NRC FORM 313
(7-87)
10 CFR 30, 32, 33, 34, 35 and 40

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED BY OMB
3150-0120
Expires 6-30-90

APPLICATION FOR MATERIAL LICENSE

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATIONS FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF FUEL CYCLE AND MATERIAL SAFETY, NMSS
WASHINGTON, DC 20555

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS. IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION I
NUCLEAR MATERIALS SAFETY SECTION B
631 PARK AVENUE
KING OF PRUSSIA, PA 19406

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION II
NUCEAR MATERIALS SAFETY SECTION
101 MARIETTA STREET, SUITE 2900
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION III
MATERIALS LICENSING SECTION
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
MATERIAL RADIATION PROTECTION SECTION
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TX 76011

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVADA, OREGON, WASHINGTON, AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION V
NUCLEAR MATERIALS SAFETY SECTION
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CA 94596

APR 7 1989

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTION.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- [ ] A. NEW LICENSE
- [X] B. AMENDMENT TO LICENSE NUMBER 35-14145-02
- [ ] C. RENEWAL OF LICENSE NUMBER _____

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include Zip Code)*

Norman Regional Hospital
P.O. Box 1308
901 N. Porter Street
Norman, OK 73070-1308

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Norman Regional Hospital
P.O. Box 1308
901 N. Porter Street
Norman, OK 73070-1308

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

David W. Anderson, Ph.D.

TELEPHONE NUMBER: (918) 599-5042

SUBMIT ITEMS 5 THROUGH 11 ON 8½ x 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL. a. Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time.	6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.
7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE.	8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.
9. FACILITIES AND EQUIPMENT.	10. RADIATION SAFETY PROGRAM.
11. WASTE MANAGEMENT.	12. LICENSEE FEES *(See 10 CFR 170 and Section 170.31)* FEE CATEGORY 7A AMOUNT ENCLOSED $ 350.00

13. CERTIFICATION *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, AND 40 AND THAT ALL INFORMATION CONTAINED HEREIN, IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948, 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

SIGNATURE-CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
Craig W. Jones	Craig W. Jones	Administrator	3/15/89

9001310317 890509
REG4 LIC30
35-14145-02 PDR

462508

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS	APPROVED BY
Amd	Apr 2-17	EX 7A	FEE EXEMPT	
AMOUNT RECEIVED	CHECK NUMBER			DATE
$350	65551	Amendment 170.11(a)(4) Only		4/20/89

Refer to Item 9 - Facilities and Equipment

9.1 The plan and elevation views which are included contain the information for the pertinent points utilized. The room entrance is shown (door has ¼" lead core) and there are no viewing windows. A 3" diameter conduit for physics cables goes through the wall in an area outside the primary barrier but it enters at about 3' above the floor and exits at floor level. Voids for heating ducts and electrical conduits will be at a height of 10 feet or more above the doorway or in the floor. There is no path for line of sight scatter through the walls and no path at all in the primary beam area.

9.2 The patient viewing system will be a closed circuit TV camera with monitor. Audible communication will be included with a two way intercom. If the TV system malfunctions, patients will not be treated until a spare TV system is installed by the biomedical electronics service department or until the equipment is repaired. Patients can be treated with the linear accelerator in the adjacent room in the interim if necessary.

9.3 With reference to interlocks and restricted areas, note the following:

a. The teletherapy room door will be equipped with an interlock switch which automatically causes the source to be moved to the off position when the door is opened. The source cannot be returned to the on position unless the door is closed and the switch on the console is reactivated.

b. A red light which comes on to warn when the source is on will be located above the teletherapy room door. A warning sign compatible with 10CFR 20.203 will be posted on the entry way to the teletherapy machine.

c. The restricted areas around the teletherapy unit will be controlled by the radiation therapy technologist on duty. The door to the teletherapy room will be locked after hours. The area of the teletherapy unit and accelerators is out of the stream of traffic in the hospital and in a corner by itself.

d. There will be a low KVp superficial x-ray machine in the room with the ^{60}Co unit. Only one machine will be operated at a time.

9.4 The unit contains a counterweight barrier beam stop. However in this case the barriers in the sidewalls and ceiling are sufficient without the counterweight barrier. In any case the head interlocks will be set so the source can be brought to the on position when the head angle is less than 10^{o} from vertical downward position, left or right. The head cannot be rotated front or back away from the barrier.

9.5 Shielding Evaluation

For the workload we assume 20 patients treated/day, 5 days/week, at 234 rad (or cGy)/min at 80 cm (axis distance) or 150 rad (or cGy)/min at 1 m from the source. The maximum strength source that can be used is 9000 RHM. Note that a patient load of twenty is larger than likely for this machine since a linear accelerator housed next door will do the bulk of the treatments. The average source on time will be about 1.28 minutes/patient to deliver 200 rad (cGy)/min at 66.7 percent average depth dose. The backstop barrier transmission is 0.001. The head will be locked on the barrier, but can be rotated away from the barrier $\leq 10^{o}$ right or left(very occasionally). Therefore the beam can only be on while it still strikes the floor. Because of this we do not consider routine wall and ceiling load without the backstop

transmission.

We use 90° scatter data in calculations even though sidewall scatter may come at different angles especially for oblique treatments. The 90° scatter is sufficient since oblique treatments are most often given with a pair of antiparallel beam directions and larger angle scatter is thereby balanced by smaller angle scatter. For example, 30° scatter will be balanced by 150° scatter and the average effect is similar to 90° scatter.

Source on time

20 patients/day (5 days/wk) 1.28 min/patient = 128 min/wk

Leakage dose

2.0 mr/hr (168 hr/wk) = 336 mr/wk at 1m

Scattered dose (90° fraction)

234 r/min (128 min/wk) 1000 mr/r (0.0009) = 27,000 mr/wk at 1m

Primary dose (with barrier backstop factor)

150 r/min (128 min/wk) 1000 mr/r (0.001) = 19,200 mr/wk at 1m

The use factor for the beam directions is estimated utilizing the fact that anterior-posterior paired fields are used twice as much as right and left lateral pairs.

u (floor) = 1/3, u (ceiling) = 1/3

u (L wall) = 1/6, u (R wall) = 1/6

The floor is on the dirt underground, and the ceiling is an uninhabited roof area with no direct access. Thus we consider it unrestricted with T = 1/16.

The room shielding was designed for a high energy accelerator and so the radiation levels for the ^{60}Co gamma rays outside the walls are very low. As shown in the calculations, there are no restricted areas where the

exposure is 100 mR/wk and no unrestricted areas where the exposure is as much as 10 mR/wk. Furthermore there is no place outside of the room where the exposure rate is as much as 2 mR for any one hour of use.

After installation of the ^{60}Co teletherapy unit with the source, and before any other tests or use of the beam is made, a survey of the premises as required by 10CFR 20.201 will be made by a qualified expert (David W. Anderson, Ph.D.) prior to clinical usage. Operation under unsafe conditions will not be allowed. A prompt survey report will be sent to the USNRC.

The medical physicist will be responsible for ensuring that the technologists and other employees are aware of the contents of 10 CFR 19.12. The physicist will personally instruct the radiation therapy technologists about details of 10 CFR 19.12 and post NRC Form 3 (Notice to Employees) in a conspicuous area. In addition, emergency procedures from Appendix I, 1985 Draft Licensing Guide FC 414-4 will be posted near the doorway to the teletherapy room.

We will adhere to the regulations in 10 CFR 20.202. In particular, all individuals except the patient are always kept out of the treatment room with source out. None of the patients or hospital personnel will not be allowed to stand by the room door with the source on. All employees regularly working in the vicinity of the teletherapy room in the restricted area will be required to wear a radiation monitor body badge.

DW Anderson

NORMAN REGIONAL HOSPITAL
Norman, OK
^{60}Co Teletherapy Room Calculations

Position	Radiation Type	Factor Inv. Sq.	Factor U	Unshielded mr/wk	Factor * Attenuation	Shielded mr/wk	Dose Rate (mr in any hour)
1 (u)	PB		0	0		0	
	S	0.022	1	594	9×10^{-8}	<0.01	<0.01
	L	0.022	1	7	1×10^{-4}	<0.01	
2 (u)	PB	0.020	1/6	64	3×10^{-5}	<0.01	
	S	0.027	1	729	6×10^{-9}	<0.01	<0.01
	L	0.027	1	9	3×10^{-5}	<0.01	
3 (u)	PB		0	0		0	
	S	0.017	1	459	1×10^{-5}	0.01	0.01
	L	0.017	1	6	2×10^{-3}	0.01	
						0.02	
4 (r)	PB		0	0		0	
	S	0.016	1	432	2×10^{-4}	0.09	0.07
	L	0.016	1	5	1×10^{-2}	0.05	
						0.14	
5 (r)	PB		0	0		0	
	S	0.019	1	513	1×10^{-10}	<0.01	<0.01
	L	0.019	1	6	3×10^{-6}	<0.01	
6 (r)	PB		0	0		0	
	S	0.022	1	594	5×10^{-9}	<0.01	
	L	0.022	1	7	2×10^{-5}	<0.01	<0.01
	SM	(0.025)(0.024)	1	9	5×10^{-9}	<0.01	
7 (r)	PB		0	0		0	
	S	0.042	1	1134	4×10^{-8}	<0.01	<0.01
	L	0.042	1	14	8×10^{-5}	<0.01	
8 (r)	PB	0.036	1/6	115	1×10^{-6}	<0.01	
	S	0.054	1	1458	3×10^{-11}	<0.01	<0.01
	L	0.054	1	18	1×10^{-6}	<0.01	
9 (r)	PB		0	0		0	
	S	0.042	1	1134	4×10^{-8}	<0.01	<0.01
	L	0.042	1	14	8×10^{-5}	<0.01	
10 (r)	PB		0	0		0	
	S	0.047	1	1269	4×10^{-6}	0.01	0.015
	L	0.047	1	16	1×10^{-3}	0.02	
						0.03	
11 (r)	PB		0	0		0	
	S	0.047	1	1269	4×10^{-6}	0.01	0.015
	L	0.047	1	16	1×10^{-3}	0.02	
						0.03	

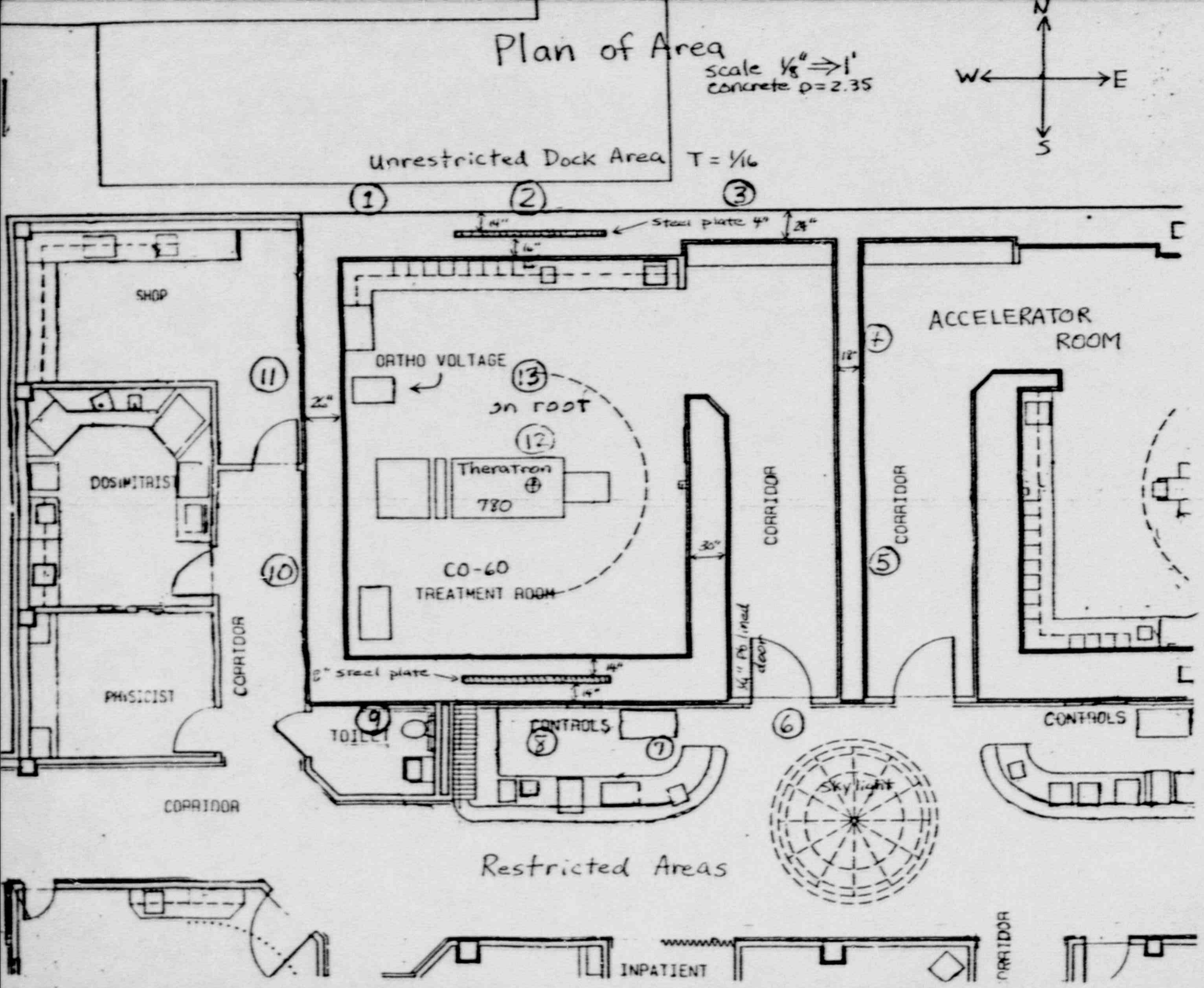
Position	Radiation Type	Factor Inv. Sq.	Factor U	Unshielded mr/wk	Factor * Attenuation	Shielded mr/wk	Dose Rate mr in any hour
12 (u)	PB	0.052	1/3	333	$1x10^{-6}$	<0.01	
	S	0.087	1	2345	$3x10^{-11}$	<	<0.01
	L	0.087	1	29	$1x10^{-6}$	<0.01	
13 (u)	PB		0	0		0	
	S	0.082	1	2214	$3x10^{-11}$	<0.01	<0.01
	L	0.082	1	27	$1x10^{-6}$	<0.01	

KEY

PB primary (with) barrier
S scatter
SM scatter (down) maze
L leakage

(r) restricted
(u) unrestricted
* From NCRP49, pp 59, 95, 101, 102

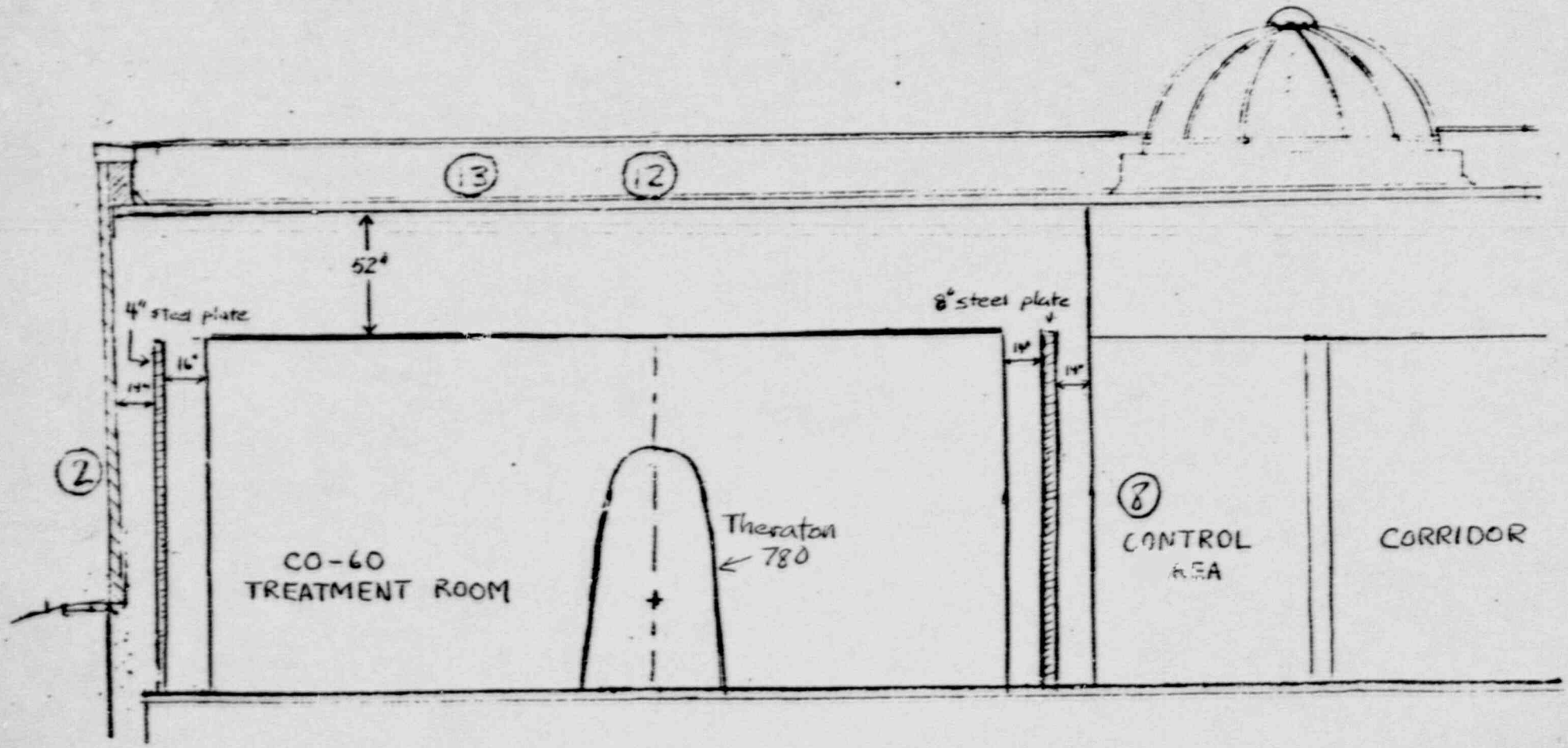
For maze $x=10^{-2}$ $A=14m^2$


Plan of Area
scale 1/8" ⇒ 1'
concrete ρ = 2.35
N
W
E
S
Unrestricted Dock Area
T = 1/16
1
2
3
14"
16"
Steel plate 4"
24"
SHOP
ORTHO VOLTAGE
13
on roof
12
Theratron
780
ACCELERATOR
ROOM
4
12"
11
22"
DOSIMITRIST
10
CO-60
TREATMENT ROOM
36"
CORRIDOR
CORRIDOR
5
PHYSICIST
CORRIDOR
8" steel plate
4"
14"
1/4" Pb lined door
9
TOILET
CONTROLS
8
7
6
CONTROLS
Skylight
Restricted Areas
INPATIENT
CORRIDOR

Elevation of Area

scale 3/16" ⇒ 1'
Concrete ρ = 2.35

N ⟷ S



Qualification Statement, Physicist

Teletherapy Calibrations

Title 10 CFR Section 35

David W. Anderson, Ph.D., FACR
7419 S. Maplewood
Tulsa, OK 74136

Home: (918) 492-6136
Office: (918) 599-5044

A. Certified: Radiological Physics (including Rad. Therapy Physics, Nuclear Medicine Physics, Diagnostic X-Ray Physics) by American Board of Radiology, 1975

B. Degree: Ph.D., Nuclear Physics, Iowa State University, 1965

C. Experience: 20 years in therapeutic radiological physics. Currently physicist of record on teletherapy licenses 35-10669-01, 35-14145-02, 35-14042-02.

462508

K & S ASSOCIATES, INC.
1926 ELM TREE DRIVE
NASHVILLE, TENNESSEE 37210

ACCREDITED DOSIMETRY CALIBRATION LABORATORY

CALIBRATION REPORT

SUBMITTED BY: CITY OF FAITH MEDICAL CENTER
8181 SOUTH LEWIS
TULSA, OKLAHOMA 74136

INSTRUMENT: VICTOREEN 550-6A, # 260
VICTOREEN 500, # 366

REPORT NO.: 1661

TEST NO.: 88370

DATE: NOVEMBER 21, 1988

K & S Associates, Inc. certifies that the CALIBRATION FACTORS specified herein were obtained by intercomparison with instruments calibrated by, or directly traceable to, the National Bureau of Standards. K & S Associates, Inc. further certifies that it is licensed by the State of Tennessee (R-19075-C91) to perform calibrations, that it is recognized by the American Association of Physicists in Medicine as an ACCREDITED DOSIMETRY CALIBRATION LABORATORY, and that it is a participant in an annual Quality Assurance program conducted by the National Bureau of Standards.

The CALIBRATION FACTORS stated herein are only valid at the K & S laboratory facility at the time and under the conditions specified. It is the instrument user's responsibility to perform the appropriate constancy tests prior to shipment and after return from calibration. It is also the responsibility of the user to assure that the interpretation of the information in this report is consistent with that intended by K & S Associates, Inc.

K & S ASSOCIATES, INC.

DOSIMETER SYSTEM CALIBRATION

11/15/88

ELECTROMETER:
Mfgr: Victoreen
Model No. 500
Serial No. 366

SUBMITTED BY:
City of Faith Medical Center
Tulsa, Oklahoma

CHAMBER:
Mfgr: Victoreen
Model No. 550-6A (.33 ml)
Serial No. 260

ORIENTATION:
serial number toward source

SCALES, SWITCH POSITIONS, CONDITIONS:

ON; PROBE VOLUME (c.c.): .33; PROBE INPUT: COAX
ELECTRODE BIAS: REV. NORM; lights: COAX, OUTER POS
TEST: +360 V; RANGE: 2; FUNCTION: EXPOSURE; indication: 0.33 cc, R

POLARIZING POTENTIAL: +356 V

SYSTEM LEAKAGE: -1.1×10^{-14} A

BEAM QUALITY HVL (mm)	H.C.	KVp	EXPOSURE RATE	SCD (cm)	CALIBRATION FACTOR	CLASS
3.90 Al	.71	102	14.8 R/min	50	0.952 R/RDG	II
*Co-60	---	----	83.39 R/min	74	0.955 R/RDG	II

COMMENTS: * with 550-6-20

Reviewed by: Thomas W. Stacy
Title: Director

Checked by: VD LGB

Log C-13 Page(s) 13
Log I-14 Page(s) 145
Log Page(s)
Log Page(s)

K & S ASSOCIATES, INC.

IONIZATION CHAMBER CALIBRATION

11/15/88

SUBMITTED BY:
City of Faith Medical Center
Tulsa, Oklahoma

CHAMBER:
Mfgr: Victoreen
Model No. 550-6A (.33 ml)
Serial No. 260

ORIENTATION / CONDITIONS:

Serial number toward source

ION COLLECTION EFFICIENCY (A_{ion}): 1.000

POLARIZING POTENTIAL: +356 V CHAMBER LEAKAGE: +1.0 x 10^{-15} A

BEAM QUALITY HVL (mm)	H.C.	kVp	EXPOSURE RATE	SCD (cm)	CALIBRATION FACTOR	CLASS
3.90 Al	.71	102	14.6 R/min	50	9.313 x 10^{9} R/C	II
*Co-60	---	---	83.4 R/min	74	9.344 x 10^{9} R/C	II

COMMENTS: * with 550-6-26

Reviewed by: Thomas W. Cosy

Title: Director

Checked by: VD LCB

Log C 13 Page(s) 13
Log 1-14 Page(s) 145
Log Page(s)
Log Page(s)

ELECTROMETER CALIBRATION

11/14/88

SUBMITTED BY:
City of Faith Medical Center
Tulsa, Oklahoma

INSTRUMENT:
Manufacturer: Victoreen
Model No. 500
Serial No. 366

SCALES, SWITCH POSITIONS, CONDITIONS:

ON: FUNCTION: EXPOSURE: RANGE: 1, 2, 3 or AUTO
ELECTRODE BIAS: REV, NORM: PROBE VOLUME (c.c.): COAX
lights: COAX, OUTER HUS: TEST: +360 V

POLARIZING POTENTIAL: +356 V

LEAKAGE: -1.1×10^{-14} A

LINEARITY: within +/- 0.1 % of full range or the precision of the reading, whichever is greater, except as noted.

CHARGE CALIBRATION FACTOR:

PROBE VOLUME (c.c.)	indication	FACTOR (C/unit of reading)
ELECTROM	nC	1.022 C/RDG
.33	R, 0.33 cc	1.022×10^{-10} C/RDG

COMMENTS:

Reviewed by: Thomas B. Grasty Log E-8 Page(s) 190

Title: Director Checked by: VD LGB

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