HOWARD UNIVERSITY
WASHINGTON, D.C. 20059

OFFICE OF THE VICE PRESIDENT
FOR HEALTH AFFAIRS
Radiation Safety Committee

October 18, 1989

Mr. John White, Chief
Nuclear Materials Safety Section C
Division of Radiation Safety and Safeguards
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, Pennsylvania 19406

Dear Mr. White:

This is in reference to the inspection of Teletherapy License Number 08-00386-20 conducted by U.S. Nuclear Regulatory Commission personnel on October 4, 1989.

At the inspection it was noted that the Janus Teletherapy Unit had been used once to irradiate mice. Prior to the use of the teletherapy unit a survey should have been performed and a copy of the results sent to the U.S. Nuclear Regulatory Commission. Since this documentation was not available during the inspection, a re-survey has been performed. Results of this survey are enclosed. The unit will not be used for any research projects involving animals.

Sincerely yours,

Marlene McKetty

Marlene H. McKetty, Ph.D., Chairperson
Howard University Radiation Safety
Committee

dmr
Enclosure

HOWARD UNIVERSITY HOSPITAL
WASHINGTON, D.C. 20060

HOWARD UNIVERSITY
COLLEGE OF MEDICINE AND
HOWARD UNIVERSITY HOSPITAL
DEPARTMENT OF RADIOTHERAPY

October 6, 1989

Marlene H. McKetty, Ph.D.
Chairperson
Radiation Safety Committee
Annex II
Howard University
Washington D.C. 20059

RE: SURVEYS AND TESTS OF THE COBALT-60 TELETHERAPY MACHINE:

Dear Dr. McKetty:

I am writing in response to your letter dated October 5, 1989 regarding the Cobalt-60 teletherapy machine under NRC license 08-00386-20 expiring on August 31, 1991. As corrective actions following the deficiency found by the U.S. Nuclear Regulatory Commission on October 4, 1989,a) the Cobalt-60 teletherapy machine will not be used for any research projects involving animals without the approval of NRC, b) all the required calibrations and inspections will be carried out in the future, and c) the following surveys and tests were conducted on the Cobalt-60 teletherapy machine on October 5, 1989.

1. The teletherapy machine is located in Room B-125C of the Howard University Cancer Research Center, 2041 Georgia Avenue, N.W., Washington, D.C. 20060

2. The teletherapy machine contains an AECL model C146 sealed teletherapy source #S-2322, with an activity of 460 curies as of September 30, 1989.

3. The machine was relocated from the Department of Radiotherapy,, Howard University Hospital, Room BA24 to Howard University Cancer Center, Room B-125C on August 24, 1985.

   The machine became operable on February 17, 1987. No patient treatments have been conducted since relocation.

4. The head of the teletherapy machine is permanently secured in the wall and cannot be moved or turned. The primary beam is always directed toward the floor. There is no space under the floor.

5. Written instructions are posted at the control of the teletherapy machine, informing the operator of the procedure to be followed, should he/she be unable to turn off the machine's primary beam of radiation with the controls outside the treatment room. These instructions caution individuals to avoid exposure from the primary beam of radiation when in the treatment room and include specific instruction for:

    a. Locating and using the device for manually turning off the teletherapy primary beam of radiation.
    b. Removing the patient from the treatment room.
    c. Securing the room against unauthorized entry.
    d. Notifying the responsible physician or radiation protection officer.

6. Access to the teletherapy room is controlled by a door at the entrance which is equipped with an electrical interlock system. It turns the teletherapy machine's primary beam of radiation off immediately upon opening of the entrance door. The interlock system is connected in such a manner that the teletherapy machine's primary beam of radiation cannot be engaged until the treatment room entrance door is closed, and the beam "on-off" control is reset at the control panel. The electrical interlock system was tested and found to be in proper working condition.

7. The teletherapy facility is provided with a closed circuit television system permitting continuous observation of the patient during the irradiation process from outside the treatment room. Patients will not be treated in case of a malfunction of the closed circuit system until it is repaired and working properly.

8. The door of the treatment room is provided with a large warning sign reading; **"CAUTION: HIGH RADIATION AREA"**

9. To test for leakage of the teletherapy source, wipe tests were made from inside of collimator with the source in the "OFF" position. L/ t leak test was done and tested in June 1989 and did not show evidence of contamination.

10. i) A radiation survey of the teletherapy source housing with the teletherapy source in the "off" position showed the maximum and average radiation levels at one meter from the teletherapy source to be 0.25 milliroentgens per hour and 0.15 milliroentgens per hour, respectively.

ii) With the teletherapy source in the "on" position, with a 34 cm x 34 cm x 30 cm phantom in the primary beam of radiation measuring 30 cm x 30 cm at 70 cm SSD a radiation survey of all areas adjacent to the treatment room showed:

a. that radiation levels in restricted areas are not likely to cause personnel exposure in excess of the limits specified in Section 20.101 of Title 10, Chapter 1, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation" (10 CFR 20).
b. that quantities of radiation in unrestricted areas do not exceed the limits specified in Section 20.105 (b) of 10 CFR 20.
c. that the intensity of the primary beam of radiation at 70 cm distance from the teletherapy source was 14.6 rad per minute in air for a field of 10 cm x 10 cm.

The dose rate measurements are reported in Table 1.

The measurements were made with a Victoreen 100R chamber, model 621, serial number 10339. Last calibration was made at Victoreen calibration center on July 18, 1988.

iii) The actual radiation levels that were measured around the teletherapy facility are given in Table 2.

11. To check the linearity of exposure vs time, readings were taken from 15 seconds upto 2 mins and plotted in Fig. 4. The linearity is good.

The timer error was calculated from measurements to be 1/10 second. This is acceptable.

12. One emergency button is located on the control panel and is found to be in good working condition.

13. The mechanical and electrical "on-off" indicators were tested and found to be in good working condition.

14. A radiation monitor is mounted inside the treatment room and is connected to a flashing red light mounted near the control panel. The light serves as an indicator that the radiation beam is on. The monitor is connected to a battery pack in case of main line power failure.

Radiation monitor system was tested with beam on and found to be in good working condition.

15. The radiation field and light field alignment was tested and the agreement is within 2 mm. The field uniformity for a 10x10 cm field at 70 cm SSD was measured and plotted in figure 5.

16. There is no distance measurement device attached to the machine. But the distance from the source to the bottom of the shadow tray is 47 cm. This was determined at the time of relocation. Distance to the skin surface of the patient is measured from the shadow tray with a measuring tape. Accuracy of the measuring tape is checked and found to be acceptable.

17. This radiaton protection survey and the calibration were carried out by Mr. J. Rao Nibhanupudy, Chief Physicist, Radiation Therapy Department, Howard University Hospital, Washington, D.C. 20060 on October 5, 1989.

Sincerely,

Alfred D. Goldson, M.D., F.A.C.R.
Professor & Chairman

/csa

TABLE 1

DOSE RATES IN AIR FOR COBALT-60 TELETHERAPY MACHINE LOCATED AT HOWARD UNIVERSITY CANCER CENTER ROOM B-125C

FIELD SIZE (cm)	70 cm SSD (Rad/Min)
4 x 4	12.9
8 x 8	14.2
10 x 10	14.6
15 x 15	14.8
20 x 20	15.0
30 x 30	15.4

Measured by:

J. Rao Nibhanupudy
ABR Certified Physicist

TABLE 2

LOCATION	TYPE	DOSE RATE (mR per hour)		OCCUPANCY FACTOR	PROJECTED MAXIMUM mR Per Week
		Maximum	Average		
Control Console	Controlled	0.3	0.5	1	3
Outside Treatment Room door (with source "on" inroom)	Controlled	0.5	0.1	1	5
Outside treatment room wall	Controlled	0.1	0.1	1	1
Simulator Room	Controlled	0.05	0.05	1	0.5
Parking Lot (Ground Floor)	Uncontrolled	0.02	0.02	½	0.1

NOTE: 1) See figures 1,2,& 3 for the locations
2) Readings are taken with a Ludium model 14C survey meter, serial No: 31050, 0-2000 mR/hr range, and calibrated with Cs-137 on June 23, 1989. A 34 cm x 34 cm x 30 tissue equivalent phantom was placed under the primary beam measuring 30cm x 30cm at 70cm from source.
3) Projected maximum mR per week is based on 10 hours beam "on" time at 1 meter in one week.

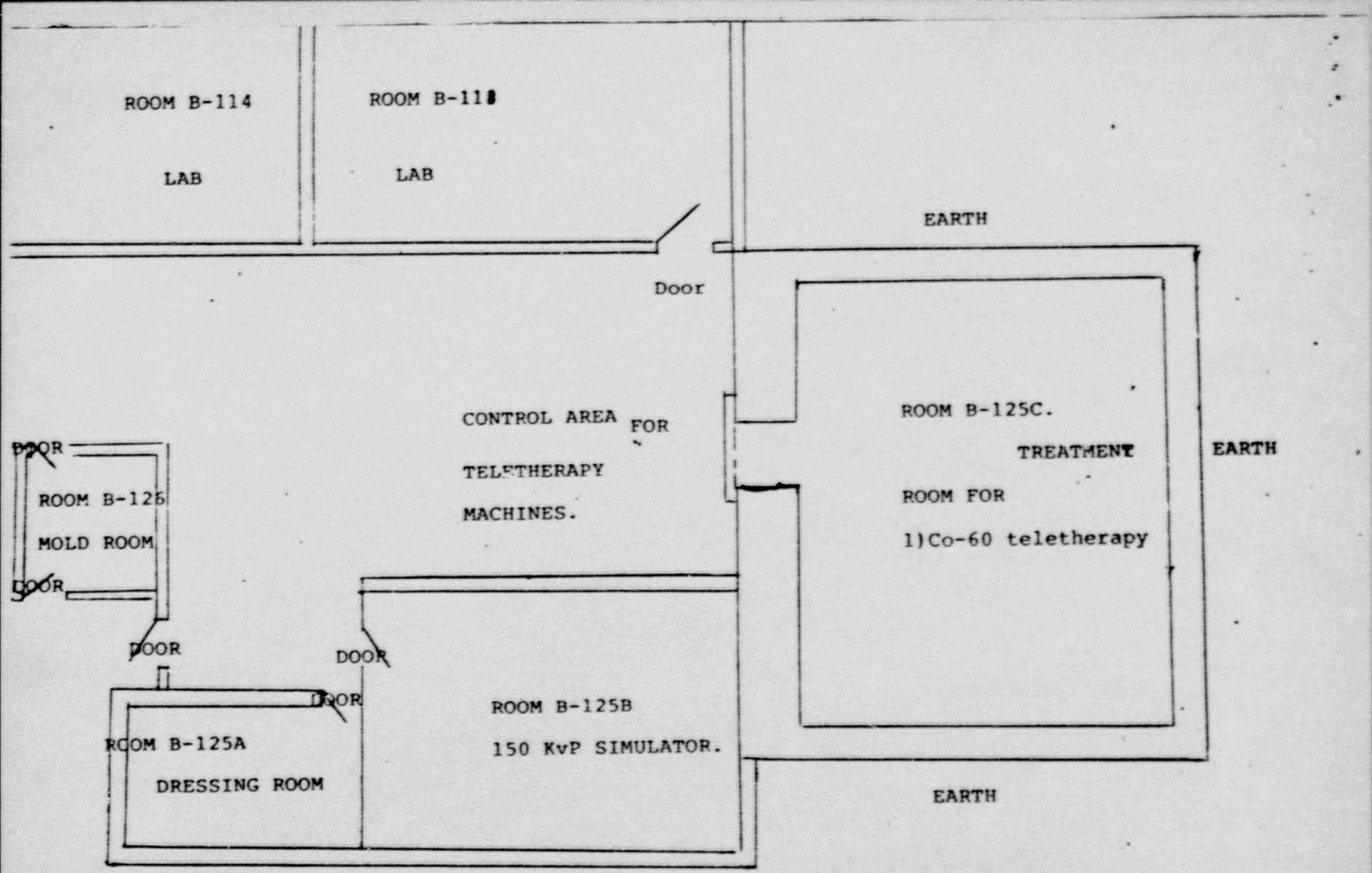
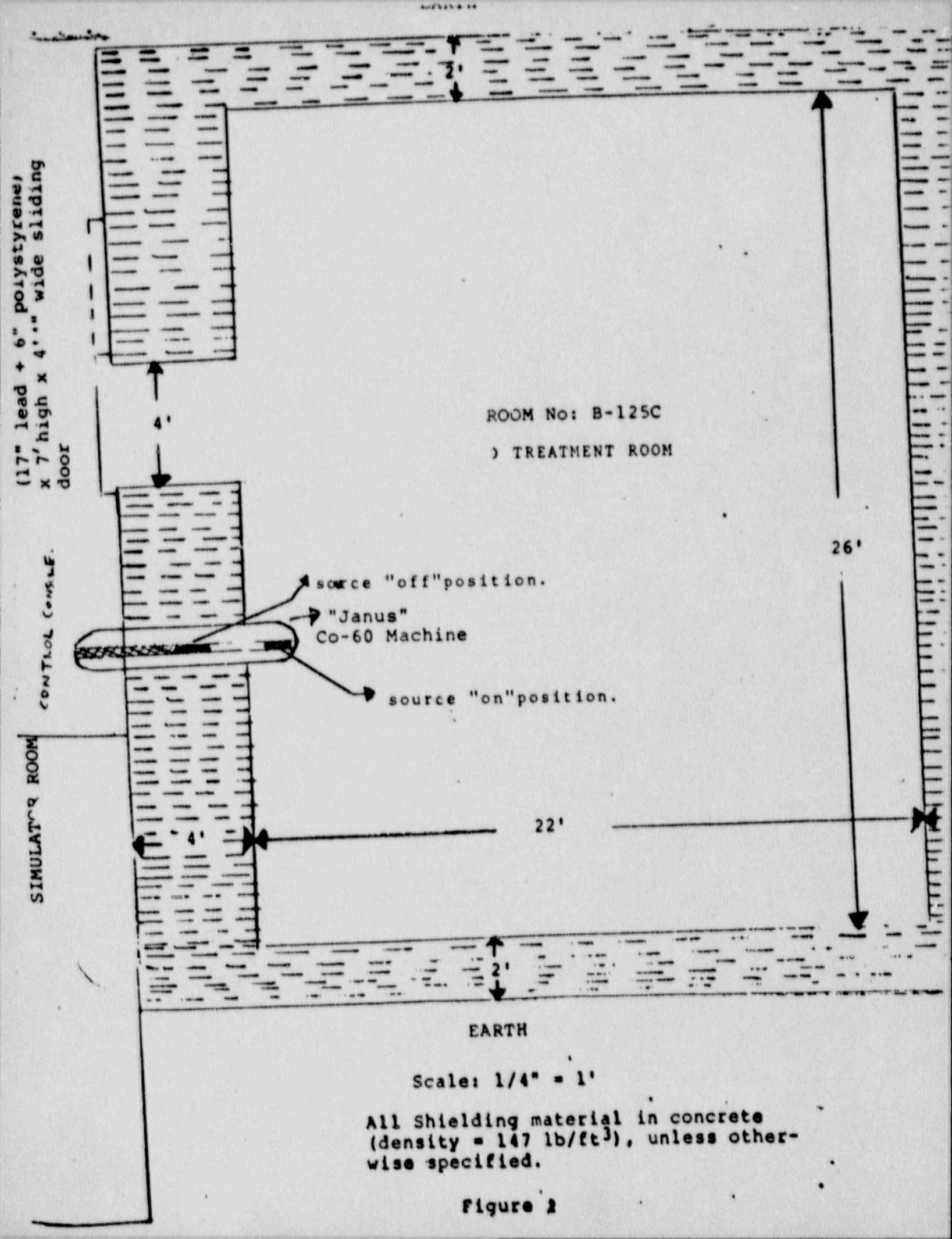


Figure 1:PART(NORTH)BASEMENT FLOOR, HOWARD UNIV.CANCER CENTER.

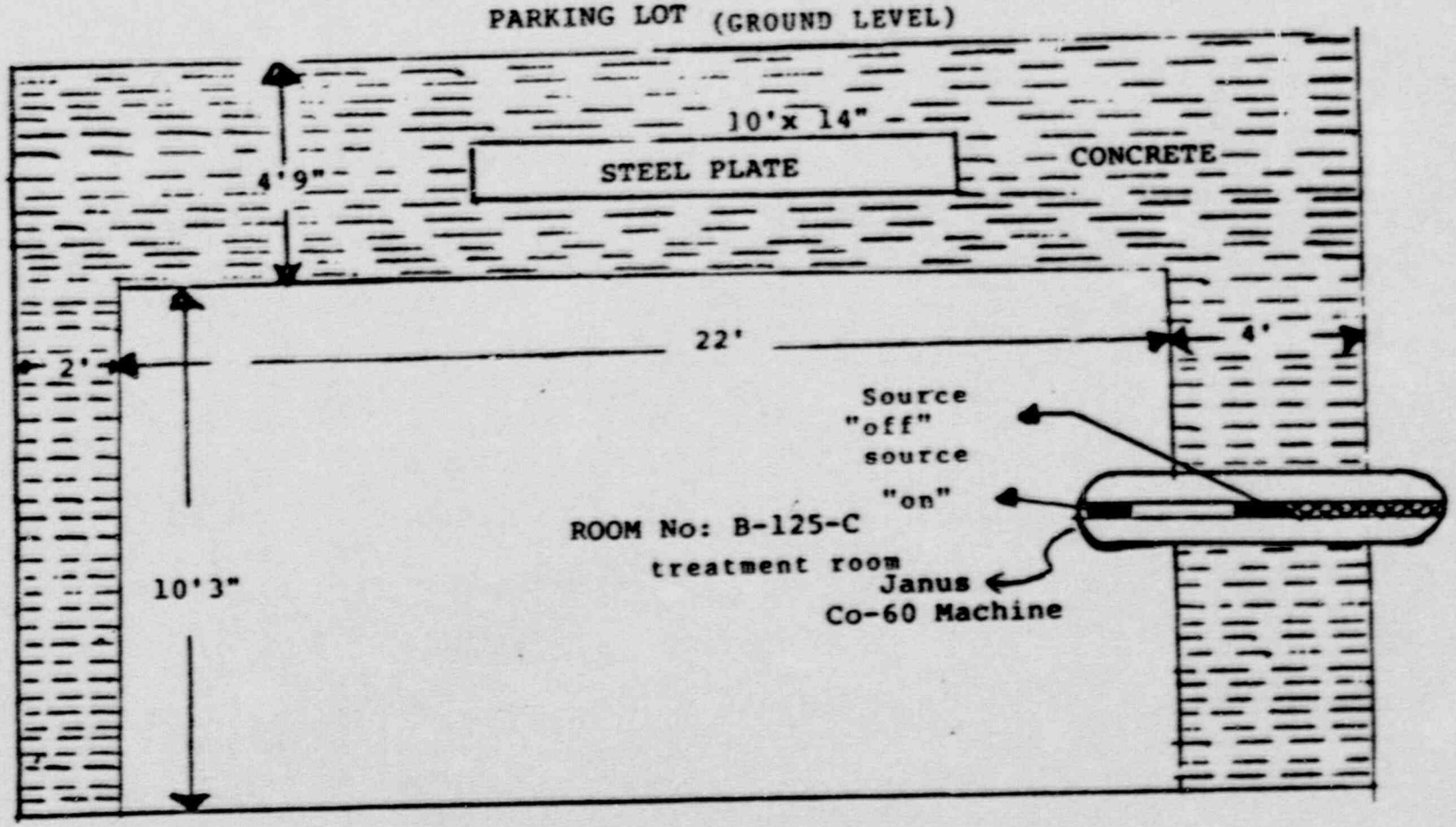
SCALE:1/8"=1'.



Scale: 1/4" = 1'

All Shielding material in concrete (density = 147 lb/ft^3), unless otherwise specified.

Figure 2



VERTICAL CROSS-SECTION

Figure 3

TIME VS EXPOSURE CO-60 MACHINE, 20x20 cm, 70cm SCD 10/5/89

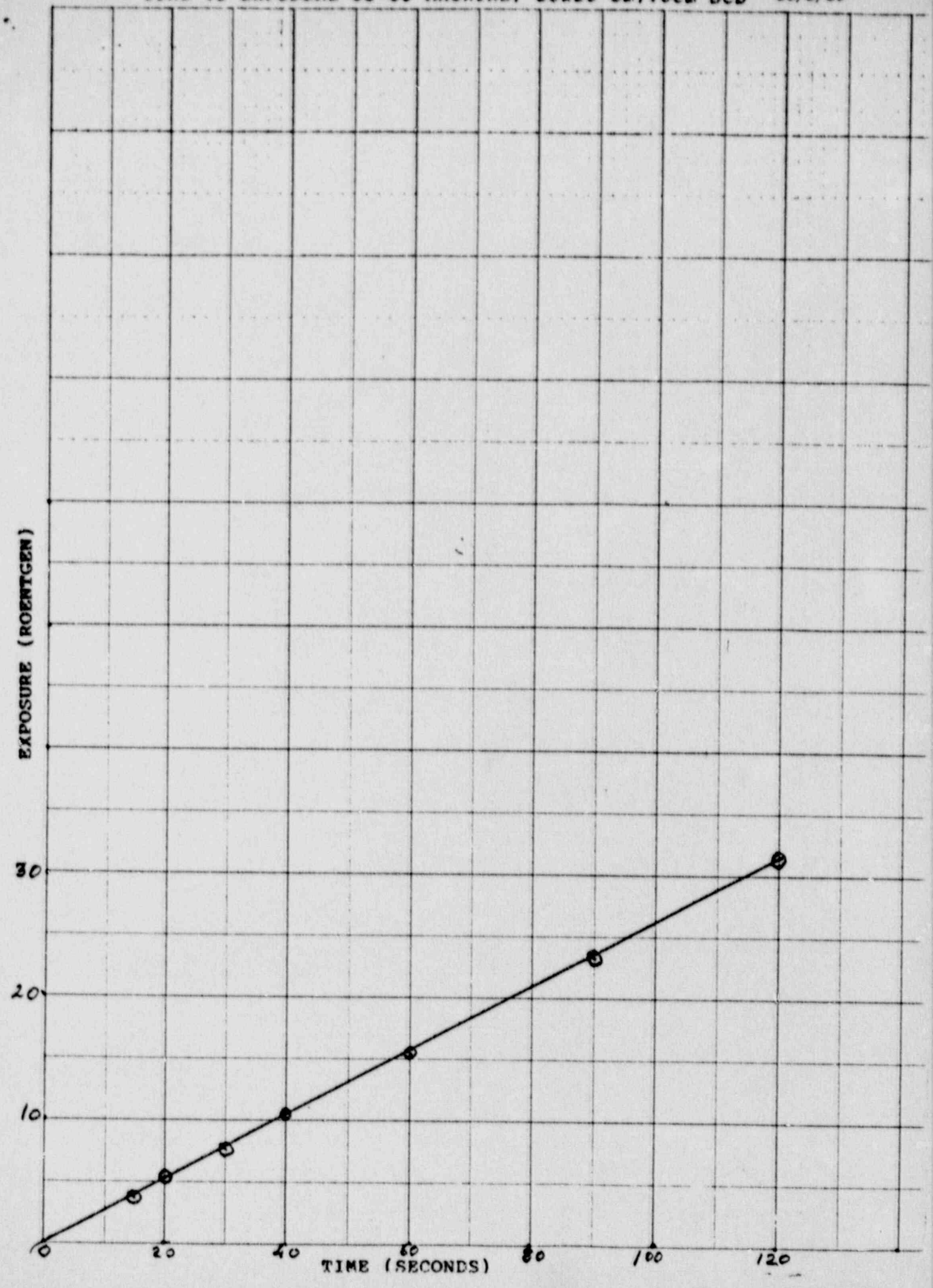
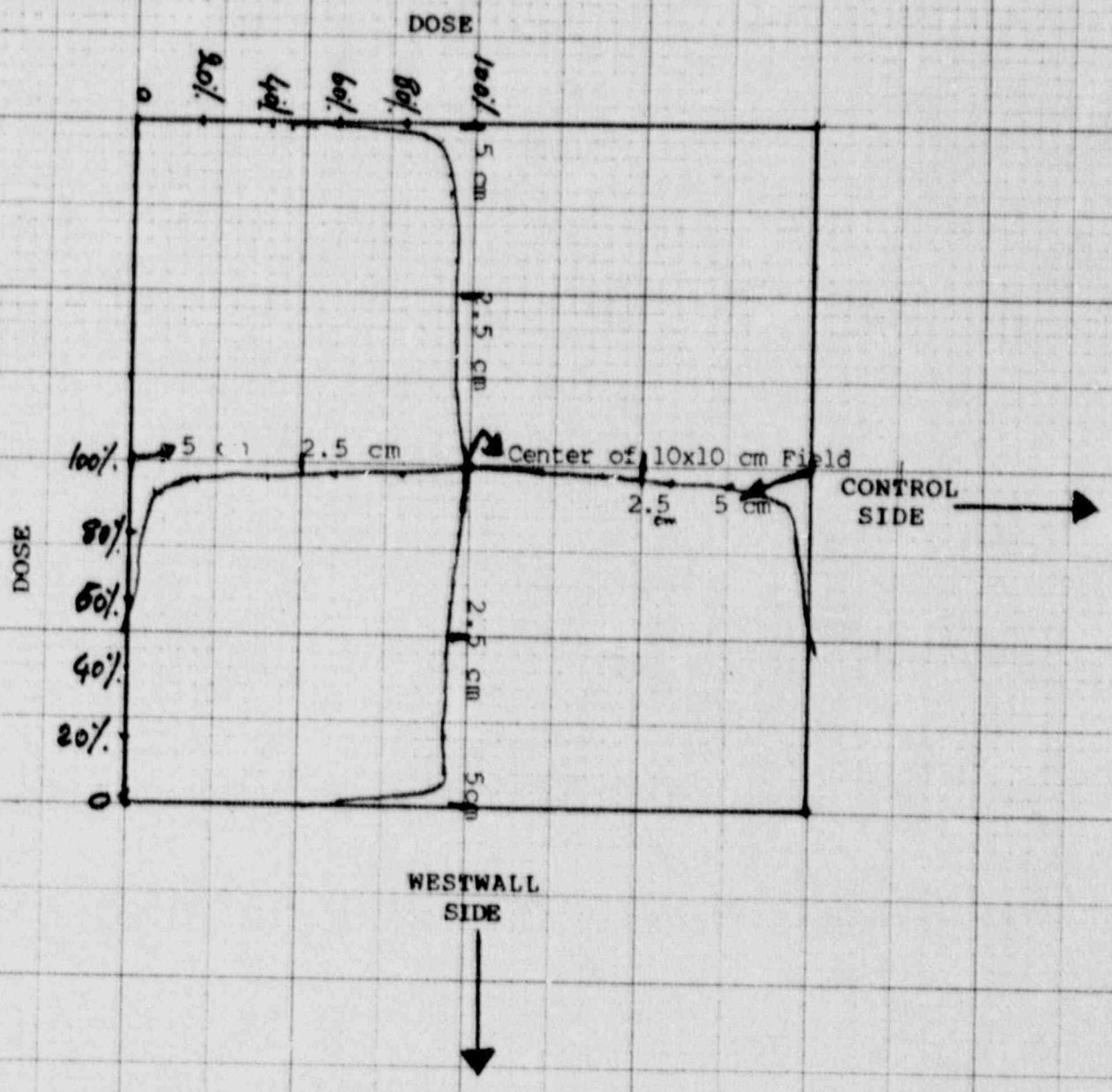
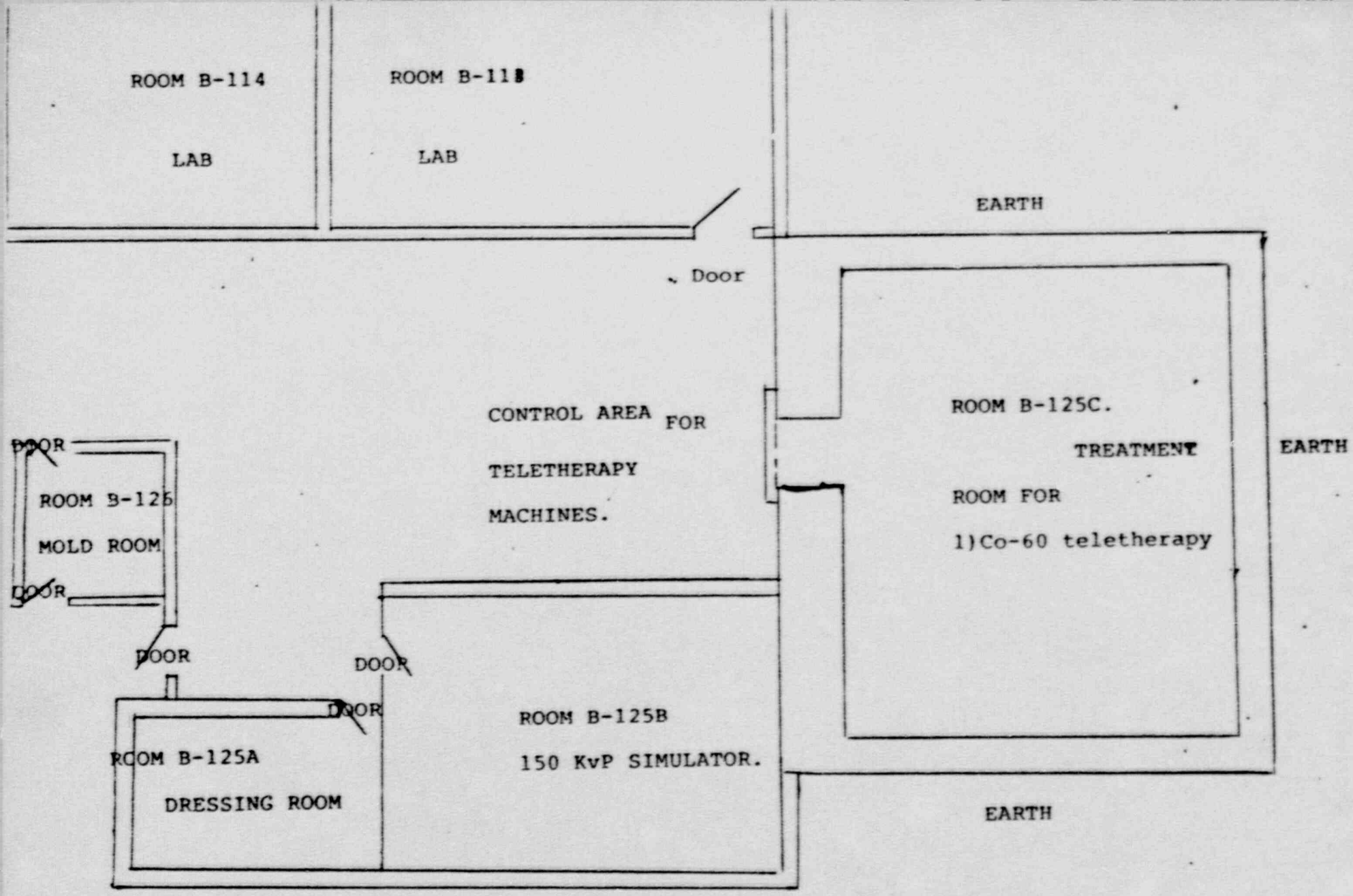


FIGURE 5

RADIATION FIELD UNIFORMITY
10 x 10 cm, 70 cm SSD





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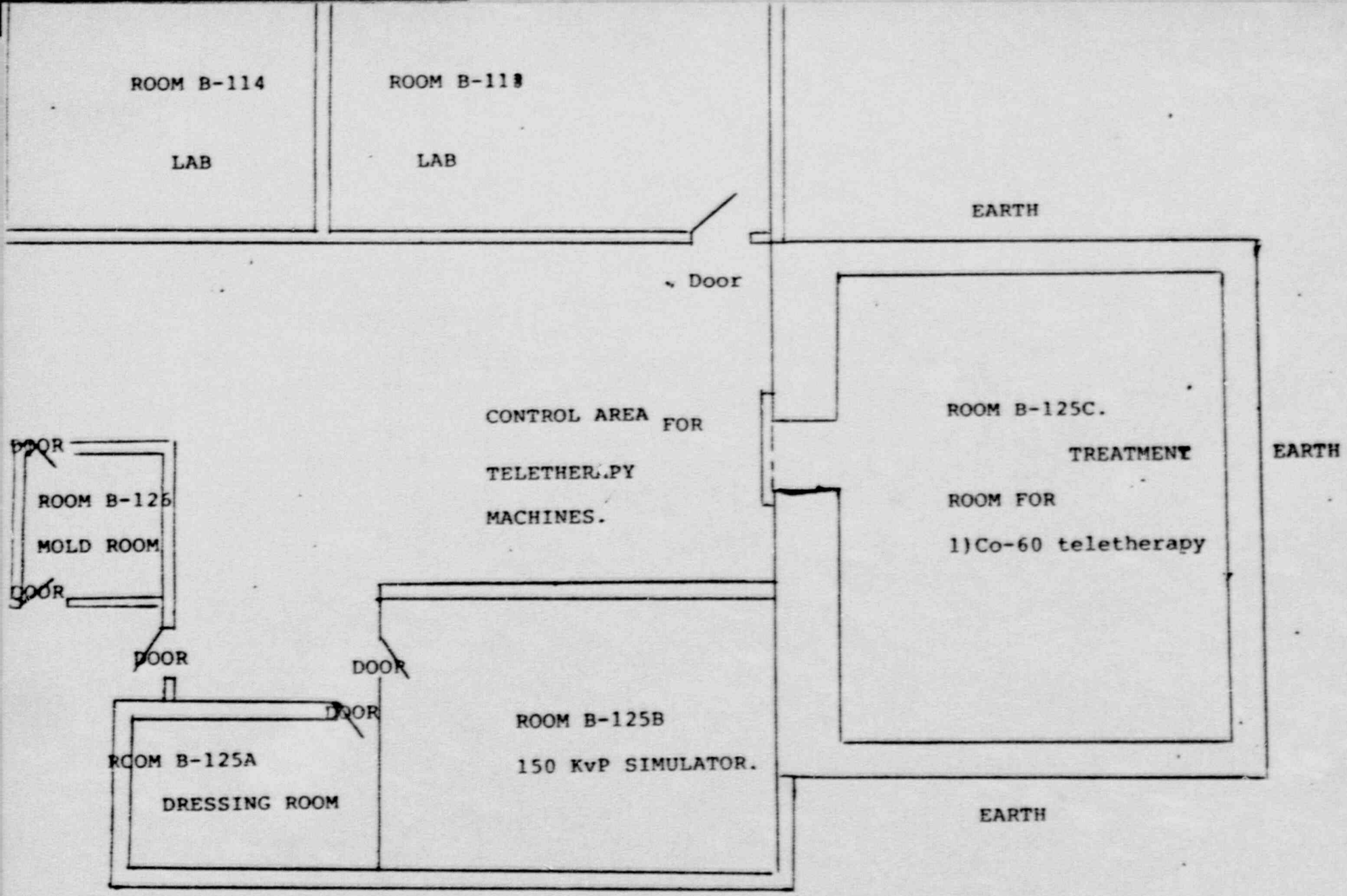

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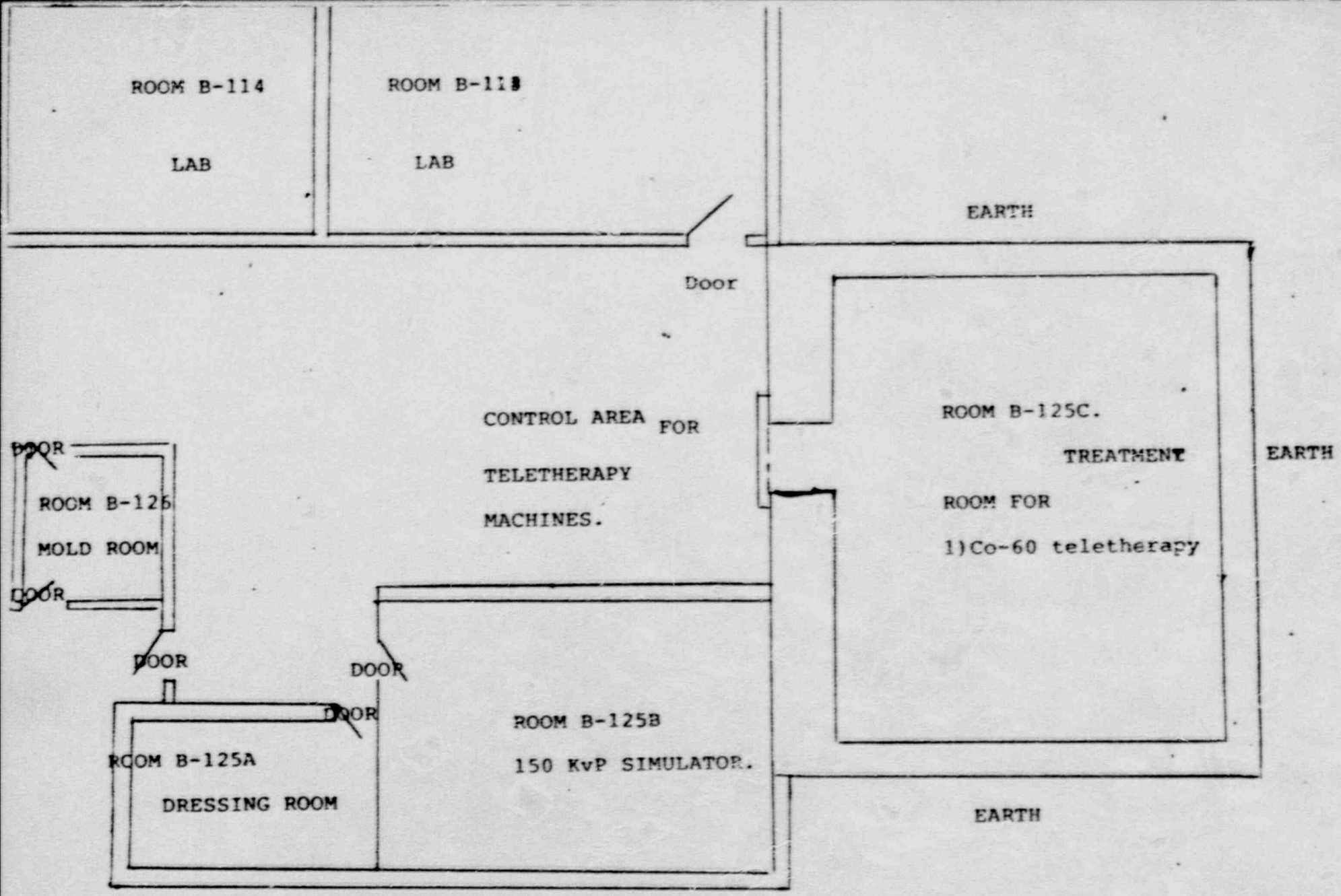

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