Amendment No. 28

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee	In accordance with letter dated October 7, 1997,
1. Department of the Army U. S. Army Communications - Electronic Command	3. License number 29-01022-07 is amended in its entirety to read as follows:
2. Fort Monmouth, New Jersey 07703-5000	4. Expiration date October 31, 2002
	5. Docket No. 030-06989 Reference No.

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
A. Cesium 137	A.	A. [ ] Ex 2
B. Cobalt 60	B.	B.

9. Authorized use:

A. and B. To be used for irradiation of materials, except explosive and flammable materials, in a J. L. Shepherd & Associates Model 81-22 irradiator as specified in the device's Sealed Source and Device Registration Certificate issued by NRC pursuant to 10 CFR 32.210 or by an Agreement

CONDITIONS

10. Licensed material may be used at the licensee's facilities located at [ ] Evans Area, and Building 2540A, Charles Wood Area, Wall Township, New Jersey. Ex 2

11. A. Licensed material shall only be used by, or under the supervision and in the physical presence of, individuals who have received the training described in letters dated February 18, 1998 and March 13, 1998.

B. The Radiation Safety Officer for this license is Joseph Santarsiero.

EE/23

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number
29-01022-07

Docket or Reference Number
030-06989

Amendment No. 28

12. Sealed sources containing licensed material shall not be opened or sources removed from the self-shielded irradiator by the licensee, except as specifically authorized by license condition.

13. A. Sealed sources shall be tested for leakage and/or contamination at intervals not to exceed the intervals specified in the certificate of registration issued by NRC under 10 CFR 32.210 or by an Agreement State.

B. In the absence of a certificate from a transferor indicating that a leak test has been made within the intervals specified in the certificate of registration prior to the transfer, a sealed source received from another person shall not be put into use until tested.

C. Sealed sources need not be leak tested if they are in storage and are not being used. However, when they are removed from storage for use or transfer to another person, and have not been leak tested within the required leak test interval, they shall be tested before use or transfer. No sealed source shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.

D. The leak test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. If the leak test reveals the presence of 0.005 microcurie or more of removable contamination, the licensee shall immediately remove the source from service, report to the Nuclear Regulatory Commission according to 10 CFR 30.52(b)(2) and (c)(1), and have the source decontaminated, repaired, or disposed of according to Commission regulations. The licensee shall file a written report according to 10 CFR 30.50(c)(2).

E. Tests for leakage and/or contamination shall be performed by the licensee or other persons specifically licensed by the Commission or an Agreement State to perform such services. In addition, the licensee is authorized to collect leak test samples for analysis by persons specifically licensed by the Commission or an Agreement State to perform such services.

14. Before initiation of irradiator operations or after reloading of sources in the irradiator and before restart of the irradiator, a radiation survey shall be conducted to determine radiation levels around, above and below the irradiator with the sources in the shielded position and in the exposed position. The results of the survey shall be sent to the U.S. Nuclear Regulatory Commission, Region I, ATTN: Director, Division of Nuclear Materials Safety, 475 Allendale Road, King of Prussia, Pennsylvania 19406, not more than 30 days after the survey is conducted.

15. The licensee shall conduct a physical inventory at intervals not to exceed 6 months to account for all sources and/or devices received and possessed under the license.

16. The licensee may transport licensed material in accordance with the provisions of 10 CFR 71, "Packaging and Transportation of Radioactive Material."

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number
29-01022-07

Docket or Reference Number
030-06989

Amendment No. 28

17. Except for maintaining labeling as required by 10 CFR 20 or 71, the licensee shall obtain authorization from NRC before making any changes in the sealed source, device, or source-device combination that would alter the description or the specifications in the respective Certificates of Registration issued either by the Commission pursuant to 10 CFR 32.210 or by an Agreement State.

18. The license shall not repair, remove, replace, or alter any of the following: electrical or mechanical systems that control source or shielding movement, the irradiator's shielding or sealed source, safety interlocks, or any component that may effect safe operation of the irradiator. These activities shall be performed by a person specifically licensed by the Commission or an Agreement State to perform such services.

19. For each J. L. Shepherd Mark I or 81-22 cesium-137 irradiator installed and used, the licensee shall:

    A. Permit the use of the irradiator only when a calibrated and operable radiation survey meter or room monitor is available; and

    B. Permit the irradiator door to be opened only after the operator has checked visual indicators to verify that the source has returned to the safe storage position; and

    C. Have room monitors that will:

        (i) Operate at all times when the irradiator is in use; and

        (ii) Activate a visible and audible alarm when radiation exceeds 2 millirem per hour; and

        (iii) Detect any radiation leaking from the irradiator door; and

        (iv) Be visible to the irradiator user when the user is next to the irradiator; or

    D. If a room monitor is not installed, have available a calibrated and operable survey meter which will be used to:

        (i) Determine the radiation level at the irradiator door when the door is closed; and

        (ii) Check for any increase in radiation levels each time the irradiator door is opened.

    E. If abnormal radiation levels or malfunctions of the irradiator are detected at any time, stop using the irradiator, restrict access to the area housing the irradiator, immediately notify the Radiation Safety Officer, and if required by 10 CFR Parts 20, 21 or 30, report to the NRC.

    F. Not repair or authorize repairs of the irradiator except by the manufacturer or other persons specifically authorized by the Commission or an Agreement State to perform such services.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number
29-01022-07

Docket or Reference Number
030-06989

Amendment No. 28

20. The licensee is exempted from decommissioning financial assurance requirements for possession of licensed material in sealed sources in quantities greater than the limits in 10 CFR 30.35 for the purpose of source changes only. This exemption is granted for no more than thirty days for any one source change.

21. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations and procedures in the licensee's application and correspondence are more restrictive than the regulations.

A. Letter dated February 13, 1998
B. Letter dated March 10, 1998
C. Letter dated March 13, 1998
D. Letter dated April 2, 1998

For the U.S. Nuclear Regulatory Commission

Date April 6, 1998

By ***Original signed by Steven Courtemanche***

Steven Courtemanche
Nuclear Materials Safety Branch 3
Division of Nuclear Materials Safety
Region I
King of Prussia, Pennsylvania 19406

April 6, 1998

Docket No. 030-06989 License No. 29-01022-07
Control No. 125086

Commander, US Army Materiel Command
ATTN: AMCSF
Department of the Army
5001 Eisenhower Avenue
Alexandria, VA 22333-0001

Dear Commander. :

This refers to your license amendment request. Enclosed with this letter is the amended license. Please note that as part of this amendment, in accordance with 10 CFR 30.36, effective February 15, 1996, the expiration date of your license has been extended by a period of five years. Your new expiration date is stated in Item 4 of the license.

Please review the enclosed document carefully and be sure that you understand and fully implement all the conditions incorporated into the amended license. If there are any errors or questions, please notify the U.S. Nuclear Regulatory Commission, Region I Office, Licensing Assistance Team, (610) 337-5093 or 5239, so that we can provide appropriate corrections and answers.

Thank you for your cooperation.

Sincerely,

Original signed by Steven Courtemanche

Steven R. Courtemanche
Health Physicist
Nuclear Materials Safety Branch 3
Division of Nuclear Materials Safety

Enclosures:
1. 10 CFR Part 30
2. Amendment No. 28
3. NUREG-1556, Volume 5

ML10

DOCUMENT NAME: G:\DNMS\DOCWORK\LICLTR\L2901022.07 12793426

To receive a copy of this document, indicate in the box: "C" = Copy w/o attach/encl "E" = Copy w/ attach/encl "N" = No copy

OFFICE	DNMS/RI C	N	DNMS/RI					
NAME	SCourtemanche							
DATE	04/06/98		04/ /98		04/ /98		04/ /98	

OFFICIAL RECORD COPY

M516
K-4

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703-5000

REPLY TO
ATTENTION OF

April 2, 1998

Directorate of Safety Risk Management

U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

Attention: Licensing Assistance Section

This refers to U.S. Nuclear Regulatory Commission (NRC) License Number 29-01022-07, Docket Number 030-06989, Control Number 125086, our letters of February 13, 1998, March 10, 1998 and March 13, 1998, and the April 2, 1998 telephone conversation between Messrs. Steven A. Horne and Barry J. Silber of this Directorate and Mr. Eric Reber, NRC Region I.

The following additional information is provided in support of our NRC license amendment requests to authorize possession and use of the J.L. Shepherd and Associates (JLS) Model 81-22 Calibrator.

a. Training: Enclosures 1 and 2 are the Answer Keys for the initial operator training final examination and annual training examination, respectively. These answer keys were unintentionally omitted from our March 13, 1998 response to you.

b. Conditions of Use: Our staff will perform the manufacturer's recommended routine maintenance of the calibrator. Biennial preventive maintenance will be performed by the manufacturer or other person specifically licensed for this purpose.

c. This is to confirm that our Radiation Control Committee or Radiological Engineering staff will evaluate the procedures used for irradiation of materials, including the types of material irradiated, to determine whether special procedures will be required specific to the types of material irradiated.

125086

APR - 2 1998

NRC RECD

OFFICIAL RECORD COPY ML 10

Your expeditious processing of this amendment request is appreciated.

Our Point of Contact is Mr. Joseph M. Santarsiero or the undersigned, Facsimile on (732) 532-6403 or (732) 542-7161; Voice on (732) 427-4427/3112.

Sincerely,

STEVEN A. HORNE
Director, Safety
Risk Management

Enclosures

Copy Furnished:

Commander, U.S. Army Materiel Command, ATTN: AMCSF-P, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-0001

SAMPLE

ANSWER KEY for OPERATOR FINAL EXAMINATION

J.L. SHEPHERD MODEL 81 MULTI GAMMA SOURCE CALIBRATOR

NAME____________________ **DATE**____________

CIRCLE THE CORRECT CHOICE

1. a b ***c*** d
2. a b ***c*** d
3. a ***b*** c d
4. ***a*** b c d
5. a b c ***d***
6. a ***b*** c d
7. a ***b*** c d
8. **Motion**
9. a b ***c*** d
10. ***a*** b c d
11. a b ***c*** d
12. a b c ***d*** e
13. a b c ***d*** e
14. **Master**
15. a b ***c*** d
16. ***a*** b c d
17. a ***b*** c d
18. a ***b*** c d
19. **Check Batteries/Cal Label**
    Inspect Meter/Check Response
20. a b ***c*** d
21. a ***b*** c d
22. a b ***c*** d
23. **Return Source to "Closed"**
    Survey Area with Meter
    Reinstall Plug
    Remove Key and Secure Room
24. ***a*** b c d
25. a ***b*** c d
26. ***a*** b c d
27. a ***b*** c d
28. a b c ***d***
29. a b ***c*** d
30. a ***b*** c d
31. a b c ***d***
32. ***a*** b c d
33. **Source is in "up" position**
    Do not enter room
34. **Spring Return Assembly**
35. ***a*** b c d

Encl 1

SAMPLE

APPENDIX C

ANSWER KEY for
ANNUAL OPERATOR EXAMINATION
FOR USE OF THE
J.L SHEPHERD MULTI GAMMA SOURCE CALIBRATOR

1. Do gamma rays induce radioactivity? Y or **N**

2. During a test you notice that a visual warning light is not operating, you should: (circle one answer)

   a. Ignore it, this is only a test.
   b. Fix it on the spot.
   c. Report it to the area supervisor.
   d. Report it to the RPO or his designee.

3. Before using a survey meter, list 4 checks you should perform to ensure it is operating properly.

   a. Check Batteries
   b. Visual inspection of meter & cable
   c. Check calibration label
   d. Test meter response with check source

4. Are TLD whole body and pocket dosimeters required to be worn when operating the source?

   Y or N

5. When all interlocks are closed, the **Master** light is illuminated.

6. Briefly describe the significance of the "red warning light" located at the entrance to the calibration room.
The source is in the "up" position and the room must not be entered.

Encl 2

7. If the source does not return to its shielded position, you should: (circle one answer)

a. Attempt to fix the problem immediately.

b. Report the malfunction to the RPO or his designee.

C. Call 911.

8. The **Motion** detector is located at the down range barrier and places the source in the "STORED" position when the beam is interrupted.

9. In the event of an air pressure loss, the automatic **Spring Return Assembly** which are mounted on the pneumatic cylinder, allows the source to return to the "CLOSED" position.

10. List the steps necessary to shut down the source and exit the calibration range.

a. Return the source to its "closed" position
b. Survey the area with meter
c. Reinstall transportation plug
d. Remove keys from panel and secure area

April 3, 1998

Docket No. 030-06989 License No. 29-01022-07
Control No. 125086

Commander
AMCSF
Department of the Army
5001 Eisenhower Avenue
Alexandria, VA 22333-0001

Dear Dr. :

This is to confirm our telephone conversation on April 2, 1998 with Mr. Barry Silber in which we discussed the information we need to continue review of your letter dated March 13, 1998. The items discussed are specified below.

1. Item d. states that the Answer Keys to the initial operator training final examination and the annual training examination were enclosed with your letter. However, our review of your letter could not locate these enclosures. Please submit copies of the above for our review.

2. On March 11, 1998, the NRC staff requested that you develop, maintain and implement model-specific operator and emergency procedures for the following:

   a. Analysis of each material to be irradiated to ensure compatibility and to determine if special procedures are needed, and

   b. Procedure on how to perform routine maintenance according to the manufacturer's written instructions and recommendations.

We will continue our review upon receipt of this information. Please reply in duplicate to my attention at the Region I Office and refer to Mail Control No. 125086. If you have any technical questions regarding this deficiency letter, please call me at (610) 337-5075.

If we do not receive a reply from you within 30 calendar days from the date of this letter, we shall assume that you do not wish to pursue your application.

Sincerely,

Original signed by Steven Courtemanche

Steven R. Courtemanche
Nuclear Materials Safety Branch 3
Division of Nuclear Materials Safety

SECTION COPY

cc:
Steven A. Horne, Director, Safety Risk Management

TELEPHONE CONVERSATON RECORD	**Date:** 4/1/98 and 4/2/98	**Time:** 14:30 and 08:45
Mail Control No.: 125086	**License No.:** 29-01022-07	**Docket No.:** 030-06989
Person Called: Barry Silber	**Licensee:** Department of the Army	**Telephone No.:** (732)427-3112 X6440
Person Calling: Steven Courtemanche/(610) 337-5075		
Subject: Telephone deficiency		
Summary: Mr. Silber called on March 31, 1998 to determine whether all of the information needed for the license was given and whether any more was needed. On April 1, 1998, I returned Mr. Silber's phone call at 10:00 and 16:00. He was not available and I left a message on his voice mail. On April 2, 1998, I was contacted by Mr. Silber and other members of the Department of the Army staff. I went over the remaining information that I needed to complete their amendment request.		
Action Required/Taken: File with licensing action.		
Signature: Steven R. Courtemanche	**Date:** 04/02/98	

ML 10

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703-5000

REPLY TO
ATTENTION OF

M516
K-4

March 13 1998

Directorate of Safety Risk Management

U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

Attention: Licensing Assistance Section

This refers to U.S. Nuclear Regulatory Commission (NRC) License Number 29-01022-07, Docket Number 030-06989, Control Number 125086, our letters of February 13, 1998 and March 10, 1998, and March 10 and 11, 1998 telephone conversations between Mr. Barry J. Silber of our staff and Mr. Eric Reber, NRC Region I.

The following additional information is provided in support of our NRC license amendment requests to authorize possession and use of the J.L. Shepherd and Associates (JLS) Model 81-22 Calibrator.

a. The calibrator will initially be installed and used in the Ionizing Radiation Research Facility, Building 9401, Evans Area, Fort Monmouth, NJ. The calibrator will be relocated to the newly designed calibration facility, Building 2540A, Charles Wood Area, Fort Monmouth, NJ, upon completion of its construction. JLS representatives will perform the installation of this system, at both facilities, including all safety and interlocking controls.

b. JLS has verified that the [ ] Cobalt 60 sealed source, General Electric Drawing 985C515, is the [ ] The [ ] Cobalt 60 sealed source was originally misidentified as the [ ]. This sealed source is the [ ]. &2

c. The floor construction of both calibration exposure rooms (Building 9401, Evans Area and Building 2540A, Charles Wood Area) is concrete slab on grade. There are no sublevel structures below these floorings.

125086

MAR 19 1998

d. Training:

(1) Enclosures 1 and 2 are the Answer Keys for the initial operator training final examination and annual training examination, respectively.

(2) The instructors conducting operator training will be qualified operators, health physicists of the Radiological Engineering Division or individuals who possess equivalent training and/or experience.

e. Conditions of Use: It is our intent to meet the conditions stipulated under "Limitations and/or Other Considerations of Use", or equivalent, as specified in the Registry of Radioactive Sealed Sources and Devices issued for the JLS Model 81-22.

f. This is to confirm that we will comply with 10 CFR Part 20.2103(a) regarding the maintenance of calibration records.

g. Physical inventory of the calibrator will be conducted at intervals not to exceed six months. This will coincide with our performance of leak test sampling procedures. Leak test sampling will be performed by representatives of the Radiological Engineering Division in accordance with the manufacturer's instructions and will serve to meet this physical inventory requirement.

h. All radiation measurement instrumentation utilized for analysis of leak test samples are equipped with computer software to determine counting efficiency, and converting the raw data from leak test analyses into the appropriate units of becquerels and microcuries.

i. Operating and Emergency procedures will be approved by the RPO.

Your expeditious processing of this amendment request is appreciated.

Our Point of Contact is Mr. Joseph M. Santarsiero or the undersigned, Facsimile on (732) 532-6403 or (732) 542-7161; Voice on (732) 427-4427/3112.

Sincerely,

for Joseph M. Santarsiero

STEVEN A. HORNE
Director, Safety
Risk Management

Enclosures

Copy Furnished:

Commander, U.S. Army Materiel Command, ATTN: AMCSF-P, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-0001

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703-5000

REPLY TO
ATTENTION OF

March 10, 1998

Directorate of Safety Risk Management

U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

Attention: Licensing Assistance Section

This refers to U.S. Nuclear Regulatory Commission (NRC) License Number 29-01022-07, Docket Number 030-06989, Control Number 125086, and to our letter of February 13, 1998, and the March 6, 1998 telephone conversation between Mr. Eric Reber, NRC Region I and the undersigned.

We are requesting an additional amendment to this NRC license to authorize possession and use of the J.L. Shepherd and Associates (JLS) Model 81-22 Calibrator. The calibrator will be used/possessed in a newly designed calibration facility which will be located adjacent to our Building 2540 of Fort Monmouth's Charles Wood Area. The facility is currently designated as Building 2540A. Construction of this facility is to begin on or about 1 April 1998, with an anticipated completion date of December 1998.

Enclosures 1, 2 and 3 are engineering drawings of the proposed facility. The calibration facility will be constructed of reinforced concrete walls and roof, and lead lined doors. The target wall thickness is 40 inches. The roof, sides and rear walls are each 12 inches thick. The proposed facility will also house administrative/office areas and machine shop. The construction of this facility will meet all building code requirements. The building has provisions for heating and air conditioning (temperature controlled environment), wet fire suppression (water sprinkler) system, fire detectors and fire extinguishers. Access to this building will be security card controlled. The building will be located within a fenced-in compound. The Fort Monmouth police patrols the area 24 hours a day, 7 days a week.

The calibrator will only be used as indicated in Shield Wall Design Calculations, Building 2540A, Ionizing Radiation Instrument Calibration, research and development facility (enclosure 4). This design adequately addresses shielding and safety requirements for

use of the JLS Model 81-22 Calibrator. The calculated estimated dose rate at the building outer wall is less than two millirem per hour. Areas immediately adjacent to the exposure room will not exceed the two millirem per hour limit. Individual members of the public will be prohibited access to the areas in or surrounding the calibration facility and will not receive a total effective dose equivalent in excess of 100 millirem in a year.

The JLS performance specifications for the Model 81-22 Calibration System addresses safety issues such as immediate return of a source to its storage mode by: actuation of safety switch; loss of power; loss of air pressure or actuation of any interlock/scram switch. The interlock system for the JLS Model 81 series meets the requirements of Title 10, Code of Federal Regulations, Part 36, and consists of radiation warning lights; red rotating beacon (source ON) and green (source OFF) light; photoelectric interlock system; and safety systems preventing raising of the sources or assuring the return of the sources to the fully shielded position when the system is deactivated. Also included in this system is a Smoke/Fire Alarm/Interlock and door interlocks.

Access to this facility will be limited to authorized users/operators and radiation protection staff. The interlocking system will be used to further prevent unauthorized entry. A warning sign/light will be installed outside the only access door. This sign will illuminate to alert personnel that the source is in the exposed position. The calibrator system will be operated external to the calibration room and will be equipped with a closed circuit camera system for viewing during calibrator operation. The beam port of the calibrator is directed away from the door. The primary beam will be aimed towards the outer wall of the building. The calibrator will have an installed sonalert alarm that sounds just prior to a source being raised into the beamport. This will alert personnel in the area that an exposure sequence is about to be initiated.

JLS representatives will perform installation of this system, including testing/verification of all safety and interlocking controls.

The area above the calibration room is the building roof. The design of the calibrator beam port will prevent the unshielded beam from passing through any portion of the ceiling of the calibration room. Any dose rate on the roof will be the

product of backscatter radiation. The roof is not occupied routinely and would only be accessed for maintenance.

A radiation survey of the exterior walls and roof of the Calibration Room and of the exterior of Building 2540A and fenced perimeter will be performed with the J.L. Shepherd Model 81-22 Calibrator in the exposed position, upon installation of this calibrator. The results of this survey will be provided to your office. If the radiation survey reveals a radiation dose rate exceeding the two millirem per hour limit, the calibrator will not be used until sufficient shielding material is added, as a minimum, to reduce the external radiation dose at the fence line to two millirem per hour limit. If radiation dose rates are detected on the roof that warrant protective measures, roof access points will be posted and access to the roof will not be authorized while the calibrator is in use.

Your expeditious processing of this amendment request is appreciated.

Our Point of Contact is Mr. Joseph M. Santarsiero or the undersigned, Facsimile on (732) 532-6403 or (732) 542-7161; Voice on (732) 427-4427/3112.

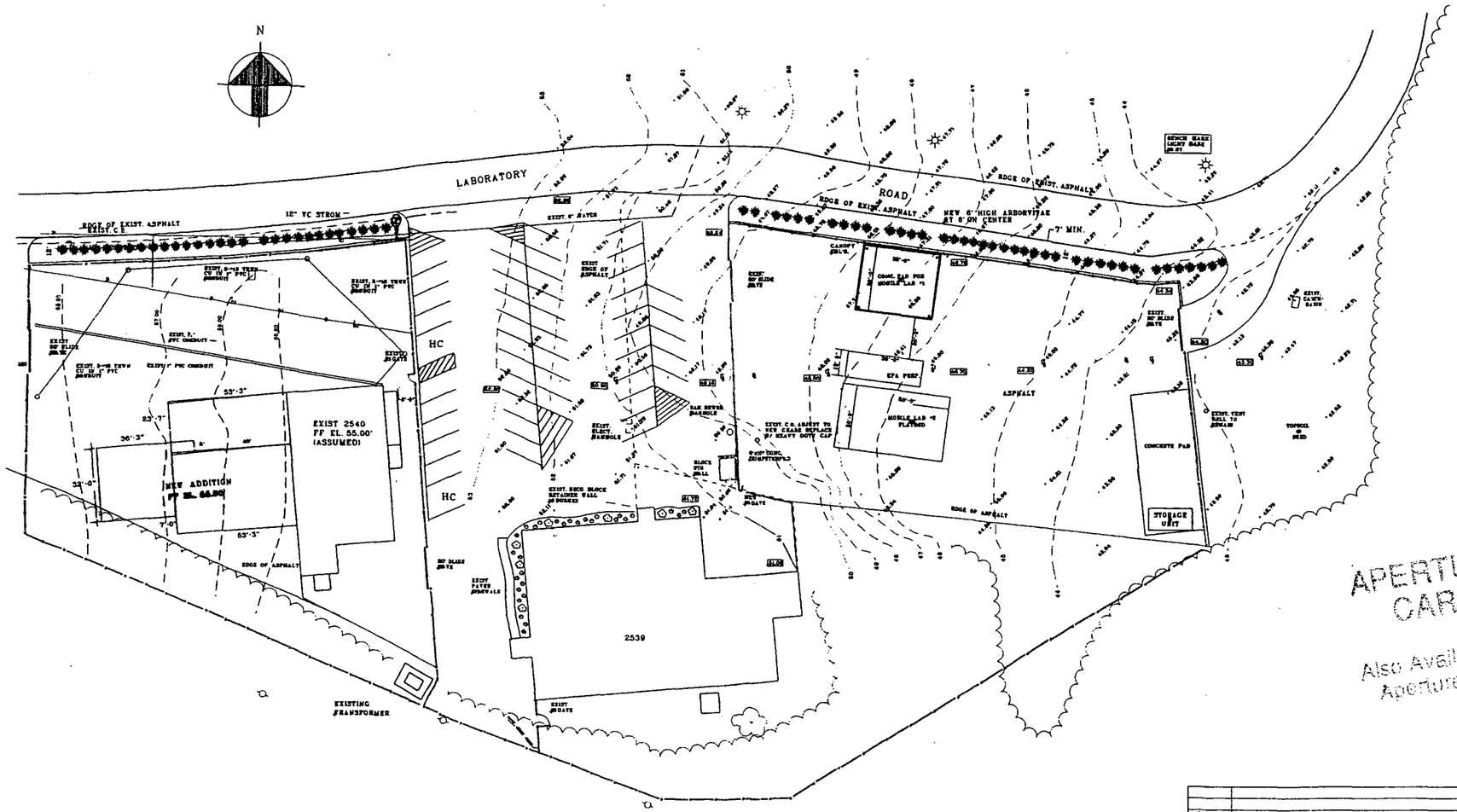
Sincerely,

STEVEN A. HORNE
Director, Safety
Risk Management

Enclosures

Copy Furnished:

Commander, U.S. Army Materiel Command, ATTN: AMCSF-P, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-0001



LEGEND:

—	EXIST. CHAIN LINK FENCE
✱	SHRUBS
—	EDGE OF NEW ASPHALT
◻	CATCH BASIN
○	LIGHT POLE

SYMBOL	DESCRIPTION	DATE	APPROVED

REVISIONS

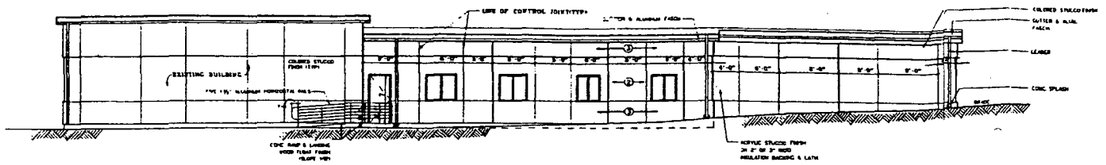
DIRECTORATE OF PUBLIC WORKS
Fort Monmouth, New Jersey
"An Army Community Of Excellence"

DWN. J.F.	DSGN. J.F.	CONSTRUCT ADDITION TO BUILDING 2540 FOR CBDCOM
DPW PR. MGR. E.EAGSDUG		
CHIEF ESB A. SMOLLIK		
SAFETY J. CAFFYN	PREV. MED. B. PELKA	SITE PLAN
FPLP BR. J. ERICKSON	ENVIRON. D. DESAI	
CHIEF CMD M. MAJER	ENGR. OFF C. KONIG	
CUSTOMER M. WALL		

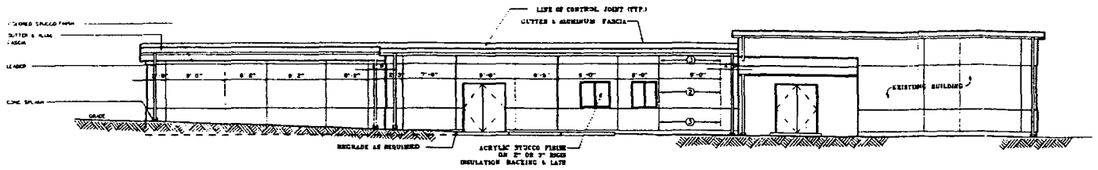
RECOMMENDED:	SCALE 1" - 20'	DRAWING NUMBER: 10666-2
CHIEF ENGINEERING PLANS & SERVICES E. DOONEY	DATE:	
APPROVED		
ACT. DIR. PUBLIC WORKS JIM OTT, PE	PR. NO.: 97-1066	SHEET 2 OF 18

Encl 1

9808060274 -01



1/1 NORTH ELEVATION
SCALE: 1/4"=1'-0"



3/1 SOUTH ELEVATION
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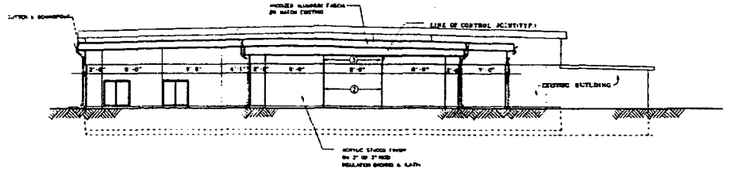

2/1 WEST ELEVATION
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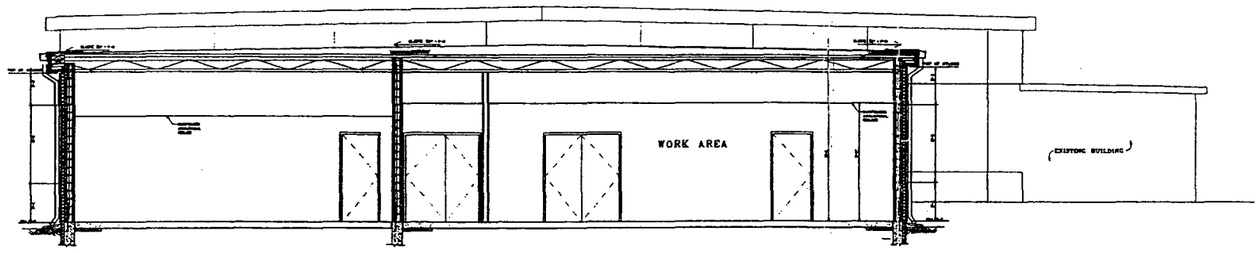
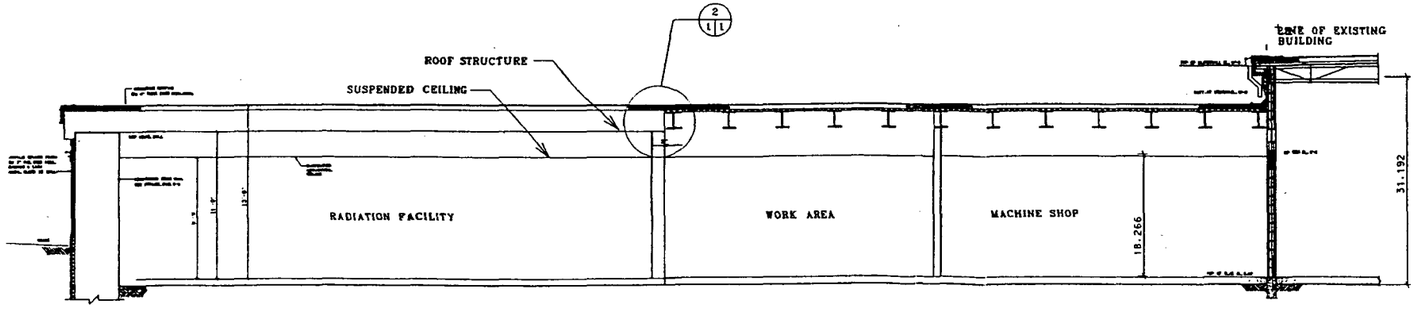


A/1 SECTION
SCALE: 1/4"=1'-0"



B/1 SECTION
SCALE: 1/4"=1'-0"

LEGEND

ACRYLIC STUCCO FINISH ON 2" RIGID INSULATION BACKING & LATH

ACRYLIC STUCCO FINISH ON 3" RIGID INSULATION BACKING & LATH

9808060274-02

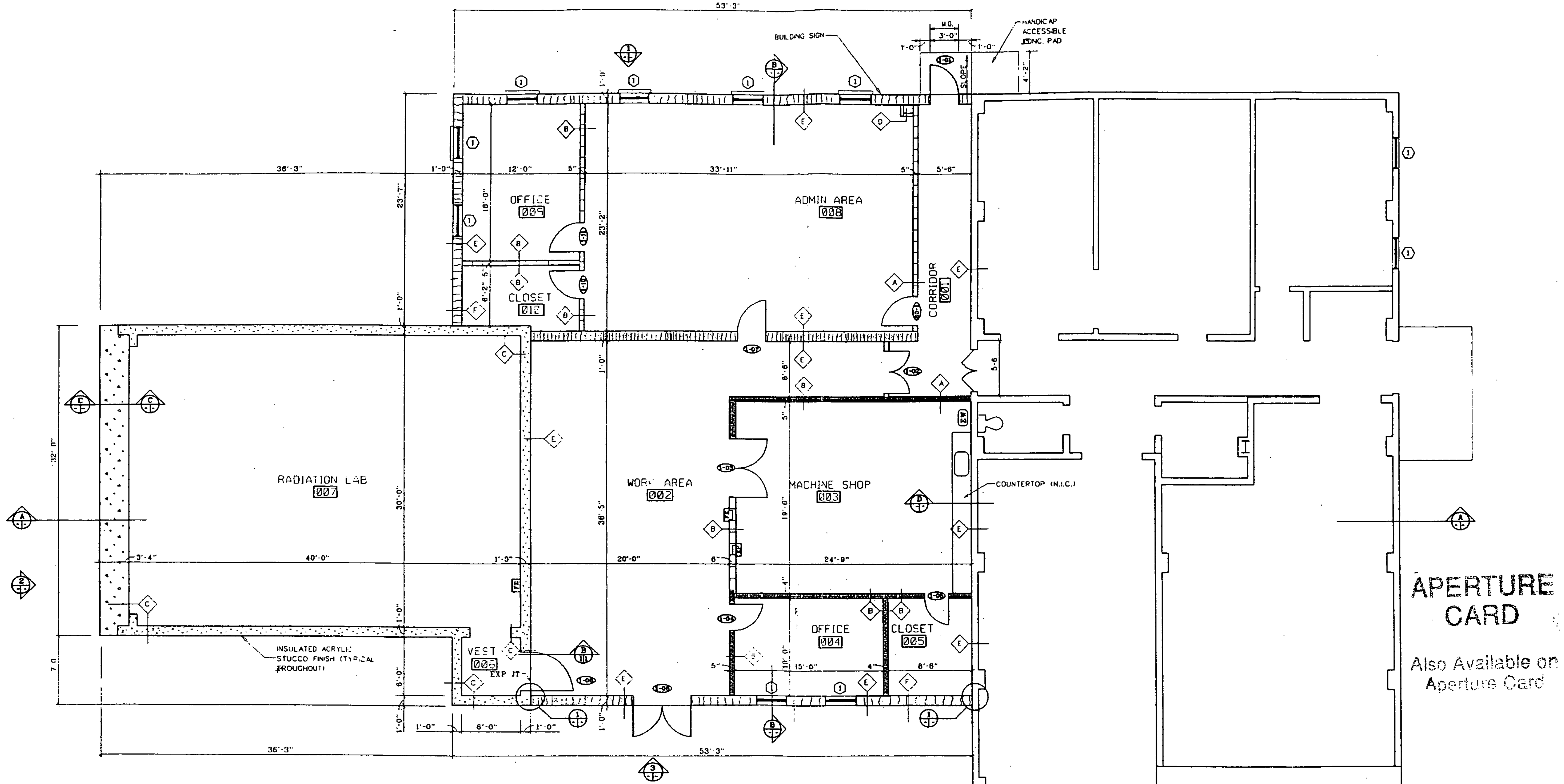
SYMBOL	DESCRIPTION REVISIONS	DATE APPROVAL

DIRECTORATE OF PUBLIC WORKS
Fort Monmouth, New Jersey
"An Army Community of Excellence"

DWN	DSGN	CONSTRUCT ADDITION TO BUILDING 2540 FOR CBDCOM
DPW PR. MGR.		
CHIEF ESB		
SAFETY	PREV. MED.	
FP&P BR	ENVIRON.	ELEVATION AND SECTIONS
CHIEF CW	ENGY. OFF.	
CUSTOMER		

RECOMMENDED: Chief Engineering Plans & Services	SCALE: AS SHOWN	DRAWING NUMBER: 10868-1
APPROVED DIR. OF PUBLIC WORKS J. OTT, P.E.	DATE:	
	PR. NO: 97-1068	SHEET 9 OF 19

End 2

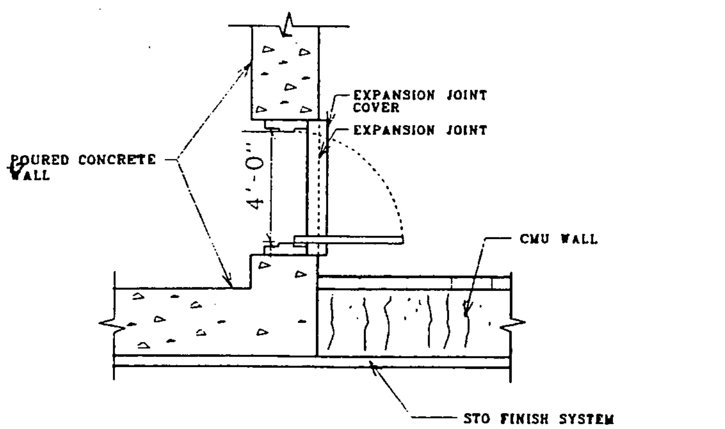


FIRST FLOOR ARCHITECTURAL PLAN

SCALE: 1/4"=1'-0"

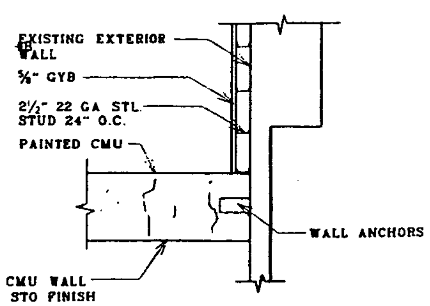
9808060274-03

N



1 DETAIL OF CMU TO CONCRETE CONNECTION

N.T.S.



1 DETAIL OF CMU TO EXISTING WALL

N.T.S.

Encl 3

LEGEND

- 004 - ROOM OR SPACE NUMBER
- 004 - DOOR NUMBER
- A - PARTITION TYPE
- POURED CONCRETE
- CONCRETE MASONRY UNIT
- EP - ELECTRICAL PANEL
- FE - SEMI-RECESSED FIRE EXTINGUISHER
- FE - SURFACE MOUNTED FIRE EXTINGUISHER
- 1 - WINDOW WITH SECURITY BARS
- STUD WALL

SYMBOL	DESCRIPTION	DATE	APPROVED
	REVISIONS		

DIRECTORATE OF PUBLIC WORKS
Fort Monmouth, New Jersey
"An Army Community Of Excellence"

DWN	DSGN	CONSTRUCT ADDITION TO BUILDING 2540 FOR CBDCOM
DPW PR. MGR.		
CHIEF ESB		
SAFETY J. CAFFYN	PREV.MED	FIRST FLOOR ARCHITECTURAL PLAN
PP&P BR A. GUZZI	ENVIRON.	
CHIEF CMD M. MATES	ENGY. OFF. C. KOMIC	
CUSTOMER CBCOM SAFETY		

RECOMMENDED: Chief Engineering Plans & Services K. DOONEY	SCALE: AS SHOWN	DRAWING NUMBER: 10666-7
	DATE:	
APPROVED DIR. OF PUBLIC WORKS J. OTT, P.E.	PR. NO. 97-1066	SHEET 7 OF 18

Shield Wall Design Calculations
Building 2540A
Ionizing Radiation Instrument Calibration
Research and Development Facility

Shielding Requirement Overview: The ionizing radiation source that will be used in this facility is the J.L. Shepherd and Associates Multi-Source Calibration System containing a maximum [ ] Cobalt-60 source. The source will be housed in a lead filled steel column with a beam port that will collimate the radiation into a beam approximately 12 feet wide and limited to 10 feet high at a distance of 35 feet from the source. The radiation beam will strike the shield wall at a distance of 35 feet. The shield wall must be constructed of material that will attenuate the radiation to a dose rate of less than 2 mrem/hr on the exterior surface. Typical construction concrete density was used in the shielding calculation. The presence of steel rebar was not considered because it would not significantly effect results. The concrete must be poured in a manner that prevents internal voids.

Facility Layout: (See attached drawing)

The calibration source will be located on the center line of a 30 x 40 ft long room. The source will be positioned 35 feet from the down range outer surface of shield.

Experimental and Mathematical Physics Consultants Calculations:

The three dimensional Monte Carlo Transport Code (Los Alamos) analysis was performed by Experimental and Mathematical Physics (EMP) Consultants. Based on this analysis, EMP Consultants recommended that the new calibration facility design be constructed of reinforced concrete with a front (target) wall thickness of 40 inches. The roof, sides and rear walls each require a thickness of 12 inches. The results of the Monte Carlo Transport Code analysis are contained in Table 1. Dose rates in all areas external to the exposure room are less than 2 mrem/hr.

Conclusion

Construct the building using the 40 inch wall thickness based upon the above Monte Carlo Transport Code calculation.

TABLE 1

MONTE CARLO COBALT 60 DOSE RATES
NEW BUILDING DESIGN
40 INCH FRONT (TARGET) WALL
12 INCH SIDE WALLS, BACK WALL AND CEILING

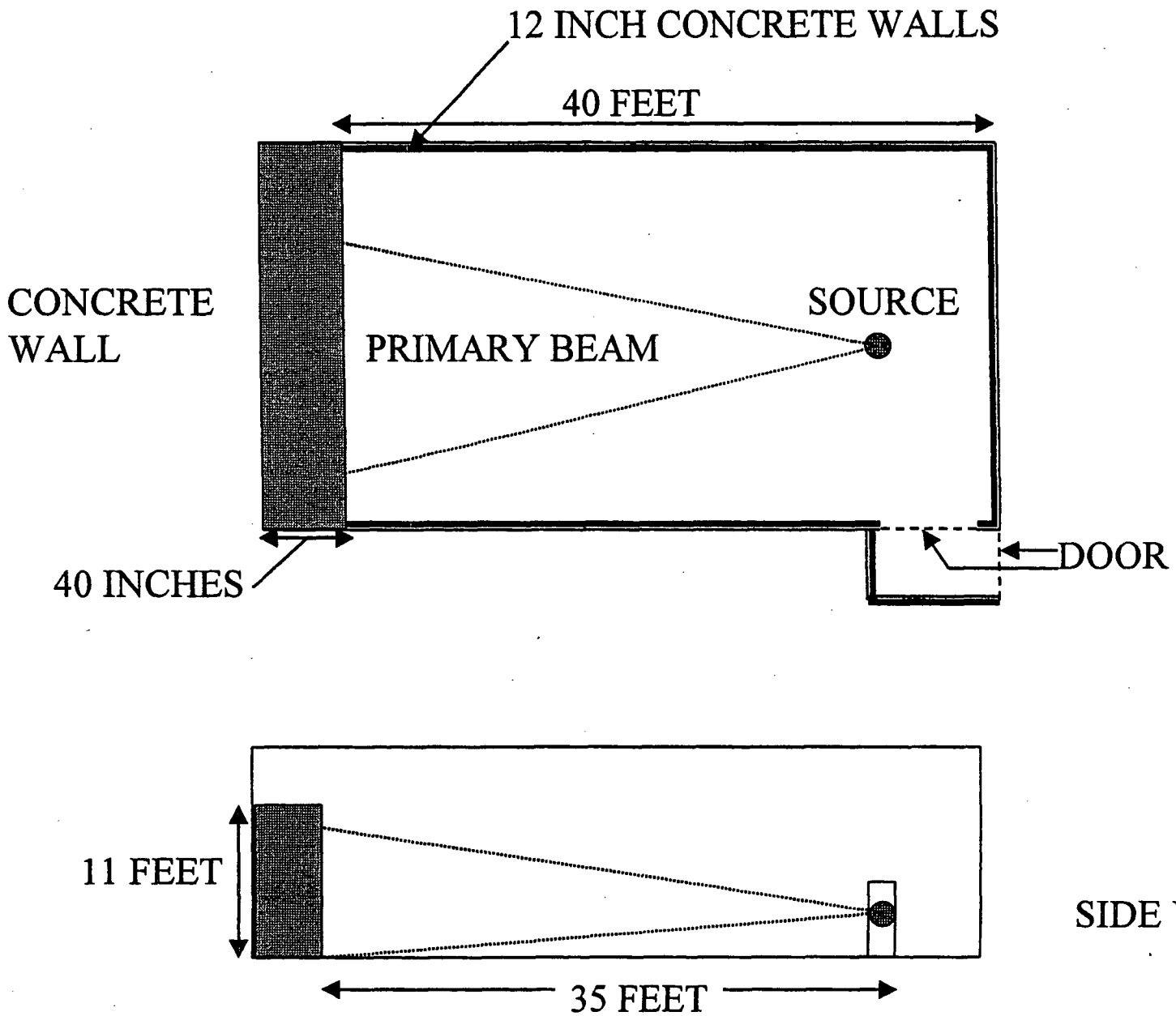
LOCATION	DOSE RATE (R/hr)
Lead door, beam/vestibule	1.69E-02
Doorway, beam/vestibule	6.53E-02
Average in vestibule	1.03E-03
Doorway, vestibule/work area	1.25E-03
Lead door, vestibule/work area	3.99E-04
Average, work room	4.70E-05
Average, shop room	1.32E-07
Average, office/closet	6.72E-07
Work room, inside left	--------
Work room, inside right	2.53E-05
Work room, inside floor	1.34E-04
Work room, inside above	2.97E-05
Work room, inside front	8.91E-05
Work room, inside back	1.36E-07
Shop room, inside left	2.97E-05
Shop room, inside right	6.70E-08
Average, inside beam room	1.06E+01
Beam room, inside left	1.71E-01
Beam room, inside right	1.48E-01
Beam room, inside floor	3.33E+00
Beam room, inside above	2.73E-01
Beam room, inside front	1.28E-01
Beam room, outside front	3.49E-04
Beam room, outside left	4.24E-04
Beam room, outside right	8.78E-04
Beam room, outside above	4.32E-04
Shop room, outside left	2.63E-06
Work roof, 0-10 feet	6.86E-06
Work roof, 10-20 feet	3.13E-06
Work roof, 20-30 feet	2.26E-06

TABLE 1

MONTE CARLO COBALT 60 DOSE RATES
NEW BUILDING DESIGN
40 INCH FRONT (TARGET) WALL
12 INCH SIDE WALLS, BACK WALL AND CEILING
(Continued)

LOCATION	DOSE RATE (R/hr)
Ground, 50-60 feet	4.61E-05
Ground, 60-70 feet	2.68E-05
Ground, 70-80 feet	1.68E-05
Ground, 80-90 feet	1.24E-05
Ground, 90-100 feet	1.11E-05
Ground, 100-200 feet	2.85E-07
Ground, 200-300 feet	7.56E-08
Ground, 300-400 feet	3.43E-08
Ground, 400-500 feet	1.50E-08

BUILDING 2540A CALIBRATION ROOM



April 3, 1998

Docket No. 030-06989 License No. 29-01022-07
Control No. 125086

Commander, U.S. Army Materiel Command
AMCSF
Department of the Army
5001 Eisenhower Avenue
Alexandria, VA 22333-0001

Dear Commander:

This is to confirm our telephone conversation on March 11, 1998, with Mr. Barry Silber in which we discussed the information we need to continue review of your letters dated February 13 and 17, 1998, and March 10, 1998. The items discussed are specified below.

1. Please confirm that the cobalt-60 sealed source designated as General Electric Drawing 985C515 is a JLS Model 7810 and that the cobalt-60 sealed source designated as a Gamma Industries Model VD(HP) was a typographical error and should have been a JLS Model 7810.

2. Enclosure 7, Item 3 states, in part, that initial radiation safety training is provided by the Radiological Engineering Division of the CECOM DSRM and that annual training is provided by the RPO and/or qualified designees. Please indicate what the minimum qualifications are for an individual to be designated as an instructor.

3. Please confirm that the areas where self-shielded irradiators are located correspond to the "Conditions of Normal Use" and the "Limitations and/or Other Considerations of Use" on the Sealed Source Device Certificate for a J. L. Shepherd & Associates (JLS) Model 81-22 irradiator.

4. Indicate that Rooms 2540 and 9410 are capable of supporting the JLS irradiator either through calculation or confirming that the room is on the ground floor with no voids underneath the rooms.

5. Confirm that the record requirements for the calibration of survey instruments in 10 CFR 20.2103(a) will be met.

6. Please state at what frequency you shall account for all licensed material during your physical inventory process.

7. Please develop, maintain, and implement model-specific operating and emergency procedures for the following:

   a. Analysis of each material to be irradiated to ensure compatibility and determine if special procedures are needed, and

   b. Procedure on how to perform routine maintenance according to the manufacturer's written instructions and recommendations.

8. Please indicate what the minimum qualifications will be for individuals who perform your leak test procedures.

9. Provide your procedures for handling samples to prevent or minimize exposure to personnel.

We will continue our review upon receipt of this information. Please reply in duplicate to my attention at the Region I Office and refer to Mail Control No. 125086. If you have any technical questions regarding this deficiency letter, please call me at (610) 337-5075.

If we do not receive a reply from you within 30 calendar days from the date of this letter, we shall assume that you do not wish to pursue your application.

Sincerely,

Original signed by Steven Courtemanche

Steven Courtemanche
Health Physicist
Nuclear Materials Safety Branch 3
Division of Nuclear Materials Safety

cc:
Steven A. Horne, Director, Safety Risk Management

TELEPHONE CONVERSATION RECORD	Date: 3/10/98	Time: 14:00
Mail Control No.: 125086	**License No.:** 29-01022-07	**Docket No.:** 030-06989
Person Called: Barry Silber	**Licensee:** Department of the Army.	**Telephone No.:** (732) 427-3112 X6440
Person Calling: Steven Courtemanche/(610) 337-5075		
Subject: Additional information for license amendment		

Summary: I contacted Joseph Santarsiero at 13:00 and determined that he wanted me to talk with Barry Silber at X6440. Mr. Silber was not in and a message was left.

14:00 Mr. Silber stated that J.L Shepherd personnel picked up the two sources from this license in the Sept/Oct 1997 timeframe for inclusion in the new irradiator. He believed that they stated that the General Electric Drawing No. Sealed Source could be traced to the JLS Model 7810 sealed source and would look into it. The reference to the Gamma Ind. Sealed Source was a typo. It should have been a 7810 source. Mr. Silber stated that he would be sending in information about the construction of a new facility. The facility would be started in April 1998 and finished about December 1998. The irradiator from this license would then be moved into the new building.

09:30 I discussed some of the deficiencies up to Enclosure 5 of the application.

15:30 I completed the review and faxed the licensee a copy of Appendix R of NUREG-1556. I went over other required information with Mr. Silber.

Action Required/Taken: Draft a telephone deficiency form.

Signature: Steven R. Courtemanche	**Date:** 3/11/98

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703-5000

M516
L-3

REPLY TO
ATTENTION OF

February 13, 1998

Directorate of Safety Risk Management

U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

Attention: Licensing Assistance Section

This refers to U.S. Nuclear Regulatory Commission (NRC) License Number 29-01022-07, Docket Number 030-06989, Control Number 125086, your letter dated January 13, 1998, and the February 9, 1998 telephone conversation between Mr. Eric Reber, NRC Region I and the undersigned.

We are providing a revised amendment request to this NRC license to authorize possession and use of the J.L. Shepherd and Associates (JLS) Model 81-22 Calibrator. The calibrator will be loaded with the following sealed sources:

Radionuclide	Activity	Sealed Source
Cobalt 60		
Cesium 137		
Cesium 137		
Cobalt 60		
Cobalt 60		

&2

Enclosure 1 is the JLS performance specifications for the Model 81-22 Calibration System, including physical and functional requirements, and addresses safety issues such as immediate return of a source to its storage mode by: actuation of safety switch; loss of power; loss of air pressure or actuation of any interlock/scram switch. The interlock system for the JLS Model 81 series meets the requirements of Title 10, Code of Federal Regulations, Part 36, and consists of radiation warning lights; red rotating beacon (source ON) and green (source OFF) light; photoelectric interlock system; and safety systems preventing raising of the sources or assuring the return of the sources to

125086

OFFICIAL RECORD COPY ML 10

FEB 17 1998

the fully shielded position when the system is deactivated. Also included in this system is a Smoke/Fire Alarm/Interlock and door interlocks.

The calibrator will be used in the Ionizing Radiation Research Facility, Building 9401, Evans Area, Fort Monmouth, NJ. JLS representatives will perform installation of this system, including all safety and interlocking controls. They will also provide training on the operation and use of this system to our user personnel. These individuals already meet the operator training criteria, based on their education, training and experience. The JLS Model 81-22 calibrator will replace the JLS Model 81-14Q calibrator (NRC License Number 29-01022-06) which has been relocated from Building 9401 to Building 2540, Charles Wood Area, Fort Monmouth, NJ. The JLS Model 81-22 is required to support our calibration of portable radiation detection instrumentation and personnel dosimeters.

Use of the calibrator will be restricted to approved calibrator operators. Access control of this facility is under direct key control, limited to authorized users/operators and radiation protection staff. The interlocking system will be used to further prevent unauthorized entry. A warning sign/light is installed outside the only access door. This sign will illuminate to alert personnel that the source is in the exposed position. The calibrator system will be operated external to the calibration room and will be equipped with a closed circuit camera system for viewing during calibrator operation. The beam port of the calibrator is directed away from the door. The primary beam will be aimed towards the outer wall of the building. The calibrator will have an installed sonalert alarm that sounds just prior to a source being raised into the beamport. This will alert personnel in the area that an exposure sequence is about to be initiated.

The area above the calibration room is the building roof. The design of the calibrator beam port will prevent the unshielded beam from passing through any portion of the ceiling of the calibration room. Any dose rate on the roof will be the product of backscatter radiation. The roof is not occupied routinely and would only be accessed for maintenance.

Enclosures 2 and 3 are drawings of building 9401 depicting the proposed location of the calibrator. The calculated estimated dose rate at the building outer wall is less than two millirem per hour.

Areas immediately adjacent to the exposure room will not exceed the two millirem per hour limit. Individual members of the public will be prohibited access to the areas in or surrounding the calibration facility and will not receive a total effective dose equivalent in excess of 100 millirem in a year. We anticipate that the use of the JLS Model 81-22 will be limited to no more than one hour per week.

Enclosure 4 contains the training program requirements to qualify individuals as operators or users, annual training and training of emergency response personnel.

Enclosure 5 is the J.L. Shepherd Model 81 Installation and Operating manual, including emergency procedures to be followed in the unlikely event that a source fails to return to the "OFF" position. This procedure will only be performed by or under the supervision of the radiation protection staff.

Enclosure 6 is the calibration standard operating procedure (SOP) for the J.L. Shepherd Model 81-14Q Calibrator currently in use in building 2540, Charles Wood Area, authorized under NRC License Number 29-01022-06. A similar SOP will be developed for use of the J.L. Shepherd Model 81-22 Calibrator in building 9401, Evans Area.

Enclosure 7 is the radiation protection program, including responsibilities of the Fort Monmouth Radiation Control Committee and Radiation Protection Officer. This program is delineated in our NRC broad scope license (29-01022-06). Enclosure 8 addresses radiation detection and measurement requirements.

A radiation survey of the exterior walls and roof of the Calibration Room and of the exterior of Building 9401 and effected fenced perimeter will be performed with the J.L. Shepherd Model 81-22 Calibrator in the exposed position, upon installation of this calibrator. The results of this survey will be provided to your office. If the radiation survey reveals a radiation dose rate exceeding the two millirem per hour limit, the calibrator will not be used until sufficient shielding material is added, as a minimum, to reduce the external radiation dose at the fence line to two millirem per hour limit. If radiation dose rates are detected on the roof that warrant protective measures, roof access points will be posted and access to the roof will not be authorized while the calibrator is in use.

a federal licensee) decommissioning monies will be obtained when necessary for the termination of subject license. Dollar amounts for future decommissioning costs, though difficult to predict, are estimated not to exceed $75,000.

Your expeditious processing of this amendment request is appreciated.

Our Point of Contact is Mr. Joseph M. Santarsiero or the undersigned, Facsimile on (732) 532-6403 or (732) 542-7161; Voice on (732) 427-4427/3112.

Sincerely,

STEVEN A. HORNE
Director, Safety
Risk Management

Enclosure

Copy Furnished:

Commander, U.S. Army Materiel Command, ATTN: AMCSF-P, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-0001

In accordance with 10 CFR 30.35, this is to certify that (as a federal licensee) decommissioning monies will be obtained when necessary for the termination of subject license. Dollar amounts for future decommissioning costs, though difficult to predict, are estimated not to exceed $75,000.

Your expeditious processing of this amendment request is appreciated.

Our Point of Contact is Mr. Joseph M. Santarsiero or the undersigned, Facsimile on (732) 532-6403 or (732) 542-7161; Voice on (732) 427-4427/3112.

Sincerely,

STEVEN A. HORNE
Director, Safety
Risk Management

Enclosure

Copy Furnished:

Commander, U.S. Army Materiel Command, ATTN: AMCSF-P, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-0001

J.L.Shepherd & Associates

1010 Arroyo Avenue San Fernando California 91340
TELEPHONE 818 898 2361 FAX: 818 361 8095

PERFORMANCE SPECIFICATIONS
J.L. SHEPHERD & ASSOCIATES CALIBRATION FACILITY
COMPRISING A MODEL 81 CALIBRATION SYSTEM
AND A MODEL 150R STAGE II CALIBRATION TRACK

REF: **JLS-4679, MODEL 81 Calibration System with Model 150R Stage II Calibration Track System**

1.0 SCOPE: This purchase description covers a projected beam ^{60}Cobalt/^{137}Cesium calibration system, and a Model 150R Stage II Calibration Track System. The system shall be automatic and remotely controlled.

2.0 SALIENT CHARACTERISTICS: The system shall be compromised of two distinct systems, a Model 81-22 Quintuple Source ^{60} Cobalt/^{137} Cesium Calibrator, and a Model 150R Stage II Calibration Track System. This equipment shall incorporate the following salient characteristics, which are essential to the needs of the customer.

2.1 PHYSICAL REQUIREMENTS:

2.1.1 RADIOACTIVE SOURCES: Sources shall be [redacted] Cobalt, and [redacted] (1.85 TBq), ^{137} Cesium in Special Form Encapsulation. All sources except the [redacted] Cobalt ^{60} sources shall be provided by Fort Monmouth. The source activities shall be certified to +/- 5%. This certification, the date of its determination, and a certification of the necessary regulatory leak tests shall be provided with the calibrator. The [redacted] ^{60} Cobalt source(s) shall be a Special Form JLS&A Model 7810 capsules as approved by the State of California, Department of Radiological Health. The ^{137} Cesium source(s) shall be Special Form JLS&A Model 6810 capsules as approved by the State of California, Department of Radiological Health. Source capsules shall be certified to ANSI 433.1/ISO 2919/IAEA Safety Series #6 Classification E 43424, meet JLS&A's Special Form Approvals: CA598S122S (Cobalt 60) & CA598S119S (Cesium 137), and have a Recommended Working Life of 20 years.

2.1.2 SOURCE MODES: The Model 81 source rod assemblies shall have two modes: a "SAFE" mode wherein the sources are stored within the shield, and an "IRRADIATE" mode to expose samples. The calibrator shall automatically move the source(s) between the two modes in accordance with control panel settings. The sources shall be able to be activated singly.

End 1

2.1.3 SOURCE CONTAINER: The exterior source housings shall be of all welded steel construction and meet Department of Transportation (DOT) 7A specifications. Internal surfaces and components shall be of inert, stable material which is not expected to suffer significant wear or degradation over a projected lifetime of thirty years. The devices shall be approved by USNRC or Agreement State and shall appear in the Approved Source and Device catalog. The source wheels shall be designed in an array which meets the customers requirements. Source rod assemblies can be customized for individual system orders.

2.1.4 SHIELDING REQUIREMENTS: The calibrator will be shielded on all sides such that the external radiation level at 0.5 meters from any exterior surface of the calibrator shall not exceed 2.0 mRem (20 μSv) per hour in the OFF position. Lower external levels are available upon request.

2.1.5 CONTROL PANEL: The Model 81 Series Calibration Facilities shall be manufactured utilizing J.L.Shepherd & Associates' Model 81/150R Series Operating/Control System. This system has been tested and approved by the Stae of California Department of Health Services. The control panel shall provide all controls and indicators necessary to allow the technician to operate the calibrator and determine its status. Cabling with a length of 40 feet will be supplied to connect the control panel to the calibrator.

2.1.5.1 CONTROLS: As a minimum, the control panel shall contain the following controls: A Master Power On/Emergency Off Switch to rapidly apply and remove all externally supplied energy sources, such as electrical power, compressed air, etc.; a switch to select whether the exposure will be automatically determined by the timer or manually by the operator; a switch to be used to manually control the movement of the source(s) between the two modes when the timer is not to be used or is to be overridden; and timer controls to program exposure times and initiate exposure. The operator shall be able to select one individual source per exposure. Selected source selected shall be exposed for the duration of the irradiation cycle.

2.1.5.2 INDICATORS: As a minimum, the control panel shall include the following indicators: System Power Status (off or on); Individual Source Mode Status to indicate the current position of each source rod assembly (SAFE, MOVING, IRRADIATE), Timer Display which will indicate the information required to determine the exposure time remaining and that already elapsed; and External Energy Source Status such as adequecy and presence of air pressure. The panel shall emit both a visible and audible signal to indicate when an irradiation cycle has ended and the source rod assemblies have returned to the "SAFE" mode.

2.1.6 CALIBRATOR STAND: The stand shall be designed to provide a stable support for the calibrator. The calibrator shall stand vertically at all times, whether stationary or being moved. The force distribution to the floor during such transport shall be such that no damage will be sustained by an epoxy mortar floor laid over a level, smooth concrete substrate.

2.1.7 PHYSICAL SPECIFICATION: No dimension of the calibrator shall exceed 80 inches. The system design shall be such that the entire calibrator can be moved through a standard 40 inch (1 meter) wide doorway. Maximum weight shall be 5,000 lbs (2,400 kg).

2.1.8 GENERAL: No routine operation of the calibrator shall require more than one person, nor shall it require the operator to exert more than twenty pounds of force. Movement of the calibrator does not constitute "routine operation." Location of parts must be such that the operator can obtain adequate leverage to exert any forces required.

2.2 FUNCTIONAL REQUIREMENTS:

2.2.1 EXPOSURE CHARACTERISTICS: The individual calibrators shall have ON/OFF source positions as standard. The calibrators shall provide exposures of approximately 1.2 R/hour/curie @ 1.0 meter for Cobalt ^{60}, and exposures of approximately 0.27 R/hour/curie @ 1.0 meter for Cesium ^{137}. The accuracy of this calibration shall be traceable to US NIST with an error of +/- 5%. Calibration data points will be generated at time of installation and curves will be supplied with the device.

The Model 81 Projected Beam Calibrations Systems can be ordered with up to six separate source positions, depending upon source material and size. Customers may decide upon the number of sources required for each system.

2.2.2 AUTOMATIC OPERATION: The range of the timer shall be 0 to at least 9999.99 minutes with a resolution of 0.1 minutes. Once all of the inter locks have been satisfied, activation of the irradiate switch shall automatically initiate all remaining actions necessary to accomplish the desired exposure in accordance with this purchase description, including retraction of the source rod assemblies to the stored mode when the preset exposure time has elapsed. The time required for the source rod assemblies to move between the two positions shall be no greater than two seconds. The source rods are driven with individual pneumatic cylinders which are attached to actuator rods. The solenoid valves for these cylinders shall be located outside of the irradiation chamber at the control panel. Provisions shall be made to introduce an emergency air supply (up to 150 PSI) into the system in case of failure of the solenoid valve or pneumatic cylinders. This emergency air supply (supplied by customer) valving shall be located adjacent to the control panel.

2.2.3 SAFETY: The source rod assemblies shall be immediately returned to the stored mode under any of the following conditions: (1) the preset time has elapsed; (2) the 'SAFE' switch has been actuated; (3) the Master Power/Emergency Off Switch has been turned off; (4) power to the irradiator has been lost; (5) air pressure is lost, or any interlock/scram switch is opened. The Source Rod Position Status indicators shall be of a positive nature, such that intermediate source positions activate a "SOURCE MOVING" indication light.

2.2.4 INTERLOCKS: The following interlocks shall be provided with this device: These interlocks meet the requirements of 10CFR 36, copy attached in Addendum B. A red rotating beacon (source ON) and a green (source OFF) light will be mounted in the room.

Radiation Warning Light: Consists of a fluorescent fixture, with a transluscent red face plate, with a black radiation symbol and the words "Caution Radiation" in 1 inch black letters. Mounting brackets to be provided for mounting to any surface with 30 feet of electrical cable terminated with connectors to mate with the warning light and the control panel. The light shall be illuminated when the source is not in the fully shielded position.

Photoelectric Interlock System: System to be incorporated with modulated LED light sources to be totally insensitive to ambient light and have a useful range of greater than 50 feet. Both the emitter and receiver are equipped with mounting brackets and 50 feet of cable terminated with connectors which mate with connectors on the interlock system and the calibrator. Relays are built in and power is supplied by the control panel. All parts are shock, vibration and moisture proof. A red LED light on the receiver glows when the emitter and receiver are aligned. The system returns the source to the fully shielded position when the beam is interrupted.

Safety Systems: The following safety systems are incorporated into the Model 81. These safety systems do not permit source to be raised and returns source to the fully shielded position when system is deactivated:

a. 'SAFE/ARM' keyswitch which locks out source operation when in the SAFE mode, and allows all indicator lights to remain functional. Also acts as an interlock to return all sources to the OFF position when moved to the SAFE position. This switch shall be located on the control panel. The keyswitch shall use the identical key to the irradiation room door. The ARM position on the control panel dose not allow the key to be removed. This key shall be attached to a portable radiation survey meter with a cable or chain.
b. "SOURCE ON" switch. This pushbutton switch can be activated within the 90 second time period of the enable circuit. (see f. below) Operator must have previously selected the source(s) desired to be activated during the cycle. This switch will not operate until all interlocks haev been satisfied.
c. 'SCRAM' switch mounted on control panel to immediately return all sources to the SAFE position.
d. DI-1 Door interlock disables source operating system.
e. PE-1 Photoelectric System which may be mounted anywhere in the room which automatically returns source to fully shielded position if beam is interrupted.
f. ENABLE circuit to be mounted in room so that prior to source exposure, operator leaving the room must press the set up push button switch. This illuminates light on both the switch box and on the control panel. If the system is not activated within 90 seconds (other adjustable time periods available upon request), operator must reenter room and activate the set up switch prior to the start of irradiation period.
g. Large mushroom PANIC button interlock switch, 1 each on opposite walls in irradiation cell will be incorporated to disable system.

h. Smoke/Fire Alarm/Interlock. A Model ESL 429 Smoke/Fire Alarm/ Interlock shall be provided with 40 feet of cabling to the master control panel. This interlock shall sense the presence of smoke and/or fire, and sound a visual and audible alarm as well as return the source to the OFF/SAFE position immediately. This system shall be located out of the direct beam of the irradiator.

i. The door to the irradiation cell shall be accessed from the outside with a key identical to the SAFE/ARM keyswitch key. The door shall be openable from the inside at all times.

FAIL-SAFE SOURCE RETURN LOGIC:

In the event of loss of electric power or interlock interruption, the source are automatically returned to the fully shielded position by the source drive pneumatic cylinder system.

In the case of loss of air pressure, sources are returned to the fully shielded position by built in constant tension springs in the operating tower of the unit.

In case of failure of constant force springs, the emergency air supply can be introduced to return sources to the SAFE position.

3.0 The High Intensity Calibration Track System covered by this purchase description is essentially the same as that contained in current J.L. Shepherd & Associates literature. The Model 150R Stage II Calibration Track System shall be installed with the Model 81 Projected Beam Calibration unit at one end.

3.1 COMPONENTS: The system consists of the following:

3.2 POSITIONING CONTROLS X, Y AXIS

3.3 Sample Table (with movable stops).

3.4 Rolling Table (one each).

3.5 Cable Carrier (floor mounted).

3.6 Position Indicator (digital, overall reproducibility± 4mm).

3.7 Track System.

3.8 CCTV System.

4.0 INTENDED USE: The remote track shall be capable of accommodating all types of equipment, dosimeters and TLD's.

5.0 SALIENT CHARACTERISTICS: The Calibration Track System shall embody the following salient performance and product characteristics:

5.1 Sample Table: To be used for accurate positioning of samples (i.e. dosimeters, radiation instruments, TLD's etc.). The table shall be height adjustable from beam centerline to 30 cm below beam centerline to accommodate various instrumentation. The height adjustment shall be manually controlled. The table shall be equipped with a HOME position which will provide a reference position for all samples.

5.2 Rolling Table: The Rolling Table is moved on the track by a roller chain drive operated by a Stepper motor. The table drive control system includes a Joystick Control switch ("FORWARD-REVERSE") to control direction of travel between Model 81 devices. The rolling table shall support the sample table with a maximum 25 kilogram loading.

5.3 Cable Carrier: Floor mounted to capture cables from the control panel to the television camera. Must provide enough length to operate over a distance of 50 feet from the calibrator to the end of the track.

5.4 Position Indicator: Consisting of a digital electronic counter, mounted on the control panel, displays the table position ± 1mm, at all times. The overall precision of the table positioning system is ±2 %. The electronic counter is driven by a shaft encoder mounted on the table drive system. The counter incorporates a preset so that the distance of the 0-0 position of the table from the source centerline is shown in millimeters on the counter when the rolling table is driven to the forward stop and the counter reset is activated. This indicator shall be integrated into the control panel.

5.5 Track System The rolling table shall be mounted on four linear bearings which will ride on dual guide shafts for the entire length of the track. The track shall have a reproducible distance indication of ± 1mm. The track (X Axis) shall be nine meters long.

5.6 CCTV System A CCTV system shall be included with each system, including the following components:

A light weight television camera with short focal length lens. The camera is mounted on pan head with clamping fixture to permit angular, vertical and horizontal adjustment.

Television Camera: "Vidicon" of type which minimizes burn damage when focused on a fixed target for long periods. Horizontal resolution with a minimum of 600 lines per inch. Signal to noise ratio to exceed 50 dB. Scanning capability of 2:1 interlace, 525 lines, 30 frames. Video output adjustable to approximately 1.4 volts P-P. External controls to include beam, target, focus and off/on controls.

Television Monitor: High resolution, 9 inch to provide accurate display of different types of radiation instruments with digital or panel meter under normal lighting conditions. Front panel to include adjustable controls for horizontal hold, vertical hold, brightness, contrast with an on/off switch.

6.0 Installation and Training: Installation shall be provided. An on-site verification of dose rates shall be performed prior to final acceptance. Training in the operation and maintenance of this device shall be provided. All ancillary equipment shall be installed prior to the introduction of the calibrator into the cell. All cabling, wires, sensor leads, etc. shall be introduced into the cell through a cable tray which is installed (by others) in the room.

Acceptance of the system will be at CUSTOMER's site.

7.0 Warranty: The warranty for this system shall be one year parts and labor, from the date of shipment. J.L. Shepherd & Associates will respond within 72 hours for any warranty service which requires on-site repairs.

8.0 MANUFACTURING EXPERIENCE: J.L.SHEPHERD & ASSOCIATES has manufactured over 200 multi-kilocurie devices.

9.0 RADIOLOGICAL CONTROLS: Complete NIST traceable calibration data points and calibration curves shall be provided. Accuracy shall be +/-5%. Calibration certificates shall also be included in accordance with ANSI N323-1078 Sections 4.6 and 4.7.3

10.0 LABELING: Each device shall have the following labels:

a. CAUTION RADIOACTIVE MATERIALS tag denoting radionuclide, activity, original date of activity
b. USDOT 7A RADIOACTIVE MATERIALS JLS
c. J.L.Shepherd & Associates identification tags with requisite Model and serial #'s.
d. WARNING: IONIZING RADIATION tag.

This is the minimum labeling package required by licensing authorities.

11.0 OPERATING CONDITIONS:

11.1 External Energy Sources: The calibrator shall operate and comply with all requirements of this purchase description while using a 110 +/- 10% volt, 60 Hz AC power source requiring current of less than 20 amperes; and, if necessary, a source of compressed air with a delivery capacity of 40 SCFM or less at not more than 100 psi.

11.2 Operating Environment: The calibrator shall operate and comply with all requirements of this purchase description in an ambient environment of 10 to 35 degrees Celsius and 10% to 80% relative humidity.

11.3 Non-Operating Environment: The calibrator shall operate and meet all requirements of this purchase description when stabilized in an operating environment after having been subjected to temperatures from -20 to +50 degrees Celsius and relative humidity from 5% to 100%.

11.4 Materials: All electrical materials shall be UL or FM tested, where available, with appropriate labeling. All materials shall be new, free of defects or mechanical damage, and in good operating condition.

12.0 ACCEPTANCE: Acceptance testing may be conducted at J.L.SHEPHERD & ASSOCIATES' facility. All specifications shall be met prior to test. Final acceptance shall be accomplished at customers facility after final assembly.

13.0 Quality Assurance: J.L. Shepherd & Associates has a quality assurance program (USNRC Certificate No. 0122, Revision 4) which complies with the requirements of 10 CFR 71, Subpart H, which deals with design, purchase, fabrication and handling of shipping containers for the transport of licensed radioactive material. A statement indicating compliance with this paragraph and a copy of the results of tests performed to assure such compliance will be supplied with the calibrator. Additionally, the Quality Assurance Program has been audited and approved to ANSI/ASME NQA-1 Section 1-18. Copies of these approvals are available upon request.

14.0 DOCUMENTATION:

I. Complete instruction manuals in English shall be provided covering installation, use and maintenance. Electrical and pneumatic schematics shall be included, including point to point electrical schematics showing terminations and color codes. Also included shall be major component/assembly layouts.

II. Each manual shall also contain:

a. Date of development of dose rate curves.
b. Statement of isotropic verification of sealed sources.
c. Source leak test data and procedures for in-situ tests.
d. Identification of instrumentation used to develop dose rate curves.
e. Accuracy of the dose rate curves and verification.
f. Complete replacement parts listing.
g. Operating/Maintenance/Troubleshooting procedures
h. External exposure rate certification.
i. Manuals from outpurchased equipment.
j. Recommended spare parts list with pricing.

J.L.SHEPHERD & Associates also keeps records of all aspects of all projects undertaken into perpetuity.

15. **Radioactive Sources Furnished by Fort Monmouth:** Fort Monmouth to provide the following sources for this proposed system:

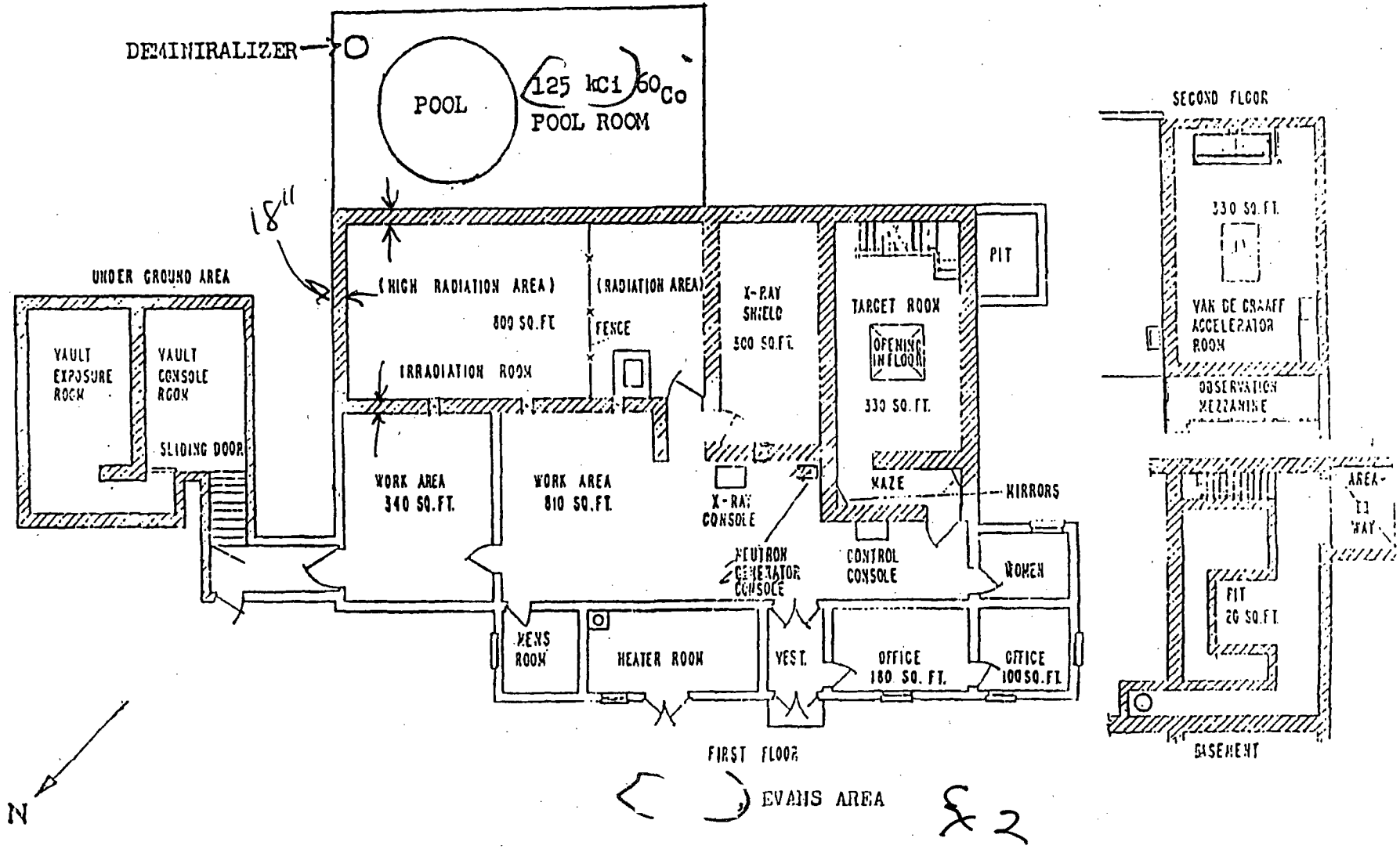
a. Cs^{137} source in JLS Custom Calibrator.
b. Cs^{137} source in AN UDM-1A Calibrator.
c. Co^{60} source in Fort Monmouth Container.
d. Co^{60} source in Fort Monmouth Container.
e. Cs^{137} source in Fort Monmouth Container.

& 2

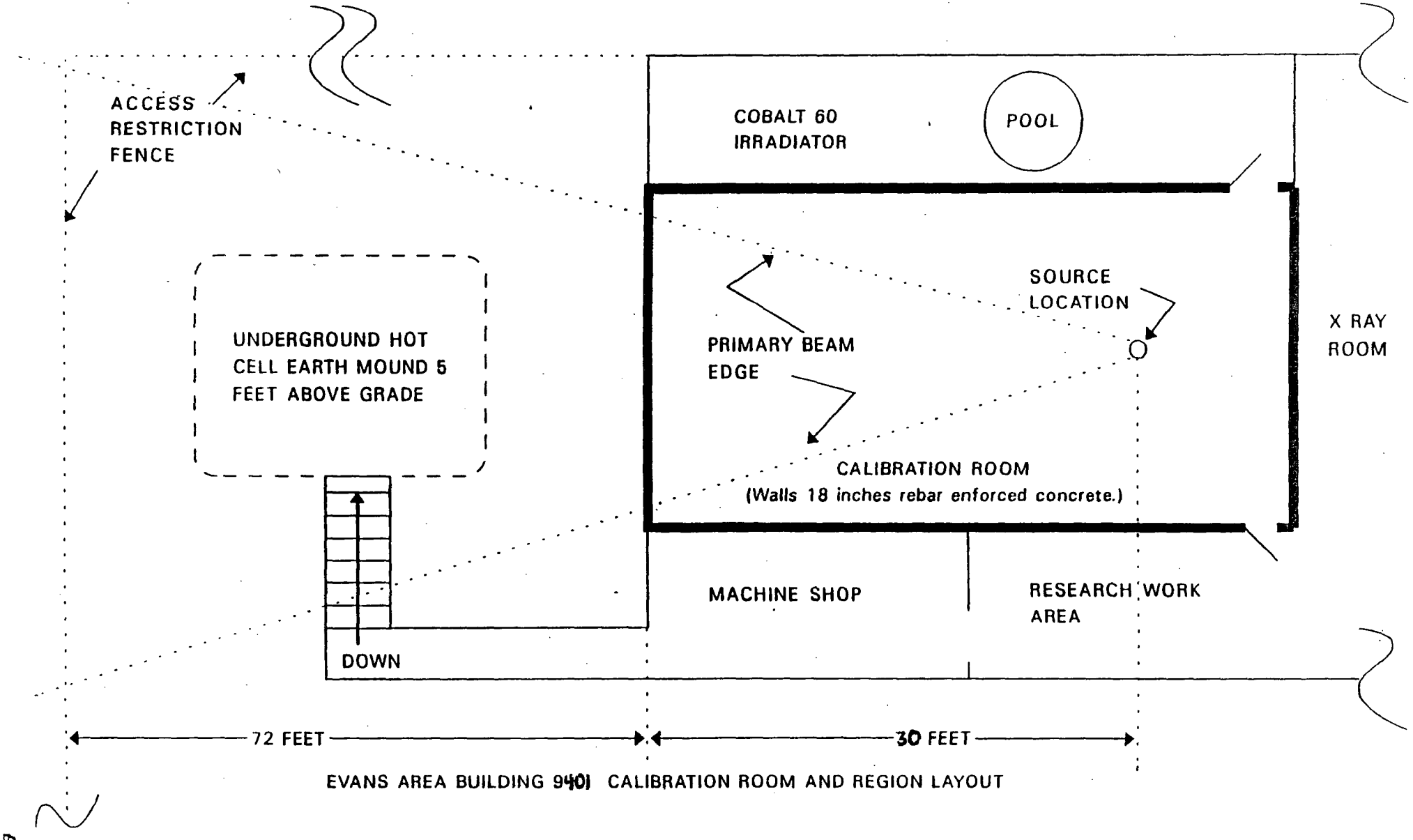
JLS&A shall provide the transport containers for shipment of these sources/devices to our facility. Fort Monmouth shall be responsible for ALL freight and rigging expenses/charges incurred in the removal of these sources/devices.

JLS&A shall be responsible for all materials which are surplus from the unloading of these sources.

16. PACKAGING: The complete system shall be disassembled and packaged for shipment in accordance with all DOT specifications and standard commercial packaging requirements.


DEMINIRALIZER
POOL
125 kCi ^{60}Co
POOL ROOM
18"
UNDER GROUND AREA
VAULT EXPOSURE ROOM
VAULT CONSOLE ROOM
SLIDING DOOR
(HIGH RADIATION AREA)
800 SQ.FT.
IRRADIATION ROOM
(RADIATION AREA)
FENCE
X-RAY SHIELD
300 SQ.FT.
PIT
TARGET ROOM
OPENING IN FLOOR
330 SQ.FT.
WORK AREA 340 SQ.FT.
WORK AREA 810 SQ.FT.
X-RAY CONSOLE
MAZE
MIRRORS
NEUTRON GENERATOR CONSOLE
CONTROL CONSOLE
WOMEN
MENS ROOM
HEATER ROOM
VEST.
OFFICE 180 SQ. FT.
OFFICE 100 SQ.FT.
FIRST FLOOR
EVANS AREA
N
SECOND FLOOR
330 SQ.FT.
VAN DE GRAAFF ACCELERATOR ROOM
OBSERVATION MEZZANINE
AREA-WAY
PIT 20 SQ.FT.
BASEMENT

£2



EVANS AREA BUILDING 9401 CALIBRATION ROOM AND REGION LAYOUT

Exel

1. Training Program.

2. Attachment 1 contains the program for instruction, including written examination, for initial training of operators of the JLS Model 81-22. It is comprised of a combination of self-study, classroom participation and on-the-job training. Similar alternative radiation safety training and experience, as approved by the Radiation Protection Officer and Fort Monmouth Radiation Control Committee, may be substituted for parts of this training program. Potential operators with approved alternative training and experience will require formal and on-the-job training in the use of the JLS Model 81-22 and its standing operating procedures.

3. Attachment 2 addresses the annual training reviews for operators.

4. Attachment 3 addresses training requirements for individuals responding to alarms or emergencies.

5. Attachment 4 is required reading in basic radiation safety for individuals visiting the calibration facility. Only authorized and trained individuals will be permitted unescorted access to restricted areas.

U.S. ARMY CECOM
DIRECTORATE OF SAFETY RISK MANAGEMENT
Training for Use of the J.L. Shepherd
Model 81 Multi Gamma Source Calibrator

TABLE OF CONTENTS

ATTACHMENT 1

Training for Use of the J.L. Shepherd Model 81 Multi Gamma Source Calibrator

PROGRAM OF INSTRUCTION

TASK 1: Introduction / Training Objectives / Course Administration Total Hours: 1.0

OBJECTIVE: At the completion of this task personnel will be given an overview of the Program Of Instruction, course policies, schedule, self-study assignments and final exam. Duty training requirements satisfied by successful completion of the course will be discussed. Upon successful completion of this course the trainee is qualified to be an approved operator of the J.L. Shepherd Model 81 Multi Gamma Source Calibrator (MSGC).

TASK 2: Basic Principles of Radiation Total Hours: 3.0
(Self-Study: 2; Class Instruction: 1)

TRAINING OBJECTIVE: At the completion of this module the trainee will have an understanding of the basic structure of the atom, properties of atomic particles (proton, neutron and electron), the major types of radiation and radioactive decay. The trainee will correctly explain radioactive decay by alpha, beta, and gamma ray emission using atomic notation and nuclear stability. The trainee will use the radioactive decay equation to determine the current activity of a radioactive source manufactured at sometime in the past.

TASK 3: Exposure, Shielding and Biological Effects Total Hours: 3.0
(Self-Study: 2; Class Instruction: 1)

TRAINING OBJECTIVE: At the completion of this module the trainee will have a basic understanding of ionizing radiation and be able to identify it as an external or internal biological hazard. The trainee will use the concepts of time, distance and shielding to explain how radiation exposure can be maintained as low as is reasonably achievable (ALARA) and be able to select effective shielding material for each of the 3 types (alpha, beta, gamma) of ionizing radiation.

TASK 4: Radiation Terms and Units / Mathematics Review Total Hours: 2.0
(Self-Study: 2)

TRAINING OBJECTIVE: At the completion of this module the trainee will become familiar with common terms used in ionizing radiation protection work. The trainee will be able to use and correctly convert either standard or SI units of radiation activity, absorbed dose and dose equivalent. In addition, the trainee will become familiar with the function of the keys on a scientific calculator. The trainee will be able to correctly use scientific notation and exponential functions to solve problems related to radioactive material shipments, radiation surveys and radioactive decay.

TASK 5: RADIAC Instrumentation and Health Physics Surveys Total Hours: 2.0
(Self-Study: 1; Class Instruction: 1)

TRAINING OBJECTIVE: At the completion of this module the trainee will understand the principles involved in detection of ionizing radiation. The trainee will use radiation instruments that can detect the presence of alpha, beta, or gamma radiation to determine if a radioactive source is emitting one or any combination of these ionizing radiations. The trainee will be able to select the proper radiation detection instrument based on the isotope and magnitude of ionizing radiation levels present. In addition, the trainee will be able to use RADIAC instrumentation in performing health physics surveys.

TASK 6: Personnel Dosimetry Total Hours: 2.0
(Self-Study: 1; Class Instruction: 1)

TRAINING OBJECTIVE: At the completion of this module the trainee will have an understanding of the Department of the Army (DA) regulations governing exposure of personnel to ionizing radiation. The trainee will become familiar with the process required to establish and operate a personal dosimetry program. The trainee will demonstrate an understanding of the process by working with examples of the elements of a dosimetry program utilizing automated dosimetry printouts, DD Form 1952 completion, filing procedures, records control and accountability.

TASK 7: NRC Requirements and Disposal Regulations and Procedures Total Hours: 2.0
(Self-Study: 1; Class Instruction: 1)

TRAINING OBJECTIVE: At the completion of this module the trainee will demonstrate a working knowledge of the NRC requirements governing the MGSC to include the NRC license, regulations, and reg guides. In addition, the trainee will possess a working knowledge of the steps to take when radioactive material, classified as radioactive waste, requires shipment to a disposal site. The trainee will demonstrate an understanding of the rules, regulations and procedures regarding the proper storage and disposition instructions for the disposal of radioactive material.

TASK 8: Operational Procedures of the MGSC Total Hours: 16.0
(Class Instruction: 6; On-Site: 10)

TRAINING OBJECTIVE: At the completion of this module the trainee will demonstrate a working knowledge of the correct use, maintenance and storage of the MGSC, to include reviewing and signing all pertinent SOPs, reviewing all pertinent local regulations and initiate 170 hours of supervised On-The-Job Training.

TASK 9: Radiological Emergencies/Rules and Regulation For Radiation Exposure — Total Hours: 2.0 (Self-Study: 1; Class Instruction: 1)

TRAINING OBJECTIVE: At the completion of this modules, the trainee will understand the requirements for a viable radiation safety SOP as it relates to accident prevention, source handling and decontamination of a radiation accident. In addition, the trainee will become familiar with the regulations governing radiation exposure, the terms and definitions used in radiation protection. The trainee will demonstrate knowledge of what information, when and how to report a radiation incident to higher command channels.

TASK 10: 10 CFR Parts 19, 20, 21 and 36 — Total Hours: 2.0 (Self-Study: 1; Class Instruction: 1)

TRAINING OBJECTIVE: At the completion of this modules, the trainee will understand the requirements set by Code of Federal Regulations Title 10, Parts 19, 20, 21 and 36 as it relates to licensing, operating and emergency procedures, posting requirements, survey requirements, program review, case histories of accidents and other related topics.

TASK 11: Transportation Regulations and Procedures — Total Hours: 1.0

TRAINING OBJECTIVE: At the completion of this module the trainee will, when given a radioactive commodity for shipment, determine the packaging, marking, labeling and other shipping requirements. In addition, the trainee will determine the number of individual commodities that may be shipped in a radioactive package shipment.

TASK 12: Course Review — Total Hours: 2.0

TRAINING OBJECTIVE: To review the subjects presented, clear up any student questions and discuss any sections that present difficulties to the student's understanding.

TASK 13: Examination — Total Hours: 2.0

OBJECTIVE: The trainee will complete the course successfully by correctly answering 70% or more of the questions on a comprehensive written examination.

SAMPLE

OPERATOR FINAL EXAMINATION

J.L. SHEPHERD MODEL 81 MULTI GAMMA SOURCE CALIBRATOR

NAME _____ DATE _____

CIRCLE THE CORRECT CHOICE

1. The Curie is a unit of:

   a. Volume
   b. Absorbed dose
   c. Activity
   d. Power density

2. A Curie is equal to:

   a. 2.2×10^{5} cpm
   b. 6.02×10^{23} cpm
   c. 3.7×10^{10} dps
   d. 4.5×10^{-7} dpm

3. The rad is a unit of:

   a. Exposure of x-ray or gamma radiation in air
   b. Radiation absorbed dose; equal to 100 ergs/gram deposited by radiation in any medium
   c. Roentgen equivalent man
   d. 3.7×10^{10} disintegrations per second

4. An alpha particle has:

   a. A positive electrical charge
   b. A negative electrical charge
   c. No charge (neutral)

5. A beta particle has:

   a. A positive electrical charge
   b. A negative electrical charge
   c. No charge (neutral)
   d. Either a positive or negative charge

6. The atomic number of an element reflects:

a. The number of neutrons in the nucleus
b. The number of protons in the nucleus
c. The total number of protons and electrons in the atom
d. The total number of neutrons and protons in the nucleus

7. If the source does not return to its shielded position, you should:

a. Attempt to fix the problem immediately
b. Report the malfunction to the RPO or his designee
C. Call 911

8. The _____detector is located at the down range barrier and places the source in the " STORED" position when the beam is interrupted.

9. For Cobalt-60 (Co-60), the number 60 (sixty) indicates the:

a. Number of radioactive particles
b. Atomic number
c. Atomic weight

10. Which type of radiation listed below presents the lowest external radiation hazard?

a. Alpha
b. High Energy Beta
c. Gamma
d. Neutrons

11. Which of the following types of radiation is the most penetrating?

a. Alpha
b. Beta
c. Gamma

12. The method(s) of protection from ionizing radiation that the operator can control is (are):

a. Time
b. Distance
c. Shielding
d. All of the above
e. None of the above

13. When not in use, all TLD badges are stored in a designated area with a control TLD badge. The reason(s) for this is (are):

a. To more accurately report exposure by subtracting the control badge reading
b. To keep all TLD badges away from radiation areas when not being worn
c. To measure the amount of radiation the storage area is exposed to
d. All of the above
e. a and b only

14. When all interlocks are closed, the _____ light is illuminated.

15. Which of the following types of radiation will the G-M survey meter detect?

a. High energy beta
b. Gamma
c. a and b

16. The source plug mechanism is equipped with a multiple interlock system. If any one interlock is opened while the source is in the "up" position, the source will immediately return to its shielded position.

a. True b. False

17. You are standing in the exposure room. Suddenly you hear the warning alarm indicating that the source is about to be raised to the "up" (exposure) position. The FIRST thing you should do is:

a. Quickly retreat to the control room
b. Set the emergency stop switch to the "up" position
c. Set the emergency stop switch to the "down" position
d. Ensure your dosimetry is positioned to accurately measure your exposure

18. The irradiator source is stuck in the "up" position. The FIRST thing you should do is:

a. Enter the exposure room and manually lower it
b. Call Radiation Area Supervisor or RPO
c. Call the fire department
d. Notify the Nuclear Regulatory Commission

19. Before using a survey meter, list 4 checks you should perform to ensure it is operating properly.

a.
b.
c.
d.

20. The irradiator source will not go into the exposure or "up" position. Which of the following situations would **NOT** be an explanation for this?

a. Electrical power failure
b. Interlock malfunction
c. Emergency switch in exposure room is in the "up" position
d. Main control panel emergency stop switch is faulty

21. The Roentgen (R) is a unit of:

a. Exposure of x-ray or gamma radiation in air
b. Radiation absorbed dose
c. Roentgen equivalent man
d. 3.7×10^{10} disintegrations per minute

22. You are in a radiation area with an exposure rate of 30 mR/hr. How long will it take you to receive an exposure of 2 mR?

a. 1 min
b. 2 min
c. 4 min
d. 10 min

23. List the steps necessary to shut down the source and exit the calibration range.

24. All radiation workers are required to have a periodic radiation physical.

a. True b. False

25. Eating, drinking, and smoking is permitted in the control room but is prohibited in the exposure room.

a. True b. False

26. An acute exposure is defined as:

a. An exposure to a large dose of radiation over a short period of time
b. An exposure to a small dose of radiation received repeatedly over a long period of time
c. An exposure of 5 mR per year

27. Dose rate is defined as:

a. The total amount of radiation absorbed per unit volume
b. The amount of radiation measured per unit time
c. The speed of light

28. What is the minimum radiological dosimetry/safety instrumentation to be used when operating the source?

a. Survey meter
b. TLD badge
c. 200 mR pocket dosimeter
d. All of the above

29. After the correct sequence of starting procedures has been executed, you turn the source key and the source will not operate, you should:

a. Check emergency switch
b. Inform the Radiation Area Supervisor
c. Repeat the start-up (operation) procedure
d. All of the above

30. "ALARA" is an acronym for:

a. The mechanism of interlock alarm systems
b. The concept of minimizing radiation exposure
c. A radiation detection device similar to the "Chirpee"
d. "Annual Limits Associated with Radiation Accidents"

31. During a test you notice that a visual warning light is not operating, you should:

a. Ignore it, this is only a test.
b. Fix it on the spot.
c. Report it to the area supervisor.
d. Report it to the RPO or his designee.

32. Are TLD whole body and pocket dosimeters required to be worn when operating the source?

a. Yes b. No

33. Briefly describe the significance of the "red warning light" located at the entrance to the calibration room.

34. In the event of an air pressure loss, the automatic _____ which are mounted on the pneumatic cylinder, allows the source to return to the " CLOSED" position.

35. Do gamma rays induce radioactivity?

a. Yes b. No

Annual Operator Training
for Use of the
J.L. Shepherd Model 81 Multi Gamma Source Calibrator

I. This 2 hour block of instruction applies to all qualified operators of the J. L. Shepherd Model 81 Multi Gamma Source Calibrator (MGSC).

II. Topics included in training session.

a. Review of the current operating procedure.
b. Proper wear of personnel dosimetry.
c. Review of current emergency procedures.
d. Emergency drill exercise.
e. Summary/Questions and answers.

III. Standing Operating Procedure (SOP)

a. Provided at *Appendix A* is the current SOP. The RPO or his designee will update the SOP annually or on an as needed basis.

b. Operators shall read the SOP at least annually prior to initial operation of the MGSC and after any changes made by the RPO.

IV. Proper Wear of Personnel Dosimetry.

a. Whole Body Badge. When monitoring of external whole body radiation exposure the personnel monitoring device will be worn below the shoulders, above the hips, and on the outside of clothing on that portion of the body nearest the radiation source. However, do not place tape or other substance over the front of the dosimeter. The TLD must face outward from the body. The preferred location is in the center of the chest. Do not wear the TLD on the sleeve or shoulder epaulet. Wear the whole body badge at all times when working with radioactive materials. Take care to prevent physical damage or loss of the TLD.

b. Self-Reading Pocket Dosimeter. A self-reading pocket dosimeter is an ion chamber that can be read while working to monitor accumulated dose. The dosimeter works by use of an electrostatic charge. The electrode protruding from the end (covered by the plastic cap) extends through the insulator into the chamber. At the end of this electrode two filaments are attached, one fixed and the other flexible. When the electrode is placed on a charger, the electrodes move apart due to the like charges. The flexible filament acts like it is under spring tension when in the charged position. When you look into the end of the chamber, the shadow of the flexible electrode is superimposed on the scale. The filament can be moved along the scale by varying the charge on the electrode. This methods allows the flexible filament to be placed on the "0" mark. When the dosimeter is exposed to radiation the positive ions, created from ionization of

ATTACHMENT 3

the gases in the chamber, reduce the charge on the electrode. As the charge is reduced the flexible filament moves toward the fixed filament and the shadow of the filament moves along the scale. The amount of movement of the flexible electrode is proportional to the radiation received and the scale is marked in dose units.

c. Dosimetry shall be worn at all times when operating the MGSC.
Note: Should your TLD become damaged or lost, notify the either the local area supervisor or the RPO immediately.

V. Emergency Procedures. Qualified operators will review the current SOP for the appropriate emergency procedure and the manufacture's emergency procedures pertinent to the MGSC.

NOTE
PROCEDURES APPLY TO EMERGENCIES INVOLVING RADIOACTIVE MATERIAL.

a. The prime objective of emergency action is to protect personnel from the hazards of radiation. Prevention of loss of materials or equipment during emergencies are secondary considerations.

b. Primary responsibility for the safety/radiation protection of personnel from radioactive materials and other radiation sources rests with the personnel working with the materials and with the primary organizational element using the materials or sources. Immediate action is required to prevent loss of life, personal injury, damage to property and disruption of mission.

c. When the situation cannot be controlled or the source of the hazard cannot be identified, activate emergency personnel by notifying the post Fire Department by dialing 911 or by sounding the alarm at the nearest fire alarm box. Initial response by emergency personnel is based largely on information furnished in the notification. If notifying by telephone, describe the situation as fully as practical. Describe the nature of the emergency. Give exact location, building, and room number, extent and nature of personal injuries, if any, the type, form, and quantity of radioactive material, whether the MGSC is either in its open or shielded position.

d. Notify the RPO and furnish any available information regarding the emergency. During non-duty hours notify the Staff Duty Officer and request that the RPO be notified. The RPO will report to the scene to supervise radiation protection procedures such as monitoring and decontamination. The RPO will request other assistance as necessary.

NOTE
MEDICAL CARE OF INJURED PERSONNEL MUST NOT BE DELAYED
BECAUSE OF
POSSIBLE CONTAMINATION.

e. Immediately notify the emergency room at the Health Clinic on Fort Monmouth. Furnish all available information as to nature and extent of injury and contamination, over-exposure, ingestion or inhalation. Follow directions of clinic personnel as to movement and decontamination of the injured person (medical personnel may elect to come to the scene). The RPO and/or designee will provide survey and decontamination assistance as directed. If the wound is minor and medical personnel agree that the condition of victim allows, the following actions will be taken:

(1) Flush the wound with running water.

(2) Survey the victim to determine location of contamination. Remove contaminated outer clothing. Begin decontamination of uninjured parts of the victim's body. Extreme care must be taken to prevent contamination from spreading into breaks or abrasions adjacent to the contamination. Survey decontaminated areas frequently.

(3) Furnish the RPO available information concerning circumstances of the accident, radionuclides involved, and extent of contamination. Assist the RPO in follow-on actions as requested.

f. When an individual is suspected of having received an unplanned/accidental external radiation exposure in excess of 100 millirem per week or any internal exposure, that individual will be removed immediately from any duty requiring potential exposure to radiation. The individual's supervisor will notify the RPO, who will coordinate as necessary with the Health Clinic and initiate an investigation to determine necessary follow-on courses of action and estimated exposure.

g. For the following emergencies, await assistance from emergency personnel and the RPO/radiological staff/assets:

(1) Spills of radioactive material.
(2) Release of airborne radioactivity.
(3) Contaminated personnel.

h. If a fire occurs in a building where radioactive material is used, warn occupants by sounding the building fire alarm, or by shouting "FIRE, FIRE." In an expeditious manner return the MGSC to its shielded position and vacate the building immediately. Upon arriving at the designated retreat location, the supervisor will conduct a personnel count and call 911 from the nearest base phone.

i. If the source does not return to it's shielded position, report this and any other operational malfunction to the Area Supervisor, do not attempt to correct the problem yourself.

j. EMERGENCY PHONE NUMBERS:

CECOM DSRM - X73112, X75606
Fire Department/Police/Ambulance - 911

VI. Emergency Drill. A limited emergency drill involving 1 or more operators will be performed on an annual basis. A description of the drill scenario is provided at *Appendix B*. Depending upon availability of resources, the RPO will determine the scope of the drill and it's participants.

VII. Written Test. At the completion of this training attendees will complete the exam provided at *Appendix C*.

SAMPLE

APPENDIX A

SOP NUMBER 20-XX

STANDARD OPERATING PROCEDURE FOR THE J.L. SHEPHERD MODEL 81 MULTI-SOURCE GAMMA CALIBRATOR (MSGC)

1. **PURPOSE:** To provide procedures to be used when performing calibrations of RADIAC sets utilizing the J.L. Shepherd Model 81 MSGC.

2. **APPLICABILITY:** This procedure applies to personnel using the CECOM Directorate of Safety Risk Management (DSRM) Calibration facility.

3. **REFERENCE:** Operational Manual for the J.L. Shepherd Model 81 MSGC.

4. **DISCUSSION:** The J.L. Shepherd Model 81 MSGC incorporates two Cesium-137 and three Cobolt-50 sources mounted on one operating rod assembly. Radiation is emitted as a controlled beam of known intensity, which is used as a standard in checking and calibrating RADIAC instruments. Operation of each source is by a pneumatic cylinder controlled by the control panel. The MSGC is equipped with three interlocks and a source position indicator. Automatic spring return assemblies are mounted on the cylinder to allow the source to return to the closed position in the event of air pressure loss.

5. **PROCEDURES:**

a. Prerequisite

(1) Obtain the key, located in Calibration Repair room, to unlock the Calibration Range.

(2) Dosimetry is required when using the calibrator. At a minimum, each individual using the calibrator must wear a pocket dosimeter and whole body Thermoluminescent Dosimeter (TLD) badge. A member of the DSRM Radiological Engineering Division will assign dosimetry.

(3) An appropriate gamma survey meter is required for use of the MSGC. Perform the following pre-operational checks prior to use:

(1) Valid calibration label.
(2) Calibrated "ACTIVE".
(3) Battery check.
(4) Response Test with a radioactive source.

d. Prior to use test the following visual warning lights and interlocks on the calibrator to ensure operability:

(1) Source position indicating lights.

(2) Red warning light, located at entrance to Calibration room, illuminates when the source is in the "EXPOSED" position.

(3) Motion detector, located at the down range barrier, places the source in the "STORED" position when the beam is interrupted.

(4) The master interlock light, which is illuminated only when all interlocks are closed.

NOTE

If there are any malfunctions with the warning lights or interlocks report the problem to the Radiation Protection Officer or designee.

e. Take area readings with an appropriate survey meter.

f. Set the viewing camera in such a manner that the operator can view the screen from behind the calibrator.

g. Perform the desired calibration IAW established procedures.

h. Ensure the calibrator has been completely shut down.

i. Ensure viewing system has been turned off.

j. Exit the Calibration Range and lock the door. Return the key to the Calibration Repair room.

k. Return the TLD to the approved storage location and Pocket dosimeter to the proper storage area for subsequent use.

6. **EMERGENCY PROCEDURES:**

a. If the source does not return to it's shielded position, report this and any other operational malfunction to the Radiation Protection Officer or designee, do not attempt to correct the problem yourself.

b. EMERGENCY PHONE NUMBERS:
Directorate of Safety Risk Management: X73112, X75606
Fire Department - 911
Police - 911
Ambulance - 911

Prepared by:_____ Date:_____
XXXXXXXXXXXXXXX
Calibration Manager

Approved By:_____ Date: _____
JOSEPH SANTARSIERO
Chief, Radiological
Engineering Division

SAMPLE

APPENDIX B

Emergency Drill

1. Scenario:

During a routine operation utilizing the source, the operator begins proper shutdown procedures, yet the source fails to return to its shield position. Upon inspecting the control panel, the light indicator shows that the source is still in the "up" position.

2. Conditions of the scenario:

a. Occurrence during normal duty hours.

b. No visual damage is observed in relationship to the MGSC.

c. No power failure has occurred.

Following standing operating procedures for the source, approved operators contact the Radiological Engineering Division, CECOM DSRM.

3. Objectives:

a. Are procedures in place for an emergency shut down of the source?

b. Are operators aware of these procedures and of actions to be employed in the event the source remains open?

c. Have operators received appropriate training in responding to such an emergency?

NOTE: Additional objectives may be exercised as the scenario evolves.

4. Participants:

a. Operator Personnel and health physics personnel from the Radiological Engineering Division, CECOM DSRM.

b. As the scenario evolves, other personnel involved will be noted. A health physicist from Radiological Engineering Division will monitor the scenario.

5. Drill Preparation:

Area supervisor personnel will be informed of when the drill will occur and overall objectives.

6. Critique of the Exercise:

At the termination of the drill, health physics personnel will provide participants with an informal critique of the exercise.

Actions necessary to correct and observed deficiencies will be determined.

If determination is made that training of operator personnel is necessary, arrangements for the training will be made with area supervisor and Chief, Radiological Engineering Division, CECOM DSRM.

SAMPLE

APPENDIX C

ANNUAL OPERATOR TEST
FOR USE OF THE
J.L SHEPHERD MULTI GAMMA SOURCE CALIBRATOR

1. Do gamma rays induce radioactivity? Y or N

2. During a test you notice that a visual warning light is not operating, you should: (circle one answer)

   a. Ignore it, this is only a test.
   b. Fix it on the spot.
   c. Report it to the area supervisor.
   d. Report it to the RPO or his designee.

3. Before using a survey meter, list 4 checks you should perform to ensure it is operating properly.

   a.
   b.
   c.
   d.

4. Are TLD whole body and pocket dosimeters required to be worn when operating the source?

   Y or N

5. When all interlocks are closed, the _____ light is illuminated.

6. Briefly describe the significance of the "red warning light" located at the entrance to the calibration room.

7. If the source does not return to its shielded position, you should: (circle one answer)

a. Attempt to fix the problem immediately.
b. Report the malfunction to the RPO or his designee.
C. Call 911.

8. The _____detector is located at the down range barrier and places the source in the "STORED" position when the beam is interrupted.

9. In the event of an air pressure loss, the automatic _____ which are mounted on the pneumatic cylinder, allows the source to return to the "CLOSED" position.

10. List the steps necessary to shut down the source and exit the calibration range.

Emergency Response Personnel Training
J.L. Shepherd Model-81 Multi Gamma Source Calibrator

I. This block of instruction applies to all emergency response personnel capable of responding to an incident occurring at the MGSC location.

II. Topics reviewed in this training session.

a. Proper usage of RADIAC instrumentation.

b. Proper entrance onto the incident site.

c. On-site review of the MGSC.

d. Notification of the Staff Duty Officer.

III. Usage of RADIAC instrumentation.

Attendees will be instructed in the proper usage of a RADIAC Meter and interpretation of the instrument readout.

IV. Proper entrance onto the incident site.

Attendees will be instructed in the selection of a safe avenue of approach to an incident site to ensure minimal potential exposure.

V. On-site review of the MGSC.

Attendees will be instructed on the safety aspects of the interlocks and other safety devices associated with the MGSC.

VI. Notification of the Staff Duty Officer.

Attendees will be instructed on necessary scenarios when CECOM DSRM Health Physics Personnel will need to be contacted for support through the Fort Monmouth Staff Duty Officer. The Staff Duty Officer's Off Duty Phone list contains all pertinent phone numbers for the RPO and Alternate RPO.

ATTACHMENT 3

SAMPLE

Oral Exam for Emergency Response Personnel

1. What does this meter face indicate? (While holding meter)

2. At which setting on the RADIAC meter should you initially enter the building? (The lowest setting)

3. Upon entering the control room, you notice that the " red light" is lit. Does this mean the source is in its shielded position?

4. Your RADIAC instrument indicates an elevated reading above background, should you contact anyone for health physics support? (Contact the Staff Duty Officer)

5. Do you feel confident in responding to an incident at this location?
(If yes, state reason(s) why you feel confident)
(If not, what additional information do you require to ensure confidence in responding to an incident at this location)?

NOTIFICATION OF POTENTIAL EXPOSURE TO RADIATION HAZARDS

I. Sources of Radiation. Radiation facilities utilize radioactive material which may emit alpha, beta, and gamma radiation. An inventory of radiation sources utilized throughout Fort Monmouth are maintained by the CECOM Safety Office.

II. Health Hazards Associated With Ionizing Radiation

a. Introduction. Radiation interacts with living cells through a process known as Ionization, which can cause a breakdown of chemicals in living cells. Ionizing radiation consists of electromagnetic radiation (gamma rays or x-rays) or particulate radiation (alpha, beta, and neutron) capable of producing ions (electrical charges), directly or indirectly as they pass through matter. It is known that exposure to ionizing radiation may produce biological damage. Radiation workers who follow the established Standing Operating Procedure (SOP) for radiation sources are unlikely to receive a radiation dose biologically detrimental to their health.

b. Biological Effects. Biological effects occur when radiation causes damage to a living cell that diminishes or destroys the function of the cell. The extent of the biological damage depends on the type and amount of radiation and the period of time over which the individual received the exposure. Cells such as white blood cells, lymph cells, and reproductive cells are more sensitive to the effects of ionizing radiation than muscle cells, bone cells, and brain cells.

III. Precautionary Measures to Minimize Radiation Exposure. To prevent unnecessary radiation exposure apply the principles of time, distance, and shielding. Keep the duration of exposure to radiation at a minimum, while maintaining a safe distance from the source of radiation. Shielding material will further reduce your exposure to radiation.

IV. Emergency Procedures. Each facility has an established emergency procedure. All personnel who may be exposed to radiation shall be made aware of the specifics of these procedures prior to entering an area of potential exposure.

V. Report of Radiation Exposure. When personnel monitoring is required, a radiation exposure record for each individual exposed to radiation will be maintained by the CECOM Safety Office. Any person so exposed has the right to receive a report of exposure incurred. A copy of this report will be made available upon request by the individual.

VI. Acknowledgement. The undersigned has read and understands the foregoing statements and, if requested, has been provided copies of the NRC Regulatory Guides 8.10, 8.13, and 8.29. My signature below indicates that the above has been explained to me and that a personnel dosimeter and/or pocket dosimeter has been issued to me.

SIGNATURE		**DATE**
NAME (PRINT)	**SSN**	**BIRTHDATE (YYYY MM DD)**
MAILING ADDRESS (INCLUDE ZIP CODE)		

Attachment 4

J.L. SHEPHERD & ASSOCIATES
1010 ARROYO AVE, SAN FERNANDO, CALIFORNIA 91340-1822
818-898-2361 FAX 818-361-8095

INSTALLATION & OPERATION MANUAL FOR MODEL 81 SERIES MULTI SOURCE GAMMA CALIBRATOR

ENCL

J.L. SHEPHERD & ASSOCIATES
1010 ARROYO AVE, SAN FERNANDO, CALIFORNIA 91340-1822
818-898-2361 FAX 818-361-8095

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J.L. SHEPHERD & ASSOCIATES
1010 ARROYO AVE, SAN FERNANDO, CALIFORNIA 91340-1822
818-898-2361 FAX 818-361-8095

INSTALLATION & OPERATION MANUAL FOR MODEL 81 MULTIPLE SOURCE GAMMA CALIBRATOR

Model 81-xxx
S.N. XXXX

NOTICE: IF AT ANY TIME THIS CALIBRATOR MALFUNCTIONS, REMOVE THE SYSTEM FROM OPERATION IMMEDIATELY AND CALL J.L. SHEPHERD & ASSOCIATES FOR INSTRUCTIONS ON CORRECTIVE PROCEDURES.

I. MODEL 81 RADIATION SAFETY

The Model 81 Calibrator emits an intense beam of radiation through the area subtended by the beamport whenever the source is in the "EXPOSED" position. A much lower level of scattered radiation extends in a penumbra surrounding the primary beam. The user should set up exclusion lines for personnel using this calibrator, as well as limit room access. Ordinarily, this information is included as part of the facility operation rules and is required as part of the user's license to possess this calibrator.

A. Leak Test Procedure

1. Locate the source in the "OFF" position.

2. Wipe the upper end of the source rods where they exit from the top of the shielded container with a piece of absorbent material. Wiping the area where the operating tower meets the top of the shield is acceptable.

3. These wipes should be measured on an instrument capable of detecting 0.005 μCi of Cs-137, Co-60 or Sr-90, depending upon isotope loading of your device.

4. If contamination above this level is detected, remove the device from service immediately and notify the manufacturer.

NOTE: The 0.005 μCi level is that generally prescribed by Regulatory Authorities; individual institutions may require more stringent standards.

II. INSTALLATION

A. REMOVAL OF MODEL 81 FROM 2OWC-5 OVERPACK (if required):

1. Using a 13/1611 or 3/411 deep well socket (as required), remove the nuts from the 16 each 1/211 rods located approximately 511 from the outer rim of the top of the overpack.

2. Sling the top chine of the overpack or attach a 1/2-13 eyebolt to the center left point and lift the top section, using a vertical lift so as not to bend the rods. The top section is approximately 1611 high.

3. Remove any wood shoring from the top and sides of the device in the overpack.

4. Attach a cable or chain to the eyebolts provided and lift the device vertically from the overpack.

5. Remove the metal or wood round affixed to the bottom of the device.

B. MODEL 81 ASSEMBLY

The Model 81 Beam Calibrator is shipped in four parts: Base, Source Shield, Operational Tower assembly, and Control Panel.

1. Bolt the calibrator to the base provided.

2. Place the calibrator complete with Cesium-137 sources in the desired location.

3. The operating tower which contains the pneumatic assembly is shipped with the outside cover or shroud attached. Remove the shroud from the tower assembly. NOTE: To remove the shroud, use the following procedure:

   (a) Remove the piece of copper tubing with compression fittings, that extends from a fitting on the side of this tower base to the tee outlet from the oiler-filter-regulator.

   (b) Open the cover and disconnect the Jones plug inside the cover.

   (c) Unbolt the cover from the tower base and remove.

   (d) Remove the padlock and lock off bolt which holds the cylinders) in the extended position. These may be replaced later to lock the source assembly in the "OFF" position.

4. Remove the shipping plate from the top of the calibrator. The dose rate at the top of the irradiator will be approx. 1/mR/hr - at contact. Dose rates surrounding the calibrator with all sources in the "OFF" position, will be less than 5mR/hr at one foot from the surface.

5. Place the pneumatic cylinder assembly on top of the calibrator. Locate over the bolt pattern provided, nothing the orientation of the tower with the arrow stamped on top of the base plate pointing toward the beamport. Secure the tower to the shield with washers and nuts provided.

6. Block the beamport with the solid lead plug provided, if it is not already in position.

7. From the position at the rear of the calibrator (opposite the beamport), raise the source rod, which is at the centerline of the calibrator, slightly. Engage the threaded end of the rod into the tapped hole at the end of the fixture which is mounted to the cylinder rod. Thread the rod in until the dimensional requirement of the source centering sketch are met. Firmly tighten the source rod set screws. Installation of the source assembly is now complete.

NOTE: Care must be taken so that no parts, chips, or foreign materials drop into the tube, (at the top of the calibrator) through which the source rod assemblies operate.

8. Mount the shroud over the cover assembly, reattaching the Jones connector which connects all wiring from the inside of the tower to the components which are mounted on the tower cover.

9. Next, connect air supply rated 90 psi or greater, to the inlet of the oiler-filter-regulator. NOTE: the Primary unit requires a setting of 60 lbs. and secondary regulator requires a setting of 20 lbs. to function properly. This is factory adjusted, and may be adjusted slightly in the field.See adjustment section. Next, fill the oiler section of the oiler-filter-regulator with SAE 10 weight non-detergent oil as indicated in the instructions for the oiler-filter-regulator contained as part of this manual.

C. CONTROL PANEL INSTALLATION

1. All noted in #3 above, all cabling from the Model 81 must be connected to the amphenol connectors in the back of the control cabinet. All radiation warning lights, sirens, alarms, etc., must be connected to corresponding amphenol connectors as marked in the control cabinet.

2. Plug the control cabinet into a 115V outlet, rated at 10 amps.

INSTALLATION IS NOW COMPLETE

III. OPERATION PROCEDURES FOR MODEL 81 MULTIPLE SOURCE CALIBRATION SYSTEM

A. TEST PROCEDURES

All systems must be plugged in and connected per installation procedures. Turn the key switch (power) to the "ON" position. The power lights should be illuminated. The beamport plug should be installed during device check out.

CHECK OUT PROCEDURES:

1. Interlock System - With the interlock circuit closed, the interlock light in the control panel should be illuminated. Each interlock component shall have its own light which illuminates only when closed.

2. Turn the arm/safe key switch to the "Arm" position.

3 Adjustable Time Delay System - Press the "Irradiate" switch on the control panel. The sonalert should be activated for the preset time.

4. Model 81 - Unscrew and remove the rear half of the tower cover, next remove the air pressure. With the door open, raise the source rod to sufficient height to release "OFF" position microswitches. The "SAFE" light on the control panel and the "OFF" light on the tower should turn off. The "UNSAFE" light on the control panel should illuminate. The red rotating beacon on the operating tower should illuminate.

   NOTE: All units (Model 81) are designed so that the sources may be raised sufficiently to test without increased personnel exposure, provided that the source rod is raised from behind the unit.

5. Lights on Operating Tower. If all sources are in the "OFF" position, all "OFF" light should be illuminated without pressing. If the source rod is away from the fully "Off" position, the rotating beacon should illuminate.

B. OPERATION OF DIGITAL PRESET TIMER

1. Place the mode selector switch to "MANUAL" or "PRESET" time.

2. To preset time, press the buttons above and below the digits on the right side of the timer.

3. With the selector switch in the "MANUAL" position the timer will show elapsed time, but will not control exposure. With the selector switch in the "PRESET" position, the timer will control the exposure. The timer counts up from "O" to the preset time.

NOTE: AFTER THE COMPLETION OF ANY EXPOSURE, IT IS NECESSARY TO PRESS THE "RESET" BUTTON BEFORE ANOTHER EXPOSURE IS INITIATED. If this is not done, the source cannot be raised. Pressing the "RESET" button will automatically reset the time previously selected. In operation, the timer starts at 00.00.00 (HRS.MINS.SECS.) and counts up to the preset time, after the exposure is completed, showing at all times the time expired on the preset exposure.

4. The electric timer is activated whenever any source is in the fully exposed position.

C. UNIT OPERATION

Activate the "SET-UP" switch on the operating tower, exit the room and close the door. All interlock lights on the control panel should be illuminated. Select source(s) to be exposed by operating the rotary switch on the control panel. Turn the key switch to the "ARM" position. Press "IRRADIATE" button, the alarm will sound in the room for the preset time prior to source exposure. At the end of alarm interval, the source selected will be raised to the "EXPOSED" position. The source may be returned to the fully shielded position by:

a. Opening/Interrupting any interlock circuit.
b. End of the preset time selected on the timer.
c. Pushing the "OFF" button on the control panel.
d. Pushing any interlock switch in the radiation room, or by turning interlock switch on the tower into "OFF" position.
e. Power failure.
f. Loss of air pressure.

D. POSITION INDICATING LIGHTS

1. The IRRADIATION light on the control panel is illuminated only when the designated source is in the fully exposed position.

2. The "OFF" light on the control panel is illuminated only when the source is in the fully shielded position.

E. COMPRESSOR

This Model 81 system is supplied with a self contained air supply to provide compressed air for the source operating cylinder. The ON/OFF control for this air supply is located on the right hand side of the control panel. A toggle switch controls the ON/OFF power. Make certain that the self-contained air supply is "ON" for at least 3 minutes before attempting source operation.

F. SAFETY SYSTEM

1. The master interlock light is illuminated only when all interlocks are closed.

2. Low pressure light is illuminated when pressure falls below levels set on pressure switch. This is NOT a source interlock modality.

3. All sources are returned to the fully shielded position by air pressure whenever:

   a. Any interlock switch is open (including pressing mushroom or panic button switches.
   b. "OFF" switch is operated.
   c. Timer times out.
   d. Power failure.
   e. Pressing the "PANIC" switch.

The source is mechanically returned (by a constant force spring) to the fully shielded position in the event of loss of air pressure.

4. The shield design provides for full shielding in ALL directions, at all times, except out the beamport when the source is in the "ON" position.

5. The spring return assembly on the pneumatic source operating cylinder provides fail-safe operation in that the source(s) automatically return(s) to the "OFF" position in case of air or power failure. In addition, the normally closed solenoid valve provides pressure to hold the sources in the "OFF" position whenever air pressure is supplied to the system and the "ON" switch is not activated.

6. The source rod never touches the bottom of the tube in which it travels (clearance is approx. 1/211), eliminating the possibility of damage to the source by striking the end of the source tube.

G. ADJUSTMENTS

Source/shutter travel should be smooth and rapid, and should not slam in either direction.

1. To adjust the source/shutter in the Model 81, the travel speed may be changed by adjusting the pressure delivered to the cylinder, or by adjusting the flow control valves provided.

2. If the source rod/shutter travel is jerky or hesitant, the pneumatic assembly is misaligned and should be readjusted. Take care that the bottom of the pneumatic assembly is clean, and that all hold bolts are evenly adjusted. If action is not smooth and regular after this adjustment, the manufacturer should be contacted for further instructions.

3. An assembly drawing, a pneumatic schematic and an electrical schematic drawing are included as part of this manual.

H. GENERAL INFORMATION

The Model 81 Calibrator incorporates three Cesium-137 sources mounted on one operating rod assembly. Operation of each source is by two pneumatic cylinders controlled by separate solenoid valves. These valves in turn are activated by the control panel. All lines between solenoid valves and cylinders are equipped with flow control valves. Automatic spring return assemblies are mounted on the cylinder.

CAUTION: AT NO TIME IS ANY LUBRICATION TO BE APPLIED TO THIS DEVICE, PARTICULARLY THE SOURCE ROD AND DRIVE MECHANISM. THE USE OF ANY LUBRICANT IMMEDIATELY VOIDS ALL WARRANTIES.

I. EMERGENCY PROCEDURES

If at any time, the source(s) fails to return to the "OFF" position, (as shown by the source position indicating lights on the control panel) at the end of the preset or manual exposure, or after operation of an interlock, the following procedures are to be followed:

a. Enter the irradiation room, approaching the calibrator from the rear (opposite beamport). Remove the access plate, and move the source rod downward until the source is in the "OFF" position. A high-range survey meter should be carried during this procedure.

b. Take the calibrator out of operation immediately and contact the manufacturer for an authorized representative to effect repairs.

SOP NUMBER 20-05

STANDARD OPERATING PROCEDURE FOR THE J.L. SHEPHERD MODEL 81 MULTI-SOURCE GAMMA CALIBRATOR (MSGC)

1. **PURPOSE:** To provide procedures to be used when performing calibrations of RADIAC sets utilizing the J.L. Shepherd Model 81 MSGC.

2. **APPLICABILITY:** This procedure applies to personnel using the CECOM Directorate of Safety Risk Management (DSRM) Calibration facility.

3. **REFERENCE:** Operational Manual for the J.L. Shepherd Model 81 MSGC.

4. **DISCUSSION:** The J.L. Shepherd Model 81 MSGC incorporates five Cesium-137 sources mounted on one operating rod assembly. Radiation is emitted as a controlled beam of known intensity, which is used as a standard in checking and calibrating RADIAC instruments. Operation of each source is by a pneumatic cylinder controlled by the control panel. The MSGC is equipped with three interlocks and a source position indicator. Automatic spring return assemblies are mounted on the cylinder to allow the source to return to the closed position in the event of air pressure loss.

5. **PROCEDURES:**

a. Obtain the key, located in Calibration Repair room, to unlock the Calibration Range.

b. Dosimetry is required when using the calibrator. At a minimum, each individual using the calibrator must wear a pocket dosimeter and whole body Thermoluminescent Dosimeter (TLD) badge. A member of the DSRM Radiological Engineering Division will assign dosimetry.

c. An appropriate survey meter is also required for use of the MSGC. Perform the following pre-operational checks prior to use:

(1) Valid calibration label.
(2) Calibrated "ACTIVE".
(3) Battery check.
(4) Source check with a radioactive source.

d. Prior to use test the following visual warning lights and interlocks on the calibrator to ensure operability:

Encl 6

(1) Source position indicating lights.

(2) Red warning light, located at entrance to Calibration room, illuminates when the source is in the "EXPOSED" position.

(3) Motion detector, located at the down range barrier, places the source in the "STORED" position when the beam is interrupted.

(4) The master interlock light, which is illuminated only when all interlocks are closed.

NOTE

If there are any malfunctions with the warning lights or interlocks report the problem to the Radiation Protection Officer or designee.

e. Take area readings with an appropriate survey meter.

f. Set the viewing camera in such a manner that the operator can view the screen from behind the calibrator.

g. Perform the desired calibration IAW established procedures.

h. Ensure the calibrator has been completely shut down.

i. Ensure viewing system has been turned off.

j. Exit the Calibration Range and lock the door. Return the key to the Calibration Repair room.

k. Return the TLD to the approved storage location and Pocket dosimeter to the proper storage area for subsequent use.

6. **EMERGENCY PROCEDURES:**

a. If the source does not return to it's shielded position, report this and any other operational malfunction to the Radiation Protection Officer or designee, do not attempt to correct the problem yourself.

b. EMERGENCY PHONE NUMBERS:
Directorate of Safety Risk Management: X73112, X75606
Fire Department - 911
Police - 911
Ambulance - 911

Prepared by: _____ Date: 3DEC97
BURT CUMMINGS
Instrument Specialist

Approved By: _____ Date: 12/5/97
JOSEPH SANTARSIERO
Chief, Radiological
Engineering Division

1. Reference: Radiation Protection Program.

2. The Radiation Protection Program established at Fort Monmouth is under the management of the Radiological Engineering Division of the CECOM DSRM and the Fort Monmouth Radiation Control Committee (FMRCC) on behalf of the Commander, CECOM. CECOM Regulation 385-18, Ionizing Radiation Protection Program (Attachment 1), establishes policies, responsibilities and procedures for possession/use of radioactive materials at Fort Monmouth.

3. The Fort Monmouth RCC is composed of members of the CECOM DSRM, representatives of research/development and installation medical and engineering activities which utilize radioactive material, and the Commander's representative. The purpose of the RCC, in part, is to advise the Commander, CECOM, on the safe utilization of radioactive material at Fort Monmouth. The qualifications of personnel authorized to conduct research activities, which require the use of radioactive materials, are reviewed/approved by the RCC. Approved radiation workers receive training in basic radiation safety from the Radiological Engineering Division of the CECOM DSRM prior to the initial work assignment. Annual training of the radiation workers is conducted by the RPO and/or qualified designee in accordance with the requirements of Title 10, Code of Federal Regulations (10 CFR), Part 19.

4. The RCC meets quarterly or as often as necessary to conduct business. It conducts periodic reviews and audits of the radiation safety program, review of records, such as user and overall inventories, frequency of radiation surveys, radiation worker dosimetry/medical surveillance review, initial and periodic training requirements, reports from the RPO, results of program inspections and written safety procedures, and audits performed by the RPO and/or his designated representatives, or audits performed by an independent auditor, to ensure the adequacy of the institution's management control systems.

5. The CECOM command group (senior management), i.e., the Commanding General, Deputy to the Commanding General, and Chief of Staff, is kept current on all aspects of the installation radiation protection program, including NRC license and regulatory requirements and compliance status, through the auspices of the RCC as well as through the Commanding General's representative to the RCC.

ENCLOSURE 7

6. The completion of a radiological permit application is required of all potential users of radioactive material at Fort Monmouth. In this document, the researcher indicates radioactive materials required, available facilities for research, safety equipment available, training/experience of research personnel and provides a standard operating procedure. The application is reviewed by the RPO for completeness and accuracy, and a recommendation for approval/disapproval is given to the RCC. The RCC has final approval/disapproval authority.

7. Procurement of radioactive material cannot be accomplished without approval of the RPO and RCC. All procurement documentation for radioactive material are flagged, requiring approval/disapproval of the DSRM. The RPO maintains a computerized recordkeeping system containing all radioactive material possessed by the installation by radionuclide, activity, location, chemical/physical form, radiological permit number, and other appropriate inventory control information. Procurement requests are compared to the current inventory listing, and approval/disapproval is based on the maximum limit authorized by the specific radiological permit and current activity listed on the inventory under that permit. This, in turn, is compared to the overall possession limit/ inventory for each specific radionuclide, including any radioactive waste in storage.

8. The RPO insures that inspections of all facilities where radioactive material are used and/or stored are performed and results maintained. Included in these inspections are radiation surveys, wipe tests (where appropriate), maintenance checks, warning light and interlock checks, and evaluation of shielding procedures, postings and overall adherence to required regulations. The RPO's duties and responsibilities are delineated in CECOM Regulation 385-18 (Attachment 1).

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY COMMUNICATIONS-ELECTRONICS COMMAND
FORT MONMOUTH, NEW JERSEY 07703-5000

CECOM REGULATION
No. 385-18

21 June 1996

Safety

IONIZING RADIATION PROTECTION PROGRAM

Issue of changes to this regulation by other CECOM elements is specifically prohibited unless approved by Commander, CECOM, ATTN: AMSEL-SF-RE.

1. Purpose.
This regulation establishes policies, responsibilities, and procedures for the U.S. Army Communications-Electronics Command (CECOM) ionizing radiation protection program (RPP).

2. Applicability.
This regulation applies to —

a. All centers, directorates, offices, activities, and program/project manager offices, CECOM, and resident activities located at CECOM installations that use and are responsible for logistical support of ionizing radiation sources.

b. Contractors and all other individuals who work in or visit CECOM facilities.

3. References.
Required and related publications are listed in appendix A.

4. Explanation of Terms.
See appendix B for explanation of special terms used in this regulation.

5. Policy.

a. The use of ionizing radiation sources will be conducted in such a manner that radiation dose to user personnel will be kept as low as is reasonably achievable (ALARA) in accordance with guidelines established by the U.S. Nuclear Regulatory Commission (NRC).

*This regulation supersedes CECOM-R 385-18, 9 March 1992.

Attachment 1

authorized users as specified in radiological permit applications.

(8) Approve procurement or procurement contracts of radioactive material, devices containing radioactive material, or ionizing radiation producing devices.

c. The RCC recorder will maintain a list of current committee members to include their training and experience. The RCC will be comprised of the following members:

(1) The Commander or designated representative.

(2) The RPO.

(3) The staff medical officer or designated representative.

(4) The recorder.

(5) Representatives of user organizations.

(6) Any other technically qualified persons appointed by the commanding officer.

d. The Chief, Safety Office, will —

(1) Implement and maintain the installation RPP.

(2) Provide an RPO and at least one alternate RPO (ARPO) for NRC licenses/DARAs.

(3) Provide technical guidance on the safe use, handling, storage, maintenance, transportation, disposal, and acquisition of ionizing radiation sources.

(4) Obtain all NRC licenses and DARAs necessary to conduct approved research and development (R&D) operations for R&D activities.

(5) Serve as license manager for all NRC licenses/DARAs issued to CECOM.

e. The Chief, Health Clinic, will —

(1) Provide medical guidance for the preservation of health of personnel who use ionizing radiation sources.

(2) Perform appropriate medical examinations and clinical laboratory tests, and approve/disapprove the assignment of individuals as radiation workers.

(3) Provide medical examinations for all individuals who may have received an over exposure.

f. The RPO, ARPO, or designee will —

(1) Administer the RPP.

(2) Provide the commander, the RCC, and radiation workers with advice and assistance on matters pertaining to radiation safety.

(3) Maintain all NRC licenses and DARAs for R&D activities at the installation in a compliant manner.

(4) Conduct periodic evaluations of ionizing radiation sources used by R&D activities.

(5) Evaluate and report on all applications for radiological permits for RCC review/approval.

(6) Maintain records on the use, storage, transfer, etc. of ionizing radiation sources as required by the NRC, Department of the Army, Department of Transportation, U. S. Army Materiel Command, and all other applicable agencies.

(3) Ensure that activities are conducted in a safe manner in full compliance with this and all other applicable regulations.

(4) Ensure that all personnel using ionizing radiation sources submit for pre-placement, periodic, and termination radiation medical examinations (physicals), as required.

i. Radiation workers will —

(1) Know and comply with applicable SOPs, regulations, rules, and special instructions.

(2) Use PPE, equipment, radiation instrumentation, and personnel monitoring devices as required by SOPs.

(3) Report to his/her supervisor any accident, unusual incident, personal injury, suspected overexposure, and/or suspected internal uptake as soon as possible after the occurrence and cooperate with efforts to evaluate the exposure.

(4) Know the location of ionizing radiation sources and maintain accountability of radioactive material for which he/she is responsible.

7. Procedures.

a. ***Personnel dosimetry:***

(1) Occupational exposure to radiation will be monitored and individual monitoring devices will be supplied and used by employees likely to receive, in one year from sources external to the body, a dose in excess of 10 percent of the limits in 10 CFR 20.1201(a); declared pregnant women likely to receive, from sources external to the body, a dose in excess of 10 percent of any of the applicable limits in 10 CFR 20.1208; and individuals entering a high or very high radiation area.

(2) Thermoluminescent dosimetry (TLD) badges provided by the U.S. Army Ionizing Radiation Dosimetry Center (USAIRDC) will be used as the primary device to measure personnel exposure. Self-reading pocket dosimeters will be used only in conjunction with TLDs provided by USAIRDC. These dosimeters are required to be worn by all personnel entering high or very high radiation areas or as specified in technical manuals (TM), operator manuals, and SOPs.

(3) Extremity badges (wrist and/or finger TLDs) and pocket dosimeters will be assigned to those individuals as required by the conditions of the applicable radiological permit.

(4) The RPO or dosimetry custodian will maintain exposure records on automated dosimetry records in accordance with AR 40-14. Personnel must submit to the RPO or dosimetry custodian a completed DD Form 1952 (Dosimeter Application and Record of Occupational Radiation Exposure) to include copies of prior exposure histories.

(5) TLDs assigned to an individual will be used only by that person for monitoring whole body/extremity exposure. If TLDs are required for any purpose other than personnel monitoring, a written request must be submitted and prior written approval received from the RPO.

(6) TLDs will be issued to personnel who may occasionally be exposed to radiation such as during visits to radiation areas or off post sites. Visitors must receive a safety briefing by the RPO or designee with the information documented.

some location other than the two listed above, will coordinate with the Transportation Division and the CECOM Safety Office, Radiological Engineering Division. The RPO will be immediately notified of all radioactive material receipts.

(3) The RPO will be notified immediately if damaged, leaking, or unidentifiable packages are received. Packages will be handled in such a manner as to minimize the radiation exposure to workers. If packages must be left unattended, they will be secured in a locked area, room, or cabinet in such a manner as to prevent unauthorized access.

(4) Packages containing radioactive material received during normal duty hours will be monitored as soon as practicable after receipt, but not later than 3 hours after the package is received at the facility, or not later than 3 hours from the beginning of the next working day if received after working hours.

(5) In addition to all other movement records required, each shipment of radioactive material must include one copy of a Radioactive Material Movement Form signed by the RPO or designee.

(6) The RPO or designee will survey and wipe test all incoming and outgoing shipments of radioactive material as required by AR 385-11 and 49 CFR.

(7) Radioactive material received by the installation will not be transferred to user organizations until the RPO authorizes the transfer.

d. ***Transfer of radioactive material/ equipment:*** A written request must be submitted to the RPO in order to transfer radioactive material between areas under the same radiological permit or between different radiological permits. The RPO will approve or disapprove the transfer based upon the conditions stated in the existing permits and the written request.

e. ***Disposal:***

(1) No radioactive waste will be disposed of by conventional methods as ordinary waste. Solid radioactive wastes may not be placed in standard waste containers to be collected by custodial personnel. Liquid radioactive wastes in accordance with 10 CFR 20, appendix B, may be discharged through the sanitary sewer system.

(2) The RPO will coordinate shipments for disposal of radioactive material through the U.S. Army Industrial Operations Command (IOC).

(3) Building 9383 is the only approved long term radioactive waste storage area on Fort Monmouth. The RPO and RCC may authorize additional storage areas, as necessary.

(4) The RPO or designee will maintain inventory records of items awaiting disposal and overall records of radioactive material disposed of as waste.

f. ***Instrumentation:***

(1) The RPO will maintain sufficient quantities and types of radiation detection instrumentation to support the RPP.

(2) All survey instruments will be calibrated prior to initial use and following repair or adjustment which could affect the calibration. Calibration will be performed using certified standards traceable to the National Institute of Standards and Technology (NIST) and at specified intervals.

(2) Procurement of commercially available radioactive items:

(a) The procurement of radioactive material, devices containing radioactive material, or ionizing radiation producing devices under a government contract will be forwarded to the CECOM Safety Office for approval before final processing.

(b) The procurement of radiation sources shall be coordinated with the CECOM Safety Office at the earliest possible stage of the acquisition process in order to ensure licensing, permits, transportation requirements, survey requirements, and any other safety/radiological requirements incident to the acquisition process that are in place to receive the source.

(3) Before anyone uses radioactive material, devices containing radioactive material, or ionizing radiation producing devices, he or she shall apply for a radiological permit as outlined in paragraph 8 below. Under no circumstances will the material/device be used, unpackaged, energized, or otherwise utilized before receiving written approval from the RPO/RCC.

8. Licenses and Radiation Permits for R&D Projects.

a. ***Licenses:***

(1) All R&D projects requiring the acquisition of radioactive material will notify the CECOM Safety Office in writing at least 9 months before proposed start-up to allow adequate time for the procurement of any necessary NRC licenses, DARAs, and/or amendments. Information provided must include the radionuclide, activity, source manufacturer and model number, source design, facilities, safety equipment, authorized users, and a description of the research project/proposed use.

(2) The RPO will review the application for acceptability within the limitations of existing licenses or authorizations, then refer the application to the RCC for review.

(3) Only the CSO may obtain NRC licenses and amendments or DARAs for activities using radioactive materials or sources at Fort Monmouth.

b. ***Radiological permits:***

(1) All researchers requiring the use of radioactive material and/or ionizing radiation producing devices will, at least 6 months before proposed start-up, submit to the RPO, ATTN: AMSEL-SF-RE, a completed radiological permit application to include an SOP for the use of radioactive materials or ionizing radiation producing devices. The RPO or designee will provide the application form.

(2) The RPO and RCC will review, evaluate, and approve applications. Before approval, the RPO or designee will conduct a preliminary radiation survey of the equipment/source, the facility, and environs during operation. The results of the survey will be presented to the RCC for ultimate approval of the permit. Operation will not begin until written approval is obtained by the requester.

(3) The RPO and RCC must approve, in writing, any changes to the original radiological permit's interlocks, safety devices, radioactive material, conditions of operation, or any feature that may affect the safety of personnel.

(4) Radiological permits are issued for a period not to exceed 2 years.

NOTE
MEDICAL CARE OF INJURED PERSONNEL MUST NOT BE DELAYED BECAUSE OF POSSIBLE CONTAMINATION.

e. Immediately notify the emergency room at the Health Clinic on Fort Monmouth. Furnish all available information as to nature and extent of injury and contamination, over-exposure, ingestion, or inhalation. Follow directions of clinic personnel as to movement and decontamination of the injured person (medical personnel may elect to come to the scene). The RPO and/or designee will provide survey and decontamination assistance as directed. If the wound is minor and medical personnel agree that the condition of victim allows, the following actions will be taken:

(1) Flush the wound with running water.

(2) Survey the victim to determine location of contamination. Remove contaminated outer clothing. Begin decontamination of uninjured parts of the victim's body. Extreme care must be taken to prevent contamination from spreading into breaks or abrasions adjacent to the contamination. Survey decontaminated areas frequently.

(3) Furnish the RPO available information concerning circumstances of the accident, radionuclides involved, and extent of contamination. Assist the RPO in follow-on actions as requested.

f. When an individual is suspected of having received an unplanned/accidental external radiation exposure in excess of 100 millirem per week or any internal exposure, that individual will be removed immediately from any duty requiring potential exposure to radiation. The individual's supervisor will notify the RPO, who will coordinate as necessary with the Health Clinic and initiate an investigation to determine necessary follow-on courses of action and estimated exposure.

g. For the following emergencies, await assistance from emergency personnel and the RPO/radiological staff/assets:

(1) Spills of radioactive material.

(2) Release of airborne radioactivity.

(3) Contaminated personnel.

h. If a fire occurs in a building where radioactive material is used, warn occupants by sounding the building fire alarm or by shouting **"FIRE, FIRE."** Dial 911 and vacate the building immediately.

Appendix A

REFERENCES

Section I. Required Publications

Title 10
Code of Federal Regulations (Energy). Cited in para 6g(5), 7a(1), 7c(1), 7e(1), 7g(3)(e).

Title 49
Code of Federal Regulations (Transportation). Cited in para 7c(6).

AR 40-14
Occupational Ionizing Radiation Personnel Dosimetry. Cited in para 7a(4), 7a(9).

AR 385-11
Ionizing Radiation Protection. Cited in para 6a(3), 7b(4), 7c(1), 7c(6), 7h(1), 8b(6).

Section II. Related Publications

DA PAM 40-18
Personnel Dosimetry Guidance and Dose Recording Procedures for Personnel Occupationally Exposed to Ionizing Radiation

AR 25-400-2
Modern Army Recordkeeping System (MARKS)

AR 200-2
Environmental Effects of Army Actions

AR 385-3
Safety Color Code Markings and Signs

AR 700-64
Radioactive Commodities in the DoD Supply System

TM 3-261
Handling and Disposal of Unwanted Radioactive Material

TB MED 522
Occupational and Environmental Health: Control of Health Hazards from Protective Material used in Self Luminous Devices

TB 43-0116
Identification of Radioactive Items in the Army

Appendix B

SPECIAL TERMS and ACRONYMS

ALARA
The acronym for "as low as is reasonably achievable," refers to an operating philosophy in which occupational exposures to radiation are kept to a minimum.

Becquerel (Bq)
The international system (IS) unit of activity, equal to 1 disintegration per second, 3.70 E10 Bq equals one curie.

Contamination (radioactive)
The deposition of radioactive material in any place where it is not desired and particularly in any place where its presence might be harmful.

Curie (Ci)
A unit of activity. One curie equals 3.70 E10 Bq or 2.22 E12 disintegrations per minute. A microcurie (uCi) equals one-millionth of a curie (3.70 E04 Bq or 2.22 E06 disintegrations per minute).

DARA
Department of the Army Radiation Authorization.

Decontamination
The reduction or elimination of radioactive contamination from any location/item.

Dose
A general term denoting the quantity of radiation or energy absorbed.

Occupational exposure
Exposure to ionizing radiation incurred during performance of work by an employee identified as a radiation worker. Exposures received in activities other than performance of work are not included in occupational exposure; i.e., medical or dental diagnostic x-rays or radiation therapy.

Ionizing radiation producing devices
Any device that is capable of producing ionizing radiation.

Leak test
The determination of the integrity of a sealed source encapsulation by measurement of the amount of radioactive material escaping the encapsulation.

Licensed material
By-product, source, or special nuclear material received, possessed, stored, used, or transferred under a general or specific license issued by the NRC.

License (specific)
A document issued by the NRC under 10 CFR that gives the bearer the authority to procure, receive, store, transfer, use, export, and import specified radioactive items under specific terms.

Rad
The unit of absorbed dose equal to 0.01 Joules/kilogram in any medium.

Radiation Control Committee (RCC)
A group of qualified personnel officially appointed to set local policy and to guide the radiation protection program.

Radiation Protection Officer (RPO)
An individual designated to provide consultation and advice on the degree of hazards associated with radiation and the effectiveness of measures to control these

Appendix B--Continued

Thermoluminescent Dosimeter (TLD)
A reusable personnel monitoring device used to measure ionizing radiation exposure.

Wipe test
A procedure in which a swab or piece of absorbent material (paper or cloth) is rubbed on a surface and its radioactivity measured to determine if the surface is contaminated with removable or non-fixed radioactive material.

X-rays
Ionizing electromagnetic radiation with wavelengths shorter than visible light. Usually produced by bombarding a metallic target with fast high energy electrons in a high vacuum.

The proponent of this publication is the U.S. Army Communications-Electronics Command. Users are invited to send comments on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to Commander, CECOM, ATTN: AMSEL-SF-RE, Fort Monmouth, New Jersey 07703-5024.

OFFICIAL:

PATRICK T. THORNTON
Colonel, GS
Chief of Staff

GERARD P. BROHM
Major General, USA
Commanding

DISTRIBUTION:
To be distributed in accordance with SEL Form 1130 requirements for CECOM regulations in the 385 series (Safety) plus

AMSEL-SF-RE 10
Record Set File, ATTN: AMSEL-IM-BM-I-ER..... 6

1. Radiation Detection and Measurement.

2. The CECOM DSRM Radiological Engineering Division possesses sufficient quantity and types of radiation detection and measurement instrumentation capable of measuring all radiations and intensities of isotopes. We also possess a sufficient quantity and types of radiation sources and a radiation instrument calibration facility capable of supporting this requirement. Gamma survey instruments are calibrated using the J.L. Shepherd and Associates Model 81 Series Calibrator, or other equivalent calibrator. Alpha survey instruments are calibrated using Plutonium-238, or equivalent, alpha calibration standards. All calibration sources are traceable to, or certified by, the National Institute for Standards and Technology (NIST). Calibrations of instrumentation are performed in accordance with American National Standards Institute N323-1978, Radiation Protection Instrument Test and Calibration. We have been evaluated and certified by the U.S. Army TMDE Activity (USATA), Redstone Arsenal, AL, as an authorized calibration facility. Re-evaluation and re-certification by USATA is performed on a frequency basis, usually not to exceed every 18 months. Neutron survey instruments are calibrated by other organizations performing calibration services and possess calibration sources, i.e., Plutonium-239/Beryllium, or equivalent, traceable to, or certified by, NIST.

3. In order to preclude the necessity for numerous license amendment requests due to changes in radiation detection and instrumentation inventory, we prefer not to list the precise quantities and types of instrumentation we have. However, to provide an insight into the types of instrumentation we currently possess, listed below are sample instrumentation. Quantities, types and manufacturers may vary, but we will maintain sufficient instrumentation, as appropriate.

a. Ludlum Model 5, with alpha detector/probe (8 each).

b. Ludlum Model 5, beta/gamma (11 each).

c. Ludlum Model 19, gamma (9 each).

d. Ludlum Model 28 Scaler, with pancake probe (beta/gamma) (2 each).

Enclosure 8

e. Eberline Model ESP-2, with alpha and beta/gamma probes (thin (pancake) and side window probes (20 each).

f. Neutron meters (Eberline Model RM-21/Victoreen SNOOPY) (2 each).

4. In addition, listed below are the types of radiation measurement instrumentation we currently have in our inventory. Future quantities, types and manufacturers may vary, but we will maintain sufficient instrumentation, as necessary.

a. Oxford/Tennelec Model LB 5100-W Series 4 Low Background Gas Flow Proportional System (5 each).

b. Canberra Model 2404 Low Background Gas Flow Proportional System (2 each).

c. Packard Tri-Carb Model 2550 TR A/B Liquid Scintillation Analyzer (4 each).

d. Canberra Genie Gamma Spectroscopy (2 each).

e. Canberra In Spector In-Situ MultiChannel Analyzer (1 each).

f. Canberra High Purity Germanium detectors (3 each 40 percent efficiency and 1 each 10 percent efficiency).

5. Leak testing sampling of the JLS Model 81-22 Calibrator will be performed by qualified personnel and will involve the following:

a. Locate the source in the "OFF" position.

b. Wipe the upper end of the source rods where they exit from the top of the shielded container with a piece of absorbent material. Wiping the area where the operating tower meets the top of the shield is acceptable.

c. These wipes will be measured with the appropriate radiation measurement instrument capable of detecting 0.005 microcurie of Cobalt 60 and Cesium 137.

d. If contamination above this level is detected, the JLS Model 81-22 will be removed from service and the manufacturer notified.

6. All personnel classified as radiation workers in accordance with 10 CFR 20 and Army Regulation (AR) 40-14, Control and Recording Procedures for Exposure to Ionizing Radiation and Radioactive Materials, are provided with whole body, wrist, finger and/or neutron thermo-luminescent dosimetry (TLD), as appropriate. The dosimetry service is provided by the U.S. Army Ionizing Radiation Dosimetry Branch (AIRDB), USATA. AIRDB is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP). TLDs are exchanged on a quarterly basis, with records maintained by the CECOM DSRM and AIRDB. In addition, users/operators of the JLS Model 81-22 will also be provided with self reading pocket dosimeters which will be worn concurrently with TLDs.

JAN 13 1998

License No. 29-01022-07
Docket No. 030-06989
Control No. 125086

Department of the Army
Commander, U.S. Army Materiel Command
ATTN: AMCSF
5001 Eisenhower Avenue
Alexandria, VA 22333-001

Dear Commander:

This is in reference to your letter dated October 7, 1997 requesting to amend Nuclear Regulatory Commission License No. 29-01022-07. In order to continue our review, we need the following additional information:

The irradiator that you have requested will be licensed pursuant to 10 CFR Part 36. A cursory review of your letter indicates that several items required by 10 CFR Part 36 were not adequately addressed in your application. Please review the enclosed Draft Regulatory Guide and address all applicable items.

We will continue our review upon receipt of this information. Please reply in duplicate to my attention at the Region I Office and refer to Mail Control No. 125086. If you have any technical questions regarding this deficiency letter, please call Eric H. Reber at (610) 337-5276.

If we do not receive a reply from you within 30 calendar days from the date of this letter, we shall assume that you do not wish to pursue your application.

Sincerely,

ORIGINAL SIGNED BY:
JENNY M. JOHANSEN
Francis M. Costello
Division of Nuclear Materials Safety

License No. 29-01022-07
Docket No. 030-06989
Control No. 125086

OFFICIAL RECORD COPY ML 10

Enclosures:
1. 10 CFR Part 36
2. Draft Regulatory Guides DG-0003

DOCUMENT NAME: R:\WPS\DLTR\D2901022.07
To receive a copy of this document, indicate in the box: "C" = Copy w/o attach/encl "E" = Copy w/ attach/encl "N" = No copy

OFFICE	DNMS/RI	N	DNMS/RI	N				
NAME	Reber/ehr		Costello					
DATE	01/12/98		01/13/98		01/ /98		01/ /98	

OFFICIAL RECORD COPY

This is to acknowledge the receipt of your letter/application dated

10-7-97, and to inform you that the initial processing which includes an administrative review has been performed.

29-01022-07

☒ There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

☐ Please provide to this office within 30 days of your receipt of this card

---

A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 125086
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI)
(6-98)

Sincerely,
Licensing Assistance Team Leader

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703-5000

REPLY TO
ATTENTION OF

October 7, 1997

U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Attention: Licensing Assistance Section

This refers to U.S. Nuclear Regulatory Commission (NRC) License Number 29-01022-07, Docket Number 030-06989.

We are requesting that referenced NRC license be amended to authorize possession and use of the J.L. Shepherd and Associates (JLS) Model 81-22 Calibrator. The calibrator will be loaded with the following sealed sources:

Radionuclide	Activity	Sealed Source
Cobalt 60		
Cesium 137		
Cesium 137		
Cobalt 60		
Cobalt 60		

&2

The calibrator will be used in the Ionizing Radiation Research Facility, Building 9401, Evans Area, Fort Monmouth, NJ. The JLS Model 81-22 calibrator will replace the JLS Model 81-14Q calibrator (NRC License Number 29-01022-06) which has been relocated from Building 9401 to Building 2540, Charles Wood Area, Fort Monmouth, NJ. The JLS Model 81-22 is required to support our calibration of portable radiation detection instrumentation and personnel dosimeters.

Use of the calibrator will be restricted to approved calibrator operators. Interlocks will be used to prevent unauthorized entry. A warning sign/light is installed outside the only access door. This sign is illuminated to alert personnel that the source is in the exposed position. The calibrator system will be operated external to the calibration

room and will be equipped with a closed circuit camera system for viewing during calibrator operation. The beam port of the calibrator is directed away from the door. The primary beam will be aimed towards the outer wall of the building. The calibrator will have an installed sonalert alarm that sounds just prior to a source being raised into the beamport. This will alert personnel in the area that an exposure sequence is about to be initiated.

The area above the calibration room is the building roof. The design of the calibrator beam port will prevent the unshielded beam from passing through any portion of the ceiling of the calibration room. Any dose rate on the roof will be the product of backscatter radiation. The roof is not occupied routinely and would only be accessed for maintenance.

Enclosures 1 and 2 are drawings of building 9401 depicting the proposed location of the calibrator. The calculated estimated dose rate at the building outer wall will exceed the two millrem per hour limit. An earth mound will be added to create sufficient shielding required to reduce the radiation dose rate to less than two millirem per hour.

To qualify as an operator or user will require a minimum of eight hours training under the guidance of a qualified Local RPO in the basic fundamentals of radiological operations, radiac instrumentation, survey techniques and on-the-job training in operation and care of the J.L. Shepherd & Associates Model 81. Instructions shall include safe working practices and inherent hazards associated with the calibrator.

Enclosure 3 is the J.L. Shepherd Model 81 Installation and Operating manual. Enclosure 4 is the calibration standard operating procedure for the calibrators currently in use in this room in building 9401, Evans Area. The bold print portions are the changes to the SOP that will be incorporated when the J.L. Shepherd Model 81 calibrator is installed.

A radiation survey of the exterior walls and roof of the Calibration Room and of the exterior of Building 9401 and effected fenced perimeter will be performed with the J.L. Shepherd Model 81-22 Calibrator in the exposed position, upon installation of this calibrator. The results of this survey will be provided to your office. If the radiation survey reveals a radiation dose rate exceeding the two millirem per hour limit, the calibrator will not be used until sufficient shielding material is added, as a minimum, to reduce the external radiation dose at the fence line to two millirem per hour limit. If radiation dose rates are detected on the roof that warrant protective measures, roof access points will be posted and access to the roof will not be authorized while the calibrator is in use.

Your expeditious processing of this amendment request is appreciated.

Our Point of Contact is Mr. Joseph M. Santarsiero or the undersigned, Facsimile on (732) 532-6403 or (732) 542-7161; Voice on (732) 427-4427/3112.

Sincerely,

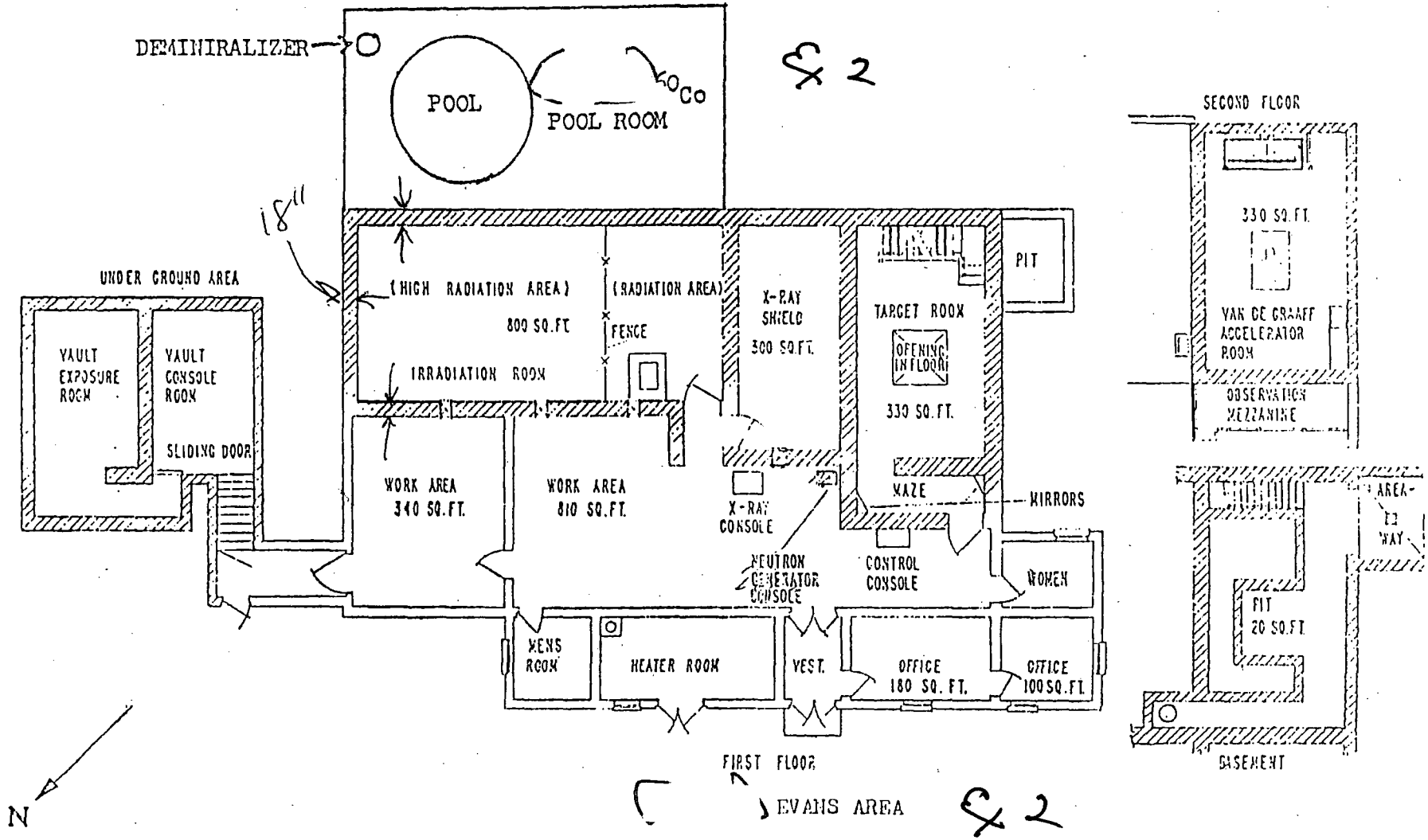
for Joseph M. Santarsiero

Steven A. Horne
Director, Safety
Risk Management

4 Enclosures

Copy Furnished:

Commander, U.S. Army Materiel Command, ATTN: AMCSF-P, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-0001


DEMINIRALIZER
POOL
POOL ROOM
^{60}Co
Ex 2
18"
UNDER GROUND AREA
VAULT EXPOSURE ROOM
VAULT CONSOLE ROOM
SLIDING DOOR
(HIGH RADIATION AREA)
800 SQ.FT.
IRRADIATION ROOM
(RADIATION AREA)
FENCE
X-RAY SHIELD
300 SQ.FT.
PIT
TARGET ROOM
OPENING IN FLOOR
330 SQ.FT.
WORK AREA 340 SQ.FT.
WORK AREA 810 SQ.FT.
X-RAY CONSOLE
MAZE
MIRRORS
NEUTRON GENERATOR CONSOLE
CONTROL CONSOLE
WOMEN
MENS ROOM
HEATER ROOM
VEST.
OFFICE 180 SQ. FT.
OFFICE 100 SQ.FT.
FIRST FLOOR
N
EVANS AREA
Ex 2
SECOND FLOOR
330 SQ.FT.
VAN DE GRAAFF ACCELERATOR ROOM
OBSERVATION MEZZANINE
AREA-
WAY
PIT 20 SQ.FT.
BASEMENT

FNCL

EVANS AREA BUILDING 9401 CALIBRATION ROOM AND REGION LAYOUT

Exhibit 2

J.L. SHEPHERD & ASSOCIATES
1010 ARROYO AVE, SAN FERNANDO, CALIFORNIA 91340-1822
818-898-2361 FAX 818-361-8095

INSTALLATION & OPERATION MANUAL FOR MODEL 81 SERIES MULTI SOURCE GAMMA CALIBRATOR

ENCL 3

J.L. SHEPHERD & ASSOCIATES
1010 ARROYO AVE, SAN FERNANDO, CALIFORNIA 91340-1822
818-898-2361 FAX 818-361-8095

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J.L. SHEPHERD & ASSOCIATES
1010 ARROYO AVE, SAN FERNANDO, CALIFORNIA 91340-1822
818-898-2361 FAX 818-361-8095

INSTALLATION & OPERATION MANUAL FOR MODEL 81 MULTIPLE SOURCE GAMMA CALIBRATOR

Model 81-xxx
S.N. XXXX

NOTICE: IF AT ANY TIME THIS CALIBRATOR MALFUNCTIONS, REMOVE THE SYSTEM FROM OPERATION IMMEDIATELY AND CALL J.L. SHEPHERD & ASSOCIATES FOR INSTRUCTIONS ON CORRECTIVE PROCEDURES.

I. MODEL 81 RADIATION SAFETY

The Model 81 Calibrator emits an intense beam of radiation through the area subtended by the beamport whenever the source is in the "EXPOSED" position. A much lower level of scattered radiation extends in a penumbra surrounding the primary beam. The user should set up exclusion lines for personnel using this calibrator, as well as limit room access. Ordinarily, this information is included as part of the facility operation rules and is required as part of the user's license to possess this calibrator.

A. Leak Test Procedure

1. Locate the source in the "OFF" position.

2. Wipe the upper end of the source rods where they exit from the top of the shielded container with a piece of absorbent material. Wiping the area where the operating tower meets the top of the shield is acceptable.

3. These wipes should be measured on an instrument capable of detecting 0.005 μCi of Cs-137, Co-60 or Sr-90, depending upon isotope loading of your device.

4. If contamination above this level is detected, remove the device from service immediately and notify the manufacturer.

NOTE: The 0.005 μCi level is that generally prescribed by Regulatory Authorities; individual institutions may require more stringent standards.

II. INSTALLATION

A. REMOVAL OF MODEL 81 FROM 20WC-5 OVERPACK (if required):

1. Using a 13/1611 or 3/411 deep well socket (as required), remove the nuts from the 16 each 1/211 rods located approximately 511 from the outer rim of the top of the overpack.

2. Sling the top chine of the overpack or attach a 1/2-13 eyebolt to the center left point and lift the top section, using a vertical lift so as not to bend the rods. The top section is approximately 1611 high.

3. Remove any wood shoring from the top and sides of the device in the overpack.

4. Attach a cable or chain to the eyebolts provided and lift the device vertically from the overpack.

5. Remove the metal or wood round affixed to the bottom of the device.

B. MODEL 81 ASSEMBLY

The Model 81 Beam Calibrator is shipped in four parts: Base, Source Shield, Operational Tower assembly, and Control Panel.

1. Bolt the calibrator to the base provided.

2. Place the calibrator complete with Cesium-137 sources in the desired location.

3. The operating tower which contains the pneumatic assembly is shipped with the outside cover or shroud attached. Remove the shroud from the tower assembly. NOTE: To remove the shroud, use the following procedure:

   (a) Remove the piece of copper tubing with compression fittings, that extends from a fitting on the side of this tower base to the tee outlet from the oiler-filter-regulator.

   (b) Open the cover and disconnect the Jones plug inside the cover.

   (c) Unbolt the cover from the tower base and remove.

   (d) Remove the padlock and lock off bolt which holds the cylinders) in the extended position. These may be replaced later to lock the source assembly in the "OFF" position.

4. Remove the shipping plate from the top of the calibrator.The dose rate at the top of the irradiator will be approx. 1/mR/hr - at contact. Dose rates surrounding the calibrator with all sources in the "OFF" position, will be less than 5mR/hr at one foot from the surface.

5. Place the pneumatic cylinder assembly on top of the calibrator. Locate over the bolt pattern provided, nothing the orientation of the tower with the arrow stamped on top of the base plate pointing toward the beamport. Secure the tower to the shield with washers and nuts provided.

6. Block the beamport with the solid lead plug provided, if it is not already in position.

7. From the position at the rear of the calibrator (opposite the beamport), raise the source rod, which is at the centerline of the calibrator, slightly. Engage the threaded end of the rod into the tapped hole at the end of the fixture which is mounted to the cylinder rod. Thread the rod in until the dimensional requirement of the source centering sketch are met. Firmly tighten the source rod set screws. Installation of the source assembly is now complete.

NOTE: Care must be taken so that no parts, chips, or foreign materials drop into the tube, (at the top of the calibrator) through which the source rod assemblies operate.

8. Mount the shroud over the cover assembly, reattaching the Jones connector which connects all wiring from the inside of the tower to the components which are mounted on the tower cover.

9. Next, connect air supply rated 90 psi or greater, to the inlet of the oiler-filter-regulator. NOTE: the Primary unit requires a setting of 60 lbs. and secondary regulator requires a setting of 20 lbs. to function properly. This is factory adjusted, and may be adjusted slightly in the field.See adjustment section. Next, fill the oiler section of the oiler-filter-regulator with SAE 10 weight non-detergent oil as indicated in the instructions for the oiler-filter-regulator contained as part of this manual.

C. CONTROL PANEL INSTALLATION

1. All noted in #3 above, all cabling from the Model 81 must be connected to the amphenol connectors in the back of the control cabinet. All radiation warning lights, sirens, alarms, etc., must be connected to corresponding amphenol connectors as marked in the control cabinet.

2. Plug the control cabinet into a 115V outlet, rated at 10 amps.

INSTALLATION IS NOW COMPLETE

III. OPERATION PROCEDURES FOR MODEL 81 MULTIPLE SOURCE CALIBRATION SYSTEM

A. TEST PROCEDURES

All systems must be plugged in and connected per installation procedures. Turn the key switch (power) to the "ON" position. The power lights should be illuminated. The beamport plug should be installed during device check out.

CHECK OUT PROCEDURES:

1. Interlock System - With the interlock circuit closed, the interlock light in the control panel should be illuminated. Each interlock component shall have its own light which illuminates only when closed.

2. Turn the arm/safe key switch to the "Arm" position.

3 Adjustable Time Delay System - Press the "Irradiate" switch on the control panel. The sonalert should be activated for the preset time.

4. Model 81 - Unscrew and remove the rear half of the tower cover, next remove the air pressure. With the door open, raise the source rod to sufficient height to release "OFF" position microswitches. The "SAFE" light on the control panel and the "OFF" light on the tower should turn off. The "UNSAFE" light on the control panel should illuminate. The red rotating beacon on the operating tower should illuminate.

   NOTE: All units (Model 81) are designed so that the sources may be raised sufficiently to test without increased personnel exposure, provided that the source rod is raised from behind the unit.

5. Lights on Operating Tower. If all sources are in the "OFF" position, all "OFF" light should be illuminated without pressing. If the source rod is away from the fully "Off" position, the rotating beacon should illuminate.

B. OPERATION OF DIGITAL PRESET TIMER

1. Place the mode selector switch to "MANUAL" or "PRESET" time.

2. To preset time, press the buttons above and below the digits on the right side of the timer.

3. With the selector switch in the "MANUAL" position the timer will show elapsed time, but will not control exposure. With the selector switch in the "PRESET" position, the timer will control the exposure. The timer counts up from "O" to the preset time.

NOTE: AFTER THE COMPLETION OF ANY EXPOSURE, IT IS NECESSARY TO PRESS THE "RESET" BUTTON BEFORE ANOTHER EXPOSURE IS INITIATED. If this is not done, the source cannot be raised. Pressing the "RESET" button will automatically reset the time previously selected. In operation, the timer starts at 00.00.00 (HRS.MINS.SECS.) and counts up to the preset time, after the exposure is completed, showing at all times the time expired on the preset exposure.

4. The electric timer is activated whenever any source is in the fully exposed position.

C. UNIT OPERATION

Activate the "SET-UP" switch on the operating tower, exit the room and close the door. All interlock lights on the control panel should be illuminated. Select source(s) to be exposed by operating the rotary switch on the control panel. Turn the key switch to the "ARM" position. Press "IRRADIATE" button, the alarm will sound in the room for the preset time prior to source exposure. At the end of alarm interval, the source selected will be raised to the "EXPOSED" position. The source may be returned to the fully shielded position by:

a. Opening/Interrupting any interlock circuit.
b. End of the preset time selected on the timer.
c. Pushing the "OFF" button on the control panel.
d. Pushing any interlock switch in the radiation room, or by turning interlock switch on the tower into "OFF" position.
e. Power failure.
f. Loss of air pressure.

D. POSITION INDICATING LIGHTS

1. The IRRADIATION light on the control panel is illuminated only when the designated source is in the fully exposed position.

2. The "OFF" light on the control panel is illuminated only when the source is in the fully shielded position.

E. COMPRESSOR

This Model 81 system is supplied with a self contained air supply to provide compressed air for the source operating cylinder. The ON/OFF control for this air supply is located on the right hand side of the control panel. A toggle switch controls the ON/OFF power. Make certain that the self-contained air supply is "ON" for at least 3 minutes before attempting source operation.

F. SAFETY SYSTEM

1. The master interlock light is illuminated only when all interlocks are closed.

2. Low pressure light is illuminated when pressure falls below levels set on pressure switch. This is NOT a source interlock modality.

3. All sources are returned to the fully shielded position by air pressure whenever:

   a. Any interlock switch is open (including pressing mushroom or panic button switches.
   b. "OFF" switch is operated.
   c. Timer times out.
   d. Power failure.
   e. Pressing the "PANIC" switch.

The source is mechanically returned (by a constant force spring) to the fully shielded position in the event of loss of air pressure.

4. The shield design provides for full shielding in ALL directions, at all times, except out the beamport when the source is in the "ON" position.

5. The spring return assembly on the pneumatic source operating cylinder provides fail-safe operation in that the source(s) automatically return(s) to the "OFF" position in case of air or power failure. In addition, the normally closed solenoid valve provides pressure to hold the sources in the "OFF" position whenever air pressure is supplied to the system and the "ON" switch is not activated.

6. The source rod never touches the bottom of the tube in which it travels (clearance is approx. 1/211), eliminating the possibility of damage to the source by striking the end of the source tube.

G. ADJUSTMENTS

Source/shutter travel should be smooth and rapid, and should not slam in either direction.

1. To adjust the source/shutter in the Model 81, the travel speed may be changed by adjusting the pressure delivered to the cylinder, or by adjusting the flow control valves provided.

2. If the source rod/shutter travel is jerky or hesitant, the pneumatic assembly is misaligned and should be readjusted. Take care that the bottom of the pneumatic assembly is clean, and that all hold bolts are evenly adjusted. If action is not smooth and regular after this adjustment, the manufacturer should be contacted for further instructions.

3. An assembly drawing, a pneumatic schematic and an electrical schematic drawing are included as part of this manual.

H. GENERAL INFORMATION

The Model 81 Calibrator incorporates three Cesium-137 sources mounted on one operating rod assembly. Operation of each source is by two pneumatic cylinders controlled by separate solenoid valves. These valves in turn are activated by the control panel. All lines between solenoid valves and cylinders are equipped with flow control valves. Automatic spring return assemblies are mounted on the cylinder.

CAUTION: AT NO TIME IS ANY LUBRICATION TO BE APPLIED TO THIS DEVICE, PARTICULARLY THE SOURCE ROD AND DRIVE MECHANISM. THE USE OF ANY LUBRICANT IMMEDIATELY VOIDS ALL WARRANTIES.

I. EMERGENCY PROCEDURES

If at any time, the source(s) fails to return to the "OFF" position, (as shown by the source position indicating lights on the control panel) at the end of the preset or manual exposure, or after operation of an interlock, the following procedures are to be followed:

a. Enter the irradiation room, approaching the calibrator from the rear (opposite beamport). Remove the access plate, and move the source rod downward until the source is in the "OFF" position. A high-range survey meter should be carried during this procedure.

b. Take the calibrator out of operation immediately and contact the manufacturer for an authorized representative to effect repairs.

Bold print identifies additions to cover the J.L.Shepherd Model 81 multi source gamma calibrator.

SOP Number 20-02

STANDARD OPERATING PROCEDURE
FOR USE OF THE AN/UDM-1 AND AN/UDM-1A
RADIAC CALIBRATOR SETS

1. PURPOSE: To provide procedures to be employed when calibrating survey meters and dosimeters utilizing the AN/UDM-1 (SN:21), AN/UDM-1A (SN:D3 and SN:12) RADIAC Calibrator Sets **and J.L.Shepherd Model 81 multi source gamma calibrator (SN:XXXX)** located in Building 9401.

2. SCOPE: This procedure applies to all users of the Calibration/Exposure Room.

3. REFERENCES:

a. Calibrator Set, RADIAC AN/UDM-1, TM 11-6665-363-12, 1 September 1990.

b. Calibrator Set, RADIAC AN/UDM-1A, TM 11-6665-217-12, 1 September 1990.

c. J.L.Shepherd & Associates, Installation and Operation Manual for Model 81 Multi Source Calibrator (JLS Model 81 MSC).

4. DISCUSSION: The RADIAC Calibrator sets AN/UDM-1, ~~and~~ AN/UDM-1A, **and JLS Model 81 MSC** house a specific quantity of radioactive material. **The** ~~its~~ radiation **is** ~~being~~ emitted as a controlled beam of known intensity which is used as a standard in checking and calibrating RADIAC instruments.

5. PROCEDURES:

a. Pre-Calibration Procedure.

(1) Obtain key to unlock Calibration Room.

(2) Personal dosimetry is required when using the calibration room. At a minimum, a pocket dosimeter and whole body TLD badge must be worn by each individual.

ENCL 4

Dosimetry for all personnel, will be assigned by the Radiation Area Supervisor or CECOM Safety Office personnel.

(3) An appropriate doserate survey meter is also required to be used. Perform the following checks of the survey meter before each use:

(a) Does the meter have a valid calibration sticker (active) affixed?

(b) Checked the batteries?

(c) Has the meter passed a functional operation test with the radioactive source located at the entrance to the exposure room?

(4) Test Visual warning lights on calibrators. If there are any malfunctions, report the problem to the Radiation Area Supervisor.

b. Calibration.

(1) Take area readings with survey meter to ensure safety.

(2) Using the calibration reports/charts posted in the Calibration Room, set the instrument to be calibrated at the required distance considering the angular distribution of dose rate.

(3) If desired, set the viewing camera and TV monitor in such a manner that the operator can either view the screen from behind the calibrators or use the telescope. **The JLS Model 81 MSC will be operated from the remote console utilizing the TV camera and monitor to observe the instrument being checked/calibrated.**

(4) Perform the desired calibration IAW established procedures.

c. Post-Operation

(1) Ensure all calibrators have been completely shut down.

(2) Ensure viewing system has been turned off.

(3) Exit room and lock door before returning key and survey meter.

(4) Place TLD and pocket dosimeter on storage rack for subsequent use for that wearing period.

(5) Ensure all dosimetry entries have been annotated in logbooks and visitor logs.

6. Emergency Procedures:

a. If the source(s) does not return to it's shielded position report this and any other operational malfunction to the Radiation Area Supervisor, do not attempt to correct the problem yourself.

b. EMERGENCY PHONE NUMBERS:

Radiation Area Supervisor - X75443
Fire Department - 911
Police - 911
Ambulance - 911
CECOM Safety Office - X73112, X75606

Approved by: _____ Date: _____
Chief, Radiological
Engineering Branch
Radiation Protection Officer