



# University of Pittsburgh

RADIATION SAFETY OFFICE

June 14, 1977

Patricia A. Vacca  
Radioisotopes Licensing Branch  
Division of Fuel Cycle and Material Safety  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555

Re: Control No. 86717

Dear Ms. Vacca:

This letter responds to your May 11, 1977 inquiry regarding the Co-60 Teletherapy Facility, (Presbyterian-University Hospital, License Number 37-00245-05) survey results.

As requested, the following information is supplied to enable you to complete the evaluation of our March 25, 1977 survey report.

1. The manufacturer of the Co-60 source is Atomic Energy of Canada Limited (AECL).  
Model Number: Type C-146, 1.5 cm diameter  
Serial Number: S-2488  
Activity: 6707 Curies on March 15, 1976
2. All radiation fields surveyed by Mr. Bukovitz on February 18, 1977 were performed using a Victoreen 440 ion chamber S/N 1211 which was previously calibrated on July 21, 1976 to a 71 millicurie Co-60 source at our calibration facility. The exposure rate from this source is measured at known distances from the source and these measurements are traceable to the National Bureau of Standards through the use of Victoreen R chambers (#552 S/N 240 C.F. = 1.02; #553 S/N 267 C.F. = 1.03 Co-60 technique) that were previously calibrated on April 4, 1975 at Victoreen's Regional Calibration Facility in Cleveland, Ohio. The Victoreen 440 is calibrated according to the manufacturer's instructions in a field of 235 mR/hr while the meter reading is adjusted to 250 mR/hr, then, as a final linearity check 2 points at 1/3 and 2/3 full scale of each scale for the ranges of 3 through 300 mR/hr are checked for exposure rate readings at known exposure rate positions. The criteria adopted by this office is to investigate and/or repair instruments that deviate from a known exposure rate reading by more than  $\pm 15\%$ .

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3. The radiation levels measured in the area below the Co-60 Teletherapy Facility for a beam orientation indicated in Section III, Page 4 of Mr. Bukovitz's survey report of February 18, 1977 indicate no exposure rates above a background of 0.05 mR/hr. Also, the "Ceiling above the Co-60 Room" statement should be corrected to read "Ceiling above Co-60 Room (restricted area)--no readings above background." These statements should be added to your copy of the survey report, Section III, Page 4. Although accidentally deleted from the original written report, this datum was included with Mr. Bukovitz's survey data sheet, which is retained in our files.
4. a. The unattenuated beam can be directed towards Wall B, the ceiling and the floor but not towards any portion of Wall D, due to a recently installed micro-mercury switch assembly that eletrically limits the unattenuated primary beam use. There are no other electrical or mechanical stops employed to serve this same purpose.

Since the beam limiting mercury switches allow the source to operate independent of the gantry rotation angle, a set of minimum angles from the vertical can be specified for the source head rotation. This will define the area of Wall D from the floor to the ceiling in terms of an angle from the vertical which can be readout directly on the source head housing. Referring to Figure #1 as attached, the maximum angle from the downward vertical position will be defined by the angle  $\theta_{\max} = 140$  degrees and the minimum angle  $\theta_{\min} = 48$  degrees. At any head rotation from  $\theta_{\max}$  through and including  $\theta_{\min}$ , the source is electrically inoperable, therefore incapable of striking any portion of Wall D with the unattenuated primary beam. This is for a maximum field size of 32 x 32 cm at 80 cm SSD.

- b. The tests to be conducted by this office are (1) verify the electrical interlock system is actually independent of the gantry position by placing the head at angle  $\theta_{\max}$  and angle  $\theta_{\min}$  as aimed toward Wall D for each of 8 gantry positions at increments of 45 degrees and test firing; (2) successively test fire toward Wall D and rotate the source head at 10 degree increments from 0 degrees through 180 degrees from the vertical to check for the proper operation of the interlock; and, (3) verify that the stipulated minimum through maximum angles in 4a. provide the proper electrical source interlock feature.

To date, the above test has not been completed although the micro-switching has been installed. The testing has been delayed until the AECL authorized repairman performs the scheduled "tune-up" of the system sometime this month.

Until that time, administrative controls in the form of instructions to the therapy technicians directing them not to utilize Wall D for any unattenuated primary beam therapy have been established. This office believes that these administrative controls are sufficient until a complete interlock test can be performed. At that time, this office will forward the specific results of the tests as outlined in this section.

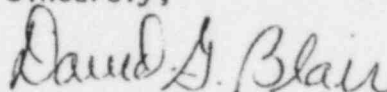
5. The roof of the Co-60 Teletherapy Room is now posted as a radiation area.
  - a. The controls used to restrict access to this area are primarily administrative, in nature. The area has been posted as a radiation area at the point of typical access to the annex roof (see Figures 2 & 3). The signs are conspicuously posted and are visible to persons who try to gain access to this roof from (1) an adjoining roof of the main building and (2) by use of a ladder from the loading dock level. Typical access to this roof is through the use of keyed windows on the 4th floor of the main building, allowing access to the previously mentioned adjoining roof.
  - b. Four 8" x 10" metal signs have been posted on the annex building roof (see Figures 2 & 3) they are placed two (2) back-to-back and each carries the words "Caution - Radiation Area - Contact the Radiation Safety Office before entering this roof area 624-2728".
  - c, d. These instructions will allow this office to ensure the Co-60 unit either not operating or allow appropriate personnel monitoring when people will be working on this roof. In either case, by contacting us when personnel wish to gain access to the roof, we shall be able to instruct these people in accordance with Section 19.12 of 10 CFR 19, if the situation requires.
  - e. The surveys to be performed in accordance with Section 20.201 of 10 CFR 20 are as follows:
    1. Annually:(a) Output measurements are made for the complete range of field sizes used and for each treatment distance used.  
(b) Inspection made for compliance with Title 25 Part I, Subpart D, Article V, Chapter 23 of the Commonwealth of Pennsylvania.
    2. Semi-annually:
      - (a) Output measurements are made for the smallest, largest and three other commonly used field sizes at the appropriate treatment distances.

- (b) Congruence between radiation field and field indicated by the localization device.
- (c) Uniformity of the radiation field and dependence upon the direction of the useful beam.
- (d) Time accuracy.
- (e) Leak test.

All output measurements, timer accuracy and uniformity/congruence checks are currently being performed by a qualified expert, Mr. Andrew G. Bukovitz.

I hope these answers to your questions will be sufficient to allow completion of the evaluation of our March 25, 1977 survey report.

Sincerely,



David G. Blair  
University Health Physicist

DGB/dbb

cc: File

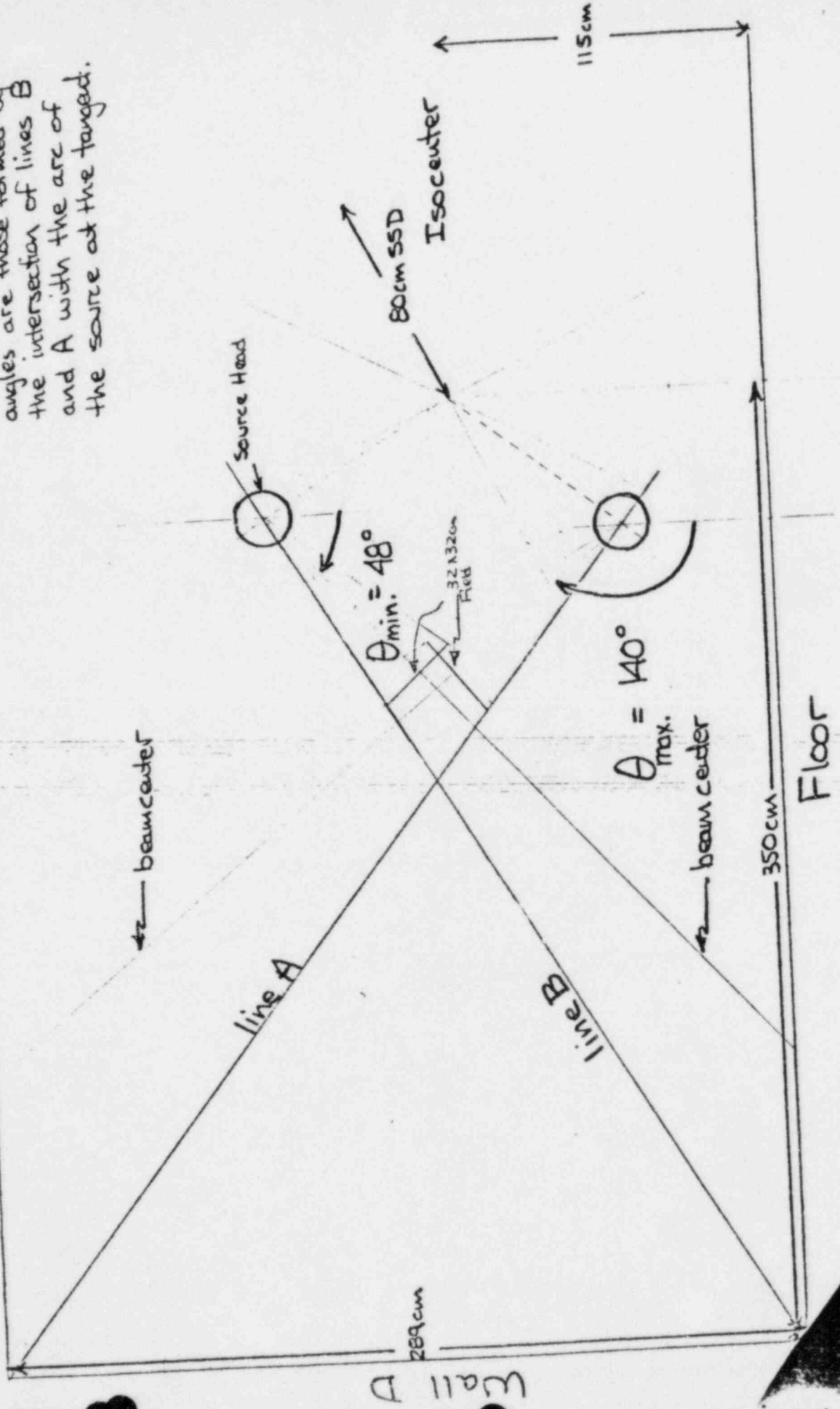
N. Wald, M.D., Chairman, Radiation Safety Committee  
E. D. Durkosh, Radiation Safety Officer

Figure #1  
Scale 1/20 Full size

Presbyterian - University 60Co Teletherapy Facility

Roof

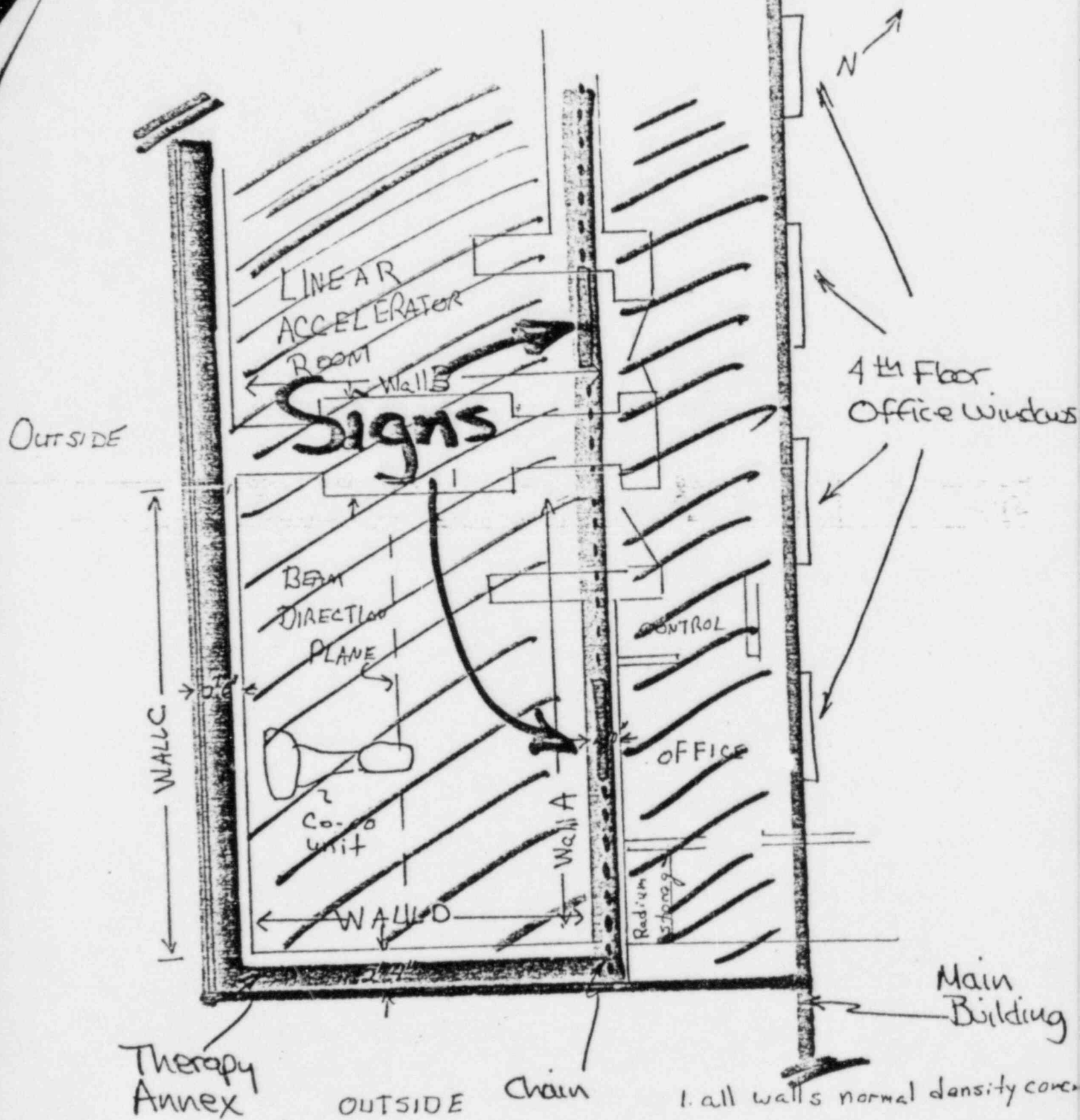
minimum and maximum limiting angles are those formed by the intersection of lines B and A with the arc of the source at the target.





# Location of Radiation COBALT THERAPY Area Signs

Figure #2



Location of Radiac  
Area Signs Figure #5

Main  
Bldg.

Wall D

Roof 3

Roof 2

Oxygen  
Storage

4th Floor Windows

Signs  
Chalk

Annex  
Co-60 Unit

Floor

top of deck

Loading dock area

Wall B

1061

not to scale

all Room walls normal density concrete