

# Muskogee General Hospital

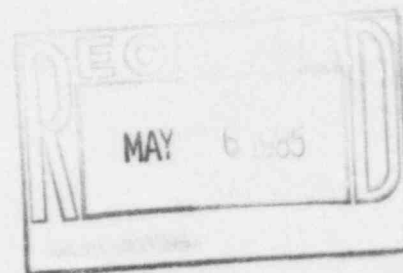
300 Rockefeller Drive, Muskogee, Oklahoma 74401



Phone (918) 682-5501

April 23, 1985

United States Nuclear Regulatory Commission  
License Management Branch  
611 Ryan Plaza Drive  
Suite 1000  
Arlington, Texas 76102



Gentlemen:

Re: License No. 35-13157-02

Enclosed is a copy of our radiation survey and test following installation of a 60 Cobalt A.E.C.L. source number S-3735 on April 12, 1985.

Five-year inspection was also carried out at that time.

Please contact us if we can be of further assistance.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Douglas V. Johnson'.

Douglas V. Johnson  
Administrator

DVJ:lr

Enclosure

5 MAY 13 1985  
MUSKOGEE MEDICAL CENTER  
BRANCH

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REG4 LIC30  
35-13157-02 PDR

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Date	5/13/85
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Fig. To	5/14/85
Action Compl	5/14/85

FEE EXEMPT

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This report is submitted to fulfill conditions 18 and 19 of your teletherapy license and pertains to the installation of a new source. This report follows the format specified in Appendix F of the "Guide for the Preparation of Applications for Licenses in Medical Teletherapy Programs" dated March, 1982.

- a. Muskogee General Hospital  
300 Rockefeller Drive  
Muskogee, Oklahoma 74401  
  
License No. 35-13157-02
  - b. Survey by Keith M. Jones, Ph.D.  
4191 S. Zuni  
Tulsa, Oklahoma 74105
  - c. Work performed--Installation of a new source
  - d. Date of installation--4/12/85
  - e. Date of survey--4/12/85
  - f. Radiation Survey performed with a Victoreen Model 491 survey meter. This meter was calibrated on 2/11/85 by placing it at various distances from a 5 mg Ra-226 source calibrated by the National Bureau of Standards. The accuracy of the calibration is not stated but a comparison of this source with a Cs-137 source also calibrated by the NBS indicates that its activity is between 5 mg and 5.25 mg.
- The source output was measured with a Capintec .6cc ion chamber(model PRO6-G) and a Keithley model 616 electrometer. This dosimetry system was calibrated on 2/6/85 by K&S Associates of Memphis, Tenn.
- g. Teletherapy unit-AECL 780
  - h. Source--AECL model C-146
  - i. Activity-10434 Curies on 4/12/85
  - j. Output--313.1 rads/min at 80.5 cm in a tissue equivalent phantom; 80 cm SSD; 20 x 20 cm field size; measured on 4/12/85.
  - k. See Teletherapy Head Survey form attached.
  - l. a. With the radiation beam centered on the beam stopper there are no limitations to the beam orientations.

b. With the radiation beam not centered on the beam stopper, the limits of beam orientation are shown on the attached diagram.

m. Measurement of radiation levels in adjacent areas.

1. Phantom-40 x 40 x 30 cm water filled plastic tank. Two areas were surveyed with no phantom or beam stopper. These areas correspond to whole body and half body techniques in which the patient is at a large distance from the machine and the collimators are opened wide. In this case the patient does not intercept the entire radiation beam.

2. Distance between source and the center of the phantom was 80 cm.

3. The collimators were opened to a 35 x 35 cm field size.

n. Attached

o. Area survey results:

Hallway(point 1)

1. Beam directed toward the hallway with phantom and beam stopper in place--0.02 mR/hr.

2. Beam directed toward the hallway but angled down 45 degrees so that the scatter from the phantom just cleared the beam stopper--0.02 mR/hr.

3. Beam directed toward the hallway with no phantom or beam stopper--1.0 mR/hr.

Outside wall(point 2): The ground outside the teletherapy room is approximately 7 feet below the level of the teletherapy room. As one moves away from the outside of the building the ground gradually slopes up until it is level with the treatment room floor at a distance of approximately 40 feet from the edge of the building. The maximum exposure rate is obtained by directing the beam toward the outside wall and slightly downward so that the radiation exits the wall at a point within reach of the surveyor.

1. Beam angled toward the outside wall but 30 degrees below the horizontal with the phantom and beam stopper in place--0.5 mR/hr.

2. Beam directed toward the outside wall but angled 30 degrees above the horizontal so that scatter from the phantom just clears the beam stopper--1.2 mR/hr.

3. Beam directed toward the outside wall but angled 60 degrees below the horizontal with the phantom in place but no beam stopper(This position represents one of the limits of the orientation interlocks that prevent the source from being activated unless directed at the beam stopper.)--2 mR/hr.

Area under teletherapy room(point 3):

1. Beam directed down with phantom and beamstopper in

460622

place--.02 mR/hr.

2. Beam directed down but angled 45 degrees from vertical so that the scatter from the phantom just clears the beam stopper--.03 mR/hr.

3. Beam directed downward with no phantom or beamstopper-2 mR/hr.

Roof(point 4):

1. Beam directed upward with the phantom and beam stopper in place--.02 mR/hr.

2. Beam directed upward but angled 45 degrees from the vertical so that the scatter from the phantom just clears the beam stopper--.05 mR/hr.

Control area(point 5):

1. Beam directed downward with the phantom and beam stopper in place--.2 mR/hr.

Stairs to basement(point 6):

1. Beam directed downward with the phantom and beam stopper in place--.05 mR/hr.

On the average five or six patients are treated per hour with a maximum of 15-20 minutes of irradiation time. Thus the maximum exposure rate at any point will be 2 mR/hr divided by 3 or .67 mR/hr. The techniques that give the highest exposure rates are rarely used.

p. NA

q. NA

r. 1. The door interlock was checked by opening the door while the source was in the "on" position. When the source returned to the "off" position the door was closed and the source could only be reactivated at the console.

2. When the source is activated a rod projects out the front of the head, a light on the head is activated, a light outside the treatment room door is activated and the independent radiation monitor is activated and switches on a second light outside the treatment room door. All these indicators were observed to operate correctly.

3. A light on the treatment head indicates when the electrical stops are activated. To test these, the head was rotated independent of the beam stopper until the interlock light came on and then an attempt was made to activate the source. The interlock system worked correctly.

4. During the full calibration of the teletherapy machine the timer was tested numerous times. The accuracy was compared with a digital back-up timer and found to be correct. During the calibration procedure the source always

returned to the off position when the timer reached "zero"  
and could be reactivated only when the timer was reset.

s. The old Cobalt-60 source was removed on 4/12/85 by  
Atomic Energy of Canada, Limited  
P.O. Box 6300  
Ottawa, Canada K2A 3W3

License No. 54-00300-04

*Keith M. Jones, Ph.D.*

Keith M. Jones, Ph.D.  
Radiation Physicist  
April 20, 1985

460622

# Figure F-1 TELETHERAPY HEAD SURVEY

(Source in "OFF" position.  
Measurements taken one meter  
from source)

Top View-Showing  
orientation  
of Views A through D

Position No.	Radiation Level (mr/hr)
View A	
1	1.2 mR/hr
2	2.8
3	1.0
4	1.6

View B	
5	.35
6	.7
7	.5
8	.3

View C	
9	1.2
10	1.0

View D	
11	.3
12	.5
13	.7
14	.35

Average value .9

Maximum value 2.8

Date of survey 4/12/85

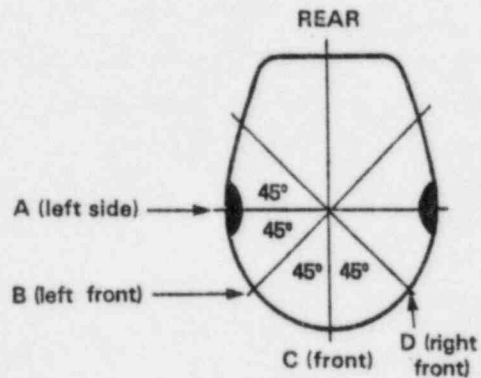
Instrument used VICTOREAN

Manufacturer's name & model number of teletherapy source ABC L Type C-146 # S-3735

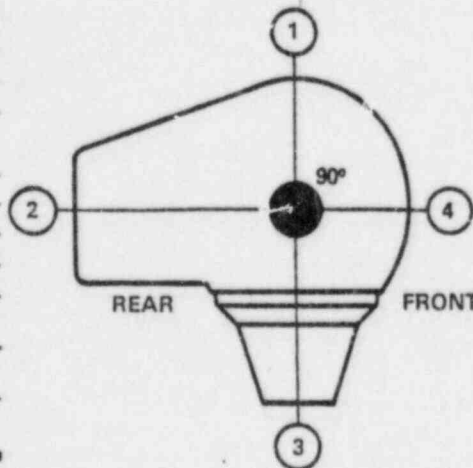
Date of installation 4/12/85

OUTPUT 182.9 ☐ RHM ☒ RMM IN MEASUREMENT Cell

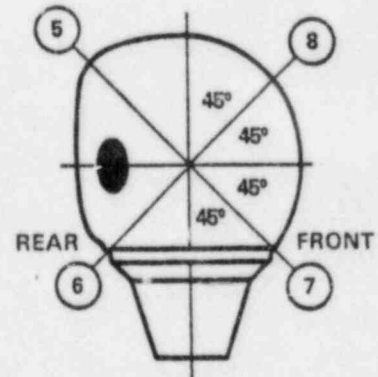
Date of output measurement 3/22/85



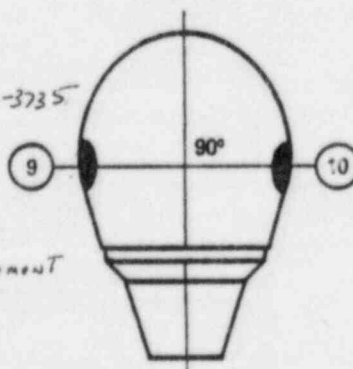
View A-Vertical  
from left side



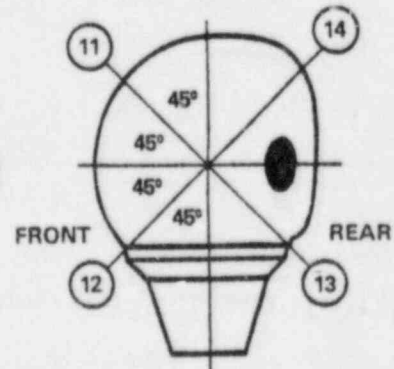
View B-Vertical  
from left front



View C-Vertical  
from front



View D-Vertical  
from right front



Muskogee General Hospital

stair well(point 6)

Hallway(point 1)

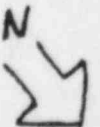
isocenter

plane of source rotation

Outside(point 2)

roof-point 4  
down stairs(accounting)-point 3

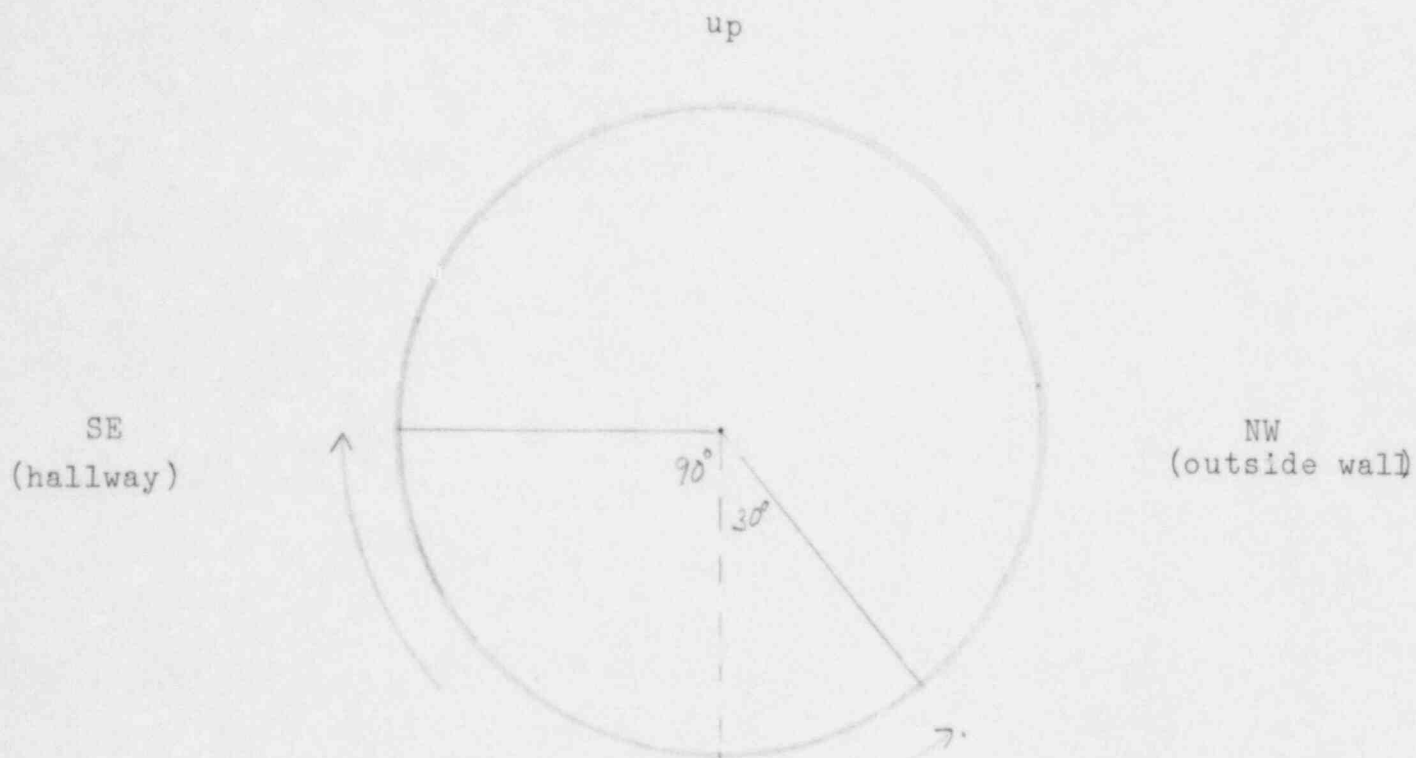
control area(point 5)



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1.b. Permissible beam orientations when the beam is not centered on the beam stopper (view from the front of the teletherapy machine.)



Exposures off beam stopper  
permitted for beam orientation  
within these angles.

down

Muskogee General Hospital  
4/12/85

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