NRC Form 313T (2-82) 10 CFR 35

U.S. NUCLEAR REGULATORY COMMISSION

Approved by OMB 3150-0091 Expires 1-31-85

# APPLICATION FOR MATERIALS LICENSE — TELETHERAPY

**INSTRUCTIONS** — Complete Items 1 through 22 if this is an initial application or an application for renewal of a license. Use supplemental sheets where necessary. Item 22 must be completed on all applications and signed. Retain one copy. Submit original and one copy of entire application to: Director, Office of Nuclear Materials Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Upon approval of this application, the applicant will receive a Materials License. An NRC Materials License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Parts 19, 20, 21, and 35 and the license fee provision of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 22 and the appropriate fee enclosed.

**1.a. NAME AND MAILING ADDRESS OF APPLICANT** *(Institution, firm, clinic, physician, etc.)* INCLUDE ZIP CODE

ST. MARY'S MEDICAL CENTER
3700 WASHINGTON AVENUE
EVANSVILLE, IN 47750

TELEPHONE — AREA CODE (812) NUMBER 479-4000

**1.b. STREET ADDRESS(ES), ACTUAL LOCATION OF TELETHERAPY SOURCE, INCLUDING BUILDING NAME, ROOM NUMBER, ETC.**

RADIATION ONCOLOGY
ST. MARY'S MEDICAL CENTER
3700 WASHINGTON AVENUE
EVANSVILLE, IN 47750

**2. PERSON TO CONTACT REGARDING THIS APPLICATION**

SAIYID M. SHAH, PH.D.

TELEPHONE — AREA CODE (812) NUMBER 479-4874

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

- [ ] a. NEW LICENSE
- [ ] b. AMENDMENT TO LICENSE NO. _____
- [XX] c. RENEWAL OF LICENSE NO. 13-03226-03

**4. INDIVIDUAL USERS** *(Name individuals who will use or directly supervise use of radioactive material. Complete Supplements A and B for each individual.)*

ALVIN KORBA, M.D.
SHANNON S. LAMB, M.D.
THOMAS P. HAYES, M.D.
ALY RAZEK, M.D.

**5. RADIATION SAFETY OFFICER (RSO)** *(Name of person designated as radiation safety officer. If other than individual user, complete resume of training and experience as in Supplement A.)*

SAIYID M. SHAH, PH.D.

**6. SEALED SOURCES TO BE USED IN TELETHERAPY UNITS** *(Attach supplemental pages if necessary)*

| | BYPRODUCT MATERIAL (Element and Mass No.) | NAME OF SOURCE MANUFACTURER | SOURCE MODEL NUMBER | MAXIMUM ACTIVITY PER SOURCE | NUMBER OF SOURCES |
|---|---|---|---|---|---|
| A. | Cobalt-60 | AECL | C-146 or C-151 | 12,000Ci | 2 |
| B. | | | | | |
| C. | | | | | |

Applicant ... 021500 ...
Check No. ... 350 ...
Amount Fee Category ... 3R20D ...
Type of Fee ...
Date Check Rec'd 9/4/84
Received By ...

**7. TELETHERAPY UNITS** *(Attach supplemental pages, if necessary)*

| | NAME OF MANUFACTURER (Include description, if unit is custom made) | MODEL NUMBER |
|---|---|---|
| A. | AECL | THERATRON 780 |
| B. | | |
| C. | | |

RECEIVED BY LFMS
Date 9/4/84
Log Sept 2 TV
By
Orig. To
Action Compl

**8. USE** *(Attach supplementary pages, if necessary)*

| A | B | C | |
|---|---|---|---|
| X | | | HUMAN USE ONLY |
| | | | HUMAN AND OTHER USE (Specify on separate sheet) |

HUMAN USE ONLY

8507290617 850702
REG3 LIC30
13-03226-03 PDR

**9. PERSONNEL MONITORING DEVICES**

| | TYPE (Check and/or complete as appropriate) | SUPPLIER (Service Company) | EXCHANGE FREQUENCY |
|---|---|---|---|
| X | (1) FILM BADGE – WHOLE BODY | R.S. LANDAUER, JR. & CO. | MONTHLY |
| | (2) THERMOLUMINESCENT DOSIMETER (TLD) – WHOLE BODY | | |
| | (3) OTHER (Specify) Finger (TLD) Neck (Film) | R.S. LANDAUER, JR. & CO. | MONTHLY |

Control No. 77382

## INFORMATION REQUIRED FOR ITEMS 10 THROUGH 21

For Items 10 through 21, check the appropriate box(es) and submit a detailed description of all the requested information. Begin each item on a separate sheet. Identify the item number and the date of the application in the lower right corner of each page. If you indicate that an appendix to the teletherapy licensing guide will be followed, do not submit the pages, but specify the revision number and date of the referenced guide: Regulatory Guide 10. Rev. _____ Date: _____

| | |
|---|---|
| 10. MEDICAL ISOTOPE COMMITTEE | 15. BEAM STOPS |
| X Names and specialties attached; and *(check one)* | X Description of stops used to restrict beam orientation attached. |
| a. Duties as in Appendix A, or | 16. SHIELDING EVALUATION |
| X b. Equivalent duties attached. | Evaluation of proposed shielding attached. |
| 11. TRAINING AND EXPERIENCE | 17. OPERATING AND EMERGENCY PROCEDURES |
| a. Supplements A & B attached for each individual user; and | X a. Description of operating procedures attached; and |
| b. Supplement A attached for RSO, | X b. Copy of emergency procedures attached. |
| 12. INSTRUMENTATION *(check one)* | 18. INSTRUCTION OF PERSONNEL *(check one)* |
| a. Appendix C form attached, or | X a. Training program and schedule in Appendix H followed, or |
| X b. List manufacturer's name and model number. | b. Description of instruction program for employees attached. |
| 13. CALIBRATION OF INSTRUMENTS *(check one)* | 19. LEAK TESTS OF SEALED SOURCES |
| a. Appendix D, Part 2 procedures followed for instrumentation calibration, or | X Description of leak-test procedures attached. |
| X b. Description of sources, calibration frequency and equivalent procedures attached. | 20. QUALIFIED EXPERT *(Use only if the individual fails to meet 10 CFR 35.24 requirements.)* |
| 14. FACILITIES AND EQUIPMENT | Statement of qualifications of the expert who will perform teletherapy calibrations attached. |
| a. Description and drawing of facilities attached, and | 21. ALARA PROGRAM *(check one)* |
| X b. Description of patient viewing and communicating systems attached; and | ALARA Program as in Appendix I, or |
| c. Description of area safeguards attached. | X Equivalent ALARA Program attached. |

### 22. CERTIFICATE

*(This item must be completed by the applicant)*

The applicant and any official executing this certificate on behalf of the applicant named in Item 1a certifies that this application is prepared in conformity with Title 10, Code of Federal Regulations, Parts 30 and 35, and that all information contained herein, including supplements attached hereto, is true and correct to the best of our knowledge and belief.

| | |
|---|---|
| a. LICENSE FEE REQUIRED *(See section 170.31, 10 CFR 170)* | b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)* Joseph R Payne |
| | (1) NAME *(Type or print)* Joseph Payne |
| (1) LICENSE FEE CATEGORY Renewal | (2) TITLE Assistant Administrator |
| (2) LICENSE FEE ENCLOSED $ $350.00 | c. DATE AUG 23 1984 Control No. 77382 |

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.

10. List of the Radiation Safety Committee

The following is the list of the members of the Radiation Safety Committee:

| | |
|---|---|
| 1. Don E. Pruitt, M.D. (Chairman) | Radiology |
| 2. Thomas Cook, M.D. | Radiology |
| 3. Alvin Korba, M.D. | Radiation Oncology |
| 4. Saiyid Shah, Ph.D. (Physicist, Radiation Safety Officer) | Radiation Oncology |
| 5. Joseph Payne | Administration |
| 6. Carol Sauer, R.N. | Cath. Lab |
| 7. Barbara Nettles, R.N. | Radiation Oncology |
| 8. Paul Luttrull, R.T. | Nuclear Medicine |
| 9. Mark Laurent, B.S., R.T. | Radiology |
| 10. Alisa Spencer, R.N. | Nursing |

Item 10

Date: AUG 2 3 1984

St. Mary's Medical Center
Evansville, IN

## RADIATION SAFETY COMMITTEE

PURPOSE: (i) To review all aspects of the use of ionizing radiation within the medical center and to insure radiation safety is maintained. (ii) Keeping the exposure as low as reasonably achievable (ALARA).

## RESPONSIBILITIES

In addition to the functions described in the "program for maintaining occupational radiation exposure ALARA" as submitted to NRC in connection with the radioactive license (Appendix A) the following will be the responsibilities:

a - Be familiar with all pertinent NRC regulations in terms of license and information submitted in support of the request for the license and its amendments.

b - Insure that the radioactive material licenses are amended, when necessary, prior to any changes in facilities, equipment, policies, procedures and personnel.

c - Develop regulations for the use, transport, storage and disposal of radioactive materials used in this medical center.

d - Recommend remedial action when there is failure to observe radiation safety rules, regulations and recommendations.

e - Establish rules to guide nursing and other individuals who are in contact with patients receiving therapeutic amounts of radioactive materials, rules relating to the discharge of such patients, and rules to protect personnel involved when such patients undergo surgical procedures or autopsy.

f - Review and approve all requests for use of radioactive material within the medical center.

g - Review the entire radiation safety program at least annually to determine that all activities are being conducted safely and in accordance with NRC regulations and the conditions of the license.

h - Maintain written records of all committee meetings, actions, recommendations, and decisions.

## MEETING FREQUENCY

The Radiation Safety Committee shall meet as often as necessary to conduct its business, but not less than once in each calendar quarter.

Item 10b.

Date: AUG 23 [illegible]

DELEGATION OF AUTHORITY

1- The Radiation Safety Committee will delegate authority to the Radiation Safety Officer for enforcement of the rules and regulations pertaining the radiation safety and the requirements of the radioactive licenses.

2- The Radiation Safety Committee will support the Radiation Safety Officer in those instances where it is necessary for The RSO to assert his/her authority. Where the RSO has been over ruled, the committee will record the basis for its action in the minutes of the committee's quarterly meeting.

DUTIES OF THE RADIATION SAFETY OFFICER

In addition to the duties prescribed for the radiation safety officer in the "Program for maintaining occupational radiation exposure ALARA" as submitted to NRC in connection with the radioactive license application (Appendix A), the following will be the duties:

a- Evaluation of radiation areas and procedures so as to ensure that all radiation work is performed without undue exposure to anyone.

b- To check various facilities, whenever necessary, to make sure that protective barriers are adequate and have structural integrity.

c- On the basis of the type, amount of work performed and the environment, to advise which areas are to be designated as controlled and which persons are to be catagorized as radiation workers.

d- To review and maintain the radiation exposure history of every individual classified as a radiation worker such records are available to the worker upon request.

e- Be available for consultation on all aspects of radiation safety.

f- To correspond and deal with all the regulatory agencies in connection with radioactive material licensing, radiation safety and related matters.

g- To evaluate the records/procedures of the departments using radioactive materials/radiation to insure compliance with the applicable rules and regulations of the relevant regulatory agencies.

Item 10b.

Date: AUG 2 3 1984

Duties---continued

h - To coordinate the radioactive decontamination procedures with the emergency department team in the event of a radiation disaster.

i - To coordinate all in-service radiation safety education activities.

Item 10b.

Date: AUG 23 1..

APPENDIX A

# PROGRAM FOR MAINTAINING OCCUPATIONAL RADIATION EXPOSURES AT MEDICAL INSTITUTIONS ALARA

## MANAGEMENT COMMITMENT

The management of this hospital is committed to the program described herein for keeping exposures (individual and collective) as low as is reasonably achievable (ALARA). In accord with this commitment, an administrative organization for radiation safety as well as written policy, procedures, and instructions to foster the ALARA concept within this institution is described. The organization will include the Radiation Safety Committee (RSC) and a Radiation Safety Officer (RSO).

Formal annual review of the radiation safety program, including ALARA considerations will be performed. This shall include reviews of operating procedures and past exposure records, inspections, etc., and consultations with hte radiation protection staff or outside consultants.

Modification to operating and maintenance procedures and to equipment and facilities will be made where they will reduce exposures unless the cost is considered to be unjustified.

In addition to maintaining doses to individual as far below the limits as is reasonably achievable, the sum of the doses received by all exposed individuals will also be maintained at the lowest practicable level. It would not be desirable, for example, to hold the highest doses to individuals to some fraction of the applicable limit if this involved exposing additional people and significantly increasing the sum of radiation doses received by all involved individuals.

## RADIATION SAFETY COMMITTEE (RSC)

Review of Proposed Users and Uses

(1) The RSC will thoroughly review the qualifications of each applicant with respect to the types and quantities of materials and uses for which he has applied to ensure that the applicant will be able to take appropriate measures to maintain esposure ALARA.

(2) When considering a new use of byproduct material, the RSC will review the efforts of the applicant to maintain exposure ALARA. The user should have systematized procedures to ensure ALARA and shall have incorporated the use of special equipment such as syringe shields, rubber gloves, etc., in his proposed use.

(3) The RSC will ensure that the user justifies his procedures and that doses will be ALARA (individual and collective).

Item 10b.

Date: AUG 23 1984

Delegation of Authority

(1) The RSC will delegate authority to the RSO for enforcement of the ALARA concept.

(2) The RSC will support the RSO in those instances where it is necessary for the RSO to assert his/her authority. Where the RSO has been overruled, the Committee will record the basis for its action in the minutes of the Committee's quarterly meeting.

Review of ALARA Program

(1) The RSC will encourage all users to review current procedures and develop new procedures as appropriate to implement the ALARA concept.

(2) The RSC will perform a quarterly review of cooupational radiation exposure with particular attention to instances where Investigational Levels in Table 0-1 below are exceeded. The principal purpose of this review is to assess trends in occupational exposure as an index of the ALARA program quality and to decide if action is warranted when Investigational Levels are exceeded (See section 6).**

(3) The RSC will evaluate our institution's overall efforts for maintaining exposures ALARA on an annual basis. This review will include the efforts of the RSO, authorized users, and workers as well as those of management.

RADIATION SAFETY OFFICER (RSO)

Annual and Quarterly Review

(1) Annual review of the radiation safety program. The RSO will perform an annual review of the radiation safety program for adherence to ALARA concepts. Reviews of specific procedures may be conducted on a more frequent basis.

(2) Quarterly review of occupational exposures. The RSO will review at least quarterly the external radiation exposures of authorized users and workers to determine that their exposures are ALARA in accordance with the provisions of this program.

(3) Quarterly review of records of radiation level surveys. The RSO will review radiation levels in unrestricted and restricted areas to determine that they were at ALARA levels during the previous quarter.

Item 10b.
Date: AUG 2 3 1984

**The NRC has emphasized that the Investigational Levels in this program are not new dose limits but, as noted in ICRP Report 26, "Recommendations of the International Commission on Radiological Protection, "serve as check points above which the results are considered sufficiently important to justify further investigations.

Education Responsibilities for ALARA Program

(1) The RSO will schedule briefings and educational sessions to inform workers of ALARA program efforts.

(2) The RSO will ensure that authorized users, workers, and ancillary personnel who may be exposed to radiation will be instructed in the ALARA philosophy and informed that management, the RSC, and the RSO are committed to implementing the ALARA concept.

Cooperative Efforts for Development of ALARA Procedures

Radiation Workers will be given opportunities to participate in formulation of the procedures that they will be required to follow.

(1) The RSO will be in close contact with all users and workers in order to develop ALARA procedures for working with radioactive materials.

(2) The RSO will establish procedures for receiving and evaluating the suggestions of individual workers for improving health physics practices and will encourage the use of those procedures.

Reviewing Instances of Deviation from Good ALARA Practices

The RSO will investigate all known instances of deviation from good ALARA practices and, if possible, will determine the causes. When the cause is known, the RSO will require changes in the program to maintain exposures ALARA.

AUTHORIZED USERS

New procedures Involving Potential Radiation Exposures

(1) The authorized user will consult with, and receive the approval of, the RSO and/or RSC during the planning stage before using radioactive materials for a new procedure.

Item 10b.

Date: AUG 23 1984

(2) The authorized user will evaluate all procedures before using radioactive materials to ensure that exposures will be kept ALARA. This may be enhanced through the application of trial runs.

Responsibility of Authorized User to Persons Under His/Her Supervision

(1) The authorized user will explain the ALARA concept and his/her commitment to maintain exposures ALARA to all persons under his/her supervision.

(2) The authorized user will ensure that persons under his/her supervision who are subject to occupational radiation exposure are trained and educated in good health physics practices and in maintaining exposures ALARA.

PERSONS WHO RECEIVE OCCUPATIONAL RADIATION EXPOSURE

The worker will be instructed in the ALARA concept and its relationship to working procedures and work conditions.

The worker will know what recourses are available if he/she feels that ALARA is not being promoted on the job.

ESTABLISHMENT OF INVESTIGATIONAL LEVELS IN ORDER TO MONITOR INDIVIDUAL OCCUPATIONAL EXTERNAL RADIATION EXPOSURES

This institution hereby establishes Investigational Levels for occupational external radiation exposure which, when exceeded, will initiate review or investigation by the RSC and/or the RSO. The Investigational Levels that we have adopted are listed in Table I below. These levels apply to the exposure of individual workers.

TABLE I

| | Investigational Levels (mrems per calendar quarter) | |
|---|---|---|
| | Level I | Level II |
| 1. Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads | 125 | 375 |
| 2. Hands and forearms; feet and ankles | 1875 | 5625 |
| 3. Skin of whole body* | 750 | 2250 |

*Not normally applicable to nuclear medicine operations except those using significant quantities of beta-emitting isotopes.

The Radiation Safety Officer will review and record on Form NRC-5 "Current Occupational External Radiation Exposures", or an equivalent form (e.g., dosimeter processor's report), results of personnel monitoring not less than once in any calendar quarter as required by 20.401 of 10CFR Part 20. The following actions will be taken at the Investigational Levels as stated in Table I:

Quarterly exposure of individuals to less than Investigational Level I.

Except when deemed appropriate by the RSO, no further action will be taken in those cases where an individual's exposure is less than Table I values for the Investigational Level I.

Personnel exposures equal to or greater than Investigational Level I, but less than Investigational II.

The RSO will review the exposure of each individual whose quarterly exposures equal or exceed Investigational Level I and will report the results of the reviews at the first RSC meeting following the quarter when the exposure was recorded. If the exposure does not equal or exceed Investigational Level II, no action related specifically to the esposure is required unless deemed appropriate by the Committee. The Committee will, however, consider each such exposure in comparison with those of others performing similar tasks as an index of ALARA program quality and will record the review in the Committee minutes.

Exposure equal to or greater than Investigational Level II.

The RSO will investigate in a timely manner the causes(s) of all personnel exposures equaling or exceeding Investigational Level II and, if warranted, will take action. A report of the investigation, actions, if any, and a copy of the individual's Form NRC-5 or its equivalent will be presented to the RSC at the first RSC meeting following completion of the investigation. The details of these reports will be recorded in the RSC minutes. Committee minutes will be sent to the management of this institution for review. The minutes, containing details of the investigation, will be made available to NRC inspectors for review at the time of the next inspection.

Reestablishment of an individual occupational worker's Investigational Level II to a level above that listed in Table I.

In cases where a worker's or a group of workers' exposures need to exceed Investigational Level II, a new, higher Investigational Level II may be established on the basis

that it is consistent with good ALARA practices for that individual or group. Justification for a new Investigational Level II will be documented.

The RSC will review the justification for, and will approve, all revisions of Investigational Level II. In such cases, when the exposure equals or exceeds the newly established Investigational Level II. those actions listed above will be followed.

Item 10b.

Date: AUG 2 3 1984

11. a. Training and Experience for Individual Users:

Training and experience records are on your office files for:

Alvin Korba, M.D.
Thomas P. Hayes, M.D.
Aly Razek, M.D.

Training and experience records are on the NRC files region II and region V for:

Shannon S. Lamb, M.D.

b. Training and Experience for Radiation Safety Officer:

Training and experience records are on your files for:

Saiyid M. Shah, Ph.D.

Item 11

Date: AUG 2 3 1984

12.

# APPENDIX C
# INSTRUMENTATION

1. Survey meters

   a. Manufacturer's name: Victorean
      Manufacturer's model number: Panaromic 470A
      Number of instruments available: one
      Minimum range: 0 mr/hr to 3 mr/hr
      Maximum range: 0 mr/hr to 10 r/hr

   b. Manufacturer's name: Eberline
      Manufacturer's model number: E-120
      Number of instruments available: one
      Ranges: 3
      Minimum range: 0 mr/hr to 0.5 mr/hr
      Maximum range: 0 mr/hr to 50 mr/hr

2. Beam-on Monitor

   Manufacturer's name: AECL Supplied with T780 (no manufacturer's name listed)
   Manufacturer's model number:
   Number of instruments available: one in Cobalt Teletherapy room
   Backup Battery Power Supply : Yes

3. Dosimetry System

   a. Electrometer

      Manufacturer's name: Capintec (Two)
      Manufacturer's model number: 192

   b. Probes

      Manufacturer's name: Capintec
      Manufacturer's model number: PR 06C
      Number of probes: 2
      Ranges:

Item 12

Date: AUG 23 1984

13. Instrument Calibration

a. Calibration of Survey Meters

The survey instruments will be calibrated at the licensee's facility using 3M company CS-137 sources, model numbers 6 D6C and 6 B6G, having activities from 0.94 to 19.3 mgm Radium Equivalent with an accuracy of ± 5% traceable to a primary standard. The exposure rate at a distance will be calculated using:

1. original activity
2. radioactive decay
3. inverse square law

In order to minimize the radiation exposure, the sources will be kept in a lead container on the floor while the instrument to source distance is adjusted. A long string will be attached to the source so it can be hoisted remotely out of the lead container for calibration measurement and returned.

Survey instruments will be calibrated annually and following repairs.

Calibration will be performed at two points on each scale used for radiation protection up to 1 R/hr. The two points will be approximately 1/3 and 2/3 of full scale. An instrument will be considered properly calibrated when:

1. On the lower scales, the known value for each point used will agree with the instrument reading ± 10% of full scale.

2. For the higher scales, when the readings are within ± 10% of the known value.

Readings within ± 20% will be considered acceptable when used with a calibration chart, graph, or response factor. If higher scales are not calibrated, an appropriate precautionary note will be posted on the instrument.

The calibration will be performed by Saiyid M. Shah, Ph.D., full time radiation physicist at St. Mary's Medical Center.

The calibration report will be the "Certificate of Instrument Calibration" form found in Appendex D of U.S. Nuclear Regulatory Commission guide for the preparation of applications for licenses in medical teletherapy programs.

13. Instrument Calibration - cont.

b. Beam-on Monitor

A daily check will be performed of the "beam-on" monitor to ensure that it is operating properly.

c. One dosimetry system will be calibrated every two years by a regional calibration laboratory accredited by AAPM. The second dosimetry system will be calibrated by direct intercomparison.

Item 13

Date: AUG 2 3 1984

14. Patient Viewing

The patient under treatment is observed either through a closed circuit TV system or a leaded glass window. The patient is, therefore, always under observation even if the TV system fails.

Item 14

Date: AUG 2 3

15. Beam Orientation Limitations

1. When the beam is intercepted by the beam stopper, the machine can be operated with the beam in any direction, as long as the teletherapy head is not swiveled.

2. The teletherapy head can be swiveled ± 180°. When the head is swiveled away from the beam stopper, interlocks prevent the beam from being turned on when the angle of the beam reached 5° below a horizontal line, i.e. the beam cannot be aimed horizontally, or at any point above a horizontal line, without the beam stop intercepting the beam. The closest the horizontal use is 95° from the vertical. In practices the beam without the stopper, would only be used when aimed towards the south wall (below ground, no occupancy) since the source-to-wall distance is only 132 cm. when the beam is aimed towards the north wall (Deep Therapy room).

Item 15

Date: AUG 2 3 1984

# Theratron 780 Teletherapy Unit

## OPERATING PROCEDURES

CAUTION: All persons operating Cobalt-60 teletherapy unit should take all possible precautions to ensure adequate protection against injury. They should also be fully acquainted with appropriate radiation protection procedures.

### Start up

At the control console proceed as follows:

1. Insert the power switch key into the key switch and turn to ON (alarm will sound).

2. Immediately, turn the power switch key to START and release (the alarm will cease - electrical power is now applied to all circuits of the unit). The RESET lamp will illuminate.

3. Allow the unit to warm up for 30 minutes.

4. If ARC and SKIP treatment is prescribed, confirm the start and end angles by the following procedure (move to the next step otherwise):
    a. Depress the ARC or SKIP treatment mode switch.
    b. Set the thumbwheel switches to the selected limits.
    c. Push the CONSOLE pushbutton on the hand control.
    d. Depress the TEST pushbutton (this will cause the arm to rotate according to the control console, with the source drawer remaining in the BEAM OFF condition).

NOTE: TEST LAMP will illuminate if TEST pushbutton is depressed provided:
- the hand control is set to CONSOLE
- the control console is correctly set for an ARC or SKIP treatment
- the arm is in a sector where the beam would be during treatment

5. Set the ARM SPEED control to the required speed.

### Patient Set-up

1. Position the patient on the couch by selecting the desired motion pushbutton on the hand control e.g. STR VERT, COUCH ROT, etc. The optical distance indicator, SSD treatment distance gauge and beam-defining light may be used to aid the correct positioning of the patient.

Item 17a.
Date: AUG 23 1984

2. To position the source, source-head, and arm proceed as follows:

Fixed Treatment

a. Select ARM ROT and move the arm to the desired angle (the rotation speed is controlled by the ARM SPEED SET-UP control on the main fram).
b. Select HEAD SWIVEL and move the source head to the desired angle. The angles are shown on the source-head scale.
c. Set the collimator to the required field size by selecting COL X and COL Y and operating the motion pushbuttons after each selection.
d. Set the collimator rotation angle by selecting COL ROT and operating the motion pushbuttons.
e. Select CONSOLE (the unit is ready to be controlled from the control consule).
f. Leave the treatment room and close the treatment room door.

Rotation Treatment

a. Set the source-head to 180°. Check that the HEAD LOCK lamp on the head display panel is illuminated.
b. Set the collimator to the required field size by selecting COL X and COL Y and operating the motion pushbuttons after each selection.
c. Set the collimator angle by selecting COL ROT and operating the motion pushbuttons.
d. Depress the TEST pushbutton and check that the arm rotates over the correct portion of the arm scale and that the TEST LAMP illuminates in the sector where the beam would be on during treatment.
e. Select CONSOLE (the unit is ready to be controlled from the control console).
f. Leave the treatment room and close the treatment room door.

Skip Treatment

a. Set the source-head to 180°. Check that the HEAD LOCK lamp on the head display panel is illuminated.
b. Set the collimator to the required field size by selecting COL X and COL Y and operating the motion pushbuttons after each selection.
c. Set the collimator angle by selecting the COL ROT and operating the motion pushbuttons.
d. Depress the TEST pushbutton and check that the arm rotates over the correct portions of the arm scale and that the TEST LAMP illuminates in the sectors where the beam would be on during treatment.
e. Select CONSOLE (the unit is ready to be controlled from the control console).
f. Leave the treatment room and close the treatment room door.

Treatment

## Fixed Treatment

1. Depress the FIX treatment mode switch.
2. Turn the timer dial to the required treatment time.
3. Depress the RESET pushbutton switch (if the lamp does not go out, follow the emergency procedures described separately).
4. Turn the timer switch to TREAT (treatment will now commence and continue until timer reaches zero).

## Rotation Treatment

1. Depress the ROT treatment mode switch.
2. Depress the CW or CCW switch (depending on whether you wish an initial clockwise or counter-clockwise rotation).
3. Check the setting of the ARM SPEED control (already set during start up procedure).
4. Check the setting of the ARC thumbwheel switches (already set during start up procedure).
5. Check the position of the arm as indicated on the digital read out. If it is between the ARC thumbwheel settings and more than 2° from either setting, proceed to the next. If it is not, depress the SET-UP switch until the arm has rotated to where it is correctly positioned, and proceed to the next step.
6. Turn the timer dial to the required treatment time.
7. Depress the RESET pushbutton switch (if the lamp does not go out, follow the emergency procedures described separately).
8. Turn the timer switch to TREAT (treatment will now commence and continue until the timer reaches zero).

Item 17a.

Date: AUG 2 3 1984

## Skip Treatment

1. Depress the SKIP Treatment mode switch.
2. Check the settings of the thumbwheel switches (already set during start up procedure).
3. Check the position of the arm as indicated on the digital read out. If it is between a pair of SKIP thumbwheel settings where the beam is to be on, and more than 2° from any one, proceed with Step 4. If it is not, depress the SET-UP switch until the arm has rotated to where it is correctly positioned and proceed to Step 6.
4. Depress the CW or CWW switch (depending on whether you wish a clockwise or counter-clockwise rotation).
5. Check the setting of the ARM SPEED control (already set during start up procedure).
6. Turn the timer dial to the required treatment time.
7. Depress the RESET pushbutton switch (if the lamp does not go out, follow the emergency procedure described separately).
8. Turn the timer switch to TREAT (treatment will now commence and continue until the timer reaches zero).

## CAUTION

IF SKIP TREATMENT STOPS THROUGH ACTUATION OF AN EMERGENCY PUSHBUTTON OR PROTECTIVE DEVICE, CHECK THAT THE ARM POSITION IS WITHIN THE THUMBWHEEL SWITCH SETTINGS BEFORE RESUMING TREATMENT. FAILURE TO DO THIS COULD CAUSE A BEAM ON CONDITION IN THE EXCLUDED SECTORS.



Item 17a.

Date: AUG 2 3 1984

# Theratron 780 Teletherapy Unit

## EMERGENCY PROCEDURES

CONTROLS AND DEVICES - The following controls and devices are provided:

EMERGENCY PUSHBUTTONS - Depressing an emergency pushbutton will immediatley stop arm rotation, retract the source drawer to its safe position, switch off main electrical power to the unit, sound the alarms, and illuminate the RESET lamp.

TIMER SWITCH - Turning the timer switch to OFF during treatment will stop arm rotation and retract the source drawer, but will not switch off main electrical power to the unit.

COLLISION DETECTOR - Operation of the collision detector will retract the source drawer, illuminate the RESET lamp, sound the alarms, and immobilize the unit. Main electrical power to the unit will be shut off.

OTHER PROTECTIVE DEVICES - Operation of any of the other protective devices, e.g. treatment room door interlock, beam-limitation switches, etc. will stop arm rotation, retract the source drawer, and illuminate the RESET lamp. Main electrical power to the unit will remain on.

EMERGENCY STOP PROCEDURE - Carry out the following procedure if treatment is stopped through actuation of an emergency pushbutton or proctective device:

1. SWITCH OFF - Turn the timer switch to OFF.
2. Reconnect main power to the unit (if not present) by momentarily turning the key-switch to START.

   ABSENCE OF MAIN POWER - Absence of main power to the unit is shown by both the BEAM ON and BEAM OFF lamps being unlit and by the alarms sounding.

3. SOURCE DRAWER RETRACTION - Check that the source drawer has retracted. Failure to retract, will be shown by the BEAM ON lamp remaining illuminated and by the beam condition indicator rod remaining visible.

   FAILURE TO RETRACT - If the source drawer fails to retract, carry out the emergency T-bar procedure described in Section 2.

4. USE OF HAND CONTROL - If necessary, enter the treatment room and operate the unit or treatment couch by using the hand control; remove the patient if necessary.

   NOTE: Before using hand control, restore main power by turning keyswitch momentarily to START, or by pressing POWER RESTART button on the unit.

Item 17b.
Date: AUG 2 3 1984

5. CLEARING THE FAULT - Clear the fault or contact maintenance personnel.

6. SKIP TREATMENT - If skip treatment is being carried out, check that the arm position is within the thumbwheel switch settings before resuming treatment; otherwise, the source drawer will move to the BEAM ON position when the arm is in the excluded sector.

7. RESTARTING TREATMENT - If treatment can be restarted immediately, check all control settings, depress the RESET pushbutton, and restart treatment by turning the timer switch to TREAT. Note that the timer dial will read the treatment time remaining and therefore its setting should not be changed.

   RESET PUSHBUTTON - The lamp in this pushbutton will light whenever there is a RESET condition; e.g. if the control settings are incorrectly set or if a protective device operates.

   NOTE: With the RESET button unlit but the timer dials at zero it is possible to expose the source by turning and holding the timer switch at TREAT. NEVER OPERATE TIMER SWITCH EXCEPT TO COMMENCE TREATMENT WITH THE CORRECT TIME SELECTED.

RESET LAMP REMAINS LIT - If the RESET lamp remains lit when the pushbutton is depressed, first check the control settings as follows:

1. Check that the CONSOLE pushbutton on the hand control is depressed.

2. Check that a treatment mode switch has been depressed.

3. Check that a CW or CCW switch has been depressed if ROT, ARC, or SKIP treatment has been selected.

4. Check that a thumbwheel switch is not set to an angle greater than 359° (regardless of treatment mode selected).

   RESET LAMP STILL REMAINS LIT - If the controls are correctly set and the RESET lamp remains lit carry out the following checks:

   1. That the treatment room door is closed.

2. That the OFF SHIELD lamp on the head display panel is off.

3. Whether a protective device has operated or an electrical, mechanical, or pneumatic fault has occurred (see Section 2). Obtain assistance from maintenance personnel if necessary.

CIRCUIT BREAKER - The circuit breaker button will spring out of the panel in the event of an electrical overload. Push the button back into the panel to reset the circuit breaker. With the breaker tripped the alarms do not sound.

CAUTION: The unit should be inspected for an electrical fault if the contact breaker repeatedly springs out.



Item 17b.

Date: AUG 2 3 1984

License No. 13-03226-03

**POST IN A PROMINENT POSITION CLOSE TO THE TELETHERAPY UNIT CONTROL CONSOLE**

# IMPORTANT

**AECL MODELS**

**76, 78, 765, 780, 780 CTS, AND 780 CC**

**TELETHERAPY UNITS**

## IF THE DRAWER FAILS TO CLOSE, PROCEED AS FOLLOWS:

1. Remove the patient from the treatment room.

2. The drawer return emergency T-bar, which is supplied with the unit and located at the control station, should be placed over the beam condition indicating rod. Forward pressure on the source drawer with the T-Bar will push the drawer backwards and into the safe position.

NOTE:

1. The amber coloured portion of the emergency T-bar must be entirely inside the front head cover before the source is in the fully safe position. This will reduce external radiation fields to normal levels and allow repairs to be made to the drawer.
   The front portion of the T-bar is painted red and the source can be considered relatively safe if no red marking appears outside the front cover.

3. Lock the door and place a large warning sign across the doorway to prevent unauthorized entry.

4. Notify Saiyid M. Shah, Ph.D., Radiation Safety Officer or Dr. Al Korba.

| | | |
|---|---|---|
| EMERGENCY PHONE NUMBERS: | SAIYID M. SHAH, PH.D. | 474-1253 |
| | Alvin Korba, M.D. | 476-4260 |
| | G.E. Evansville | 425-5400 |
| | G.E. Indianapolis | 635-4576 |

Item 17b.
Date: AUG 23 1984

19. Leak Test

Leak tests will be performed at licensee's facility by Saiyid M. Shah, Ph.D., full time radiation physicist. The teletherapy head, collimator, penumbra trimmers, beam stop and floor will be wiped (with the source in the OFF position) by using moist cotton swabs. It is requested that Saiyid M. Shah, Ph.D., be licensed to perform these tests.

The wipe samples will be counted for one minute each in a Picker Spectrosealer III well counter. The counts from the wipe tests will be compared to the counts from a 0.0005 uci Cobalt-60 standard in identical counting geometry.

If the test reveals the presence of 0.05 uci or more of removable contamination, the procedures listed as condition 14 of the license will be followed.

If the smears will be found to read counts above background level, the wipes will be stored in the low level waste storage in Nuclear Medicine Lab for appropriate disposal.

Item 19

Date: AUG 23 [illegible]

# PROGRAM FOR MAINTAINING OCCUPATIONAL RADIATION EXPOSURES AT MEDICAL INSTITUTIONS ALARA

## MANAGEMENT COMMITMENT

The management of this hospital is committed to the program described herein for keeping exposures (individual and collective) as low as is reasonably achievable (ALARA). In accord with this commitment, an administrative organization for radiation safety as well as written policy, procedures, and instructions to foster the ALARA concept within this institution is described. The organization will include the Radiation Safety Committee (RSC) and a Radiation Safety Officer (RSO).

Formal annual review of the radiation safety program, including ALARA considerations will be performed. This shall include reviews of operating procedures and past exposure records, inspections, etc., and consultations with hte radiation protection staff or outside consultants.

Modification to operating and maintenance procedures and to equipment and facilities will be made where they will reduce exposures unless the cost is considered to be unjustified.

In addition to maintaining doses to individual as far below the limits as is reasonably achievable, the sum of the doses received by all exposed individuals will also be maintained at the lowest practicable level. It would not be desirable, for example, to hold the highest doses to individuals to some fraction of the applicable limit if this involved exposing additional people and significantly increasing the sum of radiation doses received by all involved individuals.

## RADIATION SAFETY COMMITTEE (RSC)

Review of Proposed Users and Uses

(1) The RSC will thoroughly review the qualifications of each applicant with respect to the types and quantities of materials and uses for which he has applied to ensure that the applicant will be able to take appropriate measures to maintain esposure ALARA.

(2) When considering a new use of byproduct material, the RSC will review the efforts of the applicant to maintain exposure ALARA. The user should have systematized procedures to ensure ALARA and shall have incorporated the use of special equipment such as syringe shields, rubber gloves, etc., in his proposed use.

(3) The RSC will ensure that the user justifies his procedures and that doses will be ALARA (individual and collective).

Item 21

Date: AUG 2 3 1984

Delegation of Authority

(1) The RSC will delegate authority to the RSO for enforcement of the ALARA concept.

(2) The RSC will support the RSO in those instances where it is necessary for the RSO to assert his/her authority. Where the RSO has been overruled, the Committee will record the basis for its action in the minutes of the Committee's quarterly meeting.

Review of ALARA Program

(1) The RSC will encourage all users to review current procedures and develop new procedures as appropriate to implement the ALARA concept.

(2) The RSC will perform a quarterly review of cooupational radiation exposure with particular attention to instances where Investigational Levels in Table 0-1 below are exceeded. The principal purpose of this review is to assess trends in occupational exposure as an index of the ALARA program quality and to decide if action is warranted when Investigational Levels are exceeded (See section 6).**

(3) The RSC will evaluate our institution's overall efforts for maintaining exposures ALARA on an annual basis. This review will include the efforts of the RSO, authorized users, and workers as well as those of management.

RADIATION SAFETY OFFICER (RSO)

Annual and Quarterly Review

(1) Annual review of the radiation safety program. The RSO will perform an annual review of the radiation safety program for adherence to ALARA concepts. Reviews of specific procedures may be conducted on a more frequent basis.

(2) Quarterly review of occupational exposures. The RSO will review at least quarterly the external radiation exposures of authorized users and workers to determine that their exposures are ALARA in accordance with the provisions of this program.

(3) Quarterly review of records of radiation level surveys. The RSO will review radiation levels in unrestricted and restricted areas to determine that they were at ALARA levels during the previous quarter.

Item 21
Date: AUG 2 3 1984

**The NRC has emphasized that the Investigational Levels in this program are not new dose limits but, as noted in ICRP Report 26, "Recommendations of the International Commission on Radiological Protection, "serve as check points above which the results are considered sufficiently important to justify further investigations.

Education Responsibilities for ALARA Program

(1) The RSO will schedule briefings and educational sessions to inform workers of ALARA program efforts.

(2) The RSO will ensure that authorized users, workers, and ancillary personnel who may be exposed to radiation will be instructed in the ALARA philosophy and informed that management, the RSC, and the RSO are committed to implementing the ALARA concept.

Cooperative Efforts for Development of ALARA Procedures

Radiation Workers will be given opportunities to participate in formulation of the procedures that they will be required to follow.

(1) The RSO will be in close contact with all users and workers in order to develop ALARA procedures for working with radioactive materials.

(2) The RSO will establish procedures for receiving and evaluating the suggestions of individual workers for improving health physics practices and will encourage the use of those procedures.

Reviewing Instances of Deviation from Good ALARA Practices

The RSO will investigate all known instances of deviation from good ALARA practices and, if possible, will determine the causes. When the cause is known, the RSO will require changes in the program to maintain exposures ALARA.

AUTHORIZED USERS

New procedures Involving Potential Radiation Exposures

(1) The authorized user will consult with, and receive the approval of, the RSO and/or RSC during the planning stage before using radioactive materials for a new procedure.

Item 21
Date: AUG 2 3 1984

(2) The authorized user will evaluate all procedures before using radioactive materials to ensure that exposures will be kept ALARA. This may be enhanced through the application of trial runs.

Responsibility of Authorized User to Persons Under His/Her Supervision

(1) The authorized user will explain the ALARA concept and his/her commitment to maintain exposures ALARA to all persons under his/her supervision.

(2) The authorized user will ensure that persons under his/her supervision who are subject to occupational radiation exposure are trained and educated in good health physics practices and in maintaining exposures ALARA.

PERSONS WHO RECEIVE OCCUPATIONAL RADIATION EXPOSURE

The worker will be instructed in the ALARA concept and its relationship to working procedures and work conditions.

The worker will know what recourses are available if he/she feels that ALARA is not being promoted on the job.

ESTABLISHMENT OF INVESTIGATIONAL LEVELS IN ORDER TO MONITOR INDIVIDUAL OCCUPATIONAL EXTERNAL RADIATION EXPOSURES

This institution hereby establishes Investigational Levels for occupational external radiation exposure which, when exceeded, will initiate review or investigation by the RSC and/or the RSO. The Investigational Levels that we have adopted are listed in Table I below. These levels apply to the exposure of individual workers.

TABLE I

| | Investigational Levels (mrems per calendar quarter) | |
|---|---|---|
| | Level I | Level II |
| 1. Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads | 125 | 375 |
| 2. Hands and forearms; feet and ankles | 1875 | 5625 |
| 3. Skin of whole body* | 750 | 2250 |

*Not normally applicable to nuclear medicine operations except those using significant quantities of beta-emitting isotopes.

The Radiation Safety Officer will review and record on Form NRC-5 "Current Occupational External Radiation Exposures", or an equivalent form (e.g., dosimeter processor's report), results of personnel monitoring not less than once in any calendar quarter as required by 20.401 of 10CFR Part 20. The following actions will be taken at the Investigational Levels as stated in Table I:

Quarterly exposure of individuals to less than Investigational Level I.

Except when deemed appropriate by the RSO, no further action will be taken in those cases where an individual's exposure is less than Table I values for the Investigational Level I.

Personnel exposures equal to or greater than Investigational Level I, but less than Investigational II.

The RSO will review the exposure of each individual whose quarterly exposures equal or exceed Investigational Level I and will report the results of the reviews at the first RSC meeting following the quarter when the exposure was recorded. If the exposure does not equal or exceed Investigational Level II, no action related specifically to the esposure is required unless deemed appropriate by the Committee. The Committee will, however, consider each such exposure in comparison with those of others performing similar tasks as an index of ALARA program quality and will record the review in the Committee minutes.

Exposure equal to or greater than Investigational Level II.

The RSO will investigate in a timely manner the causes(s) of all personnel exposures equaling or exceeding Investigational Level II and, if warranted, will take action. A report of the investigation, actions, if any, and a copy of the individual's Form NRC-5 or its equivalent will be presented to the RSC at the first RSC meeting following completion of the investigation. The details of these reports will be recorded in the RSC minutes. Committee minutes will be sent to the management of this institution for review. The minutes, containing details of the investigation, will be made available to NRC inspectors for review at the time of the next inspection.

Reestablishment of an individual occupational worker's Investigational Level II to a level above that listed in Table I.

In cases where a worker's or a group of workers' exposures need to exceed Investigational Level II, a new, higher Investigational Level II may be established on the basis

that it is consistent with good ALARA practices for that individual or group. Justification for a new Investigational Level II will be documented.

The RSC will review the justification for, and will approve, all revisions of Investigational Level II. In such cases, when the exposure equals or exceeds the newly established Investigational Level II. those actions listed above will be followed.

Item 21

Date: AUG 2 3 1984