reid memorial hospital

November 15, 1989

Mr. D.J. Sreniawski, Chief
Nuclear Materials Safety, Section I
U.S. Nuclear Regulatory Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Dear Mr. Sreniawski:

The following information is forwarded concerning Docket No. 030-08938, License No. 13-03284-03 (Reid Memorial Hospital, Richmond, Indiana) in response to violations noted during a recent inspection.

1. Reid Memorial Hospital is expanding its radiation therapy treatment facility. Expansion includes a dual photon energy linear accelerator (6 MV and 15 MV) and a range of electron energies (from 3 MeV up to 18 MeV). The construction involves one common wall with the present Cobalt-60 teletherapy treatment room. This wall had previously been an underground wall for the present Cobalt-60 teletherapy room. Following excavation (see sited violation below), this wall is to have an additional 1.5 - 3.0 ft. of concrete. This will be sufficient radiation shielding as a secondary barrier for the 15 MV photons. (See enclosed.) The enclosed schematic indicates the x-ray treatment room and the wall thicknesses. The radiation survey will be performed for all areas surrounding this new treatment room prior to its use. Please amend our license to include the construction changes indicated in schematic to reflect this additional therapy area.

2. As indicated in this violation, radiation surveys were not performed in the unrestricted areas outside the north wall of the treatment room immediately after the soil excavation in that area. These surveys were made following the NRC inspection and the results of these radiation surveys are enclosed. Comments concerning personnel exposure during the time of the excavation and prior to the additional wall shielding are enclosed. Following the radiation survey, patient's treatment procedures were handled in such as way as to minimize possible exposures to personnel in the area adjoining the north wall. In addition, personnel working in adjoining area to Cobalt room were monitored with a pocket ionization chamber with no chamber reading noted above background (see enclosed).

NOV 27 1989

1401 chester boulevard • richmond, indiana 47374 • phone 317 / 983-3000

It is felt that full compliance has been achieved as of October 19, 1989.

John C. Spellmeyer, M.D.
Director Radiology Department
Reid Memorial Hospital

Ted Sobol
Senior Vice-President
Reid Memorial Hospital

JCS/cm

September 7, 1989

Mr. Barney Wood
Engineering Department
Reid Memorial Hospital
Richmond, Indiana 47374

Subject: Radiation Shielding Requirements for the Proposed 18 MV X-ray (Reid Memorial Hospital, Richmond, Indiana). Reference Drawings 2-10-89

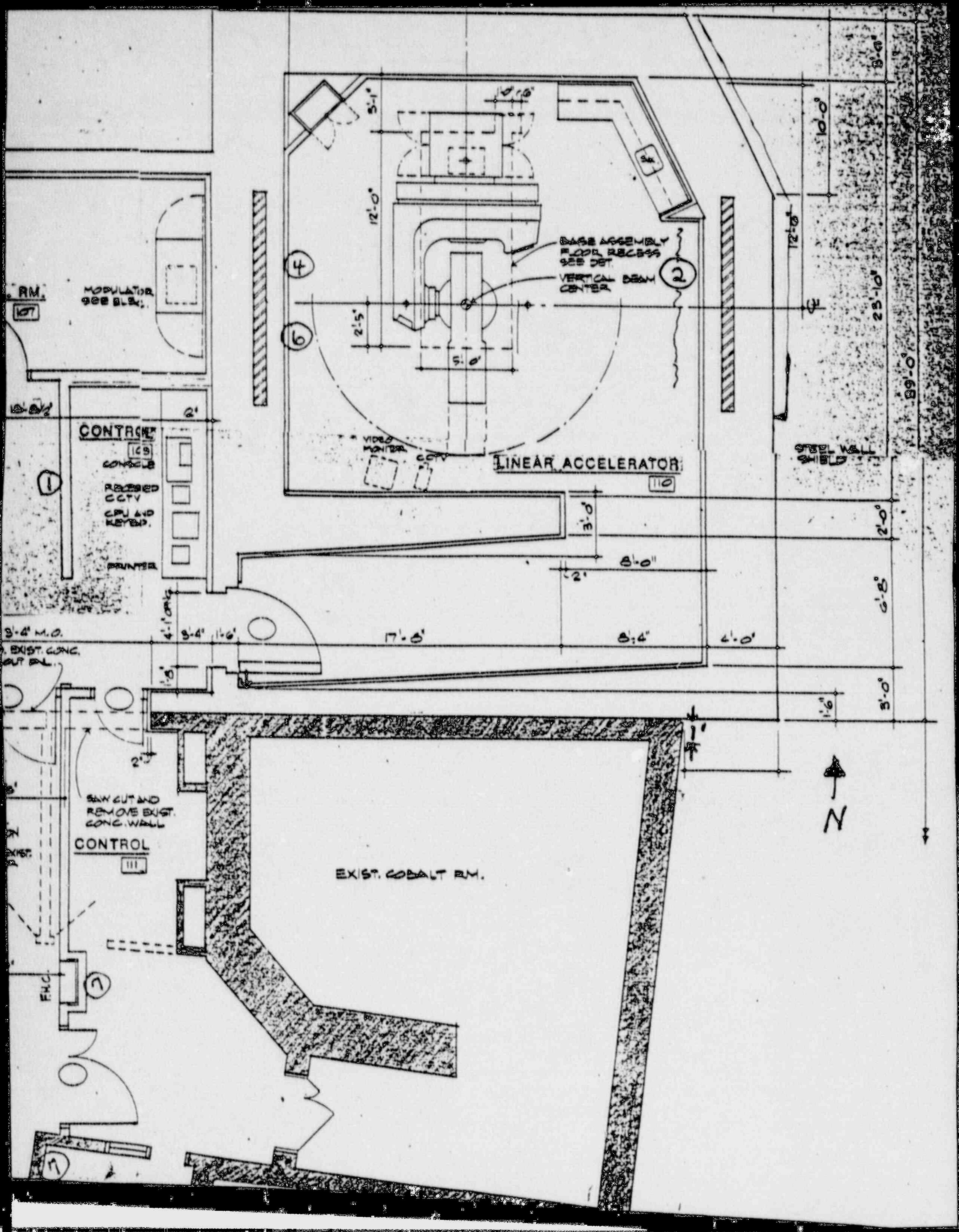
Location	Type of Area	Type of Barrier	WUT (1) R/wk at 1 meter	Recommended (4) Shielding
wall B	U (2)	S (3)	60,000	42 " concrete
wall C	U	P	10,000	---------(5)
wall D	U	S	60,000	36" concrete (6)
wall E adjoining entrance door from control area	U	S	60,000	18" concrete
door F from control area	C	S	60,000	1/2" lead (Pb)(7)
view window in door F	C	S	60,000	1/2" Pbeq Pb glass
maze wall G	U	S	60,000	36 " concrete (8)
wall A	U	P	10,000	---------(5)
area below (ground)	--	--	--	---------
area above (parking area)	U	P	20,000	---------(5)

Notes:

1. based on workload (W) = 60,000 R/wk at 1 meter
2. U-uncontrolled area; C-controlled area
3. S=secondary barrier; P-primary barrier
4. concrete density of 147 lbs/ft (3)
5. thick portion (primary barrier) of 12 ft of this wall should have 84" concrete; if use 9" steel, then require 51" concrete in thick portion (primary barrier) of side walls and ceiling; should ensure that centerline of thick portion of wall is properly aligned with central axis of primary beam.
6. this wall should have 36" concrete at its junction with wall C and tapered to 18" concrete at wall around entrance door.
7. for entrance wall and door, 18 MV-X-rays occasionally require neutron shielding (to some extent based on maze wall construction); would recommend 4" of polyethylene is needed on door for neutron shielding.
8. maze wall to have 36" concrete near wall entrance tapered to 24" concrete at its termination inside room.
9. for possible considerations of other material to be used for shielding, the following ratios are provided:
   steel/concrete = 0.27
   lead/concrete = 0.14
   high density concrete (250 lbs/ft (3))
   ---
   normal density concrete (147 lbs/ft (3))

cc: Dr. John Spellmeyer
Dr. John Dehner

James G. Kereiakes, Ph.D.
Radiologic Physicist


LINEAR ACCELERATOR
110
BASE ASSEMBLY
FLOOR RECESS
SEE DET.
VERTICAL BEAM
CENTER
MODULATOR
SEE ELEV.
RM.
107
CONTROL
109
CONSOLE
RECESSED
CCTV
CPU AND
KEYBD.
PRINTER
VIDEO
MONITOR
CCTV
STEEL WALL
SHIELD
SAW CUT AND
REMOVE EXIST.
CONC. WALL
CONTROL
111
EXIST. COBALT RM.
EXIST. CONC.
3'-4" M.O.
17'-8"
8'-4"
4'-0"
8'-0"
12'-0"
10'-0"
12'-6"
23'-10"
89'-0"
6'-8"
3'-0"
2'-0"
F.H.C.
N

September 25, 1989

Dr. John Dehner
Radiology Department
Reid Memorial Hospital
Richmond, Indiana

Subject: Radiation Survey of Area Adjoining Co-60 Teletherapy Room

Technique: Radiation survey made of outside area adjoining Co-60 teletherapy room.Measurements made at surface and at 2½ - 3 ft. distance from wall. Measurements made at 2½ - 3 ft. distance are reported here and were used for personnel exposure evaluation. Measurements made using masonite phantom (35 x 40 x 20 cm) placed in primary beam amd using an Eberline E-520 Survey Meter (calibrated 8/7/89 Cs-137 std source). All survey measurements made with beam directed towards side wall made at 30° scatter direction.

Procedure	Max. Survey Reading (mR/hr) 2½ - 3 Ft. from wall
Vertical (towards floor) 36 x 36 cm field, 80 cm SSD	7.5
Vertical (towards floor) 20 x 20 cm field, 80 cm SSD	3.5
Towards wall (30° scatter) 7 x 7 cm field, 80 cm SSD	14.0
Towards wall-breast plate (30° scatter) 10 x 15 cm field, 70 cm SSD	25.0
Towards wall (30° scatter) 9 x 9 cm field, 80 cm SSD	16.0

Procedure	Max. Survey Reading (mR/hr) 2½ - 3 Ft. from wall
Towards wall (30° scatter) 20 x 20 cm field, 80 cm SSD	32.0

James G. Kereiakes, Ph.D.
Radiologic Physicist

September 25, 1989

Dr. John Dehner
Radiology Department
Reid Memorial Hospital
Richmond, Indiana

Subject: Evaluation of Personnel Exposure in Area Adjoining Co-60 Teletherapy Room.

Technique: Radiation Survey measurements made in adjoining area. The measurements at 2½ - 3 ft. distance from wall, along with patient treatment procedures and times were used to estimate maximum personnel exposures. Measurements made using Eberline E-520 Survey Meter (Ser.#524) calibrated 8/7/89 (Cs-137 std. source). Masonite (35 x 40 x 20 cm) placed in beam, 80 cm SSD).

Assumptions (based on patient treatment records for a 1 month period):

1. Average of 18.5 patients/day

   a. Breast (70cm SSD, 10 x 15 cm max field
   4 patients/day, average treatment time = 1 min)
   max survey reading at 3 ft. from wall = 25mR/hr.

   b. Rotation (prostate) (80cm SAD, 9 x 9 cm max field
   2.5 patients/day, average treatment time = 1.2 min/day.)
   max survey reading at 3 ft. from wall = 16mR/hr.

   c. Pelvis (lateral) (80 cm SSD, 20 x 20 cm max field
   6 treatments/day, average treatment time = 1.5 min/day.)
   max survey reading at 3 ft. from wall = 32mR/hr.

   d. AP/PA (vertical) (80 cm ssd, 20 x 20 cm max field
   12 treatments/day, average treatment time = 3 min (6 patients) and 4 min (6 patients))
   max survey reading at 3 ft. from wall = 3.5mR/hr.

Calculated Radiation Level

a. Breast

$$\frac{\text{4 treatments/day x 1 min/treatment}}{\text{60 sec/hr.}} \times 25 \text{ mR/hr} = 1.7 \text{ mR/day}$$

b. Rotation (prostate)

$$\frac{\text{2.5 treatments/day x 1.2 min/treatment}}{\text{60 min/hr.}} \times 16 \text{ mR/hr} = 0.8 \text{ mR/day}$$

c. Pelvis (lateral)

$$\frac{\text{6 treatments/day x 1.5 min/treatment}}{\text{60 min/hr.}} \times 32 \text{ mR/hr} = 4.8 \text{ mR/day}$$

d. AP/PA (vertical)

$$\frac{\text{12 treatments/day x 3.5 min (av)/treatment}}{\text{60 min/hr.}} \times 3.5 \text{ mR/hr} = 2.5 \text{ mR/day}$$

Max personnel exposure (assuming occupancy of 1 at 3 ft. from wall) = 9.8 mR/day.

James G. Kereiakes, Ph.D.
Radiologic Physicist

JGK:we

reid memorial hospital

INTER-DEPARTMENTAL CORRESPONDENCE

DATE: November 15, 1989

TO:

SUBJECT: Measurement of personnel exposure in the area adjacent to present Cobalt 60 room.

COPY TO: Vicki Miller, Mike Walker

Technique: Dosimeter Corporation 500 mR Gamma and X-ray dosimeter model 883, and dosimeter charger 2959 - worn at chest pocket area. The chamber was rezeroed each morning and then read out by me each afternoon. Chamber was given to the Director of Engineer and placed on a construction worker each day.

Readings:

Monday, October 2, 1989 reading	0
Tuesday, October 3, 1989 reading	0
Wednesday, October 4, 1989 reading	0
Thursday, October 5, 1989 reading	0
Friday, October 6, 1989 reading	2 mR. (estimate)
Monday, October 9, 1989 reading	2 mR. (estimate)
Tuesday, October 10, 1989 reading	0
Wednesday, October 11, 1989 reading	0

John R Dehner MD

John R. Dehner, M.D.
Radiologist

JRD/re

reid memorial hospital

INTER-DEPARTMENTAL CORRESPONDENCE

DATE: September 25, 1989

TO: Mike Walker

SUBJECT:

COPY TO: Barney Wood, Tim Lakoff

Mike: Four items.

1. Dr. Kereiakes, our consulting physicist, confirmed that there is a small amount of radiation dose outside the north wall of the Cobalt 60 room and has indicated a cordoned off area 6 feet wide by 20 feet long for the present. He is putting together additional data, which considers the amount of "on time" of the machine, which is only 4 - 5 hours per week -- not 40 hours. So, he may be able to relax this recommendation, but for the present, and may be for the next several weeks, it will continue this way.

2. We have several patients that we need to treat with the beam directed to the north wall and we can not do this while construction workers are anywhere in the area. We will do these treatments "after-hours" starting tomorrow, will start treating these few patients at 3:40 p.m. Please let us know if workers will be remaining in the area after 3:30 p.m.

3. The most important thing is to coordinate the work on the wall between Oberle and our present treatment room. We will do everything possible to help get this accomplished since as soon as the wall goes up the problem is over. Please let us know as far as advanced as possible if you need to work in the area against the Cobalt 60 room wall -- 24 hour notice would really help us. Most of our treatment goes on before 1:00 p.m., so the area is free in the afternoon, or we can stop treatment for a larger portion of the day or all day, several days if necessary. Just let us know the schedule in advance if possible.

4. Our physicists say we need a Z shaped conduit from the treatment room to the control area - through the wall at this point. We looked at the plans but can't tell whether this is in the drawings or not. The cable to the CMS record and verify system could pass through this same conduit.

Thanks, John

John R. Dehner, M.D.

JRD/rke

reid memorial hospital

September 28, 1989

Bill Reicholt
U.S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen, Ellyn, IL 60137

Dear Mr. Reicholt,

During the past couple of months, I have obtained pictures of the former doctor's parking lot, and now the excavation for the Linear Accelerator.

The excavation for the Simulator Room - Examining Room areas was the first area excavated. They worked many weeks in that area, developing footers which extended one floor below Linear Accelerator level.

The area of the north wall of the Cobalt Room was not excavated until sometime after 9-5-89. Workman were not within 1-3 feet of that wall until sometime on or after 9-13-89. The reason we can be so clear about this date, is that work was completely suspended on September 8 and 11 while architectural drawings were elaborated upon. Large electrical conduits were introduced on the far north side of the Linear accelerator excavation on 9/12 and 9/13/89. This morning I confirmed this by speaking to two of the steel worker employees who have worked in that area. They began putting in the "steel mesh" on or after 9-13-89. This was on the Wednesday preceding the NRC inspection on Tuesday, 9-19-89.

I hope you can use the above information.

Sincerely,

John C. Spellmeyer, M.D.

JCS/js

1401 chester boulevard • richmond, indiana 47374 • phone 317 / 983-3000

Susie / Rose

reid memorial hospital

INTER-DEPARTMENTAL CORRESPONDENCE

DATE: October 12, 1989

TO: John R. Dehner M.D., Vicki Miller, R.T. - Technical Manager
Tom P. Glynn, M.D. - Radiation Safety Officer

SUBJECT: South Wall of New Linear Accelerator Room, i.e., North Wall of the Existing Cobalt Structure

COPY TO:

This note is to document that the south wall of the Linear Accelerator room was poured on Wednesday, October 11, 1989, with that "pour" completed by about 1 p.m. A roughly 2 foot thick concrete wall was poured along the south side of the Linear Accelerator room and is immediately contiguous with the north wall of the Cobalt room. This south wall of the Linear Accelerator suite encompasses the entire north wall of the Cobalt room - and then some.

Using a survey meter I have just completed a radiation check of that Linear Accelerator wall located under the metal railing at the loading dock.

The Cobalt unit was set at a 30 x 30 cm field and aimed directly at the north Cobalt wall. From the Linear Accelerator side of that wall, the survey meter was first placed at the wall at its bottom, i.e., at toe height. This was followed by placing the meter directly on the wall at knee height, again at nipple height, and again at 6 feet above the concrete floor. I moved the meter throughout the length of that wall. At no time did I find recordable radiation at any site. The meter was set at its maximum sensitivity, i.e., 0.1.

I then brought the meter back into the Radiation Therapy area to verify that the meter was working - without changing any settings. The meter is clearly working when checked against the front door of the Cesium safe, and when placed around the head of the Cobalt machine.

As I understand it, Dr. Kereiakes will come next Thursday and perform an official physics inspection of that wall. Until Dr. Kereiakes has made his inspection, I have no hesitation or reservation in recommending that routine patient radiation therapy may resume in its usual manner. I have been unable to detect any measurable radiation on the outside of this combined Cobalt north wall/Linear Accelerator south wall.

Sincerely,

John C. Spellmeyer, M.D.

JCS/cm

October 19, 1989

Dr. John Dehner
Radiology Department
Reid Memorial Hospital
Richmond, IN 47374

Subject: Followup Radiation Survey of Area Adjoining Co-60 Teletherapy Room (Following addition of concrete shielding for 6-15 MV X-Ray Unit)

Technique: Radiation survey made of outside area adjoining Co-60 teletherapy room. Measurement made at surface of wall. Measurements made using an Eberline E-520 Survey Meter (calibrated 8/7/89 Cs-137 std source). Survey measurements made with beam directed towards side wall at 30° scatter direction.

Procedure	Max. Survey Reading (mR/hr) wall surface
Towards wall (30° scatter) 32 x 32 cm field, 80 cm SSD	<0.05

James G. Kereiakes, Ph.D.
Radiologic Physicist

JGK:pak

REMITTANCE ADVICE

REID MEMORIAL HOSPITAL
1401 CHESTER BLVD.
RICHMOND, INDIANA 47374

036362

INVOICE NUMBER	INVOICE DATE	P.O. NUMBER	ENTRY DATE	BATCH	GROSS AMOUNT	DISCOUNT	NET AMOUNT
COBALT LICENSE AMENDMENT							
				TOTALS			

THE FIRST NATIONAL BANK
RICHMOND, INDIANA

reid memorial hospital
1401 CHESTER BLVD., RICHMOND, IN. 47374

036362 71-77/749

VENDOR NUMBER	DATE	NET AMOUNT
	11 16 89	***230.00

PAY TO THE ORDER OF

U S NUCLEAR REGULATORY COMM.
REGION 3
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ADMINISTRATOR

TREASURER

⑈036362⑈ ⑆074900770⑆ ⑈42⑈568⑈01⑈

REID MEMORIAL HOSPITAL

1401 CHESTER BLVD.
RICHMOND, INDIANA 47374

REMITTANCE ADVICE

036362

INVOICE NUMBER	INVOICE DATE	P.O. NUMBER	ENTRY DATE	BATCH	GROSS AMOUNT	DISCOUNT	NET AMOUNT
COBALT LICENSE AMENDMENT							
					TOTALS		

THE FIRST NATIONAL BANK

reid memorial hospital

036362

1401 CHESTER BLVD., RICHMOND, IN 47374

VENDOR NUMBER	DATE	NET AMOUNT
	11 16 89	***230.00

U.S. NUCLEAR REGULATORY COMM.
REGION 3
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

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