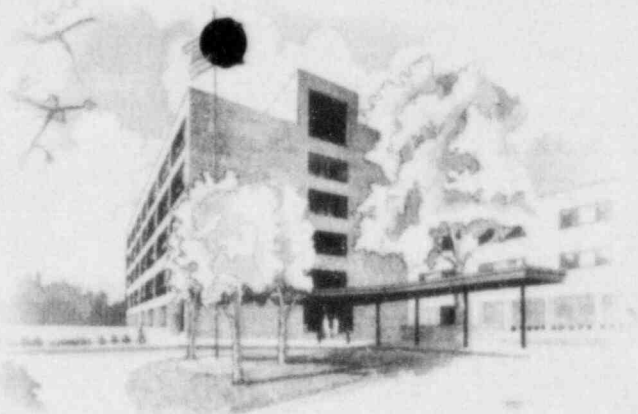


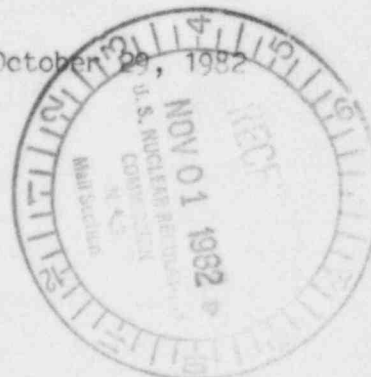
**CAMDEN-CLARK
MEMORIAL HOSPITAL**

800 Garfield Avenue
P.O. Box 718
Parkersburg, West Virginia 26102
(304) 424-2111

LEO D. CARNSER, ADMINISTRATOR



October 29, 1982



Ms. Patricia C. Vacca
Material Licensing Branch
Division of Fuel Cycle and
Material Safety

RE: Amendment 07 to License No. 47-09772-03

Dear Ms. Vacca:

Enclosed is our Teletherapy Survey Report which you requested.

Our construction project is inching along at a slow snail-like pace due to the unfortunate discovery of three different, and totally unknown sewer lines which were ruptured in the process. However, we anticipate the installation of the last concrete and steel plate barrier around the cobalt machine in the next two weeks.

If there is further information needed, we will gladly furnish it.

Sincerely,

Frances K. Gracey

Mrs. Frances K. Gracey
Associate Administrator

FKG/jat

see item t.

8505290744 850508
REG2 LIC30
47-09772-03 PDR

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INSPECTION AND ENFORCEMENT

FEE EXEMPT

t.t. report
12973

TELETHERAPY SURVEY REPORT

- Item a. Camden-Clark Memorial Hospital
800 Garfield Avenue
Parkersburg, West Virginia 26101
- Item b. Daniel A. Berkley, Physicist
Camden-Clark Memorial Hospital
800 Garfield Avenue
Parkersburg, West Virginia 26101
- Item c. The reason for the survey was the fact that we are beginning the construction of a new Radiation Therapy Department. To do this we had to remove the earth shielding from the exterior of the Cobalt 60 room. In order to do this, we reinforced the inside of the Cobalt 60 room with various thicknesses of steel so that the dirt could be removed. These changes were described in letters dated July 19, 1982 and September 8, 1982. Also, telephone conversations were held with Ms. P. Vacca of the USNRC. The control number for these letters is 70910. This survey report is in conjunction with your request for a survey report whenever changes in shielding of the teletherapy unit are made.
- Item d. The entire excavation project was completed on September 28, 1982. At this time all the dirt was removed from outside the Cobalt room and also the final internal shielding was in place. On this date a radiation safety survey was made of the outside areas of the unit.
- Item e. September 28, 1982.
- Item f. The radiation detection device that was used for the survey was the Victoreen Panoramic Survey Meter, Model No. 470-A
- The date of the last calibration of these survey meters was January 15, 1982.
- A Cesium-137 source was used to calibrate this survey meter. The instrument was calibrated at Victoreen Instruments, Inc., Cleveland, Ohio.
- Item g. The unit is a Picker C9-M80 Cobalt 60 Unit.
- Item h. The source of the unit is a Neutron Products Cobalt 60 source, Serial No. T-377, Model No. NPI-20 4500-W.
- Item i. The activity of the source is 4730 curies on November 3, 1979.
- Item j. The intensity of the radiation beam is 69.248 RMM. The date for this measurement was November 4, 1979.

Item k. See attached sheet labeled Item k.

Item l. See attached sheet labeled Item L.

(a) Angle theta is limited to $\pm 5^\circ$ or less and angle phi is limited to less than 20° when the C-arm rotation (angle psi) is greater than 25° with the vertical in either the \pm direction. These are electrical stops.

(b) When the beam is directed away from the primary beam absorber, angle theta is limited to $\pm 25^\circ$ and angle phi is limited to 90° by means of electrical limiting stops. In any case, phi is limited to no more than -20° by mechanical stops.

(c) Also, we have made the restriction that the beam in no way should leave the primary beam absorber.

Item m. The materials used in the measurement of radiation levels in adjacent areas consisted of the following items:

(1) We used a $40 \times 40 \times 40$ cm.³ water phantom as the phantom material.

(2) The source-to-phantom distance was 80 cm. SSD.

(3) The field size used was 36×36 sq. cm. which is the maximum permissible field size on the collimators of the unit.

Item n. The data submitted indicates the orientations of the beam with maximum radiation exposure when the beam is directed toward the primary beam absorber. Actual measurements do not support that maximum levels will always be encountered with the beam oriented 30° from the perpendicular. Since the unit is on grade, it is impossible to measure below the unit. Measurements are made on the roof above and around each outside wall that was excavated. Enclosed are diagrams labeled Item n which reflect the maximum radiation levels in each area.

The Department of Radiation Therapy has been limited to using the machine only when the beam is intercepted by the primary beam stopper. Therefore, no surveys were attempted with the primary beam away from the beam stopper.

Item q. It can be noted that in Item n-3 and n-4 that radiation levels do exist in excess of 2 mr/hr. These maximum radiation levels exist at two beam angles, that being angle 60° and angle 300° . We feel that an individual standing outside of this area will receive no more than 2 mr any one hour for the following reasons:

(1) Our beam-on time has been limited to 26 minutes in any one hour by License Condition No. 26 of our License No. 47-09772-03, Amendment No. 07, dated September 14, 1982.

(2) As you can see by Items n-1 and n-2, when the beam is oriented at 0° and 180° , the radiation levels around the room are much less than 2 mr/hr. We feel that we can conservatively make an estimate that our beam is in the 0° and 180° position at least 50% of the time. Therefore, with these two conditions, we feel that we could not exceed 3 mr in any one hour no matter what type of treatment conditions came up.

(3) These surveys were made with a maximum field size of 36 x 36 cm². If we were to use this machine at such an oblique angle we would never use a field size larger than 10 x 20 cm. sq.

Item r. (1) The teletherapy door interlocks are checked on a monthly basis. This is done by turning the machine on and verifying the machine is on by using a radiation detection device inside the room. Once this machine is in the "on" condition, the door is then opened and the machine proceeds to turn off. This is also verified by the radiation detection device inside the room.

(2) The teletherapy machine was turned on with radiation detection devices in the room. It was noted that all control lights that indicated a beam-on condition were functioning and in the proper positions. This check is done on a monthly basis during monthly quality control.

(3) All interlocks were checked by moving the machine into a position in which the machine is not allowed to function. We then attempted to energize the machine with the results being that the machine cannot be turned into an "on" position. This was also verified with radiation detection device in the room to insure that the primary beam did not come into the "on" position.

(4) The teletherapy timing device is checked every month for accuracy according to the American National Standard Institute's Report No. N-449.1 which was issued in 1978, entitled "Procedures for Periodic Inspection of Cobalt 60 and Cesium-137 Teletherapy Units." All results indicate that the timer error is never greater than 0.5 seconds. All tests were verified with a radiation detection device, insuring that the beam did return to the "off" position when the timer shut off.

Also, the timer was tested to check that the machine did not turn on once the timer was re-set.

Item t. We wish to have License Condition No. 26 of License No. 47-09772-03, Amendment No. 07, amended so that we can removed the restricted area from the roof of the teletherapy unit. We have, at the present time, the roof of the unit encircled with a restriction device that says "CAUTION - CONSTRUCTION AREA - DO NOT ENTER." However, we wish to remove this present barricade since the radiation levels in this area are less than 1.4 mr/hr as indicated in Item n-5.

Also, at this time we feel it is necessary to inform you that construction is continuing in this area and the footers and reinforcement rods are in place to add additional steel and concrete to the outside of this room so it may be acceptable for use with a 6 MEV linear accelerator. The concrete and steel for this additional shielding will be in place sometime in the very near future. Hopefully, at that time we can resubmit many of the radiation levels for your review and comment.

<u>336.9</u>	<u>49</u>	Totals
<u>12.96</u>	<u>1.88</u>	Average
<u>29</u>	<u>9</u>	Maximum

$$BG = 0.1 \text{ mF} / \mu$$

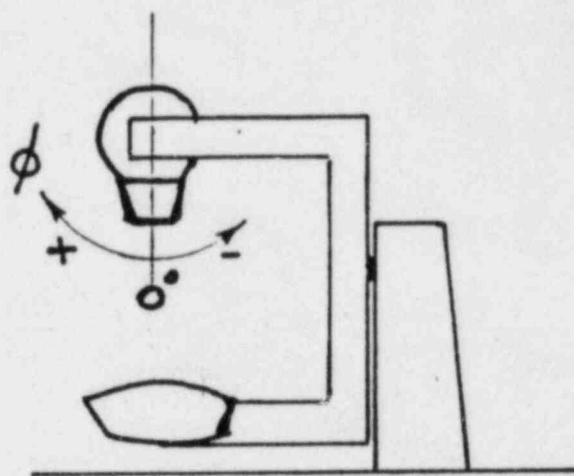
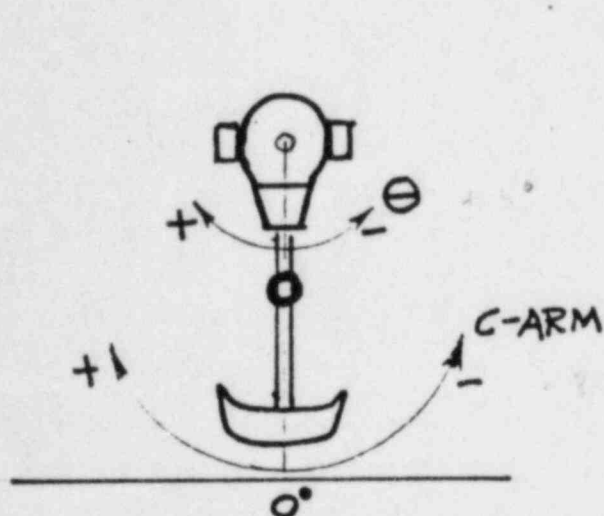
COLLIM WIDE OPEN - 36X36

METER: VICTOREEN 470-A

Mon. Callender

12973

Item: L



ψ = C-ARM ROTATION: POSITIVE CLOCKWISE - 0° AS SHOWN

θ = HEAD ROTATION: POSITIVE CLOCKWISE - 0° DOWN

ϕ = HEAD TILT: POSITIVE OUT - 0° DOWN

Note: "Down" for $\theta \neq \phi$ is toward center of Beam Stopper

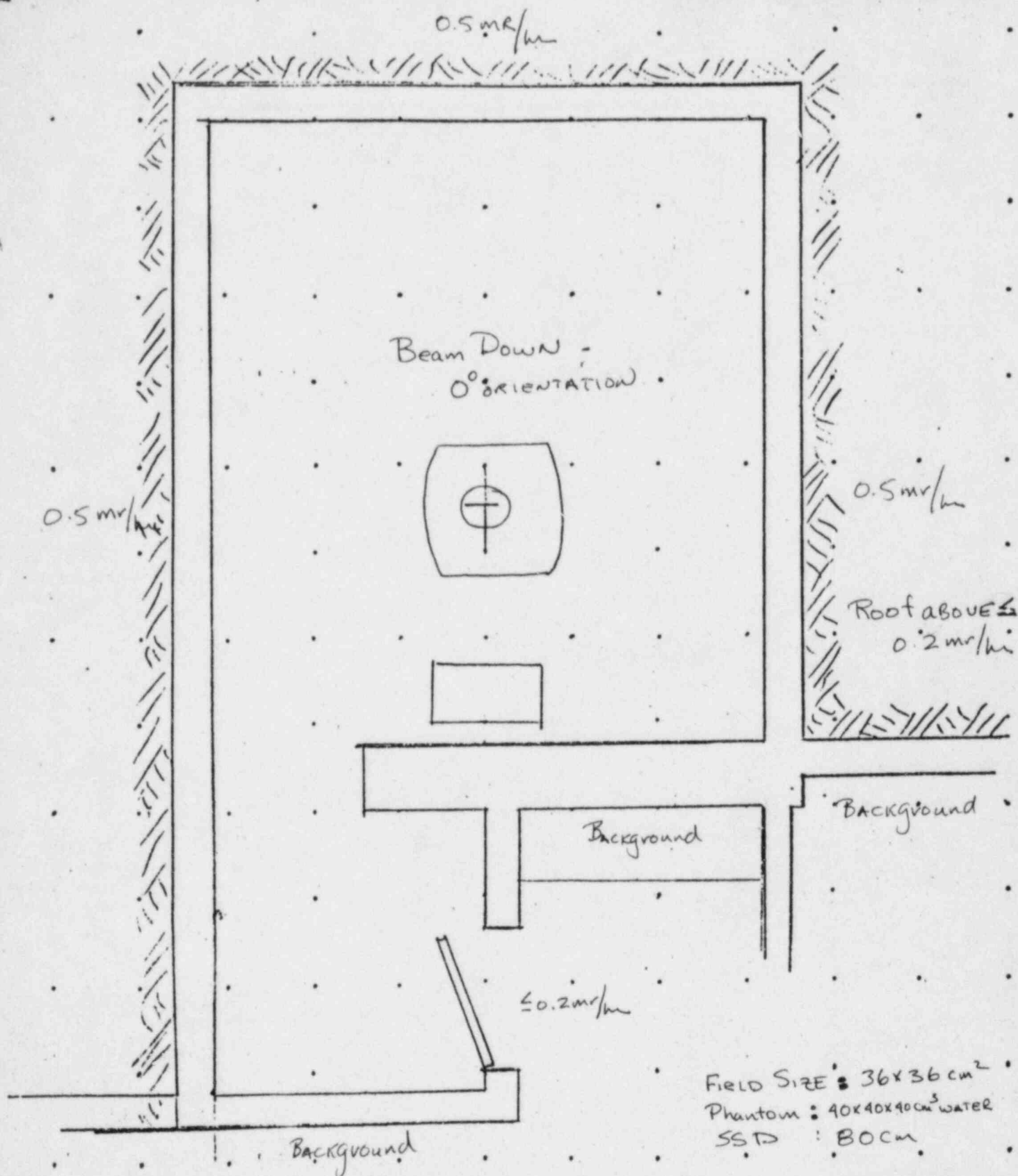
George W. Callendine, Jr., Ph.D.
803 Oxford Street
Worthington, Ohio
43085

(614) 885-6187

BEAM ORIENTATIONS
TELETHERAPY

Item : N1

N 



PLAN - 60 Co TELETHERAPY
RADIOLOGY

CAMDEN-CLARK HOSPITAL
PARKERSBURG W.VA.

SCALE: $\frac{1}{4}'' = 1' - 0''$

DATE:

DWG:

12073

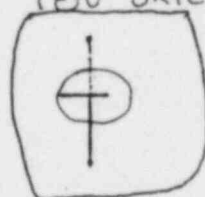
Item: N/2

N →

0.6 mr/hr

0.6 mr/hr

Beam Up
180° ORIENTATION



0.6 mr/hr

Roof above \leq
0.9 mr/hr

Background

Background

≤ 0.2 mr/hr

Background

FIELD SIZE: 36×36 cm²

Phantom: $40 \times 40 \times 40$ cm³ water

SSD = 80 cm

PLAN - 60 Co TELETHERAPY
RADIOLOGY

GARDEN-CLARK HOSPITAL
PICKERSVILLE W.VA.

SCALE: $\frac{1}{4}'' = 1' - 0''$

DATE:

DWG:

Item: N3
 N ← Maximum South wall
 Maximum on East wall

0.7 mr/hr

0.3 mr/hr

7.0 mr/hr

Root above \leq
 0.2 mr/hr

Background

Background

Background

Background

Beam angle: 60°
 Field Size: $36 \times 36 \text{ cm}^2$
 Phantom: $40 \times 40 \times 40 \text{ cm}^3$ water
 SSD: 80 cm

PLAN - 60 Co TELETHERAPY
 RADIOLOGY

GARDEN-CLARK HOSPITAL
 PARKERSBURG W.VA.

SCALE: $\frac{1}{4}'' = 1' - 0''$

DATE:

DWG:

N ←

Item: N4
MAXIMUM NORTH Wall

0.5 mr/hr

7.8 mr/hr

0.2 mr/hr

Roof above.
≤ 0.2 mr/hr

≤ 0.4 mr/hr

≤ 1.0 mr/hr

Background

Background

Beam angle : 300°

Field Size: $36 \times 36 \text{ cm}^2$

Phantom : $40 \times 40 \times 40 \text{ cm}^3$ water

SSD : 80 cm

PLAN - 60 Co TELETHERAPY
RADIOLOGY

GARDEN-CLARK HOSPITAL
PARKERSBURG W.VA.

SCALE: $\frac{1}{4}'' = 1' - 0''$

DATE:

DWG:

N ←

Item: N5

Maximum on Roof

Maximum on East wall

0.7 mr/hr

1.7 mr/hr

0.2 mr/hr

Roof above
≤ 1.4 mr/hr

BACKGROUND

≤ 0.2 mr/hr

≤ 0.5 mr/hr @ door

Background

Beam angle: 210°

Field size: $36 \times 36 \text{ cm}^2$

Phantom: $40 \times 40 \times 40 \text{ cm}^3$ water

SSD: 80 cm

PLAN - 60 Co TELETHERAPY
RADIOLOGY

GARDEN-CLARK HOSPITAL
PARKERSBURG W.VA.

SCALE: $\frac{1}{4}'' = 1' - 0''$

DATE:

1978

DWG: