SRT-7 ISSUE NO. 3

1986 JULY 30

INSTRUCTION

SOURCE REPLACEMENT PROCEDURE

THERATRON 765, 780, 780C & PHOENIX

AECL MEDICAL

INSTRUCTION

SOURCE REPLACEMENT PROCEDURE

THERATRON "780" & THERATRON "765"

A.E.C.L. TELETHERAPY EQUIPMENT

INSTRUCTION REFERENCE: SRT-7 ISSUE NUMBER

SECTION A: GENERAL

1. - Not less than one (1) authorized A.E.C.L. person and one (1) assistant shall participate in this operation.

2. - Prior to commencement, the authorized person shall check that the following equipment is on hand.

   (a) pocket dosimeter charger
   (b) calibrated radiation survey meter - Berthold-Rato/F type with built in accoustical device or equivalent capable of reading radiation field as low as .5 mr/hr and a high range in the order 10 r/hr.
   (c) set of source drawer handling tools (see dwg. #A1024 25 001.
   (d) hydraulic lift truck for moving source transfer shipping container.
   (e) source container fitted with one dummy/ filler drawer and fire shield (if a shipment or source storage is planned).

3. - Both persons shall wear a 0-200 mr/hr and a 0 - 5 r/hr pocket dosimeters - correctly zeroed together with an A.E.C.L. film badge.

4. - Prior to commencement, the authorized person shall:

   (a) perform a survey of the shipping container to ensure the levels observed agree with those on the shipping documents.
   (b) make a survey of those areas from which uncontrolled persons may have to be evacuated in the event of a maltransfer. Any area in which the radiation field is 5 m/r/hr or greater will be considered as a "Controlled Area".

SECTION A: GENERAL - Cont'd

(c) have readily available the telephone number, contact officer, etc., of the nearest office of the official Atomic Energy Control Authority in the area in which the transfer is to take place.

(d) have similar information at hand if immediate assistance is required from:

i) The Municipal Police Department
ii) The Municipal Fire Department
iii) The Civil Defence Department

NOTE: (1) In the event of a maltransfer, do not depend on locked doors to secure the "Controlled Area". See that guards are posted to prevent entrance to the "Area".

(2) Report to A.E.C.L. Radiation Hazards Section immediately after all entrances to the "Controlled Area" have been secured.

SECTION B: PREPARATION

1. - Ensure that the source is in the "OFF" or storage position then, enter the treatment room and place the radiation survey meter in the working area. The meter must be in the "ACTIVATE" or "ON" condition at all times while this operation is in progress.

2. - Rotate the arm to approximately the 270° degree position and check that the source head rotation is in the "0" position.

3. - Operate the treatment stretcher and couch pedestal to a position offering the least interference.

4. - Close collimator to minimum opening and remove all source head and neck covers. Wipe test the collimator leaves for any indication of removable contamination.

5. - Remove power from the unit by means of the key switch on the control unit.
DO NOT RELEASE THE AIR PRESSURE FROM THE STORAGE RESERVOIR.

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SECTION B: PREPARATION - Cont'd

6. - By means of the hydraulic lift truck, position the transfer case in line with the therapy head, with approximately one (1) foot separation. Close collimator to minimum opening.

7. - Unlock the transfer case cover plate and remove. Wipe test both ends of the drawers and check for any removable contamination.

8. - Place head rotator in lock position.

9. - Remove front bracket assembly, light housing assembly and front connecting plate (illustrated in Figure 5-7 in the Service Manual).

10. - Carefully move the transfer case toward the therapy head (correcting any misalignment during the process) until the large register on the transfer case engages with the machined boss on the therapy head.

11. - Ensure that all passageways above, below and at both sides are evacuated so that there is no possibility of others receiving exposure as a result of the transfer. Very carefully mate the source container with the unit head, there is a spigot on head and a recess on the container for this purpose.

12. - Place the survey meter on the floor in such a position that it is not subjected to the direct radiation field during transfer, but is accessible from behind the container. Use the 0 - 10 r/hr scale.

13. - Block between the source container and the floor as a safety precaution.

SECTION C: SOURCE REMOVAL

1. - Ascertain that the electrical power is still off.

2. - Check that the radiation meter is "ON", dosimeters are zeroed, and film badges are worn.

3. - Insert the "T" rod source handlers tool through the hole in the center of the filler or dummy drawer in the container and thread it firmly into the source drawer in the head.

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SECTION C: SOURCE REMOVAL - Cont'd

4. - The assistant will disconnect the auxiliary retractor rod followed by, the removal of the cylinder connecting rod shaft to the source drawer connecting rod assembly. He will then likewise take up a position behind the source container.

5. - The authorized person will by means of the "T" bar, gently draw the source drawer forward approximately two to three inches. He will then rotate the drawer in a clockwise direction 90° and continue to draw the drawer forward until it butts against the dummy or filler drawer.

At this stage the assistant will take a position whereby he can support the weight of the dummy/ filler drawer as it emerges from the case.

The authorized person will then continue to draw the source drawer forward until it is completely in the container. He will then unthread the "T" bar and withdraw it from the filler/dummy drawer.

6. - Carefully remove the air cylinder connecting rod and plate assembly from the opposite end of the source drawer. Put the container rear cover plate in place and secure.

7. - Move the container forward and install the other cover plate.

8. - Store the filler/dummy drawer and the air cylinder and plate assembly in a safe place.

9. - Place the source container in a convenient location in the room, as remote as possible from the working area. Make sure that the Radiation Warning signs are readily visible.

10. - Proceed with the major servicing of the unit (if applicable).

SECTION D: SOURCE INSTALLATION

1 - Review Section A: General before proceeding further.

2. - Rotate the arm to approximately 225° position.

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A.E.C.L. TELETHERAPY EQUIPMENT

INSTRUCTION REFERENCE: SRI-7 ISSUE NUMBER

SECTION A: GENERAL

1. - Not less than one (1) authorized A.E.C.L. person and one (1) assistant shall participate in this operation.

2. - Prior to commencement, the authorized person shall check that the following equipment is on hand.

   (a) pocket dosimeter charger
   (b) calibrated radiation survey meter - Berthold Rato/F type with built in accoustical device or equivalent capable of reading radiation field as low as .5 mr/hr and a high range in the order 10 r/hr.
   (c) set of source drawer handling tools (see dwg. #A1024 25 001.
   (d) hydraulic lift truck for moving source transfer shipping container.
   (e) source container fitted with one dummy/ filler drawer and fire shield (if a shipment or source storage is planned).

3. - Both persons shall wear a 0-200 mr/hr and a 0 - 5 r/hr pocket dosimeters - correctly zeroed together with an A.E.C.L. film badge.

4. - Prior to commencement, the authorized person shall:

   (a) perform a survey of the shipping container to ensure the levels observed agree with those on the shipping documents.
   (b) make a survey of those areas from which uncontrolled persons may have to be evacuated in the event of a maltransfer. Any area in which the radiation field is 5 m/r/hr or greater will be considered as a "Controlled Area".

SECTION A: GENERAL - Cont'd

(c) have readily available the telephone number, contact officer, etc., of the nearest office of the official Atomic Energy Control Authority in the area in which the transfer is to take place.

(d) have similar information at hand if immediate assistance is required from:

i) The Municipal Police Department
ii) The Municipal Fire Department
iii) The Civil Defence Department

NOTE: (1) In the event of a maltransfer, do not depend on locked doors to secure the "Controlled Area". See that guards are posted to prevent entrance to the "Area".

(2) Report to A.E.C.L. Radiation Hazards Section immediately after all entrances to the "Controlled Area" have been secured.

SECTION B: PREPARATION

1. - Ensure that the source is in the "OFF" or storage position then, enter the treatment room and place the radiation survey meter in the working area. The meter must be in the "ACTIVATE" or "ON" condition at all times while this operation is in progress.

2. - Rotate the arm to approximately the 270° degree position and check that the source head rotation is in the "0" position.

3. - Operate the treatment stretcher and couch pedestal to a position offering the least interference.

4. - Close collimator to minimum opening and remove all source head and neck covers. Wipe test the collimator leaves for any indication of removable contamination.

5. - Remove power from the unit by means of the key switch on the control unit.
DO NOT RELEASE THE AIR PRESSURE FROM THE STORAGE RESERVOIR.

..../3

SECTION B: PREPARATION - Cont'd

6. - By means of the hydraulic lift truck, position the transfer case in line with the therapy head, with approximately one (1) foot separation. Close collimator to minimum opening.

7. - Unlock the transfer case cover plate and remove. Wipe test both ends of the drawers and check for any removable contamination.

8. - Place head rotator in lock position.

9. - Remove front bracket assembly, light housing assembly and front connecting plate (illustrated in Figure 5-7 in the Service Manual).

10. - Carefully move the transfer case toward the therapy head (correcting any misalignment during the process) until the large register on the transfer case engages with the machined boss on the therapy head.

11. - Ensure that all passageways above, below and at both sides are evacuated so that there is no possibility of others receiving exposure as a result of the transfer. Very carefully mate the source container with the unit head, there is a spigot on head and a recess on the container for this purpose.

12. - Place the survey meter on the floor in such a position that it is not subjected to the direct radiation field during transfer, but is accessible from behind the container. Use the 0 - 10 r/hr scale.

13. - Block between the source container and the floor as a safety precaution.

SECTION C: SOURCE REMOVAL

1. - Ascertain that the electrical power is still off.

2. - Check that the radiation meter is "ON", dosimeters are zeroed, and film badges are worn.

3. - Insert the "T" rod source handlers tool through the hole in the center of the filler or dummy drawer in the container and thread it firmly into the source drawer in the head.

..../4

SECTION C: SOURCE REMOVAL - Cont'd

4. - The assistant will disconnect the auxiliary retractor rod followed by, the removal of the cylinder connecting rod shaft to the source drawer connecting rod assembly. He will then likewise take up a position behind the source container.

5. - The authorized person will by means of the "T" bar, gently draw the source drawer forward approximately two to three inches. He will then rotate the drawer in a clockwise direction 90° and continue to draw the drawer forward until it butts against the dummy or filler drawer.

At this stage the assistant will take a position whereby he can support the weight of the dummy/ filler drawer as it emerges from the case.

The authorized person will then continue to draw the source drawer forward until it is completely in the container. He will then unthread the "T" bar and withdraw it from the filler/dummy drawer.

6. - Carefully remove the air cylinder connecting rod and plate assembly from the opposite end of the source drawer. Put the container rear cover plate in place and secure.

7. - Move the container forward and install the other cover plate.

8. - Store the filler/dummy drawer and the air cylinder and plate assembly in a safe place.

9. - Place the source container in a convenient location in the room, as remote as possible from the working area. Make sure that the Radiation Warning signs are readily visible.

10. - Proceed with the major servicing of the unit (if applicable).

SECTION D: SOURCE INSTALLATION

1 - Review Section A: General before proceeding further.

2. - Rotate the arm to approximately 225° position.

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SECTION D: SOURCE INSTALLATION - Cont'd

3. - Position the transfer case in line with the therapy head. Open one cover plate on the case to determine the correct orientation to the head, i.e. that when the registers on the case and the therapy head are mated, the new source drawer will be aligned with the bore in the head. Close the cover plate.

4. - Place head rotator in lock position and check that the head zero lock is in the 0^{o} position.

5. - Move the case to a position approximately one (1) foot from and in line with the therapy head.

6. - Rotate couch to approximately 90^{o} position. Stretcher elevation and rotation to a position offering the least obstruction.

7. - Remove power from unit but do not release the air pressure in the storage reservoir.

8. - Note that the air cylinder shaft is in the "source off" position (fully retracted) and the collimator is set to the minimum opening.

9. - Remove the cover plate on source container facing the head. Fit the air cylinder connecting shaft to the new source drawer. Move the container up to the head, elevate and mate the respective registers.

10. - Remove the other cover plate from the source container. Rotate the new source drawer until the arrow on the drawer end is pointing in a direction approximately 90^{o} from the axis of the collimator.

11. - Carefully move the new source drawer in the container toward the head one (1) inch. The assistant will now support the filler/dummy drawer in line with the new source drawer and the authorized person will insert the "T" bar through the filler/dummy drawer and thread it into the live source drawer. The assistant can now insert the end of the dummy/filler drawer into the one (1) inch space until it butts to the live source drawer.

..../6

SECTION D: SOURCE INSTALLATION - Cont'd

12. - The authorized person will then push the dummy/filler drawer into the source container until it is fully entered then, immediately, gently push the "T" bar until the live source drawer comes to a stop against the air cylinder shaft in the therapy head.

13. - After noting that the survey meter indicates a safe condition, the assistant will take a position where he can observe the orientation of the slot in the source drawer connecting rod to the mating section on the end of the air cylinder piston shaft.

14. - The assistant can then advise the authorized man in which direction to rotate the source drawer for any minor correction in the alignment of the source drawer to the air cylinder. On completion, the assistant will:

(a) place the auxiliary retracting rod plunger head into its nest.
(b) insert the detent pin to secure the source drawer connecting rod to the air cylinder piston shaft.

15. - The authorized person will inspect (a) and (b) above to ensure that the operations were correctly performed.

16. - Unthread the "T" bar. Carefully withdraw the shipping container to a workable position and install both end plates and lock.

17. - Survey the container, prepare new radiation labels and indicate the calculated curie content of the decayed source. Move the container to a convenient area.

18. - Perform the following:

(a) Assemble the front rider ring followed by the light housing.
(b) Assemble the front bracket assembly to the therapy head.
(c) Install trim covers, etc.

SECTION D: SOURCE INSTALLATION - Cont'd

19. - Survey the head and complete the Head Survey forms in duplicate. This survey is not to be construed as an official survey for licensing purposes but only to make reasonably certain that the radiation leakage levels are within permissible tolerances.

20. - With the treatment room door closed, operate the shutter to the "ON" position and then open the treatment room door just enough to energize the door interlock switch and note

(1) that the shutter closes immediately and that the reset button must be operated before the shutter will open again - repeat at least five (5) times.
(2) that all signal lights are functional.

21. - Record personal exposure. This should not be more than 5 m/r, if exposure is more than 10 m/r, include an explanation in the job report. Check out unit and source operation as instructed in Installation and Service Manuals.

SECTION E: CONCLUSION

1. - Wipe test the items listed hereunder for any removable contamination.

(1) Collimator leaves
(2) Stretcher top
(3) Source container
(4) Source handling tools

2. - Arrange the return shipment of the decayed source with the customer. Recheck that the container is correctly labelled to meet shipping requirements.

3. - Obtain customer's acceptance of services performed.

APPENDIX "C"

ITEM 7.1

Individuals who will use or directly supervise the use of licensed material*

Please refer to License No. 54-00300-04, Amendment 40, Item 12.

G.J. Cook	Manager Service Operations & Technology
M. Pregent	General Service Manager, U.S. Operations
J.S. Fox	Senior Marketing Specialist - Canada - Africa
A.B. Crandell	Senior Service Rep.
P.G. Cowan	Sales Manager Midwest Region
D. Tegtmeyer	Marketing Rep.
F.T. Lyon	Service Rep.
C. Britt	Service Rep.
M. Scanabel	Service Rep.
D. DiJoseph	Service Rep.
C. Maychak	Manager Unit Installations - U.S.A.
E. Kayto	Service Manager Northeast Region
J. Weir	Service Rep.
W.T. Schlunegar	Service Rep.
W.J. Clarke	Service Rep.
P.H. Dresselt	Service Rep.
W. Hughes	Service Rep.
R. Hilbert	Service Rep.
W.E. Downs	Manager Quality Assurance & R.S.O.
R.E. Johnston	Manager Installation & Service Can. & World
M. Kinsaul	Service Rep.
R. Hoblitzell	Service Rep.
J. Jackson	Senior Service Representative

* or anyone designated by G.J. Cook or M. Pregent and W.E. Downs.

Note:

A) Please note that, in this application, the names R.W. Dismukes and J.W. Blount Jr. have been deleted from Item 12 of the referenced license.

B) The names R.E. Johnston, M. Kinsaul, R. Hoblitzell and J. Jackson have been included with this application. Ref. Item 7.3

Item 7.2

INDIVIDUAL RESPONSIBLE FOR RADIATION SAFETY PROGRAM

The Radiation Safety Officer, W.E. Downs, is responsible for the Radiation Safety Program.

He directs the licensing of all byproduct material, radiation facilities and the transportation of these items.

He represents AECL/Theratronics in the advent of a recall on licensed products.

ITEM 7.3

TRAINING AND EXPERIENCE

Refer to Condition 20 Parts A to K of the AECL License for previously submitted resume outlining the academic, professional and service experience qualifications of the individuals listed in Item 7.1 of this application.

Additional resumes and letters of certification are enclosed for R.E. Johnston, M. Kinsaul, J. Jackson and R. Hoblitzell.

THERATRONICS

TO WHOM IT MAY CONCERN

Theratronics International Limited a Crown Corporation being for all its purposes an agent of her Majesty the Queen in Right of Canada, hereby certifies that the employees designated below are accredited technicians properly authorized and licensed by the United States Nuclear Regulatory Commission (and its agreement States) to act on behalf of the Corporation in all work areas associated with field operations on **Theratronics** Standard Products, formerly manufactured by AECL Medical.

Each technician so designated is qualified to perform the following specialized tasks:

(a) installation of equipment(s) and its radioactive contents;
(b) removal of equipment(s) and its radioactive contents;
(c) servicing equipment(s) and manipulation of its radioactive contents;
(d) refurbishing and testing radiation equipment(s);
(e) transfer of radioactive materials;
(f) replenishment and removal of radioactive materials;
(g) contamination detection and decontamination procedures;
(h) radiation surveys with approved instrumentation;
(i) emergency procedures to be adopted in the event of an incident;
(j) preparation of equipment(s) and radioactive source(s) for on-going shipment, and
(k) all operations coincident with commissioning these devices.

This is to certify that each technician so designated has received in-house training in applied:

(l) principles and practices of radiation protection;
(m) radioactivity measurement standardization & monitoring techniques and instruments;
(n) mathematics and calculations basic to the use and measurement of radioactivity, and
(o) biological effects of radiation.

Employees currently designated under this certification are:

C.E. Britt
J.W. Clarke
P.G. Cowan
A.B. Crandell
D. DiJoseph
M. Kinsaul
P.H. Dresselt
J.S. Fox
R. Hilbert
W. Hughes
R.E. Johnston
J. Jackson
R. Hoblitzell
E. Kato
C. Maychak
W.T. Schluneger
D.J. Tegtmeyer
J. Weir
F.T. Lyon
M. Schnabel

FOR: Theratronics International Limited

BY: G.J. Cook

TITLE: G.J. Cook
Manager, Technology & Service

DATE: 27-X.88

BY: W.E. Downs

TITLE: W.E. Downs
Radiation Safety Officer

DATE: 88/10/27

Theratronics
International Limited
413 March Road
P.O. Box 13140
Kanata Ontario Canada
K2K 2B7
(613) 591-2100
Fax (613) 592-3816
Telex 053-4416

JODIE L. JACKSON

SOURCE WORK

A. While employed by AECL, working out of the Dallas office Aug.83 - Mar.85, I completed source transfers and other related source mechanism work under the supervision of licensed source handlers in the following locations:

1.	Fitzsimmons Army Hospital, Denver, Co.	T-80 #207
2.	Parkland Hospital, Dallas, Texas	T-80 #34
3.	Mt. Carmel Hospital, Columbus, Ohio	T-80 #137
4.	Tripper Army Hospital, Honolulu, Hawaii	T-80 #336
5.	University of Texas Medical Branch, Galveston, Texas	T-80 #99
6.	Rio Grande Radiation Treatment Center Clinic,McAllen, Tx	T-80 #150
7.	Holt Krock Clinic, Fort Smith, Ark.	T-80 #150
8.	V.A. Hospital, Dallas, Texas	T-80 #17
9.	Touro Infirmary, New Orleans, La.	T-80 #82
10.	Brook Army Medical Center, San Antonio, Texas	T-80 #51
11.	East Texas Cancer Center, Tyler, Texas	T-80 #333

B. While working out of Ottawa (May 86 - Oct.88), I've completed the following:

1.	L.N.E.T.I., Sacavem, Portugal	E6 Calibrator
2.	Institution Asuntos Nuclearis, Bogota, Colombia	E6 #210
3.	Instituto Oncologico Del Oriente Boliviano Crueena De Combate al Caneu, Santa Cruz, Bolivia	T765 #17
4.	Victoria General Hospital, Halifax Nova Scotia, (2 New Sources, 1 Cascade)	T80 #64; E8#15; E6 #45
5.	Jinnah Post Graduate Medical Centre, Karichi, Pakistan (Square Drawer)	T80 #272; F #15
6.	Lagos University Teaching Hospital, Lagos, Nigeria	T780 #22
7.	Queen Elizabeth Hospital, Charlottetown, P.E.I.	T780 #310

SOURCE HANDLER EXPERIENCE LIST FORM

Mike Kinsaul

P&S	DATE	PLACE/LOCATION	UNIT TYPE	ASSISTED
Source Changes				
43978	3 Mar 87	Broward Med. Cntr,Ft. Laud.,FL	T-780	C. E. Britt
44105	14 Oct 87	Trippler Army Hosp, Hon, Hawaii	T-80	Mike Schnable
44171	29 Jan 88	Crawford Long, Atlanta, GA	T-780	C. E. Britt
44279	14 Apr 88	Greenville Hosp., Greenville, SC	T-80	" "
44286	5 May 88	Depaul Hosp, Norfolk, VA	T-80	" "
44292	27 May 88	Mcleod Reg. Med, Florence,SC	T-780	" "
Move jobs involving removal of source				
53	8 July 87	St. Joseph, Tampa, FL	T-80	C. E. Britt
14863	8 Sept. 87	Hollywood Mem, Hollywood, FL	Eld 8	" "
44070	20 Oct 87	Winter Haven Hosp, Winter Haven,FL	Eld G sq drw.	" "
14905	9 Dec 87	Waycross Radiology, Waycross, GA	Eld 8	" "
14905	17 Dec 87	Waycross Radiology, Waycross,GA	T-780	" "
90411	6 Feb 88	U.N.M., Albreturkey, NM	T-80	Bill Schluneger
44311	19 Apr 88	Downstate, Brooklyn, NY	T-80	" "
Removed unit, shipped source in head				
12478	28 July 87	Spartanburg, SC	T-780	C. E. Britt

NOTE: under the ASSISTED column put the name of the certified source handler who you assisted ; if you were in charge then put IN CHARGE.

AECL MEDICAL

A Division of Atomic Energy of Canada Limited

has awarded this certificate of achievement to:

Mike Kinsaul

upon successful completion of:

Cobalt Source Handlers Certification
on Round Drawer Units

course

30 Sept. 88
Date

Manager, Technology and Service

T. J. McEwen
Technical Training Officer

Signed at Ottawa, this 5th *day of* October 19 88.

BOB HOBLITZELL

SOURCE HANDLER EXPERIENCE LIST FORM

P&S	DATE	PLACE/LOCATION	UNIT TYPE	ASSISTED
43783	870202	Associated Radiology Warren, NJ	T780-C Installation	A. Crandell
44042	870710	Baystate Medical Springfield, MA	T780-C Source	E. Kato
44128	870917	St. Francis Hartford, CT	T780 Source	E. Kato
44134	871022	Bon Secours Methuen, MA	T80 Source	B. Schlueçer
15389	871102	Aroostook Medical Ctr. Presque Isle, ME	T780 Move	C. Maychak
43935	871109	Worcester Mem. Hosp. Worcester, MA	T780-C Installation	B. Schlueçer
44233	871217	Dr. Maddock, M.D. Worwick, RI	T80 Source	E. Kato
170	880114	Medical Ctr. Vermont Burlington, VT	T780 Source	E. Kato
44020	880314	NYU Medical Center New York, NY	T780-C Installation	E. Kato
44257	880408	South Nassau Oceanside, NY	T780 Source	B. Hilbert
44277	880414	Elliott Hosp. Manchester, NY	T780 Source	E. Kato
44311	880627	Downstate Med. Ctr. Brooklyn, NY	T780-C Installation	B. Schlueçer
44417	880915	Terre Haute Indiana	T780 Source	D. Tegtmeyer
44461	881024	Good Samaritan Hosp. Arizona	T80 Source	A. Crandall

NOTE: Under the ASSISTED column put the name of the certified source handler who you assisted.

SIGNATURES:
PLICANT: Robert K. Hoblitzell Jr DATE: 11/18/88

SERVICE MANAGER Edward M. Kato DATE: 11-1-88

AECL MEDICAL

A Division of Atomic Energy of Canada Limited

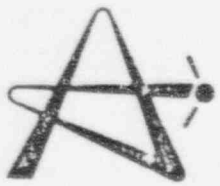
has awarded this certificate of achievement to:

Robert Hoblitzell

upon successful completion of:

Cobalt Source Handlers Certification
on Round Drawer Units

course



24th Oct. 88

Date

S J Cook.

Manager, Technology and Service

T. J. McEwan

Technical Training Officer

Signed at Ottawa, this 5th *day of* December *19* 88.

QUALIFICATIONS AND EXPERIENCE
SERVICE TECHNICIAN
MEDICAL SERVICE

FULL NAME: Robert E. Johnston, Service Manager Cobalt Operations Canada and Off Continent

ACADEMIC QUALIFICATIONS:

a. Fisher Park High School

b. Eastern Ontario Institute of Technology

c. Provincial Institute of Trades

EMPLOYMENT WITH AECL: May 1976 to present as factory representative.

TRAINING: In-house and on-the-job training in:

a. Principles and practices of radiation protection (AECL)

b. Radioactivity measurements, standardization, monitoring techniques and instruments (AECL).

c. Mathematics and calculations basic to use and measurements of radioactivity (AECL).

d. Biological effects of radiation (AECL).

Installation, field servicing and source replacements with licenced installers during 1976, 1977:

a. Little Rock, Arkansas, T750, T780.

b. Ann Arbor, Michigan, T80.

c. New York, New York, T720, T780.

d. Thunder Bay, Ontario, E1d 8.

e. Philadelphia, Pa., T780

f. Sherbrooke, Quebec, T80.

g. Montreal Hotel Dieu, Quebec, T80.

h. McGill University, Quebec, C11.

i. Crawford W. Long, Georgia, T780.

j. Baldwin County, Georgia, T80.

Installation, field service and source replacements as required internationally 1978-1985.

Installations, field servicing and source replacements 1986 to date:

a.	Trinidad	T780	No. 213	Jan. 27
		T80	No. 388	Jan. 28
b.	Largo, Florida	T780C	No. 014	Feb. 11
c.	Belfast, Ireland	T780C	No. 003	Feb. 27
d.	Leeds, England	T780C	No. 005	Mar. 3
e.	Bologna, Italy	T780C	No. 004	Mar. 10
f.	Milano, Italy	T780C	No. 006	Mar. 12
g.	Genova, Italy	T780C	No. 012	Mar. 13
h.	Alexandria, Egypt	T780	No. 355	May 13
i.	Alexandria, Egypt	T780	No. 309	May 20
j.	Kirkwood, Missouri	T780C	No. 020	June 2
k.	Cairo, Egypt	E1d 8	No. 004	July
l.	Cairo, Egypt	T80	No. 059	July
m.	Cairo, Egypt	T80	No. 241	July
n.	Tunis, Tunisia	T80	No. 137	July
o.	Tunis, Tunisia	T80	No. 330	July
p.	Ottawa, Canada	T780		Aug. 20
q.	Springfield, Massachusetts	T780C	No. 002	Aug. 27
r.	Poland	T780	No. 427	Sept.12
s.	Poland	T780C	No. 013	Sept.16
t.	India	T780C	No. 017	Oct. 6
u.	Riverside, California	T780C	No. 022	Nov. 2
v.	Cordoba, Spain	T780	No. 365	Nov. 22
w.	Chicago, Illinois	T780C	No. 016	Dec. 8
x.	Saint John, N.B.	T780	No. 134	Feb. 7 1987
y.	Winnipeg, Manitoba	T.F	No. 022	Feb. 18 1987

Note: Continue to install and service AECL/Theratronics therapy units and to train other Theratronics personnel thru on the job training to the present time.

1988 October 20

APPENDIX "D"

ITEM 8.

Individual Training

All accredited Theratronics personnel will have received a formal in-house training course in applied:

a) Principles and practices of radation protection.
b) Radioactivity measurement standardization and monitoring techniques and instruments.
c) Mathematics and calculations basic to the use and measurement of radioactivity.
d) Biological effects of radiation.

In addition, all accredited Theratronics personnel will have received on-the-job training in all work areas associated with field oprations on AECL/Theratronics teletherapy units as follows:

a) Installation of equipment and its radioactive contents.
b) Removal of equipment and its radioactive contents.
c) Servicing equipment and manipulation of its radioactive contents.
d) Refurbishing and listing radiation equipment.
e) Transfer of radioactive materials.
f) Replenishment and removal of radioactive materials.
g) Contamination detection and decontamination procedures.
h) Radiation surveys with approved instrumentation.
i) Emergency procedures to be adopted in the event of an incident.
j) Preparation of equipment and radioactive sources for ongoing shipment.

All training instructions are under the direction of qualified Physicists and Senior Service Supervisor.

APPENDIX "E"

ITEM 10. RADIATION SAFETY PROGRAM

ITEM 10.1

RADIATION DETECTION INSTRUMENTS

LN NO.	INSTRUMENT A	MANUFACTURER'S NAME B	MODEL NUMBER C	NUMBER AVAILABLE D	RADIATION DETECTED E	SENSITIVITY RANGE F
1	Survey	Berthold	Rado/F	2 or more	Beta-Gamma	0-1;0-10;0-100mR 0-1 & 0-10R
2	Pocket Dosimeter	Stephen Quartz Fibre	P-1164A	1	Beta-Gamma	0-200 mR
			P-1164B	1	Beta-Gamma	0-5 R

ITEM 10.2 CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10.1

A. Instruments used by U.S. based personnel are calibrated at three month intervals by:

Health Physics Associates
3312 Commercial Avenue
North Brook, Illinois 60062
U.S.A.

B. Instruments used by Canadian based personnel are calibrated at three month intervals by:

Nordion International Inc./Formerly AECL-Radiochemical Company
447 March Road
P.O. Box 13500
Kanata, Ontario, Canada
K2K 1X8

ITEM 10.3 PERSONNEL MONITORING DEVICES

A. All personnel use a thermoluminescence Dosimeter (TLD).

B.(i) Dosimeters used by U.S. personnel are exchanged on a monthly cycle. The radiation levels are determined by

Tech-Ops Landauer Inc.
2 Science Road
Glenwood Illinois - U.S.A.
60425-1586.

B.(ii) Dosimeters used by Canadian personnel are exchanged on a two week basis. The radiation levels are determined by:

Atomic Energy of Canada Limited
Research Company
Chalk River, Ontario, Canada
K0J 1J0

ITEM 10.4 IN-HOUSE SPECIFICATIONS

1. Engineering Specification DG0347-Revision A "Radiation Limits"

2. Engineering Specification DG0569- Revision 0
"Routine wipe test for removable contamination on AECL-CP/Theratronics equipment containing Cobalt-60 or Caesium 137 Sources or uranium Components".

3. Engineering Specification DS0573 - Revision 0
"Routine wipe test for removable Cobalt-60 contamination on therapy equipment (including uranium components").

4. Engineering Specification DS0574 - revision 0
"Routine wipe test for removable Caesium-137 contamination on therapy equipment (including uranium components).

5. Report of routine wipe test for contamination, Form Q.A.-026-1.

6. Engineering Specification DG0273 - Revision C
"Calibration procedures for portable radiation survey instruments and direct reading dosimeters (DRD's)."

7. Engineering Specification DG0295 - Revision B
"Calibration procedure for radiation dosimetry instruments".

8. Engineering specification DS0701Z0J, Revision 0
"Calibration of Berthold Model RATO/F survey meter".

All the above specifications were submitted on March 26, 1984 with AECL renewal application for License 54-00300-04. They are referenced in Amendment 40, Condition 20, Part G of the License and are still in effect.

APPENDIX "F"

ITEM 11 WASTE MANAGEMENT

There is no commercial waste disposal service employed in the U.S.A.

All depleted sources are returned to:

Theratronics International Limited
413 March Road, P.O. Box 13140
Kanata, Ontario, Canada
K2K 2B7

The depleted sources are shipped in U.S.D.O.T. and U.S.N.R.C. approved containers.

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SRT-8 ISSUE NO. 2

1979 FEBRUARY 20

INSTRUCTION

SOURCE REPLACEMENT PROCEDURE

ELDORADO 76 AND 78

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
OTTAWA, CANADA

INSTRUCTION
SOURCE REPLACEMENT PROCEDURE
ELDORADO 78 AND ELDORADO 76
A.E.C.L. TELETHERAPY EQUIPMENT

INSTRUCTION REFERENCE: SRT-8 ISSUE NO. 2

SECTION A: GENERAL

1. - Not less than one (1) authorized A.E.C.L. person and one (1) assistant shall participate in this operation.

2. - Prior to commencement, the authorized person shall check that the following equipment is on hand.

   (a) pocket dosimeter charger
   (b) calibrated radiation survey meter - Berthold-Rato/F type with built in accoustical device or equivalent capable of reading radiation field as low as .5 mr/hr and a high range in the order 10 r/hr.
   (c) set of source drawer handling tools (see dwg. #A1024 25 001).
   (d) hydraulic lift truck for moving source transfer shipping container.
   (e) source container fitted with one dummy. filler drawer and fire shield (if a shipment or source storage is planned).

3. - Both persons shall wear a 0 - 50 m/r/hr and a 0 - 5 r/hr pocket dosimeters - correctly zeroed, together with an A.E.C.L. film badge.

4. - Prior to commencement, the authorized person shall:

   (a) perform a survey of the shipping container to ensure the levels observed agree with those on the shipping documents.
   (b) make a survey of those areas from which uncontrolled persons may have to be evacuated in the event of a maltransfer. Any area in which the radiation field is 5 m/r/hr or greater will be considered as a "Controlled Area".

SECTION A: GENERAL - Cont'd

(c) have readily available the telephone number, contact officer, etc., of the nearest office of the official Atomic Energy Control Authority in the area in which the transfer is to take place.

(d) have similar information at hand if immediate assistance is required from:

i) The Municipal Police Department
ii) The Municipal Fire Department
iii) The Civil Defence Department

NOTE: (1) In the event of a maltransfer, do not depend on locked doors to secure the "Controlled Area". See that guards are posted to prevent entrance to the "Area".

(2) Report to A.E.C.L. Radiation Hazards Section immediately after all entrances to the "Controlled Area" have been secured.

SECTION B: PREPARATION

1. - Ensure that the source is in the "OFF" or storage position then, enter the treatment room and place the radiation survey meter in the working area. The meter must be in the "ACTIVATE" or "ON" condition at all times while this operation is in progress.

2. - Operate the head vertical travel to a convenient working level and the head rotation to its zero lock position.

3. - Close collimator to minimum opening and remove all source head and neck covers. Wipe test the collimator leaves for any indication of removable contamination.

4. - Remove power from the unit by means of the key switch on the control unit.
DO NOT RELEASE THE AIR PRESSURE FROM THE STORAGE RESERVOIR.

5. - By means of the hydraulic lift truck, position the transfer case in line with the therapy head, with approximately one (1) foot separation. Close collimator to minimum opening.

SECTION B: PREPARATION - Cont'd

- Unlock the transfer case cover plate and remove. Wipe test both ends of the drawers and check for any removable contamination.

7. - Remove front bracket assembly, light housing assembly and front connecting plate (illustrated in Figure 5-7 in the Service Manual).

8. - Carefully move the transfer case toward the therapy head (correcting any misalignment during the process) until the large register on the transfer case engages with the machined boss on the therapy head.

9. - Ensure that all passageways above, below and at both sides are evacuated so that there is no possibility of others receiving exposure as a result of the transfer. Very carefully mate the source container with the unit head, there is a spigot on head and a recess on the container for this purpose.

10. - Place the survey meter on the floor in such a position that it is not subjected to the direct radiation field during transfer, but is accessible from behind the container. Use the 0 - 10 r/hr scale.

11. - Block between the source container and the floor as a safety precaution.

SECTION C: SOURCE REMOVAL

1. - Ascertain that the electrical power is still off.

2. - Check that the radiation meter is "ON", dosimeters are zeroed, and film badges are worn.

3. - Insert the "T" rod source handlers tool through the hole in the center of the filler or dummy drawer in the container and thread it firmly into the source drawer in the head.

4. - The assistant will disconnect the auxiliary retractor rod followed by, the removal of the cylinder connecting rod shaft to the source drawer connecting rod assy. He will then likewise take up a position behind the source container.

SECTION C: SOURCE REMOVAL

5. - The authorized person will by means of the "T" bar, gently draw the source drawer forward approximately two to three inches. He will then rotate the drawer in a clockwise direction 90° and continue to draw the drawer forward until it butts against the dummy or filler drawer.

   At this stage the assistant will take a position whereby he can support the weight of the dummy/ filler drawer as it emerges from this case.

   The authorized person will then continue to draw the source drawer forward until it is completely in the container. He will then unthread the "T" bar and withdraw it from the filler/dummy drawer.

6. - Carefully remove the air cylinder connecting rod and plate assembly from the opposite end of the source drawer. Put the container rear cover plate in place and secure.

7. - Move the container forward and install the other cover plate.

8. - Store the filler/dummy drawer and the air cylinder and plate assembly in a safe place.

9. - Place the source container in a convenient location in the room, as remote as possible from the working area. Make sure that the Radiation Warning signs are readily visible.

10. - Proceed with the major servicing of the unit (if applicable).

SECTION D: SOURCE INSTALLATION

1. - Review Section A: General before proceeding further.

2. - Operate the head to a vertical position close to the lower limit of travel.

3. - Position the transfer case in line with the therapy head. Open one cover plate on the case to determine the correct orientation to the head, i.e. that when the registers on the case and the therapy head are mated, the new source drawer will be aligned with the bore in the head. Close the cover plate.

SECTION D: SOURCE INSTALLATION

4. - Place head rotator in lock position and check that the head zero lock is in the 0° position.

5. - Move the case to a position approximately one (1) foot from and in line with the therapy head.

6. - Position the head at a convenient level for transfer operations.

7. - Remove power from unit but do not release the air pressure in the storage reservoir.

8. - Note that the air cylinder shaft is in the "source off" position (fully retracted) and the collimator is set to the minimum opening.

9. - Remove the cover plate on source container facing the head. Fit the air cylinder connecting shaft to the new source drawer. Move the container up to the head, elevate and mate the respective registers.

10. - Remove the other cover plate from the source container. Rotate the new source drawer until the arrow on the drawer end is pointing in a direction approximately 90° from the axis of the collimator.

11. - Carefully move the new source drawer in the container toward the head one (1) inch. The assistant will now support the filler/dummy drawer in line with the new source drawer and the authorized person will insert the "T" bar through the filler/dummy drawer and thread it into the line source drawer. The assistant can now insert the end of the dummy/filler drawer into the one (1) inch space until it butts to the live source drawer.

12. - The authorized person will then push the dummy/filler drawer into the source container until it is fully entered then, immediately, gently push the "T" bar until the live source drawer comes to a stop against the air cylinder shaft in the therapy head.

13. - After noting that the survey meter indicates a safe condition, the assistant will take a position where he can observe the orientation of the slot in the source drawer connecting rod to the mating section on the end of the air cylinder piston shaft.

SECTION D: SOURCE INSTALLATION - Cont'd

14. - The assistant can then advise the authorized man in which direction to rotate the source drawer for any minor correction in the alignment of the source drawer to the air cylinder. On completion, the assistant will:

(a) place the auxiliary retracting rod plunger head into its nest.
(b) insert the detent pin to secure the source drawer connecting rod to the air cylinder piston shaft.

15. - The authorized person will inspect (a) and (b) above to ensure that the operations were correctly performed.

16. - Unthread the "T" bar. Carefully withdraw the shipping container to a workable position and install both end plates and lock.

17. - Survey the container, prepare new radiation labels and indicate the calculated curie content of the decayed source. Move the container to a convenient area.

18 - Perform the following:

(a) Assemble the front rider ring followed by the light housing.
(b) Assemble the front bracket assembly to the therapy head.
(c) Install trim cover, etc.

19. - Survey the head and complete the Head Survey forms in duplicate. This survey is not to be construed as an official survey for licensing purposes but only to make reasonably certain that the radiation leakage levels are within permissible tolerances.

20. - With the treatment room door closed, operate the shutter to the "ON" position and then open the treatment room door just enough to energize the door interlock switch and note

(1) that the shutter closes immediately and that the reset button must be operated before the shutter will open again - repeat at least five (5) times.
(2) that all signal lights are functional.

SECTION D: SOURCE INSTALLATION - Cont'd

21. - Record personal exposure. This should not be more than 5 m/r, if exposure is more than 10 m/r include an explanation in the job report. Check out unit and source operation as instructed in Installation and Service Manuals.

SECTION E: CONCLUSION

1. - Wipe test the items listed herunder for any removable contamination.

(1) Collimator leaves
(2) Stretcher top
(3) Source container
(4) Source handling tools

2. - Arrange the return shipment of the decayed source with the customer. Recheck that the container is correctly labelled to meet shipping requirements.

3. - Obtain customer's acceptance of services performed.

SRT-6 ISSUE NO. 4

1979 FEBRUARY 20

INSTRUCTION

SOURCE REPLACEMENT PROCEDURE

ELDORADO 6 AND 8

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
OTTAWA, CANADA

INSTRUCTION

SOURCE REPLACEMENT PROCEDURE

ELDORADO "C" & ELDORADO "B"

A.E.C.L. TELETHERAPY EQUIPMENT

INSTRUCTION REFERENCE: SRT-6 ISSUE NUMBER 4

SECTION A: GENERAL

1. Not less than one (1) authorized A.E.C.L. person and one (1) assistant shall participate in this operation.

2. Prior to commencement, the authorized person shall check that the following equipment is on hand.

   (a) pocket dosimeter charger
   (b) calibrated radiation survey meter - J. equivalent capable of reading radiati and a high range in the order of 25 -
   (c) end window geiger counter - Electron EA-1,T-A or equivalent having a low sc the range of 0 - 500 counts per minute less than 25,000 C.P.M.
   (d) set of source drawer handling tools (s
   (e) hydraulic lift truck for moving source
   (f) teletherapy Head Survey blanks in dupl
   (g) return shipping instructions and docum

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3. Both persons shall wear 0 - 50 m/r/hr and 0 - 5 r/hr pocket dosimeters - currently worked together with an A.E.C.L. film badge.

4. Prior to commencement, the Authorized person shall:

   (a) make a survey of those areas from which uncontrolled persons may have to be evacuated in the event of a mal-transfer. This area in which the radiation field is 5 r/r/hr or greater will be referred to as the "Danger Area"
   (b) should an accident occur, be guided by the Official Atomic Energy Control Authority in the country in which you are working
   (c) if immediate assistance is required, consult the Municipal Police, Fire Department or Civil Defense Authority
   (d) do not depend on locked doors. See that guards are posted to prevent entrance to the "Danger Area"
   (e) report to A.E.C.L. Radiation Hazards Section immediately, after the entrances to the "Danger Area" have been secured

SECTION B - PREPARATION

1. Check that the shutter is in the closed position by noting that the "shutter closed" green light is illuminated on the control panel and on the equipment before entering the treatment room. Enter the treatment room with a survey meter in the "on" position and check that the radiation level is normal.

SECTION B - PREPARATION (continued)

2. Position the head to vertical or 0° (degrees). Operate the head and arm assembly to the lowest vertical position.

3. Position the source transfer case approximately in line with the head.

4. Check that the radiation level at both drawer ends is within the level indicated on the radiation warning label.

5. Unlock the transfer case and remove the end plates.

6. Check the loading card and note the location of the live source drawer eg upper or lower compartment.

NOTE:
Note that the live source drawer has a brass end plate stamped with the source serial number and an arrow indicating the position of the source proper. The dummy drawer is of stainless steel and is stamped as such.

7. Check that the number stamped on the live drawer end plate is that indicated on the shipping document and note that the live source drawer indicator (arrow) is in the horizontal plane.

8. Remove:

a) power
b) air from reservoir
c) wires from solenoid valves nos. 1 & 3
and wires from compressor nos. 203 & 204
d) light system assembly - dwg. D-93-V-26, item 11
e) roller assembly - dwg. D-93-V-26, item 10

9. Install item 8 on dwg. D-93-V-26.

NOTE: (Applicable only to units equipped with single acting air cylinder)
No. 10 involves the removal of the return spring. Maintain pressure on item 16 while releasing tension on spring item 17.

10. Refer drawing D-93-V-26, remove item 19, 18, 14, 16 and 17.

11. By means of the hydraulic lift truck, raise the transfer case until the dummy drawer is in line with the head aperture.

12. Remove item No. 8 - dwg. D-93-V-26.

13. Very carefully recheck the alignment between the dummy drawer in the transfer case and the live drawer in the Cobalt Head. Block and shim between the transfer case and members and the floor as a safety precaution. Install item 9 (dwg. D-93-V-26) after removing core insert in the dummy drawer, as illustrated in dwg. D-93-V-26.

14. Place the survey meter in such a position that it is not subjected to the incident beam during the transfer, but in such a position that the meter scale may be viewed by both operators. Use the 0 to 50 r/hour scale.

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SECTION B - PREPARATION (continued)

15. Insure that all passageways above, below and both sides, are controlled so that there is no possibility of other persons being exposed during the transfer.

SECTION C - SOURCE REMOVAL

1. Check pocket dosimeters for zero prior to starting.

2. Never move from your assigned position during the source transfer without first observing the survey meter and advising the other person of your intent.

3. Never use more force to effect a transfer of the drawer into the head of the unit than is required to move the drawer in the transfer case.

4. Both persons shall take positions behind the transfer case. It will be the duty of one person to operate the "T" bar to withdraw the source and the assistant shall support the weight of the dummy drawer as it is withdrawn from the transfer case.

5. Check that the survey meter is within reach of either or both persons. Check that the diaphragm is at minimum opening.

6. The authorized person, after notifying the other of his intent, will gently draw the old live drawer through the Cobalt 60 Head until it comes in contact with the dummy drawer, at which time he will continue to draw the old live drawer into the transfer case. With the assistant supporting the weight of the dummy drawer, the authorized person will disconnect the "T" bar from the live drawer. Disconnect drawer push rod item 6, dwg. D-93-V-26. Install the end plates on the transfer case.

7. Carry out the test procedure using the geiger probe as detailed in D-1421 through D-1429. Any waste disposal shall be dealt with as outlined in Bulletin WD-3 part B Section no. 1.

8. Complete any servicing and/or repairs necessary.

9. After all servicing and/or repairs have been satisfactorily completed, test the door interlock switch as follows:

   (a) close the door to the treatment room
   (b) set up the remote control for a simulated treatment
   (c) remove wire no. 0 from all solenoid valves and connect an A.C. Voltmeter with the range selecting switch set to read 0 - 150 volts A.C.
   (d) operate the unit with the shutter in the "on" condition and note that the Voltmeter indicates a scale reading of 115 volts (approximately)
   (e) open the treatment room door and check that the meter reading is 0 volts.
   (f) repeat at least 5 times.

NOTE: The CA 147A geiger has been calibrated against AECL standards. In the United States the licensee must be notified if the wipe test indicates contamination of .05 micro-curies or more. A reading of 2,220 counts per minute is equal to .05 micro-curies. With a geometry of approximately 25%, a window of 2.5 milli-grams/centimeter squared and a counting [illegible] counts per minute is equal to .05 micro-curies.

SECTION C - SOURCE REMOVAL (continued)

Any removable contamination of this level or greater must be reported to the licensee, who in turn must advise the appropriate office of the U.S.A.E.C. This condition shall be reported to the Radiation Hazards Section in AECL. Follow all instructions issued by the Regional Office of the U.S.A.E.C. in the area in which the equipment is located.

SECTION D - REPLACEMENT

1. Review Section A paragraph 4, section (a) to (e)

2. Realign the Replacement Live Drawer in the transfer case to the aperture in the head.

3. Double check the alignment, block and shim the transfer case to the floor.

4. Connect item 6, dwg. D-93-V-26 to the replacement live drawer.

5. Gently push the dummy drawer into the transfer case until the Drag Brake (dwg. D-93-V-27) comes in contact with the face of the transfer case. Then push on the "T" handle until the Replacement Live Drawer is in the Cobalt Head as far as it will go. This is indicated by a register mark on the "T" bar handle which will be (approximately) the end face of the dummy drawer.

6. Disconnect the "T" bar, insert the filler section in the dummy drawer. Fasten the end plates on the transfer case and remove case to a convenient position.

7. Install in this order on those equipments supplied with single action air cylinder only.

item 5	drawing D-93-V-26
item 17	drawing D-93-V-26
item 15	drawing D-93-V-26
item 14	drawing D-93-V-26
item 18	drawing D-93-V-26
item 19	drawing D-93-V-26

7A. Install in this order on those equipments supplied with the double acting type air cylinder.

item 5	drawing D-93-V-26
item 27	drawing D-93-A-106
item 26	drawing D-93-A-106
item 25	drawing D-93-A-106

8. Remove item 3 (above).

9. Reconnect all wiring.

10. Perform the following operations:

(a) close the door to the treatment room
(b) set up the remote control for a simulated treatment
(c) operate the unit with the shutter in the "on" condition
(d) open the door to the treatment room and note that the "shutter" closes immediately and that the "reset" control must be re-activated before the "shutter" will open (red lights on control unit and equipment)

SECTION D - REPLACEMENT (continued)

(e) repeat the above at least 5 times.

11. Perform head survey and fill the blank forms.

12. With the diaphragm set to the maximum opening, and the shutter in the open position, perform a radiation survey on all external surfaces of the treatment room to insure that there are no obvious deficiencies in the room construction.

NOTE:

If possible, all above should be performed in the compny of the customer's physicist.

SECTION E - CONCLUSION

1. All source drawers, tools, transfer cases are free of any contamination before shipment. However, check all tools, etc., before packing for return shipment.

2. Should low level contamination be encountered, all waste, etc., shall be handled as outlined in Bulletin TB-WD-3, attached to this instruction.

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS DIVISION
OTTAWA, CANADA.

SRT-5 ISSUE NO. 4

1979 FEBRUARY 20

INSTRUCTION

SOURCE REPLACEMENT PROCEDURE

THERATRON 60 AND 80

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
OTTAWA, CANADA

[illegible]

[illegible] PROCEDURE

[illegible] "80"

A.E.C.L. TELETHERAPY EQUIPMENT

INSTRUCTION REFERENCE: SRT-5

ISSUE NUMBER 4

SECTION A: GENERAL

1. Not less than one (1) authorized A.E.C.L. person and one (1) assistant shall participate in this operation.

2. Prior to commencement, the authorized person shall check that the following equipment is on hand.

   (a) pocket dosimeter charger
   (b) calibrated radiation survey meter - Jordan type AGB-50-SR or equivalent capable of reading radiation field as low as .5 m/r/hr and a high range in the order of 25 - 50 r/hr.
   (c) end windows meter counter - Electronic Associates Ltd. type EA-IRT-A or equivalent having a low scale capable of reading in the range of 0 - 500 counts per minute and a high scale of not less than 25,000 C.P.M.
   (d) set of source drawer handling tools (see dwg. No. D-96-V-25)
   (e) hydraulic lift truck for moving source transfer shipping container
   (f) gantry crane, A.E.C.L. type 165 or equivalent with 5000 lbs working capacity
   (g) teletherapy Head Survey blanks in duplicate
   (h) return shipping instructions and documents

3. Both persons shall wear 0 - 50 m/r/hr and 0 - 5 r/hr pocket dosimeters - correctly zeroed together with an A.E.C.L. film badge.

4. Prior to commencement the Authorized person shall:

   (a) make a survey of those areas from which uncontrolled persons may have to be evacuated in the event of a mal-transfer. This area in which the radiation field is 5 m/r/hr or greater will be referred to as the "Danger Area"
   (b) should an accident occur, be guided by the Official Atomic Energy Control Authority in the country in which you are working
   (c) if immediate assistance is required, consult the Municipal Police, Fire Department or Civil Defense Authority
   (d) do not depend on locked doors. See that guards are posted to prevent entrance to the "Danger Area"
   (e) report to A.E.C.L. Radiation Hazards Section immediately after the entrances to the "Danger Area" have been secured.

..... 2

SECTION B - DISMANTLING

1. Check that the shutter is in the closed position by noting that the "shutter closed" green light is illuminated on the control panel and on the equipment before entering the treatment room. Enter the treatment room with a survey meter in the "on" position and check that the radiation level is normal.

2. Rotate the curved arm to the horizontal or 90° position as indicated on the rotation scale.

3. Position the source transfer case approximately in line with the head.

4. Check that the radiation level at both drawer ends is within the level indicated on the radiation warning label.

5. Unlock the transfer case and remove the end plates.

6. Check the loading card and note the location of the live source drawer e.g. upper or lower compartment.

NOTE:

Note that the live source drawer has a brass end plate stamped with the source serial number and an arrow indicating the position of the source proper. The dummy drawer is of stainless steel and is stamped as such.

7. Check that the number stamped on the live drawer end plate is that indicated on the shipping document and note that the live source drawer indicator (arrow) is in the horizontal plane.

8. Remove:

   a) power
   b) air from reservoir
   c) wires from solenoid valve nos. 43 & 11 and wires no. 0 and no. 40 to the compressor
   d) light system assembly - dwg. D-93-V-26 item 11
   e) roller assembly - dwg. D-93-V-26 item 10

9. Install item 8 on dwg. D-93-V-26.

NOTE: (Applicable only to units equipped with single acting air cylinder)
No. 10 involves the removal of the return spring. Maintain pressure on item 16 while releasing tension on spring item 17.

10. Re drawing D-93-V-26, remove item 19, 18, 14, 16 and 17.

11. By means of the crane and the adjustable sling assembly, hoist the transfer case until the dummy drawer is in line with the head aperture.

12. Remove item No. 8 - dwg. D-93-V-26.

13. Very carefully recheck the alignment between the dummy drawer in the transfer case and the live drawer in the cobalt head. Block and shim between the transfer case skids and the floor as a safety precaution. Install item 9 (dwg. D-93-V-26) after removing core insert in the dummy drawer, as illustrated in dwg. D-93-V-26.

14. Place the survey meter in such a position that it is not subjected to the incident beam during the transfer, but in such a position that the meter scale may be viewed by both persons. Use the 0 to 50 r/hr scale.

15. Ensure that all passageways above, below and both sides, are controlled so that there is no possibility of other persons being exposed during the transfer.

SECTION C - SOURCE REMOVAL

1. Check pocket dosimeters for zero prior to starting.

2. Never move from your assigned position during the source transfer without first observing the survey meter and advising the other person of your intent.

3. Never use more force to effect a transfer of the drawer into the head of the unit than is required to move the drawer in the transfer case.

4. Both persons shall take positions behind the transfer case. It will be the duty of one person to operate the "T" bar to withdraw the source and the assistant shall support the weight of the dummy drawer as it is withdrawn from the transfer case.

5. Check that the survey meter is within reach of either or both persons. Check that the diaphragm is at minimum opening.

6. The authorized person, after notifying the other of his intent, will gently draw the old live drawer through the Cobalt 60 Head until it comes in contact with the dummy drawer, at which time he will continue to draw the old live drawer into the transfer case. With the assistant supporting the weight of the dummy drawer, the authorized person will disconnect the "T" bar from the live drawer. Disconnect drawer push rod item 6 dwg. D-93-V-26. Install the end plates on the transfer case.

7. Carry out the test procedure using the geiger probe as detailed in D-1421 through D-1429. Any waste disposal shall be dealt with as outlined in Bulletin WD-3 part B Section no. 1.

8. Complete any servicing and/or repairs necessary.

9. After all servicing and/or repairs have been satisfactorily completed, test the door interlock switch as follows:

   (a) Close the door to the treatment room
   (b) Set up the remote control for a simulated treatment
   (c) Remove wire No. 11 from all solenoid valves and connect an A.C. Voltmeter with the range selecting switch set to read 0 - 150 volts a.c.
   (d) Operate the unit with the shutter in the "on" condition and note that the Voltmeter indicates a scale reading of 115 volts (approximately)
   (e) Open the treatment room door and check that the meter reading is 0 volts.
   (f) Repeat at least 5 times.

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SECTION 2 - SOURCE CONTROL (continued)

Note: The CA 1147A (alpha) counter has been calibrated against AECL standards. In the United States the licensee must be notified if the wipe test indicates contamination of .05 micro-curies or more. A reading of 6,000 counts per minute is equal to .05 micro-curies. With a geometry of approximately 35%, a window of 2.5 milli-rems/centimeter squared and a counting efficiency of 8%, a scale reading of 1,000 counts per minute is equal to .05 micro-curies. Any removable contamination of this level or greater must be reported to the licensee, who in turn must advise the appropriate office of the U.S.A.E.C. This condition shall be reported to the Radiation Hazards Section in AECL. Follow all instructions issued by the Regional Office of the U.S.A.E.C. in the area in which the equipment is located.

5. [illegible] the Drag Brake [illegible] transfer case. [illegible] Drawer Drawer is in the [illegible] ball head as far as it will go. This is indicated by a register mark on the "T" bar handle which will be (approximately) the end face of the dummy drawer.

6. Disconnect the "T" bar, insert the filler section in the dummy drawer. Fasten the end plates on the transfer case and remove case to a convenient position.

7. Install in this order on those equipments supplied with single action air cylinder only.

Item 6	drawing D-93-V-26
Item 17	drawing D-93-V-26
Item 16	drawing D-93-V-26
Item 14	drawing D-93-V-26
Item 18	drawing D-93-V-26
Item 19	drawing D-93-V-26

7A. Install in this order on those equipments supplied with the double acting type air cylinder.

Item 8	drawing D-93-V-26
Item 27	drawing D-93-A-106
Item 28	drawing D-93-A-106
Item 29	drawing D-93-A-106

8. Remove item 8 (above).

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9. Reconnect all wiring.

10. Perform the following operations:

(a) close the door to the treatment room
(b) set up the remote control for a simulated treatment
(c) operate the unit with the shutter in the "on" condition
(d) open the door to the treatment room and note that the "shutter closed" interlock fails and that the "reset" control must be re-activated before the "shutter" will open (red lights on control unit and treatment)
(e) repeat the above at least 5 times

11. Perform head survey and fill in the blank forms.

12. With the diaphragm set to the maximum opening, and the shutter in the open position, perform a radiation survey on all external surfaces of the treatment room to insure that there are no obvious deficiences in the room construction.

NOTE:

If possible, 12 above should be performed in the company of the customer's physicist.

SECTION 2 - CONCLUSION

1. All source drawers, tools, transfer cases are free of any contamination before shipment. However, check all tools, etc, before packing for return shipment.

2. Should low level contamination be encountered, all waste, etc, shall be handled as outlined in Bulletin TB-MD-3, attached to this instruction.

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS DIVISION
OTTAWA, CANADA.

SRT-4 ISSUE NO. 4

1979 FEBRUARY 20

INSTRUCTION

SOURCE REPLACEMENT PROCEDURE

THERATRON JUNIOR AND C-II

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
OTTAWA, CANADA

INSTRUCTION

SOURCE REPLACEMENT PROCEDURE

THERATRON JUNIOR & THERATRON C11

TELETHERAPY EQUIPMENT

INSTRUCTION REFERENCE: SRT-4 ISSUE NUMBER 4

SECTION A: GENERAL

1. Not less than one (1) authorized A.E.C.L. person and one (1) assistant shall participate in this operation.

2. Prior to commencement, the authorized person shall check that the following equipment is on hand.

   (a) pocket dosimeter charger
   (b) calibrated radiation survey meter - Jordan type AGB-50-SR or equivalent capable of reading radiation field as low as .5 mr/hr and a high range in the order of 25 - 50 r/hr.
   (c) end windows geiger counter - Electronics Associates Ltd. type EA-147-A or equivalent having a low scale capable of reading in the range of 0 - 500 counts per minute and a high scale of not less than 25,000 C.P.M.
   (d) set of source drawer handling tools
   (e) hydraulic lift truck for moving source transfer shipping container
   (f) teletherapy Head Survey blanks in duplicate
   (g) return shipping instructions and documents

3. Both persons shall wear 0 - 50 m/r/hr and 0 - 5 r/hr pocket dosimeters - correctly zeroed together with an A.E.C.L. film badge.

4. Prior to commencement the Authorized person shall:

   (a) make a survey of these areas from which uncontrolled persons may have to be evacuated in the event of malfunction. This area in which the radiation field is 5 m/r/hr or greater will be referred to as the "Danger Area".
   (b) should such an accident occur, be guided by the Official Atomic Energy Control Authority in the country in which you are working.
   (c) if immediate assistance is required, consult the Municipal Police, Fire Department or Civil Defense Authority.
   (d) do not depend on locked doors. See that guards are posted to prevent entrance to the "Danger Area"
   (e) report to A.E.C.L. Radiation Hazards Section immediately after the entrances to the "Danger Area" have been secured.

SECTION B: PREPARATION

1. Check that the shutter is in the closed position by noting that the "shutter closed" green light is illuminated on a control panel and on the equipment before entering the treatment room. Enter the treatment room with a survey meter in the "on" position and check that the radiation level is normal.

2. Operate the curved arm to the 180° position, i.e. counterweight at the top and head at the bottom position of rotation.

3. Position the source transfer case approximately in line with the head.

4. Check that the radiation level at both drawer ends is within the level indicated on the radiation warning label.

5. Unlock the transfer case and remove the source drawer cover plates and lead filler plug.

6. Check the loading card and note the location of the live source drawer e.g. upper or lower compartment.

NOTE:

Note that the live source drawer has a brass end plate stamped with the source serial number and an arrow indicating the position of the source proper. The dummy drawer is of stainless steel and is stamped as such.

7. Check that the number stamped on the live drawer end plate is that indicated on the shipping document and note that the live source drawer indicator (arrow) is in the inverted vertical plane.

8. With the power off - disconnect wiring to air compressor and release the air from the air reservoir.

9. Disconnect the wires to the skinner air valve - wires No. 0 and No. 1

10. Position the transfer case to a point approximately 2 inches from the head. Elevate the transfer case by means of the elevation screws (supplied in tool section of transfer case.)

11. Align the dummy drawer with the head aperture.

12. Very carefully recheck the alignment between the dummy drawer in the transfer case and the live drawer in the Cobalt Head. Block and shim between the transfer case skid members and the floor as a safety precaution. Connect the appropriate drawer couplings as detailed on drawing D5V-62.

13. Place the survey meter in such a position that it is not subjected to the incident beam during the transfer, but in such a position that the meter scale may be viewed by both persons. Use the 0 to 50 r/hr scale.

14. Insure that all passageways above, below and both sides, are controlled so that there is no possibility of other persons being exposed during the transfer.

SECTION C: SOURCE REMOVAL

1. Always check pocket dosimeters for zero prior to starting.

2. Never move from your assigned position during the source transfer without first observing the survey meter and advising the other person of your intent.

3. Never use more force to effect a transfer of the drawer into the head of the unit than is required to move the drawer in the transfer case.

4. Both persons shall take position behind the transfer case during the actual transfer.

5. The Authorized person shall securely thread the "T" transfer tool into the dummy drawer, after removing cover plates from the transfer case and releasing the locking screw on the rear of the live drawer in the Cobalt head.

6. The person in 5 above, after notifying the other of his intent, will gently draw the dummy drawer out of the transfer case and unlock the quick release connection after the decayed source is fully entered the transfer case. Install the end plates on the transfer case until servicing has been completed.

7. Carry out the test procedure using the geiger probe as detailed in Issue 1, Contamination Test of Teletherapy Units, D-1421 through D-1427. Any waste disposal shall be dealt with as outlined in Bulletin WD-3 part B Section No. 1.

8. Complete any servicing and/or repairs necessary.

9. After all servicing and/or repairs have been satisfactorily completed, test the door interlock switch as follows:

   (a) Close the door to the treatment room
   (b) Set up the remote control for a simulated treatment
   (c) Operate the unit with the shutter in the "on" condition
   (c) Open the door to the treatment room and note that the "shutter" closes immediately and that the "reset" control must be re-activated before the "shutter" will open (red lights on control unit and equipment).
   (e) Repeat the above at least 5 times

NOTE:

The EA 47A geiger counter has been calibrated against AECL standards. In the United States the licensee must be notified if the wipe test indicates contamination of .05 micro-curies or more. A reading of 8,800 counts per minute is equal to .05 micro-curies. With a geometry of approximately 35%, a window of 2.5 milligrams/centimeter squared and a counting efficiency of 8%, a scale reading of 8,800 counts per minute is equal to.05 micro curies. Any removable contamination of this level or greater must be reported to the licensee, who in turn must advise the appropriate office of the U.S.A.E.C. This condition shall be reported to the Radiation Hazards Section in A.E.C.L. Follow all instructions issued by the Regional Office of the U.S.A.E.C. in the area in which the equipment is located.

SECTION D: REPLACEMENT

1. Review Section A, paragraph 4, section (a) to (e)

2. Realign the Replacement Live Drawer in the transfer case to the aperture in the head.

3. Double check the alignment, block and shim the transfer case to the floor.

4. Connect the dummy drawer to the live replacement drawer with the quick release couplings.

5. With the dummy drawer, gently push the replacement live drawer into the Cobalt Head and disconnect the coupling between the drawers.

6. Reconnect all wiring, install the retaining end blocks. Install the rear retaining screw in the live drawer in the Cobalt Head.

7. Perform head survey and fill in the blank forms.

8. With the diaphragm set to the maximum opening, and the shutter in the open position, perform a radiation survey on all external surfaces of the treatment room to insure that there are no obvious deficiencies in the room construction.

NOTE:

If possible, 8 above should be performed in the company of the customer's physicist.

SECTION E: CONCLUSION

1. All source drawers, tools, transfer cases are free of any contamination before shipment. However, check all tools, etc., before packing for return shipment.

2. Should low level contamination be encountered, all waste, etc., shall be handled as outlined in Bulletin TB-WD-3 attached to this instruction.

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS DIVISION
OTTAWA, CANADA

SRT-3 ISSUE NO. 7799

1979 FEBRUARY 20

INSTRUCTION

SOURCE REPLACEMENT PROCEDURE

ELDORADO A, G AND SUPER G

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
OTTAWA, CANADA

INSTRUCTION

SOURCE REPLACEMENT PROCEDURE

ELDORADO "A", ELDORADO "G" AND ELDORADO SUPER "G"

A.E.C.L. TELETHERAPY UNITS

INSTRUCTION NO. SERIES: SRT-3 ISSUE NUMBER 3

SECTION A: GENERAL

1. Not less than one (1) authorized A.E.C.L. person and one (1) assistant shall participate in this operation.

2. Prior to commencement, the authorized person shall check that the following equipment is on hand.

   (a) pocket dosimeter charger
   (b) calibrated radiation survey meter - Jordan type AGB-50-SR or equivalent capable of reading radiation field as low as 5 mr/hr and a high range in the order of 25 - 50 r/hr.
   (c) end window geiger counter - Electronic Associates Ltd. type CA-112-A or equivalent having a low scale capable of reading in the range of 0 - 500 counts per minute and a high scale of not less than 25,000 C.P.M.
   (d) set of source drawer handling tools
   (e) hydraulic lift truck for moving source transfer shipping container
   (f) Teletherapy Head Survey blanks in duplicate
   (g) return shipping instructions and documents

3. All persons shall wear 0 - 50 m/r/hr and 0 - 5 r/hr pocket dosimeters - all persons together with an A.E.C.L. film badge.

4. Prior to commencement the Authorized person shall:

   (a) make a survey of these areas from which uncontrolled persons may have to be evacuated in the event of a malfunction. This area in which the radiation field is 5 m/r/hr or greater will be referred to as the "Danger Area"
   (b) should such an accident occur, be guided by the Official Atomic Energy Control Authority in the country in which you are working
   (c) if immediate assistance is required, consult the Municipal Police, Fire Department or Civil Defense Authority
   (d) do not depend on locked doors. See that guards are posted to prevent entrance to the "Danger Area".
   (e) report to A.E.C.L. Radiation Hazards Section immediately after the entrances to the "Danger Area" have been secured.

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SECTION B - PREPARATION

1. Check that the shutter is in the closed position by noting that the "shutter closed" green light is illuminated on a control panel and on the equipment before entering the treatment room. Enter the treatment room with a survey meter in the "on" position and check that the radiation level is normal.

2. Operate the Head so that it is vertical and at the lowest position of the vertical travel.

3. Position the source transfer case in line with the head with a separation of approximately one (1) foot.

4. Check that the radiation level at both drawer ends is within the level indicated on the radiation warning label.

5. Unlock the transfer case and remove the source drawer cover plates and lead filler plug.

6. Check the loading card and note the location of the live source drawer e.g. upper or lower compartment.

NOTE:
Note that the live source drawer has a brass end plate stamped with the source serial number and an arrow indicating the position of the source proper. The dummy drawer is of stainless steel and is stamped as such.

7. Check that the number stamped on the live drawer end plate is that indicated on the shipping document and note that the live source drawer indicator (arrow) is in the horizontal plane.

8. Recheck that the Head is vertical and remove the name plates and drawer end plugs.

9. With the power off, disconnect the wires to the compressor.

10. By means of the lift truck, align the dummy drawer in the transfer case to the live drawer in the Cobalt Head.

11. Adjust the hydraulic lift truck to position the source transfer case to within 2 inches of the live drawer in the Cobalt Head.

12. Very carefully align the alignment between the dummy drawer in the transfer case and the live drawer in the Cobalt Head. Block and shim between the transfer case skid members and the floor as a safety precaution. Connect the appropriate drawer couplings as detailed on drawing D5V-62.

13. Place the survey meter in such a position that it is not subjected to the incident beam during the transfer, but in such a position that the meter scale may be viewed by both persons. Use the 0 to 50 r/hour scale.

14. Ensure that all personnel above, below and both sides, are controlled so that there is no possibility of other persons being exposed during the transfer.

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SECTION D: SOURCE REMOVAL

1. Always check pocket dosimeters for zero prior to starting

2. Never move from your assigned position during the source transfer without first observing the survey meter and advising the other person of your intent.

3. Never use more force to effect a transfer of the drawer into the head of the unit than is required to move the drawer in the transfer case.

4. One person shall take a position behind the head in such a way that he has a clear view through the head source aperture.

5. The authorized person shall take a position behind the transfer case and securely thread the "T" transfer tool into the dummy drawer after removing the end filler lead plugs. Check that the meter is within reach of either or both persons.

6. The person in 5 above, after notifying the other of his intent, will gently draw the dummy drawer out of the transfer case and unlock the quick release connection after the decayed source is fully entered the transfer case. Install the end plates on the transfer case until servicing has been completed.

7. Carry out the test procedure using the geiger probe as detailed in Issue 1. Contamination Test of Teletherapy Units, D-1421 through D-1429. Any waste disposal shall be dealt with as outlined in Bulletin WD-3, part B, Section No.1.

8. Complete any servicing and/or repairs necessary.

9. After all servicing and/or repairs have been satisfactorily completed, test the door interlock switch as follows:

   (a) Close the door to the treatment room
   (b) Set up the remote control for a simulated treatment
   (c) Operate the unit with the shutter in the "on" position
   (d) Open the door to the treatment room and note that the "shutter" closes immediately and that the "reset" control must be re-activated before the "shutter" will open (red lights on control unit and equipment)
   (e) Repeat the above at least 5 times

NOTE:

The RA LUTA geiger counter has been calibrated against AECL standards. In the United States the licensee must be notified if the wipe test indicates contamination of 0.5 micro-curies, or more. A reading of 8,800 counts per minute is equal to .05 micro-curies. With a geometry of approximately 35%, a window of 2.5 milligrams/centimeter squared and a counting efficiency of 8%, a scale reading of 8,800 counts per minute is equal to .05 micro-curies. Any removable contamination of this level or greater must be reported to the licensee, who in turn must advise the appropriate office of the U.S.A.E.C. This condition shall be reported to the Isolation Hazards Section in AECL. Follow all instructions issued by the Regional Office of the U.S.A.E.C. in the area in which the equipment is located.

SECTION C: REPLACEMENT

1. Review Section A, paragraph 4, section (a) to (e)

2. Realign the Replacement Live Drawer in the transfer case to the aperture in the head.

3. Double check the alignment, block and shim the transfer case to the floor.

4. Connect the dummy drawer to the live replacement drawer with the quick release couplin

5. With the dummy drawer, gently push the replacement live drawer into the Cobalt Head and disconnect the coupling between the drawers.

6. Reconnect all wiring, install the retaining end blocks, etc.

7. Perform head survey and fill in the blank forms.

8. With the diaphragm set to the maximum opening, and the shutter in the open position, perform a radiation survey on all external surfaces of the treatment room to insure that there are no obvious deficiencies in the room construction.

NOTE:
If possible, B above should be performed in the company of the customer's physicist.

SECTION D: CONCLUSION

1. All source drawers, tools, transfer cases are free of any contamination before shipment. However, check all tools, etc., before packing for return shipment.

2. Should low level contamination be encountered, all waste, etc., shall be handled as outlined in Bulletin TB-WD-3, attached to this instruction.

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS DIVISION
OTTAWA, CANADA