



TEXAS DEPARTMENT OF STATE HEALTH SERVICES

EDUARDO J. SANCHEZ, M.D., M.P.H.
COMMISSIONER

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September 15, 2005

SOURCE CONTAINMENT AND DEVICES BRANCH
OFFICE OF NUCLEAR MATERIAL SAFETY
AND SAFEGUARDS (190B)
U.S. NUCLEAR REGULATORY COMMISSION
ATTN TRACI KIME
DOCUMENT CONTROL DESK P1-37
WASHINGTON, D. C. 20555

Dear Ms. Kime:

Enclosed is the safety evaluation of source sheet, TX-0586-S-110-S for Schlumberger Technology Corporation Models NSR-M series and NSR-T well logging sources. This source sheet has been amended in entirety to include a new source manufacturer and two new variants of the basic NSR-M source design. We would appreciate you distributing copies of this sheet to the other State Programs and NRC Regions, as appropriate.

Thank you for your cooperation and efforts.

Sincerely,

David B. Fogle, Chief
Advanced Technology Licensing Program
Technical Assessments Group
Radiation Safety Licensing Branch

Enclosure 12/3002

Handwritten note: NIMS512

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES  
SAFETY EVALUATION OF DEVICE  
(AMENDED IN ITS ENTIRETY)

NO.: TX-0586-S-110-S

DATE: September 16, 2005

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DEVICE TYPE: Well Logging Source

MODEL: NSR-M series and NSR-T

DISTRIBUTOR: Schlumberger Technology Corporation  
200 Gillingham Lane  
Sugar Land, TX 77478  
(281) 285-8526

MANUFACTURER: NUMEC (Nuclear Materials Equipment Corporation)  
Subsidiary of Babcock-Wilcox  
Warren Avenue  
Apollo, PA 15613

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Monsanto Agricultural Company  
1515 Nicholas Road  
Dayton, OH 45418

Gammatron Inc.  
5703 Etheridge Street  
Houston, TX 77087

AEA Technology QSA, Inc.  
40 North Avenue  
Burlington, MA 01803

ISOTOPE:  
Americium-241(Be)

MAXIMUM ACTIVITY:  
19.99±0.01 Ci (739.6±0.74 GBq)

LEAK TEST FREQUENCY: 6 months

PRINCIPAL USE: (F) Well Logging

CUSTOM SOURCE: \_\_\_\_\_ YES  X  NO

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DEVICE TYPE: Well Logging Source

DESCRIPTION:

The Models NSR-M and NSR-T are well logging sources containing a maximum of 19.99 Ci (739.6 Gbq) of <sup>241</sup>Am-Be. The source is designed to produce neutrons which are directed into rock formations surrounding a well-bore to measure the hydrogen content of the fluids in the formation. The design of the Model NSR-M sources has three variants. Variant 1 differs from Variant 2 only in the materials of construction of the outer source capsule. The overall construction of Variant 3 and the Model NSR-T are identical to Variant 2, but each uses a different total radioactivity.

For all Model NSR-M variants and Model NSR-T, the source material consists of americium oxide and beryllium powders which are mixed and pelletized. These pellets are then encapsulated by welding into an inner capsule of 304 stainless steel. The inner capsule is 4.25 inches (10.79 cm) long with an outer diameter of 0.593 inches (1.506 cm) and an inner diameter of 0.5 inches (1.27 cm). This inner capsule is sealed by welding a 304 stainless steel plug into the opening of the capsule. For Variant 1, the inner capsule is sealed into an outer capsule of 18 percent nickel maraging steel. For all other variants and Model NSR-T, the inner capsule is sealed into an outer capsule of MP35N corrosion resistant steel. All outer capsules are 4.72 inches (11.98 cm) long and have an outer diameter of 0.749 inches (1.90 cm) and an inner diameter of 0.594 inches (1.508 cm). This outer capsule is sealed by welding either a plug made of 18 percent nickel maraging steel or MP35N corrosion resistant steel into the opening of the capsule.

Model	Nominal Activity	Inner Capsule	Outer Capsule
NSR-M (variant 1)	10 Ci (370GBq)	304 Stainless Steel	18% nickel maraging steel
NSR-M (variant 2)	10 Ci (370GBq)	304 Stainless Steel	MP35N corrosion resistant steel
NSR-M (variant 3)	12 Ci (444GBq)	304 Stainless Steel	MP35N corrosion resistant steel
NSR-T	7.5 Ci (277.5 GBq)	304 Stainless Steel	MP35N corrosion resistant steel

Models NSR-M and NSR-T are carried to the field in a locked, shielded transport container and attached to a logging tool as part of a logging system.

The sources are manufactured by NUMEC of Apollo, Pennsylvania; Monsanto Research Corporation, 1515 Nicholas Road, Dayton, Ohio; Gammatron Inc., 5703 Etheridge Street, Houston, Texas or AEA Technology QSA, Inc., 40 North Avenue, Burlington, Massachusetts using the specifications supplied by Schlumberger.

CONDITIONS OF NORMAL USE:

These sources are designed and manufactured for use in well logging tools that are inserted into oil and gas wells and operate at temperatures and pressures common to deep underground environments. The source and its logging system are designed to operate in temperatures of 200°C and pressures of 20,000 psi. However, testing has demonstrated that these systems can operate up to 260°C and 25,000 psi.

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**DEVICE TYPE:** Well Logging Source

**PROTOTYPE TESTING:**

The licensee used ISO 2919 as the standard for testing these sources. These sources were classified as E66525. This is the same classification under the ANSI standard. Original prototype testing (08/10/89) only tested the sources to a temperature of 600°C. Retesting (01/15/99) demonstrates that the sources can withstand up to 800°C. Both the older sources and current sources meet ANSI standards for well logging sources.

**EXTERNAL RADIATION LEVELS:**

The following dose rates were reported by Schlumberger for the Model NSR-M source containing 10 Ci (370 GBq) of <sup>241</sup>Am-Be:

Distance		Maximum Radiation Level	
1.6 feet	0.5 m	100 mR/hour	1 mSv/hour
6.5 feet	2 m	10 mR/hour	100 μSv/hour
15.0 feet	4.6 m	2 mR/hour	20 μSv/hour

**QUALITY ASSURANCE AND CONTROL:**

Schlumberger maintains a quality assurance and control program which has been deemed acceptable for licensing purposes by the Texas Department of State Health Services (DSHS). A copy of the program is on file with DSHS. The manufacturer has an established ISO 9001QA/QC program to maintain minimum standards for the manufacture of the sources. This program is also used during acceptance testing of the sealed sources.

**LABELING:**

The source has a label, similar to the one shown below, etched into the side of the outer capsule. This label has the etched information filled with black epoxy paint. These sources are engraved with the radiation symbol, isotope, model and serial number, year of manufacture, name of distributor, and the words, "DANGER RADIOACTIVE, DO NOT HANDLE, NOTIFY CIVIL AUTHORITIES." The text is 0.094 inches (2.38 mm) high and is on the side of the source capsule. The neutron flux is recorded on the bottom left-hand side of the label and the year the source was made (e.g., 1977) is etched on the bottom left hand side. On each end of the source the serial number and model number are stamped into the metal. Other information, such as activity and date of assay, are recorded on a label attached to the transport container.

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DEVICE TYPE: Well Logging Source

DANGER RADIOACTIVE  
DO NOT HANDLE  
NOTIFY CIVIL AUTHORITIES  
AmBe  $2.4 \times 10^7$  N/S SOURCE



REWARD - CALL COLLECT  
SCHLUMBERGER  
HOUSTON TEXAS U.S.A.  
1977

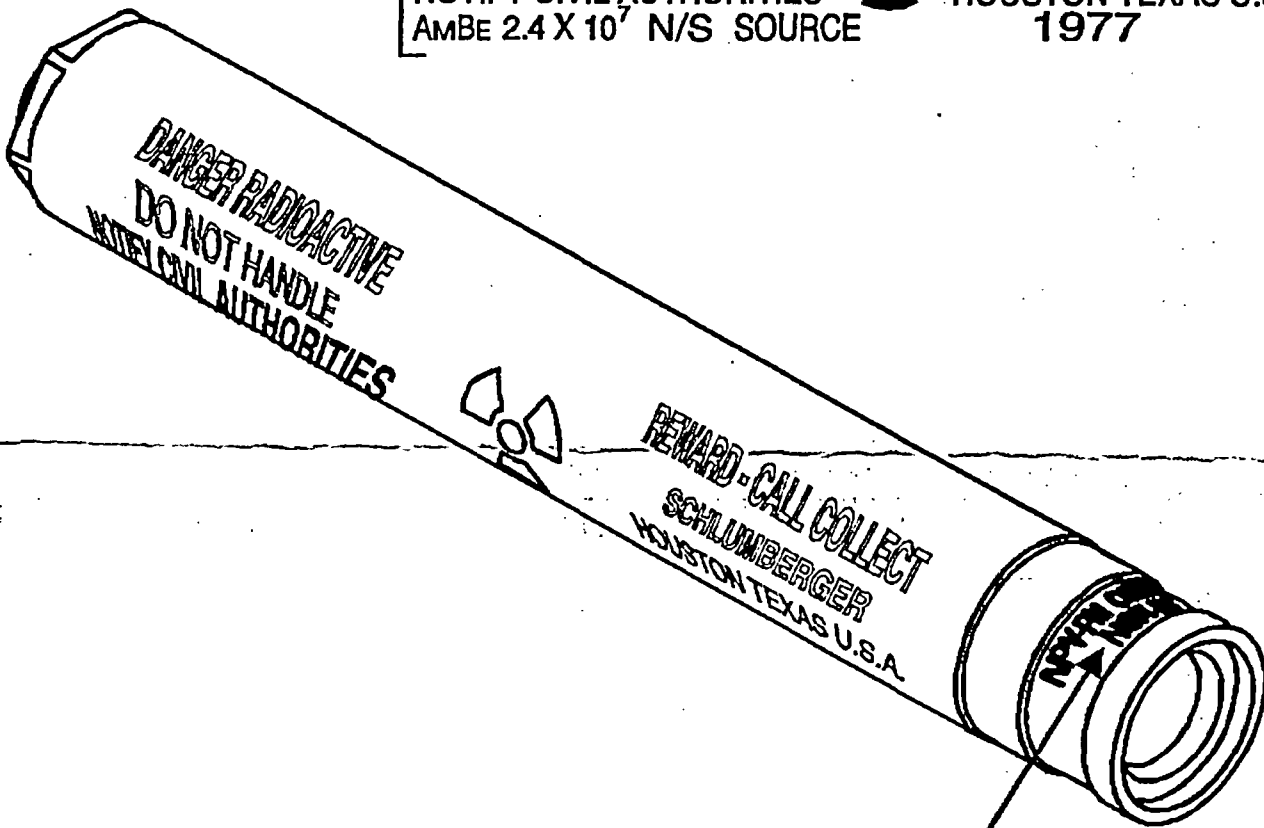


DIAGRAM:

SOURCE SERIAL NO.

See Attachment 1 of 1

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- These sources shall be distributed only to Schlumberger companies holding a specific license from the NRC or an Agreement State.
- Handling, storage, use, transfer and disposal should be determined by the licensing authority.
- These sources should be leak tested at intervals not to exceed six months using techniques capable of detecting 5 nanocuries (185 Bq) of removable contamination.
- These sources shall not be subjected to conditions that exceed the ISO 2919 classification, E66525.
- This registration sheet and the information contained within the references shall not be changed without the written consent of DSHS.

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DEVICE TYPE: Well Logging Source

SAFETY ANALYSIS SUMMARY:

Based on the review of the information provided by Schlumberger Technology Corporation, the design and construction of this source exceeds the ANSI classification for well logging sources, and the information and test data cited below, we continue to conclude that the sources are acceptable for licensing purposes.

Furthermore, we continue to conclude that these sources would be expected to maintain their containment integrity for normal conditions of use and accidental conditions which might occur during uses specified in this certificate.

REFERENCES:

The following supporting documents for the Models NSR-M series and NSR-T sealed sources are hereby incorporated by reference and are made a part of this registry document.

- Schlumberger Technology Corporation's application dated August 27, 1999 with enclosures thereto.
- Schlumberger Technology Corporation's letter dated June 14, 2005 with enclosures thereto.

ISSUING AGENCY:

Radiation Safety Licensing Branch  
Texas Department of State Health Services

Date: September 16, 2005

Reviewer: 

David B. Fogle

Date: September 16, 2005

Concurrence: 

Peter H. Myers

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ATTACHMENT 1

DIAGRAM:

