



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION I  
475 ALLENDALE ROAD  
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

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REGION 1

2003 OCT 22 PM 1:09

October 15, 2003

ABB Inc.  
ATTN: Jonathan Fortkamp, Ph.D.  
Corporate Radiation Safety Officer  
650 Ackerman Road  
Columbus, OH 43202-1577

SUBJECT: NRC INSPECTION REPORT NO. 999-90002/03-04

Dear Dr. Fortkamp:

This refers to the special inspection conducted on September 16, 2003, at your temporary jobsite located at Lees Carpets in Glasgow, Virginia. The purpose of the inspection was to review the circumstances surrounding an event regarding the loss of a generally-licensed industrial gauge source containing byproduct material. This event was reported to the U. S. Nuclear Regulatory Commission's (NRC) Operations Center on September 11, 2003. At the conclusion of the inspection, the findings were discussed with you and other ABB and Lees Carpets representatives.

The inspection was an examination of activities as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license as they related to this incident. Within these areas, the inspection consisted of selective examinations of procedures and representative records and interviews with personnel.

Based on the results of the inspection, one apparent violation was identified involving the loss of control of licensed material in an unrestricted area under 10 CFR 20.1802.

Our review of the circumstances surrounding this apparent violation continues. Since the NRC has not made a final determination in this matter, no Notice of Violation is being issued for these inspection findings at this time. In addition, please be advised that the number and characterization of the apparent violation described in the enclosed inspection report may change as a result of further NRC review.

You will be advised by separate correspondence of the results of our deliberations on this matter. No response regarding this apparent violation is required at this time.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response should you choose to provide one, will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Should you have any questions concerning this letter, please contact me at (404) 562-4721.

Sincerely,



Thomas R. Decker, Chief  
Nuclear Materials Safety Branch 3  
Division of Nuclear Materials Safety

Docket No.: 999-90002  
License No.: General License (10 CFR 31.6)

Enclosure: NRC Inspection Report  
No. 999-90002/03-04

cc w/encl:  
Commonwealth of Virginia

ABB Inc.

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OFFICE	RI:DNMS	RI:DNMS									
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NAME	BParker	TDecker									
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U. S. NUCLEAR REGULATORY COMMISSION  
REGION I - ATLANTA OFFICE

Docket No.: 999-90002

License No.: General License (10 CFR 31.6)

Report No.: 999-90002/03-04

Licensee: ABB Inc.  
650 Ackerman Road  
Columbus, Ohio 43202-1577

Location: Lees Carpets  
404 Anderson St.  
Glasgow, Virginia 24555

Date: September 16, 2003

Inspector: Bryan A. Parker, Health Physicist  
Nuclear Materials Safety Branch 3  
Division of Nuclear Materials Safety  
Region I - Atlanta Office

Accompanied by: Andrew Mauer, Health Physicist, NMSS

Approved by: Thomas R. Decker, Chief  
Nuclear Materials Safety Branch 3  
Division of Nuclear Materials Safety  
Region I - Atlanta Office

Enclosure

## EXECUTIVE SUMMARY

ABB Inc.  
Jobsite - Lees Carpets, Glasgow, Virginia  
NRC Inspection Report No. 999-90002/03-04

This special, announced safety inspection was conducted on September 16, 2003, to evaluate the circumstances surrounding the loss of a generally-licensed industrial gauge source that contained approximately 78 millicuries (mCi) (decay-corrected from a nominal 100 mCi activity) of strontium-90 (Sr-90). The source was owned by Lees Carpets through a general license to possess and use under 10 CFR 31.5. ABB Inc., through a contract with Lees Carpets, took possession of the source (and two more identical sources) in order to remove the sources from the gauges and prepare them for shipment. This work was done under ABB's State of Ohio license with a general license granted by 10 CFR 31.6 to work in NRC jurisdiction (Virginia). Since the loss of the source most likely occurred during the period in which ABB conducted its work with the sources, ABB is considered to be the entity in possession at the time of the loss.

On July 30, 2003, an ABB field service engineer (FE) took possession of three gauges containing Sr-90 (each approximately 78 mCi), partially dismantled them, and packaged the sources and source holders for shipment to the ABB facility in Columbus, Ohio for further dismantlement and ultimate disposal. During the dismantlement/packaging process, the ABB FE apparently allowed one of the source capsules to fall out of its holder, losing it on the plant floor. This was not discovered until weeks later on September 11, 2003, by ABB-Columbus personnel while they were completing the dismantlement.

On September 11, 2003, ABB initiated a thorough search for the missing source by conducting various surveys, interviewing Lees employees and distributing photos of what the source capsule looked like. The source was not recovered. Through ABB's efforts, it appeared most likely that the source was placed into plant trash within 1-2 days after it was lost and sent to a local landfill on August 4, 2003. By the time ABB traced it to the landfill, that trash was under 15-20 feet of fill. Surveys of the landfill by ABB revealed no elevated readings.

No evidence of significant exposures to any individuals was found and none appeared likely.

One apparent violation was identified for a loss of control of licensed material in an unrestricted area under 10 CFR 20.1802.

### Attachments:

List of Persons Contacted  
Inspection Procedure Used

## REPORT DETAILS

### 1. Program Scope

Lees Carpets (Lees) is authorized to possess and use radioactive material under a general license for the purpose of detecting, measuring, gauging or controlling certain industrial processes (10 CFR 31.5). As part of its manufacturing of commercial carpet, Lees possessed six generally-licensed fixed gauges, all of which were Sr-90 beta gauges measuring density (thickness). As part of changing out three of its gauges, Lees contracted with ABB Inc. (ABB) to remove the old sources and ship them for disposal. ABB holds a State of Ohio license to, in part, possess and use byproduct material, including Sr-90, for installation into and removal from gauging devices. Through the contract with Lees, ABB conducted the source removal under a general license granted by 31.6 to install or service 31.5 general-licensed devices. Since the loss of the source most likely occurred during the period in which ABB conducted its work with the sources, ABB is considered to be the entity in possession at the time of the loss.

### 2. Circumstances Surrounding the Loss of the Generally-Licensed Gauge

#### a. Scope

The inspector reviewed records and interviewed knowledgeable Lees and ABB personnel at the Glasgow, Virginia facility to evaluate the loss of the source.

#### b. Observations and Findings

This special, announced safety inspection was conducted on September 16, 2003, to evaluate the circumstances surrounding the loss of a general-licensed industrial gauge source containing approximately 78 mCi (decay-corrected from a nominal 100 mCi activity) of Sr-90. The gauge containing the source was owned by Lees Carpets through a general license to possess and use this type of gauge under 10 CFR 31.5. ABB Inc., through a contract with Lees Carpets, took possession of the gauges (and two more identical gauges) in order to remove the sources and prepare them for shipment. This work was done under ABB's State of Ohio license with a general license granted by 10 CFR 31.6 to work in NRC jurisdiction (Virginia).

On or around March 1, 2003, Lees Carpets removed the I-beam frames from the manufacturing lines with the source heads still attached and had new frames and heads installed. Each of the old source heads was a box containing some electronics and a source holder attached to a solenoid shutter actuator. The source holder/solenoids were all Advanz Model No. 260110 (device nos. 260110-04, -05 and -06 with source serial nos. 3456, 3457 and 3458, respectively). At the time of the old frame removal, the source head shutters were closed and locked. The old frames stayed in the general area until July 30, 2003, when an ABB FE removed the source heads from the frames. He then removed the source holders from the solenoid shutter actuators by disconnecting the actuator arms from the shutters and tie-wrapping the shutters closed on each source holder. The ABB FE then removed the labels from the outside of the source heads, since they were now empty, and stuck the label onto the top of the corresponding source holder. However, for device

no. 26110-06, that held source capsule no. 3458, the label came off in several pieces and the ABB FE was unable to cover the top of the source holder like the other two. The ABB FE then took the source holders and placed them into small shipping barrels for transfer to ABB's office in Columbus, Ohio, taking care to keep the shutters pointing away from his body. Unbeknownst to the ABB FE, the design of the Advanz Model No. 260110 gauge was such that the shutter solenoid held the source capsule in the body of the source holder. After the ABB FE finished packing the source holders into the barrels, with two in one barrel and one in the other, he completed the shipping paperwork and turned them over to Lees for shipment to ABB-Columbus.

The drums containing the sources arrived at ABB's office in Columbus, Ohio on August 6, 2003, where they were received properly and set aside. The drums were not opened by ABB staff until August 22, 2003, at which point the contents were checked against the shipping papers where it was found that the three gauge serial numbers matched the paperwork. Once again, the gauges were set aside for later dismantlement to remove the source capsules from the holders. On September 11, 2003, ABB staff began disassembling the source holders and discovered that a source capsule was missing. Later that day, after a preliminary search of the ABB lab, including radiation surveys, the ABB RSO contacted the ABB FE to discuss the situation. The ABB FE went to Lees Carpets and initiated a search but did not find the source. Further searches on September 12, 13 and 15, 2003, ensued, but the source was never located.

The ABB RSO traveled to the jobsite in Galsgow, Virginia to assist in the event followup. He began interviewing Lees personnel and reviewing relevant records. From this it was found that the area where the ABB FE worked was cleaned by Lees personnel on or around August 1, 2003, and the trash from that cleaning was sent to a local landfill on August 4, 2003. Digital photos of a similar source capsule were distributed to Lees personnel, but no one came forth with any knowledge of the missing source. On September 13 and 15, 2003, ABB personnel went to the landfill and conducted interviews and records reviews and found that trash from the early August timeframe was in a cell of the landfill under approximately 15 -20 feet of earth. Surveys conducted by ABB personnel on top and around the edges of this cells revealed no elevated readings.

c. Conclusions

It is believed that the source was lost on July 30, 2003 while the ABB FE was preparing the source housings for shipment and ultimately transferred to a local landfill on August 4, 2003. Apparently, source capsule no. 3458 inadvertently fell out of its source holder onto the plant floor without the ABB FE's notice. The empty source holder was placed in the barrel containing two source holders since radiation measurements taken by the ABB FE indicated a surface reading of approximately 7 millirem per hour and 0.2 millirem per hour at one meter (the "transport index") on each barrel. These readings would not seem unusual since Sr-90 is a pure beta emitter.

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From discussions with the landfill authorities at the time of discovery of the loss in mid-September 2003, it was estimated that the source would be buried under approximately 15-20 feet of earth. Surveys of the landfill by ABB personnel revealed no unusual readings. If it is there, leaving the source in the landfill would pose essentially no risk to the general public and alleviates other health-related concerns associated with trying to retrieve such an item from a sanitary landfill.

The root causes of the event were identified to be 1) a poorly designed source holder, and 2) a lack of knowledge of the source holder design on the part of the ABB FE. The ABB FE was unaware that when he removed the shutter solenoid from the top of the gauge, the source capsule was no longer secured in the source holder. Prior to the dismantlement, ABB personnel reviewed drawings of the Advanz Model No. 260110 device, and it was not apparent from those drawings that the shutter solenoid also acted to secure the source in place. In fact, according to the ABB RSO, other Advanz models have sources secured in the holders similar to other makes and models using clips or other means. The ABB FE was not familiar with this particular gauge model, although he was well-trained and experienced with 20+ years of working with fixed gauging devices.

The loss of the source to the public domain has a low-to-medium actual safety significance because radiation measurements of the source (by design - see Registry of Radioactive Sealed Sources and Devices Sheet No. IL-136-0S-194-S) for a 78 millicuries were calculated to be as follows:

Distance from front of source	Calculated radiation reading
5 cm	1,011 rads/hour
30 cm	28 rads/hour
100 cm	2.5 rads/hour
Distance from side and back of source	Calculated radiation reading
5 cm	55 rads/hour
30 cm	1.5 rads/hour
100 cm	0.14 rads/hour

Given these dose rates, exposure to an individual would only be of significant concern if the individual came into direct contact with the source for an extended period of time. No evidence was found that any individuals, including the ABB FE or the Lees cleaning personnel, ever came into direct contact with the source. Also, other significant exposure, if any, would most likely have occurred at greater than 30 cm distances and for short periods of time. Lastly, the source would have been

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significantly shielded if combined with other trash materials. Therefore, significant exposure to workers or other members of the public appears unlikely.

10 CFR 20.1802 requires that the licensee control and maintain constant surveillance of licensed material that is in the a controlled or unrestricted area and that is not in storage. The loss of the source capsule by ABB sometime on July 30, 2003, constituted a loss of control of licensed material in an unrestricted area, and was therefore identified as an apparent violation of 10 CFR 20.1802.

One apparent violation was identified for a loss of control of licensed material in an unrestricted area under 10 CFR 20.1802.

#### EXIT MEETING SUMMARY

An exit meeting was held with ABB and Lees representatives on September 16, 2003. The overall findings from the inspection were discussed, including the apparent violation. Additional information regarding the event was received from ABB on September 17 and 25, and October 1, 2003. A 30-day report pursuant to 10 CFR 20.2201 was received from ABB on October 7, 2003. Of the information provided by ABB, none was specified to be proprietary in nature.

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## ATTACHMENT

## 1. PERSONS CONTACTED

ABB Inc.

\*Jonathan C. Fortkamp, Corporate RSO

\*Mike Callahan, Senior Field Engineer

Lees Carpets

\*Jack Bukovsky, Project/Process Engineer

\*Attended the September 16, 2003, Exit Meeting

## 2. INSPECTION PROCEDURE USED

IP 87103	Inspection of Materials Licensees Involved in an Incident or Bankruptcy Filing
IP 87124	Fixed and Portable Gauges

## 3. ABBREVIATIONS USED

CFR	Code of Federal Regulation
cm	centimeters
FE	field engineer
mCi	millicurie
RSO	Radiation Safety Officer
Sr-90	strontium 90

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