State of Maryland

OFFICE OF ENVIRONMENTAL PROGRAMS
DEPARTMENT OF HEALTH AND MENTAL HYGIENE
201 WEST PRESTON STREET • BALTIMORE, MARYLAND 21201 • Area Code 301 • 383 2744
TTY FOR DEAF: Balto. 383-7555
D.C. Metro. 565-0451
Adele Wilzack, R.N., M.S. Secretary
William M. Eichbaum, Assistant Secretary

November 22, 1983

Mr. Donald A. Nussbaumer
Assistant Director for State
Agreements Program
Office of State Programs
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Nussbaumer:

REF: SA/LAB

In reply to your letter of July 29, 1983 requesting further information on Neutron Products, Inc. sources, we are enclosing the November 14, 1983 letter from Mr. Carmine Smedira of Neutron Products.

You will note that some of the enclosed material is marked "Proprietary".

If you have further questions, please let us know.

Sincerely,

Robert E. Corcoran

Robert E. Corcoran, Chief
Division of Radiation Control

REC/CRF/ajs

Enclosure: Letter & Attachments
11/14/83 - NPI

cc: Mr. David L. Resh, Jr.

C/2

NEUTRON PRODUCTS Inc

22301 Mt. Ephraim Road, P.O. Box 68
Dickerson, Maryland 20842 USA
301/349-5001 TWX: 710-828-0542

November 14, 1983

Mr. Robert E. Corcoran
State of Maryland
Department of Health & Mental Hygiene
201 West Preston Street
Baltimore, Maryland 21201

Re: Information Requested by NRC on Sources

Dear Mr. Corcoran:

This letter is written in response to your request of August 25, 1983 for information to furnish Mr. Donald Nussbaumer at the NRC.

The information provided below is presented in the same order as the items in Mr. Nussbaumer's letter to you of July 29, 1983 (see Enclosure 1).

1. Detailed descriptions of the sources in question are presented in NPI drawings 200259, 200200, 200275 and 200276 which are included as Enclosure 2, 3, 4 and 5 respectively. The procedure used for fabrication is NPI procedure P 1 (Enclosure 6).

2. With respect to operating conditions which the sources experience:

   When the Dickerson II irradiator is in use, the source rack stands in flowing ambient (50°F-100°F) air. When in storage, the rack is in water whose temperature is usually between 80°F-95°F. In batch operation, the source rack may be cycled from water to air and back to water once every few hours. During continuous operation, the source rack may stand in the irradiate position for days at a time.

   The cell into which the rack rises is approximately 13 feet long, 12 feet wide and 11 feet high. The ventilation system moves approximately 2,000 ft^3/hr through this cell. Air velocities by the source rack are not known, however the cell exhaust is very near the top of the source rack when the rack is in its full up (irradiate) position.

3. Stress levels:

   Neutron Products has not performed detailed stress analyses of these sources.

   The end cap design for the sources in Dickerson II is substantially different than that used in the sources which were analyzed by O'Donnell & Associates, Inc. The material used for the tubing and end caps is the same, 321 stainless steel.

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The analysis used in the O'Donnell & Associates, Inc. report was based on an estimated heat flux at the inside surface of the end cap of 600 Btu/hr-ft^2. The end cap mass and heat transfer surface area for the Dickerson II sources are 24 gms and .015 ft^2 versus 84 gms and .029 ft^2 for the other sources. Hence the heat transfer surface area to mass ratio for the Dickerson II 1" diameter sources is approximately 1.8 times as high as the same ratio for the sources analyzed by O'Donnell. However, the maximum amount of contained activity within the Dickerson II sources as of November 1983 is approximately 1.6 times the amount of contained activity for the sources analyzed by O'Donnell. The activity distribution within the sources, however, is such that the dose rate to the end cap per contained curie within the Dickerson II sources should be less than the dose rate per contained curie for the sources analyzed by O'Donnell. Hence, 600 Btu/hr-ft^2 heat flux will be a conservative value for the Dickerson II sources. O'Donnell calculated that assuming 600 Btu/hr-ft^2 heat flux and an initial crack depth through 25% of the tube wall existing initially, it would take in excess of 5,000,000 cycles to propagate to a depth of 50% of the tube wall. At the rate of 10 cycles per day, this represents a useful life exceeding a thousand years and this ignores the fact that cobalt-60 has a 5.27 year half-life.

4. In view of the information provided above no operating restrictions on these sources are necessary.

5. The materials and techniques used to fabricate these sources are such that we do not expect any problem of compliance with ANSI N538 or the new July 1983 DOT special form tests.

Also provided for your information (Enclosure 7) is a copy of an internal document containing analyses of source temperatures for several different types of sources.

If there are any questions on this information please do not hesitate to call.

Sincerely,

NEUTRON PRODUCTS, INC.

Carmine Smedira

Carmine Smedira
Vice President

Enclosure

CS/kmw