised of offices and a fixed radiographic cell situated in a back corner of the structure. The front portion of the warehouse is occupied by another company but segregated from the licensee's facility by locked garage-type doors. The radiographic cell consists of a 19 by 14 by 16 foot high concrete brick enclosure of sufficient thickness to usually reduce radiation levels at its exterior to unrestricted area status. The radiographic cell, however, does not contain significant shielding to attenuate radiation in the vertical direction. As a result, roof access is controlled and continually monitored by the licensee during radiographic operations using a video camera. Exposure cell entry is controlled pursuant to 10 CFR 20.203(c)(2)(iii) and includes visible and audible alarms in accordance with 10 CFR 34.29(b).

The licensee's Erie, Pennsylvania facility houses two permanent poured concrete radiographic cells located within a large warehouse type building. The facility is described in licensee letter dated December 19, 1986, referenced in License Condition No. 18. Facility access is controlled similar to that of the Canton, Ohio cell.

Since neither the Canton or Erie radiographic cells include shielded ceilings, use restrictions have been developed to maintain roof radiation levels below 100 mrem/hr. Use restrictions are delineated in Section I-II of the licensee's operations manual and include maximum collimated/uncollimated source activity and location liritations. The inspectors reviewed use restrictions, access controls and audible/visible alarm operations for the Canton, Ohio facility; no significant problems were noted. Desirable use restriction improvements are discussed in Section 9.

No violations or deviations were identified.

4. Overexposure Event Description

a. Overview

On August 3, 1989, the licensee notified NRC Region III that a radiographer may have received a whole-body exposure of about 93.5 rem, while conducting radiographic operations at a

customer's facility in Erie, Pennsylvania the previous day. A Region III reenactment (at the Eire field site) of the radiographer's actions at the time of the apparent overexposure revealed that the 93.42 rem whole-body exposure was valid and localized to the radiographer's right hip area. Other portions of the radiographer's body, including the extremities, are calculated to have received significantly less than 93 rem. The reenactment determined that the radiographer had properly retracted an 87 curie Ir-192 source into its shielded position within the radiography device (projector) after completing a radiograph and performed adequate surveys to verify the source was returned to the shielded position within the device; however, the worker neglected to secure the source assembly in the shielded position by rotating the projector's selector ring to the "lock" position. The radiographer then repositioned the exposure device and guide tube in preparation for the next radiograph and the source apparently moved out of the fully shielded position when the crank mechanism rotated slightly. While the radiographer was completing the setup for the next radiograph, he was unknowingly working within the radiation field of the exposed source.

Relevant aspects of the event and its reenactment are described in subsections below.

b. Event Reenactment and Findings

The individual involved in the apparent overexposure event is a licensee trained and qualified radiographer that possesses about six years direct radiographic field experience obtained during his nearly seven year tenure with the licensee. (Training and qualifications are described in Section 5). The individual was working alone conducting radiographic operations at a customer's industrial plant in Erie, Pennsylvania. Operations commenced about 11:30 p.m. on August 1, 1989 and terminated several hours later on August 2, after completing ten planned radiographs.

(i) Equipment and Physical Setup

Radiography was conducted using an Amersham/Tech Ops Model 660 exposure device (projector) housing an 87 curie iridium-192 sealed source and a standard four foot long guide tube and associated drive cable/crank assembly. Personnel dosimetry consisted of a 0-200 mR range self-reading dosimeter and a vendor supplied thermoluminescent dosimeter (TLD) worn together in a pouch hung from the radiographer's belt. Ten radiographs of 2-inch diameter, 165-mil, carbon steel boiler economizer tube welds were planned. The exposure device was positioned atop a platform to enable the guide tube tip to reach the desired exposure area and the radiographer manipulated the crank mechanism from behind a large shield wall

about 20-feet behind the exposure device. During setup between radiographs (i.e., film and guide tube placement), the radiographer worked with his backside toward the exposure device which was located about belt high.

(ii) Radiographic Sequence

At about 12:30 a.m. on August 2, 1989, the radiographer had completed his initial radiographic setup and performed the first of ten planned radiographs. After completing the first radiograph, an approximate 25 second test exposure, the radiographer returned (cranked back) the source to the shielded position within the exposure device, surveyed the exposure device and guide tube to verify that the source was fully retracted and rotated the projector's selector ring to the "lock" position. This latter step assures the source assembly is secured in the fully shielded position within the projector and cannot move provided the "lock" position is maintained. (The Amersham exposure device includes a safety feature that prohibits source assembly movement if the selector ring is in the "lock" position. Additionally, the selector ring is incapable of being placed in the "lock" position unless the source assembly is fully retracted within the device.) The individual then key locked the exposure device, removed the key and proceeded to another area of the plant to have the exposed film developed and read. There is no information to suggest that any radiological problems existed at this time. The film was analyzed by two customer technician's that were stationed well outside the radiographers 2 mR/hr boundary.

After film analysis, the radiographer returned to the radiographic area, setup and conducted a second radiograph. After the second exposure was complete, the radiographer cranked the source back into the shielded position within the device, performed the necessary surveys to assure the source was fully retracted and proceeded to setup the next (third) radiograph. However, the radiographer failed to rotate the projector's selector ring to the "lock" position and therefore, did not secure the source assembly in the exposure device. This failure is an apparent violation of 10 CFR 34.22(a) and the licensee's Radiographic Operations Manual referenced in License Condition No. 18. Section I-II, Procedure 6, Paragraph 4.6.5 of this manual requires that after each radiographic exposure, the source be returned to the shielded position and the projector's selector ring rotated to the "lock" position.

To setup the third radiograph, the radiographer repositioned the guide tube, which involved moving the exposure device about one foot towards him. This movement apparently also caused the drive cable and crank mechanism to move. Since the source assembly was not secured at this time and due to the rotation

of the crank mechanism, the source apparently moved to an unshielded position at the outlet port of the exposure device. According to the exposure device manufacturer, a one-quarter revolution of the crank handle translates to about three inches of source travel. Five inches or nearly one-half revolution of the crank mechanism will cause the sealed source to travel from its fully retracted position within the projector to an unshielded position at the outlet port of the device.

Based on inspector measured distances and associated exposure times from event reenactments, combined with vendor dosimetry results and NRC calculations, the sealed source appears likely to have been located at the outlet port of the device while the radiographer was completing the setup for the third radiograph. During this time (one minute), the radiographer was unknowingly working in close proximity to the unshielded iridium-192 sealed source. The reenactment revealed the radiographers right hip was closest to the source and in essentially the same location that his dosimetry was worn. Specifically, the right hip was twelve inches from the presumed source location for about 45 seconds and at two inches for about 15 seconds. This resulted in a 93.42 rem whole body exposure that was primarily localized to the right hip area and greater than 90% of which occurred while the individual was about two inches from the source. This exposure is an apparent violation of 10 CFR 20.101(b) which limits the total occupational dose to the whole body of an individual in a restricted area to three rem during any calendar quarter. Contrary to this requirement, the radiographer received a whole body dose of 93.42 rem on August 2, 1989 and 93.48 rem for the third calendar quarter of 1989. Licensee self-reading dosimeter data showed that the radiographer received 60 millirem from July 10-August 1, 1989. Based on the reenactment of the radiographers actions during the setup for the third exposure, other portions of his body received significantly less exposure than the right hip (refer to Subsection (d) below).

(iii) Actions Subsequent to Apparent Overexposure

The radiographer performed the third radiograph, returned the source to the shielded position, surveyed the exposure device and guide tube and placed the projector's selector ring in the "lock" position and key locked the device. The films from the second and third radiographs were then delivered to the dark room for development and analysis. At this time, the radiographer checked his dosimeter and noticed it was offscale (greater than 200 milliroentgen). The radiographer rezeroed his dosimeter and continued radiographic operations, completing the remaining seven planned radiographs before terminating operations for that day. The radiographer was aware of regulatory

and licensee procedural requirements that work be stopped and immediate notifications made if a dosimeter goes offscale; nevertheless, the radiographer continued operations because he believed the work was conducted properly, no radiological problems existed, and he assumed the dosimeter drifted or was jarred offscale and was not offscale due to radiation exposure. According to the radiographer, proper surveys were performed and the projector's selector ring was placed in the "lock" position after each of the last seven radiographs. No additional exposure was measured by his self-reading dosimeter during the last seven exposures. The radiographer informed the Erie office ARSO of the offscale dosimeter at about 7:00 a.m. on August 2, 1989, several hours after it was noted offscale. Failure to immediately stop work and notify the ARSO in the event a workers dosimeter goes offscale is contrary to Section I-II, Procedure 1, of the licensee's Radiographic Operations Manual. This appears to be a violation of License Condition No. 18, which references license application dated January 15, 1987 and the licensee's manual.

c. Event Summary and Conclusions

Based on licensee statements, interviews with the involved radiographer and repeated reenactments of the individuals actions during the event, the 93.48 rem exposure measured by the TLD worn by the radiographer for the period July 10, 1989 through August 2, 1989, appears valid. The majority (greater than 90%) of this exposure was received when the radiographer's right hip was about two inches from the unshielded source.

Although the radiographer apparently conducted adequate radiation surveys to verify the source was fully retracted into the exposure device after each radiograph, the individual failed to secure the source assembly in the device after the second of ten radiographs. This allowed the source to move to an unshielded position and expose the radiographer to its direct radiation field.

The involved radiographer appears properly trained, qualified an knowledgeable of regulatory and radiation safety requirements; however, the licensee admitted that the individual had previously been observed failing to secure (lock) the source assembly in the projector after each radiograph (refer to Section 6).

d. Radiological Significance

A 93 rem whole body exposure potentially manifests significant radiological and medical consequences. Its significance, however, is lessened because the exposure was primarily localized to the right side of the hip. Based on inspector reenactments and dose calculations combined with vendor dosimetry results, the

radiographer's head is calculated to have received about 2.6 rem, the middle back about 8 rem and the thighs 5 rem. Nevertheless, the 93.48 rem exposure is a non-extremity, non-skin dose over a significant volume (> 1 cm^3) of tissue and is considered a whole body exposure pursuant to 10 CFR 20.101. Blood samples collected from the exposed individual on several occasions between August 2 and 23rd exhibited only one instance of potential radiation effect when the lymphocyte count dropped below the normal range; however, the effect was short term and not indicative of significant cell damage. No significant medical effects have been observed to date; the radiographer remains under a physician's care and an NRC medical consultant continues to monitor the individual. A cytogenetic (chromosome) study arranged by the Commission and conducted by Oak Ridge National Laboratory concluded that the radiographer was exposed to an equivalent whole body dose of 5-8 rem. This result is consistent with the NRC dose calculations summarized above. The cytogenetic study does not predict localized exposure that, in this instance, was significantly greater than the overall equivalent whole body dose.

e. Licensee Corrective Actions

Immediate actions taken by the licensee after management discovery of the event are as follows:

- Revoked the radiographer's RT certification pending retraining and testing.
- Obtained physician care for the individual, blood sample analysis and a drug (urine) test.
- Conducted tests of the involved radiographic equipment to rule out malfunction.

Subsequent actions taken, planned, or under consideration are as follows:

- Conducted a tailgate meeting with Erie, radiographic personnel on August 4, 1989 (one day after event discovery), followed by a two-hour radiation safety training class the next day. Canton, Ohio personnel were notified within the next few days.
- Plan refresher radiation safety training for all licensee radiographic personnel within 30-days of the event.

The licensee is also considering a 30-day without pay suspension for personnel observed not to secure (lock) source assemblies after completing each radiograph and is contemplating methods to strengthen their performance audit program (Section 6).

Three apparent violations related to the event were identified.

5. Radiographic Personnel Training/Retraining

The licensee is authorized to conduct inhouse radiographic and radiation safety training in accordance with Section II-I of their Radiographic Operations Manual. The training for Assistant Radiographers generally involves six hours of classroom instruction, two days on-the-job training and requires passing grades in oral and operational performance tests. The training of new radiographers, with no prior training or experience, involves 40 hours of classroom training in the areas of radiation safety fundamentals, instruments, radiographic equipment, inspection and maintenance of equipment, regulations and licensee procedures. Radiographers are also required to complete three months of on-the-job training and achieve passing grades (80%) in a 50 question written exam and an operational performance test. Radiographers with prior experience are required to complete less rigorous training. Retraining is conducted for all radiographic personnel on an annual basis and when significant changes in regulations occur or the licensee purchases new equipment. Individual radiographic personnel are retrained if that individual has not performed radiography within the last three months.

The radiographer involved in the event described in Section 4 had no previous radiation safety training or radiography experience prior to his employment with the licensee in August 1982. The individual completed the licensee's 40 hour classroom training in October 1982, was certified an Assistant Radiographer in May 1983 and as a Radiographer in October 1983. Inspectors interviewed the individual and reviewed his training file including written exams, operational tests and refresher training. The individual appears to be knowledgeable in radiography and radiation safety has been properly trained and certified by the licensee. No significant problems were identified with this radiographers training or qualifications.

The inspectors also reviewed training records of two recently upgraded radiographic personnel and discussed the licensee's training program with them; no problems were noted.

No violations or deviations were identified.

6. Internal Audit Program

The licensee's radiographic personnel (internal) audit program required pursuant to 10 CFR 34.11(d) and (e) was approved by the NRC and is delineated in their Radiographic Operations Manual. The manual is referenced in License Condition No. 18 and was transmitted with license application dated January 15, 1987. Section II-I, Procedure 51 of this manual requires that a performance audit be conducted, at intervals not to exceed three months, for each radiographer and assistant radiographer who used radioactive sources. In addition, this procedure requires that branch office operations be audited on an annual basis. Audit report forms H and J are used to document radiographer performance and branch office audit results, respectively. The inspector's discussed the

audit program with the licensee and selectively reviewed radiographer performance audit records for 1988 and 1989 to date and records of the last branch office audit. The review revealed that performance audits have not been performed for each radiographer at intervals not to exceed three months and that branch office operations have not been audited annually. Specifically, at least three radiographers each conducted several radiographic operations up to 6-10 months after their last performance audit. In addition, as of August 15, 1989, the last audit of branch (Erie) office operations was December 1987. Failure to conduct performance and branch office audits at the required frequencies is contrary to section II-I, procedure 51 of the licensee's manual. This appears to be a violation of License Condition No. 18, which references license application dated January 15, 1987 and the licensee's manual.

Performance audit records reviewed by the inspectors are summarized in the table below. Dates of radiographic operations were obtained from licensee utilization records.

Radiographer	Performance Audit Date(s)	Radiographic Operation Date(s)
L. Jeffries	November 22, 1988; May 22, 1989	March 6, 14 and 16, 1989 May 20 and 21, 1989
L. Gulnac	June 22, 1988; April 18, 1989	January 16 and 30, 1989 March 10, 1989 April 17, 1989
K. Ramsier	October 22, 1988; April 18, 1989	March 16 and 23, 1989 April 8, 10 and 12, 1989

As previously discussed (Section 4(c)), the licensee's Radiation Safety Director reported that he had informally observed the radiographer involved in the August 2, 1989 overexposure event failing (on a couple of occasions) to secure (lock) the source assembly in the projector after completing each radiograph. The radiographer was verbally reprimanded at the time and no further action was taken. This problem has not been identified in formal performance audits of this individual nor does it appear to be a programmatic problem. Although more stringent action may have prevented reoccurrence of this problem, the actions taken by the licensee at the time appear acceptable.

One violation was identified.

7. Material Inventory/Control and Source Leak Testing

a. Byproduct Material Inventory

The licensee performs quarterly physical inventories of its sealed sources and records the appropriate data on quarterly inventory sheets. The licensee currently possesses five Ir-192 sealed sources, three Co-60 sealed sources and two Cs-137 sealed sources; source activities are within license possession limits.

The licensee conducts quarterly inventories of sealed sources pursuant to Section I-II of their Radiographic Operations Manual and 10 CFR 34.26. The licensee routinely conducts inventories during the first week of each calendar quarter. The inspectors reviewed inventory records for 1989 to date and found them in good order and containing all the required information; no problems were identified.

b. Sealed Source Leak Testing

Sealed source leak testing is performed by the Assistant Radiation Safety Officers or designated radiographer using a Tech/Ops Amersham Model 518 leak test kit. Tests are performed according to the manufacturers instructions, swabs surveyed for gross contamination and mailed to the licensee's Radiation Safety Director who forwards the swabs to a vendor for analysis. If contamination is found on the swabs by the licensee, the Radiation Safety Director is notified for further instructions. Inspectors reviewed selective leak test records for 1988 and 1989 to date; no discrepancies were noted.

No violations or deviations were identified.

8. Inspection and Maintenance of Devices and Changers

The licensee conducts inspection and maintenance of radiographic exposure devices, source changers and storage containers at the required intervals and as outlined in their Radiographic Operations Manual. The program includes daily equipment checks and periodic inspections and maintenance at intervals not to exceed three months.

The licensee conducts daily checks of exposure devices source changers and storage containers prior to use and records the results on daily utilization logs. The licensee has also implemented a quarterly inspection and maintenance program for devices, changers, and containers. Inspectors selectively reviewed records of daily checks and quarterly inspection and maintenance for 1988 and 1989 to date; no discrepancies were noted. The licensee's equipment check and inspection and maintenance program appears properly implemented and meets the requirements of 10 CFR 34.28 and the licensees Operations Manual. The licensee's exposure devices and related equipment appear to be in good condition and properly maintained.

No violations or deviations were identified.

9. Utilization Logs

The inspectors reviewed radiographic operation utilization logs to verify compliance with 10 CFR 34.27 and licensee Radiographic Operations Manual requirements. Utilization log requirements are delineated in Section I-II, Procedures 3 and 14, of the licensee's manual. Each sealed source use is recorded on "Radiation Record Form A" and includes all the information required for utilization records pursuant to 10 CFR 34.27. Inspector review of selective utilization logs for 1989 to date revealed

that appropriate logs were completed whenever radiographic operations were conducted. No significant problems were noted; however, the desirability to record component shielding equivalency when collimators are not used to reduce roof radiation levels during operations in the licensee's fixed exposure cells was discussed with the licensee. The licensee agreed that since source activity and collimation or shielding equivalency use restrictions exist for operations conducted in their fixed cells, component shielding information was necessary for inclusion on utilization logs. (Collimation information is currently preprinted on utilization logs.) The licensee stated that radiographic personnel would be instructed to record component shielding information on utilization logs in instances where collimators are not used.

No violations or deviations were identified.

10. Radiation Survey Instrumentation and Calibration

The licensee maintains forty-eight Gamma Industries Model 250-B and two Canadian Admiral Model RD-5016-C radiation survey instruments which meet 10 CFR 34.24 range requirements. These survey instruments are used routinely during radiographic operations.

Survey instruments are calibrated and repaired by the licensee pursuant to Section II-I of their Radiographic Operations Manual. Calibrations are conducted using a Tech/Ops Model 773 survey meter calibrating device, which houses a nominal 150 mCi cesium-137 sealed source. The inspectors selectively reviewed survey instrument calibration and maintenance logs for 1988 and 1989 to date; no deficiencies were noted. Calibrations are performed in accordance with the licensee's operating manual and at the required frequencies.

No violations or deviations were identified.

11. External Exposure Monitoring

The licensee utilizes the services of Tech/Ops Landauer, Inc. to provide and analyze whole body exposure monitoring devices. Three chip thermoluminescent (TLD) badges are provided to all radiographic personnel and are exchanged on a monthly basis. Non-radiographic personnel (office workers) are normally not provided with TLD badges. The licensee maintains completed Form NRC-4's on file for radiographic personnel. Inspectors selectively reviewed the forms for several radiographers and also reviewed vendor monthly exposure reports for the period January 1988 to June 9, 1989. The maximum and average quarterly whole body exposures for the period reviewed, excluding the radiographer involved in the event described in Section 4, were 1025 and 100 millirem, respectively. The individual involved in the event described in Section 4 had a lifetime exposure prior to the event of 4.99 rem and a 1989 exposure through July 9, 1989 of 220 millirem. This individual had no previous quarterly exposure exceeding three rem.

The licensee supplies each radiographer and assistant with a Victoreen or Dosimeter Corporation of America 0-200 mR range pocket chamber (self-reading) dosimeter. Dosimeters are zeroed at the beginning of each shift and exposures recorded daily on the radiographers individual time sheet. Inspectors selectively reviewed time sheets and verified that dosimeter readings correspond to vendor TLD analyses.

The licensee follows the procedure for testing pocket dosimeters as outlined in Section II-I of their Radiographic Operations Manual. This procedure includes a drift check and radiation response, jarring and charging tests. A dosimeter that fails any of these tests is removed from service. The inspectors selectively reviewed records of dosimeter testing; no problems were identified.

The licensee's selection and use of personnel monitoring devices appears to comply with 10 CFR 20.202 and 34.33 requirements.

No violations or deviations were identified.

12. Radiological Surveys

During the August 2, 1989 overexposure event in Erie, Pennsylvania, radiation surveys were performed by the radiographer after each radiograph to determine that the sealed source had returned to its shielded position in the exposure device. The source assembly moved to an unshielded or partially unshielded position outside the exposure device subsequent to the surveys and after the exposure device was repositioned in preparation for the third radiograph. Inspector discussions with other licensee radiographers disclosed that proper surveys are performed after each radiographic exposure and include the source guide tube when applicable. Utilization records reviewed by the inspectors showed that radiation levels at the boundary of restricted areas is 2 millirem/hour or less. Fixed cell exterior wall surveys are also performed during inhouse cell operations.

As discussed in Section 9, the licensee's Radiographic Operations Manual includes source activity and component shielding or collimation use restrictions to assure roof radiation levels resulting from operations in their fixed cells does not exceed high radiation area limits. These limitations are delineated in manual section I-II, procedure 14. A video camera is installed on the roof of the licensee's Canton, Ohio facility to allow continuous surveillance of the area during radiographic operations. Results of Canton, Ohio facility surveys (excluding the roof) performed by the licensee assimilating "worst case" radiographic operations using both iridium-192 and cobalt-60 sources are described in referenced letter dated December 1, 1981. Survey results show that cell walls are sufficient to attenuate radiation to unrestricted area levels (less than 2mR/hr) in all but a few isolated locations. Additional directional or panoramic collimators are used, or the exposure geometry rearranged to assure that the radiation intensity does not exceed 2 mR/hr at any location adjacent to the four exterior walls of the fixed exposure cell.

No violations or deviations were identified.

13. Posting and Labeling

Based on inspector observations, area posting and device/container labeling requirements of 10 CFR 20.203 appear to be met. Review of utilization logs revealed that high radiation and radiation areas were properly posted and controlled.

No violations or deviations were identified.

14. Shipping, Receiving and Transportation of Radioactive Material

The licensee's procedures for shipping, receiving and transporting radioactive material are delineated in their Radiographic Operations Manual and include general instructions for transporting radioactive packages, shipping and receiving radioactive materials through an independent carrier and transporting material in licensee vehicles. The licensee maintains certificates of compliance for those Type B packages transported to field sites, is registered with the Commission as a user of the packages and has an NRC approved QA program pursuant to 10 CFR 71.12. The QA program approval expires on September 30, 1989.

The licensee routinely transports sources and devices used in field radiography in company vehicles. Packages appear to be properly marked, labelled and secured within the vehicle. The licensee's daily utilization log and an addendum to it double as the shipping papers for transporting radioactive materials. Shipping papers generated in 1988 to date were selectively reviewed by the inspectors and found to contain all the required information. Shipping papers are properly located in the cab of the vehicle during transportation. No problems were noted with the licensee's shipping, receiving or transportation program.

No violations or deviations were identified.

15. Notifications and Reports

The apparent overexposure event described in Section 4 occurred at about 1:00 a.m. (EDT) on August 2, 1989, after the second of ten planned radiographs. The radiographer discovered his dosimeter was offscale after completing the third radiograph at roughly 1:30 a.m. Despite this discovery, radiographic operations continued until all ten planned radiographs were completed at about 3:00 a.m. The offscale dosimeter was reported to the Erie Office ARSO when that individual reported for work at about 7:30 a.m. on August 2. Failure to immediately terminate work and make appropriate notifications upon discovering the offscale dosimeter appears to be a violation of regulatory requirements (Section 4(b)). The TLD worn by the radiographer was sent for emergency processing to the licensee's dosimetry vendor on the afternoon of August 2 and the analysis results teleconed to the licensee at about 3:00 p.m. on August 3. Pursuant to 10 CFR 20.403, the NRC was notified about the exposure in a telecon from the licensee's Radiation Safety Director about two hours after TLD analysis results were received from their vendor. The licensee's written report of the event, submitted pursuant to 10 CFR 20.405, was received in the Region III office on August 31, 1989. The written report includes all 10 CFR 20.405 required information.

The inspectors reviewed two employee termination reports and the 1988 annual exposure report, submitted to the Commission in accordance with 10 CFR 20.408 and 20.407, respectively. No problems were noted.

On violation was identified as described in Section 4(b)).

16. Independent Measurements and Observations

During the site inspection at the licensee's North Canton, Ohio office and the site visit to the Erie, Pennsylvania office at the time of the reenactment of the event described in Section 4, the inspectors conducted independent radiological surveys. The surveys were conducted using an NRC Eberline PIC-6A, Serial Number 2302 last calibrated on June 6, 1989. The Tech Ops Model 660 exposure device containing approximately 87 curies of iridium-192 and involved in the August 2 exposure event was surveyed to verify compliance with 10 CFR 34.21. Independent inspector surveys were also conducted on other exposure devices and outside the fixed exposure cell at the North Canton, Ohio office with a collimated 25 curie iridium-192 source exposed in the cell. No problems were noted.

Inspector observations of exposure device labeling, physical condition and security revealed no problems. Appropriate signs were posted on walls and doors of exposure rooms. Visible and audible alarms pursuant to 10 CFR 34.29(b) were functioning properly and appeared adequate. The roof mounted video camera described in Sections 3(c)and 12 also appeared to be in proper working order.

No violations or deviations were identified.

17. Exit Meeting

The inspectors met with licensee representatives (denoted in Section 1) at the conclusion of the North Canton, Ohio facility inspection on August 15, 1989. The inspectors discussed the overexposure event and summarized the scope and findings of the overall inspection. The inspectors also summarized the NRC Enforcement Policy as described in 10 CFR 2, Appendix C and its applicability to the inspection findings. The following matters were discussed specifically by the inspectors:

a. The three apparent violations associated with the August 2, 1989 overexposure event. (Section 4(b))

b. The violation associated with the licensee's internal audit program. (Section 6)

c. Inspector comments regarding the effectiveness of the licensee's previous preventative steps to preclude the radiographer involved in the overexposure event from failing to secure (lock) the source assembly in the projector. (Section 6)

d. The desirability to expand source utilization records to include component shielding information when uncollimated exposures are conducted in one of the licensee's fixed cells. (Section 9)