

March 14, 1985

Mr. Jack E. Whitten  
Nuclear Materials Safety Section  
U.S. Nuclear Regulatory Commission  
Region IV  
611 Ryan Plaza Drive, Suite 1000  
Arlington, Texas 76011

Re: Control Number 18418

Dear Mr. Whitten:

This is in reference to your letter of January 16, 1985, requesting information in support of our byproduct material license amendment.

After receipt of this letter, I spoke with you concerning the three items of deficiency outlined in your letter of January 16, 1985. This letter is our response.

Item 1. Table 2 and Table 3 were omitted from our application dated November 20, 1984. These tables demonstrate that the requirements of 10 CFR 20.105 are met. In order to provide a thorough response, however, a complete answer is presented to satisfy Item 1.

Radiation levels in unrestricted areas.

a. Workload. The maximum workload is 48 patients per day treated over a five day work week. Each patient is treated to an average of 200 rads tumor dose per day. This is approximately 300 rads given dose (at depth of maximum dose in patient) requiring approximately 1.5 minutes treatment time per patient. Since patient handling time is more significant than actual treatment time in determining the frequency of patient treatments, a maximum of six patients will be treated in any one hour. Based on this workload, the maximum beam-on time in any one hour will be nine minutes.

b. Maximum Exposure Rate (mR/hr). Exposure rate was measured at the locations shown in Table 1. All walls were treated as secondary barriers. These measurements were taken one foot outside each wall and above ground over the cobalt-60 room at the location of maximum reading. These were recorded at the four major gantry angles of 0°, 90°, 180° and 270°.

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At each of these locations, the exposure rate was again measured with a slow 360° rotation with beam-on. Both the stationary and rotational data is presented in Table 1. The maximum values for each wall and the ceiling are identified. These measurements were repeated with the gantry angle set at 0° and with head swivel at +30° and -30°. The maximum exposure readings with the beam not intercepting the primary beam stop were less than those presented in the table.

c. Maximum Exposure in Any One Hour. The maximum exposure an individual could receive in any one hour, if continuously present in the area, is given in Table 2. These data are calculated from Table 1. The conversion from Table 1 to Table 2 is as follows:

$$\frac{\text{mR}}{\text{hr}} \times (\text{workload}) \times \frac{\text{hr}}{60 \text{ min}} = \text{mR}$$

where:

$$\frac{\text{mR}}{\text{hr}} = \text{maximum exposure rate from Table 1}$$
$$\text{workload} = 9 \text{ minutes beam-on time per hour}$$

$$\frac{\text{hr}}{60 \text{ min}} = \text{conversion from per hour to per minutes.}$$

$$\text{mR} = \text{maximum exposure in any one hour.}$$

The radiation levels in Table 2 meet the requirements of paragraph 20.105(b)(1).

d. Maximum Exposure in Any Seven Consecutive Days. The maximum exposure an individual could receive in any seven consecutive days, if continuously present in the area is given in Table 3. These data are calculated from Table 2. The conversion from Table 2 to Table 3 is as follows:

$$\frac{\text{mR}}{\text{hr}} \times \frac{48 \text{ patients/day}}{6 \text{ patients/hour}} \times \frac{5 \text{ days}}{\text{week}} = \frac{\text{mR}}{\text{week}}$$

where:

$$\frac{48 \text{ patients/day}}{6 \text{ patients/hour}} = \text{conversion to maximum exposure per day}$$

$$\frac{5 \text{ days}}{\text{week}} = \text{conversion to maximum exposure in a 7 day week}$$

$$\frac{\text{mR}}{\text{week}} = \text{maximum exposure in seven consecutive days}$$

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The radiation levels in Table 3 meet the requirements of paragraph 20.105(b)2.

e. Conclusion. The maximum design workload of this installation could be further increased without exceeding NRC regulations by using realistic use and occupancy factors. The current workload is 9 patients/day. Please note that Table 2 and 3 consider 100% occupancy and 100% use at each position.

Item 2. Attached to your letter of January 16, 1985, were copies of the current Code of Federal Regulations and the Guide for the Preparation of Applications for Licenses in Medical Teletherapy Programs. These documents describe the surveys and tests that must be performed and reported to the NRC following the installation of a new cobalt-60 teletherapy source. With the exception of the omission listed in Item 1, our report of November 20, 1984, addressed all items required to be reported to NRC by the current Federal Regulations. We are unable to find any regulatory basis for the information requested in Item 2. This information is required for license applications, not source changes. However, in a spirit of cooperation with the NRC, we want to provide you with any information needed to access the quality of our program. Send us the regulatory requirements and we will be happy to respond to them.

Item 3. Information on the teletherapy treatment timer device check is described in Items 2, 3 and 5 of our November 20, 1984 report. In your discussions with me, you were satisfied there was no deficiency in our response. However, in order to clarify the terminology per our discussions, we would like to offer the following statements:

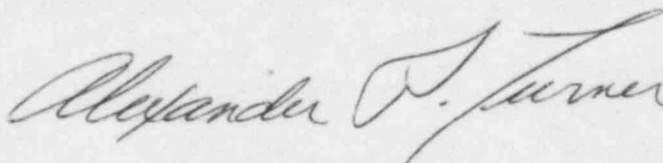
- a. The device cannot be turned on except by the timer.
- b. There is no mechanism to override the timer.
- c. The source returns to the "off" position at the end of the present time.
- d. The source does not return to the "on" position until the timer is reset.

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We very much appreciate your thorough review of our report of surveys and tests required after the installation of a new cobalt-60 teletherapy source. We hope this additional information is sufficient to continue review of our report.

We look forward to hearing from you.

Sincerely, yours,

A handwritten signature in cursive script, reading "Alexander P. Turner". The signature is fluid and elegant, with a large, sweeping "T" at the end.

Alexander P. Turner, Ph.D.

APT/kkh  
Attachments  
cc: Stephen Acker, M.D.  
Dale Hamilton  
John W. Turner



TABLE 1  
MAXIMUM EXPOSURE RATE (mR/hr)

----- Gantry Angle -----					
<u>Location</u>	<u>0°</u>	<u>90°</u>	<u>180°</u>	<u>270°</u>	<u>Description***</u>
1	0.2	<0.1	0.2	4.6*	Console
2	0.1	<0.1	0.1	2.6*	Viewing Window
3	0.2	0.2	0.2	1.3*	Door
4	0.8	2.3*	0.8	0.3	North Wall
5	<0.1	1.1*	<0.1	<0.1	East Wall
6**	0.1	<0.1	0.1	0.1	West Wall
7	<0.1*	<0.1	<0.1	<0.1	South Wall
8	<0.1*	<0.1	<0.1	<0.1	Ceiling

\* Maximum Reading

\*\* Maximum Reading 1.2 mR/hr @ 230° and 320°.

\*\*\* All Areas Unrestricted

Phantom - SCRAD Phantom (Lucite)  
25 x 25 x 25 cm cube

Field Size - 18.5 x 18.5 cm (maximum)

Distance - 60 cm SAD (center of phantom)

Beam centered at isocenter and intercepted by primary beam stop.

TABLE 2  
MAXIMUM EXPOSURE IN ANY ONE HOUR (mR)

<u>Location</u>	----- Gantry Angle -----			
	<u>0°</u>	<u>90°</u>	<u>180°</u>	<u>270°</u>
1	0.030	<0.015	0.030	0.690
2	0.015	<0.015	0.015	0.390
3	0.030	0.030	0.030	0.195
4	0.120	0.345	0.120	0.045
5	<0.015	0.165	<0.015	<0.015
6**	0.015	<0.015	0.015	0.015
7	<0.015	<0.015	<0.015	<0.015
8	<0.015	<0.015	<0.015	<0.015

\*\* Maximum = 0.18 mR @ 230° and 320°.

TABLE 3  
MAXIMUM EXPOSURE IN SEVEN CONSECUTIVE DAYS

<u>Location</u>	----- Gantry Angle -----			
	<u>0°</u>	<u>90°</u>	<u>180°</u>	<u>270°</u>
1	1.2	<0.6	1.2	27.6
2	0.6	<0.6	0.6	15.6
3	1.2	1.2	1.2	7.8
4	4.8	13.8	4.8	1.8
5	<0.6	6.6	<0.6	<0.6
6**	0.6	<0.6	0.6	0.6
7	<0.6	<0.6	<0.6	<0.6
8	<0.6	<0.6	<0.6	<0.6

\*\* Maximum = 7.2mR @ 230° and 320°.