REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE
(Amended in its entirety)

NO.: NR476S144S DATE: OCT 1 8 1982 PAGE 1 OF 5

SEALED SOURCE TYPE: Beta Source

MODEL: NER-8190

MANUFACTURER/DISTRIBUTOR: New England Nuclear
601 Treble Cove Rd.
North Billerica, MA 01862

MANUFACTURER/DISTRIBUTOR:

ISOTOPE: Promethium-147 MAXIMUM ACTIVITY: 500 millicuries

LEAK TEST FREQUENCY: 6 months

PRINCIPAL USE: (E) Beta Gauges

CUSTOM SOURCE: ___ YES _X_ NO

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DESCRIPTION:

Each source consists of Pm-147 as a chemical component of a vitreous ceramic glaze fused into the cavity of a ceramic insert. This material is placed inside the cavity of the titanium capsule housing and is 3.4" long x 0.375" wide x 0.27" high. A 2 mil thick kapton polymide film is bonded with a high temperature epoxy to the capsule, covering the active matrix. A titanium window support is bonded to the window and held in place with two DRIV-LOK studs. The overall dimensions are shown on the diagrams.

LABELING:

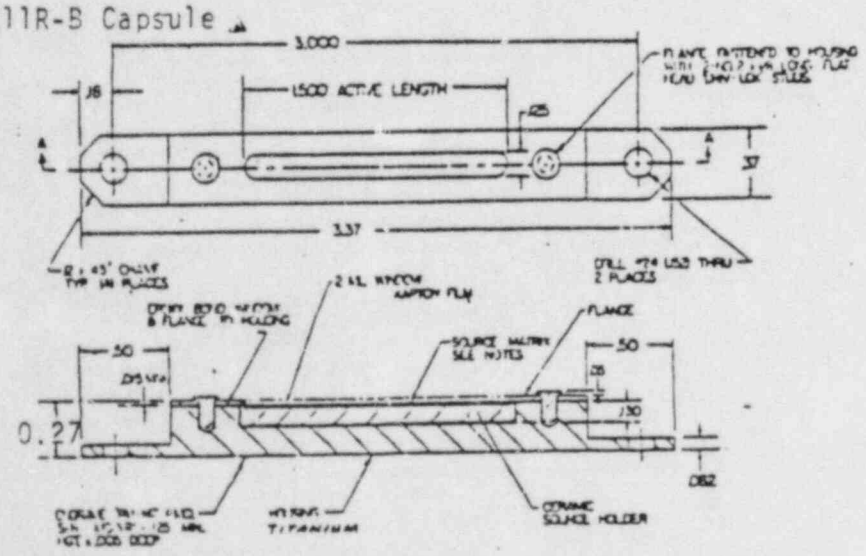
Each sealed source capsule is engraved with the nuclide, activity of Pm-147, month/year, and serial number in accordance with NEN Corporation Drawing Number 313-430.

CONDITIONS OF NORMAL USE:

The Model NER-8190 promethium-147 source is intended for use in industrial beta gauging applications wherein it will be secured in a shielded and shuttered holder bearing required warning and identification labels.

DIAGRAM:

T211R-B Capsule



NOTES

1. [illegible] CERAMIC FUSED TO THE CERAMIC HOLDER
2. NOMINAL ACTIVITY SHALL BE 60 MCi, NOMINAL ACTIVITY TOLERANCE TO BE ± 20% (MIN)
3. ANSI N542-1977 PERFORMANCE CLASSIFICATION C111222
4. LEAK TEST FOR ANSI N542-1977 PROCEDURES A221 (SNIFFER TEST) & A221 (BUBBLE TEST), LIMIT 0.01 μCi

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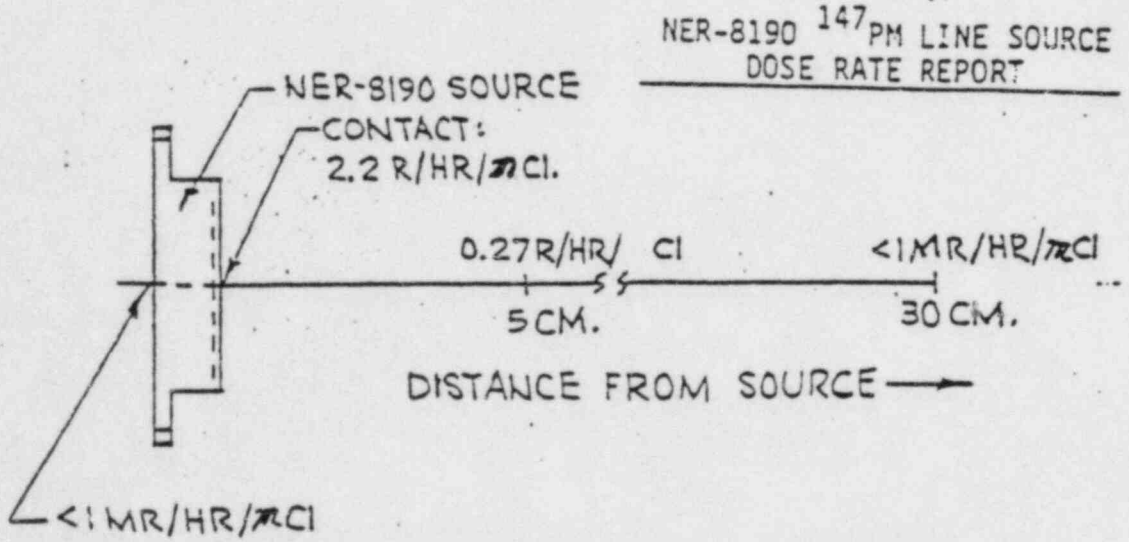
PROTOTYPE TESTING:

Two prototype sources were tested by New England Nuclear in accordance with the procedures specified in American National Standards Institute (ANSI) N542-1977. According to these test results, New England Nuclear has classified the Model NER-8190 as ANSI 77C33322.

EXTERNAL RADIATION LEVELS:



Notes

1. The dose rates are measured with a survey meter through a mylar window (1 mg/cm^2 thick). The meter is calibrated to ±15%. The test sources contain 10 mCi. Pm-147.

2. Gamma radiation dose rates were less than 1 mr/hr/mCi as measured with the same survey meter through a plastic window (less than 300 mg/cm^2 thick).

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QUALITY ASSURANCE AND CONTROL:

The quality assurance and control program described by New England Nuclear in correspondence cited below is considered acceptable. Basic components of the program include:

- Design and procurement control.
- Process quality control including: activity content, contamination/leak testing, physical dimensions, and visual inspections.
- Final acceptance testing and records.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- This source shall be distributed only to specific licensees of NRC or Agreement States.
- Handling, Storage, Use, Transfer and Disposal: To be determined by the licensing authority.
- This source shall not be subjected to environmental or other conditions of use which exceed American National Standards Institute (ANSI) 77C33322.
- This source shall be leak tested at intervals not to exceed six months using methods capable of detecting the presence of 0.005 microcuries of removable contamination.
- Since this source design incorporates a thin kapton film window, it should be protected against such factors as abrasion, impact and puncture.
- This source shall be used or stored in devices which are labelled in accordance with the provisions of Section 20.203, 10 CFR Part 20 or Section 32.51, 10 CFR Part 32 or equivalent Agreement State regulations.

SAFETY ANALYSIS SUMMARY:

The Model NER-8190 sealed source is designed for use in industrial beta gauging devices to measure thickness of materials. The radioactive material is

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incorporated in a vitreous ceramic glaze which is fused to a ceramic insert and encapsulated in a titanium capsule with a kapton polymide film window. When loaded to the maximum of 500 millicuries of Pm-147 the surface dose rate from the source is estimated to be about 1100 rads/hr. Because of this high surface dose rate, persons loading the source into the gauging device must be trained in radiation protection and use protective handling equipment. In addition, care must be taken to avoid puncture, abrasion or impact of the source window.

Since these sources are authorized for distribution only to specific licensees who are required to train and equip their personnel to safely handle the sources, it appears unlikely that any person will be exposed in excess of Part 20 limits.

Even though the sealed source is equipped with a thin window, the ceramic glaze matrix incorporating the radioactive material will withstand considerable abuse without loss of significant activity. For example, the glaze melting temperature is about 1000°C. In addition, the source window and epoxy seal are resistant to radiation damage and chemical attack. The manufacturer's prototype testing of these sources show that they meet ANSI recommendations for use in gauging devices.

Based on the above considerations and the information and test data cited in the references listed below, we conclude that the NEN Model NER-8190 sealed source design is acceptable for licensing purposes in accordance with the terms of this registration and the provisions of 10 CFR Part 30.

REFERENCES:

- New England Nuclear letters dated October 5, 1982, August 27, 1981 and October 1, 1981 and enclosures thereto.
- NRC registration sheet dated September 1980 for Model NER-462 sealed Fe-55 source.
- Supersede NRC registry document dated October 15, 1981.

ISSUING AGENCY: U.S. Nuclear Regulatory Commission

Date: OCT 1 8 1982 Reviewer: Joseph M. Brown Jr.

Date: OCT 1 8 1982 Concurrence: Nathan Bassin