

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS  
WASHINGTON, D.C. 20555-0001

October 20, 2016

NRC INFORMATION NOTICE 2016-12: POTENTIAL ABSENCE OF REQUIRED LOCK  
WASHERS IN BSI INSTRUMENTS, INC. LB 7400  
SERIES FIXED GAUGES

## **ADDRESSEES**

All U.S. Nuclear Regulatory Commission (NRC) specific and general fixed gauge licensees and service providers. All Agreement State Radiation Control Program Directors and State Liaison Officers.

## **PURPOSE**

The NRC is issuing this Information Notice (IN) to alert addressees of the potential absence of a required lock washer between the source assembly and source holder in BSI Instruments, Inc. LB 7400 Series density fixed gauges. The absence of the required lock washer may cause the source to become dislodged during use. Recipients should review the information contained in this IN for applicability to their facilities and consider taking appropriate action, if necessary. However, the information conveyed in this IN is not a new NRC requirement; therefore, no specific action or written response is required.

The NRC is providing this IN to the Agreement States for information and distribution to their licensees, as appropriate.

## **DESCRIPTION OF CIRCUMSTANCES**

### Event 1

In December 2009, an NRC licensee encountered high radiation levels around a BSI Instruments, Inc. (formerly Apgee Corporation) Model LB 7440-D density fixed gauge (LB 7400 Series), while the licensee was attempting to relocate the gauge. The gauge contained a 5.5 GBq (150 mCi) cesium-137 source. The radiation field was not reduced when a radiation worker moved the shutter to the closed position. The worker retreated from the area within 2 minutes. Upon removing the source head, a service engineer discovered that the source capsule had become unscrewed from the source holder and had fallen into a cylindrical hole intended to provide a path for the radiation beam. The service engineer also noticed that a lock washer, required between the source and the source holder, was absent. The source was removed and placed inside a new source head.

The root cause of the event was failure of the gauge manufacturer to install a required lock washer in the fixed gauge. The licensee identified 35 additional gauges that were missing the required lock washer (but had not experienced source capsule detachment or any other

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malfunctions). A public dose assessment for workers in the area determined that six nonradiation workers received estimated doses ranging from 1.09 to 1.46 mSv (109 to 146 mrem), in excess of the 1 mSv (100 mrem) regulatory limit for members of the public.

## Event 2

In February 2016, an Agreement State licensee discovered in its facility a BSI Instruments, Inc. fixed gauge Model LB 7442-D (LB 7400 Series), containing 1.1 GBq (30 mCi) of cesium-137, with the shutter stuck in the open position. The manufacturer evaluated the gauge, identified that the operating rod had been sheared in half, and attributed the malfunction to corrosion buildup on the brass shutter shaft. However, during repairs, the service engineer for the manufacturer noted that the lock washer between the source holder and the source was missing. The manufacturer stated that the missing lock washer could result in the source capsule coming loose due to vibration of the source. Other fixed gauges at the facility were inspected and were determined to be missing the required lock washer. The lock washers were installed in all the affected gauges.

## **DISCUSSION**

Although the root causes of the above events are different, they share the similar trait of missing lock washers. During use, a Model LB 7400 Series gauge can experience vibration or temperature fluctuations that shift its source out of its shielded position within the source housing. Also, if this gauge is installed in a vertical orientation, gravity may act upon the source capsule and cause the source to fall to the bottom plate of the gauge. Lock washers are required because they secure the sources in their installed positions within the source housing. This prevents the occurrence of unnecessary personnel exposure, as is illustrated by Event 1.

The above events suggest that licensees who possess Model LB 7440 Series gauges are likely to encounter missing lock washers. For LB 7400 Series fixed gauges, a lock washer should be installed between the source assembly and source holder, as described in the gauge's Sealed Source and Device Registry, NR-0112-D-811-B, which has been superseded by TN-1031-A-101-B. Therefore, licensees who decide to perform routine maintenance on their gauges should exercise caution because of the possibility that some of their gauges may be missing the required lock washers. Licensees may wish to consider having a qualified service provider verify the installation of the lock washer. Licensees should exercise caution prior to performing maintenance on their fixed gauges and should conduct radiation surveys to confirm that sources are in their shielded position.

BSI Instruments, Inc. addressed this issue by requesting and obtaining an amendment to their Sealed Source and Device Registration Certificate (NR-0112-D-811-B), requiring that lock washers be installed in certain models. The current distributor, Berthold Technologies U.S.A, LLC, is aware of this issue in older models distributed by BSI Instruments, Inc. and is actively working with customers to refurbish older gauges. The lock washer is incorporated into the design of all models distributed by Berthold Technologies U.S.A, LLC, as evidenced in their Sealed Source and Device Registration Certificate, TN-1031-D-101-B.

As a reminder, installation, replacement, removal from service, and disposal of sealed sources used in the LB 7400 Series fixed gauges shall only be performed by the device manufacturer, or other persons authorized by an Agreement State or U.S. Nuclear Regulatory Commission specific license.

Furthermore, licensees are reminded that Title 10 of the *Code of Federal Regulations* (10 CFR) 30.50(b)(2) requires a report within 24 hours after the discovery of any event in which equipment is disabled or fails to function. A 30-day followup report is required by 10 CFR 30.50(c)(2).

## **CONTACT**

This notice requires no specific action or written response. For questions, please contact the technical contact below.

***/RA/***

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and Rulemaking Programs  
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Note: NRC generic communications may be found on the NRC public Web site, <http://www.nrc.gov>, under "NRC Library" > "Document Collections"

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