U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 90-01

Docket No. 99990005

Licensee: B & B X-Ray and Inspection
2015 Westwind Drive #10
Bakersfield, CA 93301

Inspection at: B & B X-Ray and Inspection
Bakersfield, CA

and

Vandenberg Air Force Base, California

Inspector: David D. Skov, Radiation Specialist — Date Signed: 3/2/90

Approved by: H. D. Chaney, Acting Chief
Nuclear Materials Safety Section — Date Signed: 3/2/90

Inspection Summary:

Inspection on February 2-12, 1990 (Report No. 99990005/90-01)

Areas Inspected: This was a routine, unannounced inspection of a California Agreement State licensee operating under an NRC general license at Vandenberg Air Force Base (AFB). The inspection included an examination of the licensee's organization and management controls; radiographic training program, internal audit program; source inventory/leak tests; use of licensed materials during field radiography; radiological surveys; utilization logs; radiation survey instruments and calibration; inspection and maintenance of radiographic exposure devices; external exposure monitoring of personnel; posting and labeling; source receipt and transfer; radioactive material shipping and transportation; and notification and reports.

Results: Eleven apparent violations and no deviations were identified during the inspection. The apparent violations are summarized as follows:

A. A 56 curie iridium-192 sealed radiographic source (source) was not secured in the shielded position inside the exposure device (projector) after each source exposure and retraction (Section 7).

B. A licensee radiographer conducted incomplete radiation surveys of radiographic equipment following source exposure and retraction (Section 8).

C. No record was made of projector radiation levels that were measured at the time the projector was placed into storage on one occasion (Section 8).

D. The licensee failed to record exposures that were measured by pocket dosimeters (PDs) worn by radiographic personnel on several occasions (Section 10).

E. The licensee had no records of receipt and transfer of a projector containing a 25 curie iridium-192 source (Section 13).

F. A "Caution High Radiation Area" sign was not posted at the boundary of a high radiation area during radiographic operations (Section 14).

G. A Form NRC-3 ("Notice to Employees") was neither posted at the licensee's office nor at a temporary job site where employees were engaged in licensed activities (Section 14).

H. A projector containing a 56 curie iridium-192 sealed source was transported by private carrier without Department of Transportation (DOT) required shipping papers (Section 15).

I. The outer enclosure (vehicle foot locker) of a shipping package containing a 56 curie iridium-192 source was not labeled with DOT "Radioactive" category labels during its shipment (Section 15).

J. The licensee does not have an NRC approved quality assurance program for shipping packages pursuant to 10 CFR 71.12 (Section 15).

K. The licensee has not registered with the NRC as a user of Type B shipping packages pursuant to 10 CFR 71.12 (Section 15).

The California State licensed program does not appear to be properly implemented in several areas, as demonstrated by the apparent violations that were identified during the inspection. Two of the apparent violations had more than minor safety significance because of the potential for large personnel radiation exposures. Also of particular concern is the effectiveness of the licensee's audit program to ensure compliance with State license and NRC requirements.

DETAILS

1. Persons Contacted

Licensee

I. Bertrand, President/Radiation Safety Officer
S. Bechtel, Radiographer/Alternate Radiation Safety Officer
J. Aal, Radiographer
L. Isom, Radiographer Helper

Non-Licensee

Lt Col K. Chandler, Radiation Safety Officer,
Bioenvironmental Engineering, Vandenberg Air Force Base
SSgt B. Schultz, Environmental Monitor, Bioenvironmental
Engineering, Vandenberg Air Force Base
W. Hatfield, Cook's Welding and Machine Company
C. DeLaCruz, Martin-Marietta Corporation

2. Background and Purpose of Inspection

On January 11, 1990, the NRC Region V office received written notification from B & B X-Ray and Inspection of its intent to conduct field radiography between January 12, 1990 and March 12, 1990, at Vandenberg AFB, California. B & B X-Ray holds a specific license (License Number 5368-15), issued by the State of California (State license), authorizing possession of sealed sources for use in radiography at temporary job sites not under exclusive Federal jurisdiction. After examination by Region V, and as provided by 10 CFR 150.20, B & B X-Ray was granted a general license to conduct radiography at Vandenberg AFB, a temporary job site under Federal jurisdiction. B & B X-Ray has conducted radiography on nearly a daily basis at Vandenberg AFB since January 22, 1990.

3. Summary of Licensed Program

a. Program Overview

B & B X-Ray was issued a California specific license on October 30, 1989, authorizing possession of eight iridium-192 sources of up to 100 curies each. The specific license authorizes the use of sources in Gamma Industries Model Century S and Amersham/Tech-Ops Model 660 exposure devices, and in certain source changers.

Approximately 95 percent of the licensee's non-destructive examination business is industrial radiography. All radiography has been conducted in the field using portable projectors containing iridium-192 sources.

b. Organization

The part owner and President, Issac Bertrand, is also the designated radiation safety officer (RSO). Spencer Bechtel is Vice-President and serves as alternate RSO in the organization. Messrs. Bertrand, Bechtel, and one employee work as radiographers. Three additional personnel are employed as helpers to assist radiographers in such duties as developing film and performing restricted boundary radiation surveys. The licensee's organizational structure and responsibilities are clearly defined.

4. Radiographic Personnel Training Program

The only personnel authorized to work as radiographers are those named in License Condition No. 12 of the State license. B & B X-Ray does not employ assistant radiographers as defined by 10 CFR 34.2, and none are authorized under the State license. The inspector examined the training of the two radiographers who had worked at Vandenberg AFB, for compliance with State license requirements. Both individuals are experienced radiographers and are named as radiographers on the State license. The inspector verified that the radiographers had completed training, and passed written examinations provided by the licensee in October 1989. The inspector also examined licensee records indicating that both individuals were trained and had demonstrated competence in the handling and use of radiographic equipment of the type that was used at Vandenberg AFB.

The inspector examined the licensee's retraining program for radiographer personnel. A combined refresher course and safety meeting was last held on December 9, 1989. A record of the meeting was maintained on file as required by License Condition No. 22.

No apparent violations or deviations were identified.

5. Internal Audit Program

The State license requires the RSO to conduct field inspections at temporary job sites at intervals not to exceed three months. The RSO uses a 12-point check list to audit the performance of each radiographer. The two radiographers working at Vandenberg AFB, were audited within the previous three months. The licensee's internal inspection findings were documented as required; no deficiencies were identified by the RSO from these audits.

The audit program appeared to have been properly implemented in accordance with State license requirements.

Due to the findings of this inspection, the audit system should be expanded by the RSO into additional areas of the licensee's program to ensure compliance with NRC and State license requirements. Examples of additional areas that should be checked during program audits include radioactive material shipping papers, package labeling, and records of pocket dosimeter exposures, radiation surveys, and source utilization.

No apparent violations or deviations were identified.

6. Material Inventory/Control and Source Leak Testing

a. Byproduct Material Inventory

The licensee currently possesses three Gamma Century S exposure devices containing iridium-192 sources. The sources and a previously possessed Tech/Ops Model 660 projector, used at Vandenberg AFB, were authorized under the State license. Source activities were also within license possession limits.

Inventory control of sealed sources is accomplished using a projector and source log-in/log-out system. A daily record is maintained in the licensee's Bakersfield office of the source location, the responsible radiographer, and the time and date the source is removed from and returned to storage. Records for sources used at Vandenberg AFB were found complete and current.

b. Sealed Source Leak Testing

The inspector examined leak test records for all sources used by the licensee at Vandenberg AFB. The source supplier and the licensee had conducted source leak tests within six months prior to source usage.

No apparent violations or deviations were identified.

7. Use of Licensed Material During Field Radiography

During radiographic operations on February 2, 1990 at Vandenberg AFB, the inspector observed the radiographer's use of licensed material. 10 CFR 34.22(a), in part, requires the projector source assembly to be secured in the shielded position each time the source is returned to that position. Section II, paragraph 2.19.6 of the licensee's Quality Assurance (QA) Manual, referenced in License

Condition No. 13 of the State license, also requires the source to be secured within the Gamma Century S projector by depressing the device lock plunger after source exposure and retraction.

At the time of the inspection, the radiographer was taking radiographs of pipe welds on the fourth floor of the Missile Support Tower (MST), at Space Launch Complex (SLC) 4E. Radiography was conducted using a Gamma Century S projector housing a 56 curie iridium-192 source, a guide tube with shielded collimator, and a drive cable and associated crank assembly. After completing each of three radiographs, the radiographer returned (cranked back) the source to its shielded position within the projector, surveyed one side of the exposure device, and then retrieved the exposed radiographic film for processing. However, in each case, the radiographer failed to secure (lock) the source in the device.

The failure to secure the source after each radiograph potentially could have allowed the source to move to an unshielded position outside the projector. In explaining his actions, the radiographer informed the inspector that the source only had to be secured at the completion of radiography at each location of use. Also, the radiographer was apparently unaware of either the NRC (10 CFR 34.22) or California regulatory requirement to physically secure the source assembly each time the source was returned to its shielded position. The licensee's failure to secure or lock the source between radiographic source exposures is considered an apparent violation of 10 CFR 34.22(a) and State License Condition No. 13.

One apparent violation and no deviations were identified.

8. Radiological Surveys

The inspector observed the licensee conduct radiological surveys during field radiography at the Vandenberg SLC 4E-MST structure. 10 CFR 34.43(b) requires radiation surveys of the entire circumference of a projector and source guide tube after each exposure to determine that the source has been returned to its shielded position inside the projector.

As discussed in Section 7, on three separate occasions, the radiographer retracted the source into its shielded position within the projector after completing each radiograph. However, on each occasion immediately after source retraction, the radiographer surveyed only one side of the projector with his survey meter. The radiographer then placed his survey meter on the floor directly opposite the projector without conducting a radiation survey around the

circumference of the projector, and without conducting a survey of the source guide tube. The radiographer appeared to be unaware of the survey requirements. The failure to survey the source guide tube and the entire circumference of the projector is considered an apparent violation of 10 CFR 34.43(b).

The licensee routinely conducts radiation surveys of projectors each time they are stored or secured in vehicles for transport following radiography. The storage survey results are documented by licensee personnel on the form, "Radiation Survey Record and Utilization Log." The inspector examined logs associated with radiographic operations at Vandenberg AFB since January 22, 1990. The examinations disclosed that recorded radiation levels at the surface of one projector (Serial Number 2670), frequently differed by a factor of up to ten between daily measurements. The licensee was unable to explain the variant radiation levels.

The inspector also examined licensee compliance with 10 CFR 34.43(d), which requires records of surveys whenever a projector is placed into a storage area following radiographic operations to ensure that the source is in its shielded position. The examination revealed that the time-of-storage survey results were not recorded following radiography on January 26, 1990, at Vandenberg AFB. The responsible radiographer stated to the inspector that the survey had been made, but that the measured radiation levels were inadvertently not recorded. The failure to record the storage radiation survey is considered an apparent violation of 10 CFR 34.43(d).

Two apparent violations and no deviations were identified.

9. Utilization Logs

The inspector examined radiography utilization logs to verify compliance with 10 CFR 34.27 and licensee QA manual requirements. Section I, paragraph 1.20.1, of the licensee's QA manual, requires that utilization logs include, among other items, a "description or make and model number of each source or storage container." Spaces are provided on the utilization log for identifying the projector and sealed source model, and their serial numbers.

The inspector verified that appropriate utilization logs were being prepared whenever radiographic operations were conducted at Vandenberg AFB. The logs properly identified the make and model number of exposure devices used, the date and location of use, and the names of radiographer personnel, as required by the QA manual and 10 CFR 34.27.

However, the projector serial number, and sealed source make, model, and serial number were either not recorded or were incorrectly recorded on several completed logs. This record keeping deficiency resulted in confusion and difficulty in properly identifying the specific iridium-192 source and exposure device utilized by the licensee at the Vandenberg AFB job site. These record discrepancies were apparently caused by inattention to detail on the part of the radiographer and his helper in completing the logs, and by the absence of, or inadequate review by the responsible radiographer following each job.

No apparent violations or deviations were identified.

10. External Exposure Monitoring

The licensee utilizes the services of a vendor to provide and analyze whole body exposure monitoring dosimeters. The vendor had been NVLAP accredited, in accordance with 10 CFR 20.202(c). Film badges (dosimeters) are provided to all radiographic personnel and are exchanged monthly. During licensee field radiography on February 2, 1990, at Vandenberg AFB, the inspector observed that film badges were properly worn by the radiographer and helper.

The inspector examined all monthly exposure reports for the fourth calendar quarter of 1989. The maximum and average quarterly whole body exposures were 600 and 213 millirem, respectively. The reported exposures were all received during licensee radiographic operations at job sites not under NRC jurisdiction. A current exposure report had not yet been received by the licensee for radiography conducted during January 1990.

The licensee supplies each radiographer and helper with a 0 to 200 milliroentgen (mR) range ion pocket chamber (direct-reading) dosimeter (PD). PDs are recharged (zeroed) at the beginning of each day or work shift. The licensee's procedure for use of PDs, as delineated in Section II, paragraph 2.1.1 of their QA manual, calls for PDs to be read daily, and the exposures recorded at the beginning and end of each day (work shift). Spaces provided on the form: "Radiation Survey Record and Utilization Log," are used for recording PD exposures and the serial number of each PD worn by licensee personnel. 10 CFR 34.33(b) also requires that PDs must be read and exposures recorded daily.

The inspector's review of licensee completed PD exposure records for the Vandenberg AFB job site between January 22, 1990 and February 8, 1990, revealed that on several occasions, PD serial numbers were either not recorded or incorrect numbers were recorded. Daily PD exposures

recorded were all less than 20 mR. However, PD readings had not been recorded for two radiographers and one helper working at Vandenberg AFB on the following dates: January 23, 26, 28-29, 1990, and February 3, 1990. According to the radiographers, the PDs were always read during and following radiographic operations and never read off-scale (greater than 200 mR). The licensee's failure to record pocket dosimeter exposures is considered an apparent violation of 10 CFR 34.33(b), and State License Condition No. 13.

The licensee employs the services of a vendor to annually check PDs for proper response to radiation. All six PDs used by licensee personnel at Vandenberg AFB had been response checked on December 21, 1989.

One apparent violation and no deviations were identified.

11. Radiation Survey Instrumentation and Calibration

The licensee maintains six portable radiation survey instruments which meet 10 CFR 34.24 range requirements. The survey instruments used during radiography at Vandenberg AFB, were last calibrated by a vendor on January 20, 1990. The vendor is authorized under a California license to perform calibration services.

No apparent violations or deviations were identified.

12. Inspection and Maintenance of Exposure Devices (Projectors)

The licensee routinely conducts daily checks of projectors for obvious defects prior to use and records the results on radiation survey and utilization logs. The inspector examined all utilization logs for projectors used by the licensee at Vandenberg AFB for compliance with the requirements of 10 CFR 34.28. The State license requires a maintenance program for inspection of projectors at three month intervals. However, the program has not been implemented to date since the licensee has used the devices only since November 28, 1989.

No apparent violations or deviations were identified.

13. Receipt and Transfer of Radioactive Material

The inspector examined the licensee's source receipt and transfer program for compliance with the requirements of 10 CFR Parts 30.41 and 30.51. 10 CFR 30.41 allows the transfer of byproduct material to only recipients holding a specific license authorizing possession of the material. 10 CFR 30.51 requires licensees to keep records showing the receipt, transfer, and disposal of byproduct material.

On January 22, 1990, the licensee acquired on loan from another State licensee, an Amersham/Tech Ops Model 660 projector, containing a 25 curie iridium-192 source. The projector was subsequently used for radiography by B & B X-Ray at Vandenberg AFB on January 22-23, 1990. According to the alternate RSO, the device was returned to the other State licensee on January 23, 1990. Both the receipt and return transfer of the device occurred at Vandenberg AFB. At the time of the inspection, the licensee had no records to document the receipt and transfer of the 25 curie iridium-192 source. The licensee appeared to be unaware of the receipt and transfer record requirement. This is considered an apparent violation of 10 CFR 30.51(a).

One apparent violation and no deviations were identified.

14. Posting and Labeling

10 CFR 20.203(b) requires each radiation area to be conspicuously posted with a sign bearing the radiation caution symbol and the words: "Caution (or Danger) Radiation Area." In the case of a high radiation area, 10 CFR 20.203(c)(1) requires the conspicuous posting of a "Caution (or Danger) High Radiation Area" sign. 10 CFR 20.202(b)(3) defines a high radiation area as any area, accessible to personnel, where radiation from licensed material could cause a major portion of the body to receive in any one hour a dose in excess of 100 millirem.

Prior to field radiographic operations on February 2, 1990, at the Vandenberg SLC-4E facility, the licensee properly posted "Caution Radiation Area" signs at roped off restricted area boundaries located at the North entrance to the adjacent Launch Support Building, and at the vehicle access road approximately two hundred feet west of the Missile Support Tower (MST) radiographic job site.

During radiographic operations, the radiographer properly maintained direct surveillance to protect against unauthorized entry into the high radiation area, as required by 10 CFR 34.41. However, the inspector observed that no "High Radiation Area" sign was posted at the entrance to or within the high radiation area that existed due to radiation exposures in excess of 100 millirem per hour during radiographic operations on the fourth floor of the MST structure. The licensee instead posted a "Caution High Radiation Area" sign at the west road restricted area boundary where the licensee's radiographer had determined radiation levels to be less than 2 millirem in any one hour. The licensee's failure to post a "Caution (or Danger) High Radiation Area" sign to warn personnel of the presence of

high radiation area levels, is considered an apparent violation of 10 CFR 20.203(c)(1).

The inspector also examined licensee compliance with 10 CFR 19.11 posting requirements. In particular, 10 CFR 19.11(d) requires the conspicuous posting of Form NRC-3 ("Notice to Employees") in a sufficient number of places to permit individuals engaged in licensed activities to observe the form on the way to or from the licensed activity location. The licensee had posted a copy of California Department Form RH-2364, "Notice to Employees," at their Bakersfield, California office, and in the darkroom truck used to transport licensed material to Vandenberg AFB. However, at the time of the inspection, the licensee had not posted the required Form NRC-3. The licensee was apparently not aware of the posting requirement. The failure to post Form NRC-3 is considered an apparent violation of 10 CFR 19.11(d).

Two apparent violations and no deviations were identified.

15. Shipping and Transportation of Radioactive Material

The licensee's procedures for shipping and transporting radioactive material are described in Section II, paragraphs 2.13 through 2.16 of it's QA manual. Instructions cover packaging, labeling, use of shipping papers, radiation surveys, and transporting radioactive sources. However, the instructions regarding U. S. Department of Transportation (DOT) required information on shipping papers are inadequate in detail, and appear to be applicable only to common carrier, and not private carrier transport requirements. Also, the instructions are incorrect with regard to allowed package surface radiation levels and the transport index (TI) used in determining the proper DOT "Radioactive" category (Radioactive Yellow-II and Yellow-III) labeling.

The inspector reviewed the licensee's program for shipping and transporting of sources to Vandenberg AFB, for compliance with DOT requirements. 49 CFR 172.200(a) requires each shipper of radioactive material to describe the material on a shipping paper in a manner prescribed by 49 CFR 172.202(a).

The licensee routinely transports projectors by private carrier (company vehicles) to temporary job sites. On several separate occasions between January 24, 1990 and February 1, 1990, a 60 curie iridium-192 sealed source had been transported by the licensee between Lompoc, California, and the Space Launch Complex 4E facility at Vandenberg AFB, without a DOT shipping paper describing the hazardous material. The licensee's failure to prepare the required

shipping paper is considered an apparent violation of 49 CFR 172.200(a).

Also, 49 CFR 172.403(a) requires each package of radioactive material to be labeled with appropriate "Radioactive" category labels that identify the activity and radioactive contents. A Gamma Century S projector (Serial Number 2670), transported by the licensee, was correctly labeled with DOT Yellow-III labels. The projector was secured in an outer enclosure (shielded foot locker) inside the darkroom truck during transport to Vandenberg AFB. A small "Caution Radioactive Material" label was attached to one side of the foot locker. However, the inspector observed the absence of DOT "Radioactive" category labels on the foot locker during the February 2, 1990, NRC inspection at Vandenberg AFB. According to the licensee, the foot locker also had not been appropriately labeled during previous shipments to the Vandenberg job site. The absence of the required DOT labeling is considered an apparent violation 49 CFR 172.403(a).

The inspector also examined licensee compliance with the general license requirements of 10 CFR 71.12 for NRC approved shipping packages. 10 CFR 71.12, in part, grants a general license to the licensee to transport a Type B radioactive package, for which an NRC Certificate of Compliance (COC) has been issued, provided the user has an NRC approved quality assurance (QA) program, has a copy of the applicable COC, and registers with the NRC for use of the package.

The licensee maintains a COC for Type B packages of the type (Gamma Industries Model Century S) that have been transported to Vandenberg AFB. However, B & B X-Ray does not have an NRC approved QA program for Type B packages as required by 10 CFR 71.12(b). Also, the licensee has not registered with the Commission as a user of specific Type B packages, which is required by 10 CFR 71.12(c)(3). The licensee was not aware of the registration/QA program requirements. The failure to register with the NRC and the absence of a QA program for the shipping packages are considered as two apparent violations of 10 CFR 71.12(b) and 71.12(c)(3), respectively.

Three apparent violations and no deviations were identified.

16. Notification and Reports

To authorize field radiography at Vandenberg AFB, the licensee submitted to NRC Region V, "Report of Proposed Activities in Non-Agreement States," (NRC Form 241) dated January 9, 1990. NRC Form 241 was filed with the Region V

office within 3 days prior to the licensee's first use of material at Vandenberg AFB, as required by 10 CFR 150.20.

According to the licensee, no incidents have occurred that required NRC notification or reporting.

No apparent violations or deviations were identified.

17. Independent Measurements and Observations

The inspector conducted independent radiological surveys during licensee radiography at the Vandenberg SLC facility. The surveys were conducted using a Keithley Model 36100 X-Ray/Gamma Radiation Survey Meter, Serial Number 10444, last calibrated on October 26, 1989. The licensee's Gamma Century S projector was surveyed to verify compliance with the radiation level limits in 10 CFR 34.21. Inspector surveys were also made at the restricted/radiation area boundary to evaluate compliance with the requirements of 10 CFR 20.105(b).

No apparent violations or deviations were identified.

18. Exit Briefing

The inspector held an exit briefing with the alternate RSO at the conclusion of the Bakersfield office site inspection. The inspector summarized the scope and findings of the overall inspection. Each apparent violation identified was reviewed. Special emphasis was placed on the seriousness of two of the apparent violations which had more than minor safety significance, including the licensee's failure to secure the radioactive source in the projector, and inadequate radiation surveys following source exposures. The NRC Enforcement Policy was also discussed at it related to the inspection findings. In addition, the inspector stressed the need for increased management attention to program audits to ensure compliance with regulatory and license requirements.