HALLIBURTON SERVICES

GOVERNMENT REGULATIONS DEPARTMENT
RON BECHTEL
Manager
DAN KELLY
Regulatory Specialist

Writer's Direct Dial Number
(405) 251-3749

DRAWER 1431, DUNCAN, OKLAHOMA 73536
Senior Environmental Engineers
STEVE BURFORD
RALPH HOUSER
BILL JONES
Environmental Engineer
JOHN PRESGROVE
Radiation Safety Officers
RICHARD LEONARDI
STEVE HOOK

February 14, 1984

'84 FEB 16 P3:04

Division of Fuel Cycle
and Material Safety
Office of Nuclear Material
Safety and Safeguards
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Sirs:

Enclosed is a completed application for renewal of Halliburton Services Byproduct Material License Number 35-00502-03 which has an expiration date of February 29, 1984.

Also enclosed is a check for the amount of $460.00 made payable to the U. S. Nuclear Regulatory Commission which is the fee for category 3.A.

Sincerely,

Dan G. Kelly

Dan G. Kelly

DGK/cdd
Attachments

Date 2/23/84
Log Reg 3 Renewal
By Brown
Orig. To
Action Compl 2/27/84

1560476
$460.00 3A
Revenue 2/23/84
Brown

(Broad verified 5/20/87 per Reg IV (Chuck Cain) B Jackson)

Information in this record was deleted in accordance with the Freedom of Information Act, exemptions
FOIA- 2012-0067

COPY SENT REGION IV

7/27/84

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NRC Form 313 I (12-81) 10 CFR 30

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE INDUSTRIAL

See attached instructions for details.

Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.

1. APPLICATION FOR: *(Check and/or complete as appropriate)*

	a. NEW LICENSE
	b. AMENDMENT TO: LICENSE NUMBER
X	c. RENEWAL OF: LICENSE NUMBER 35-00502-03

2. APPLICANT'S NAME *(Institution, firm, person, etc.)*
Halliburton Services

TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
405/251-3760

3. NAME AND TITLE OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION
Dan G. Kelly

TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
405/251-3749

4. APPLICANT'S MAILING ADDRESS *(Include Zip Code)* *(Address to which NRC correspondence, notices, bulletins, etc., should be sent.)*
P. O. Drawer 1431
Duncan, Oklahoma 73536

5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED *(Include Zip Code)*
Halliburton Services, North 40, Osage Road
Research Center, 1500 South Second St.
RAYFRAC Bldg., 1409 South 13th Street
Duncan, Oklahoma 73536

(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)

6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL
(See Items 16 and 17 for required training and experience of each individual named below)

	FULL NAME	TITLE
a.	Dan G. Kelly	Radiation Safety Officer
b.	Richard A. Leonardi, Jr.	Radiation Safety Officer
c.	Stephen E. Hook	Radiation Safety Officer

7. RADIATION PROTECTION OFFICER
Same as 6. a., b., and c.

Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.
Resume's attached

8. LICENSED MATERIAL

LINE NO.	ELEMENT AND MASS NUMBER A	CHEMICAL AND/OR PHYSICAL FORM B	NAME OF MANUFACTURER AND MODEL NUMBER *(If Sealed Source)* C	MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTIVITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME D
(1)				
(2)	See Attachment #1			
(3)				
(4)				

	DESCRIBE USE OF LICENSED MATERIAL E
(1)	See Attachment #1
(2)	8804250077 860306 REG4 LIC30 35-00502-03 PDR
(3)	
(4)	

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9. STORAGE OF SEALED SOURCES

LINE NO.	CONTAINER AND/OR DEVICE IN WHICH EACH SEALED SOURCE WILL BE STORED OR USED. A.	NAME OF MANUFACTURER B.	MODEL NUMBER C.
(1)	See Attachment #2	Halliburton Services	10SD
(2)	These are drawings for the newer 8"		20SD
(3)	densometer, Model 100SD, other drawings are presently on file at NRC.		55SD
(4)			100SD

10. RADIATION DETECTION INSTRUMENTS

LINE NO.	TYPE OF INSTRUMENT A	MANUFACTURER'S NAME B	MODEL NUMBER C	NUMBER AVAILABLE D	RADIATION DETECTED (alpha, beta, gamma, neutron) E	SENSITIVITY RANGE (milliroentgens/hour or counts/minute) F
(1)	Multi-channel Analyzer	Canberra		one	all	(b)(4),(b)(7)(F)
(2)	Survey Meter	Victoreen	Thyac III	one	beta-gamma	
(3)	Survey Meter	Ludlum	2	five	beta-gamma	
(4)	Survey Meter	Ludlum	15	one	neutron	

Ex 4 & 7F

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

☒ a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

Ludlum Measurements, Inc.
501 Oak St.
Sweetwater, TX 79556

Six Month Frequency

☒ b. CALIBRATED BY APPLICANT

Attach a separate sheet describing method, frequency and standards used for calibrating instruments.

Attachment #3

12. PERSONNEL MONITORING DEVICES

TYPE (Check and/or complete as appropriate.) A	SUPPLIER (Service Company) B	EXCHANGE FREQUENCY C
☐ (1) FILM BADGE	Nuclear Sources & Services, Inc.	☐ MONTHLY
☒ (2) THERMOLUMINESCENCE DOSIMETER (TLD)	Dosimeter Corporation Victoreen Corporation	☒ QUARTERLY
☒ (3) OTHER (Specify): Direct Reading dosimeters for occasional users only (See Attachment #4)		☒ OTHER (Specify): DRD are calibrated and drift tested annually

13. FACILITIES AND EQUIPMENT (Check were appropriate and attach annotated sketch(es) and description(s).

☒ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS *(Include filtration, if any)*, ETC.
☒ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING *(fixed and/or temporary)*, ETC.
☒ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.
☒ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC.

See Attachment #5

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED Our waste is returned to Gulf Nuclear, Inc. to their licensed holding facility in Odessa, Texas.

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE.

N/A

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Describe in detail the information required for Items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

See Revised "Radiation Safety Manual" attached.

15. RADIATION PROTECTION PROGRAM. Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures *(if needed)*, day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.

16. FORMAL TRAINING IN RADIATION SAFETY. Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.

See Attached Resume's

a. Principles and practices of radiation protection.

b. Radioactivity measurement standardization and monitoring techniques and instruments.

c. Mathematics and calculations basic to the use and measurement of radioactivity.

d. Biological effects of radiation.

17. EXPERIENCE. Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

See Attached Resume's

18. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 30, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

WARNING.—18 U.S.C., Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

a. LICENSE FEE REQUIRED *(See Section 170.31, 10 CFR 170)*	b. CERTIFYING OFFICIAL *(Signature)* Dan G. Kelly
	c. NAME *(Type or print)* Dan G. Kelly
(1) LICENSE FEE CATEGORY: 3.A.	d. TITLE Radiation Safety Officer
(2) LICENSE FEE ENCLOSED: $ 460.00	e. DATE February 14, 1984

ATTACHMENT #1

Item 8, A, B, C, D and E.

(1)	Scandium-46	Any	
(2)	Iridium-192	Any	
(3)	Zinc-65	Any	
(4)	Iron-59	Any	
(5)	Silver-110^m	Any	
(6)	Lanthinum-140	Any	
(7)	Cobalt-60	Any	
(8)	Any nuclide with Atomic Numbers 33 through 83	Contaminated Reacter-Components	
(9)	Cesium-137	Sealed Sources	U. S. Nuclear 375 General Nuclear CS-1000 Gamma Industries CS-1000 Gammatron GT-GHP Gulf Nuclear CS-2 New England Nuclear NER-572 Texas Nuclear 570-57157C Monsanto) Amersham CDCQ4935) R/A-D 3M Company) Kay-Ray - Any Model Campbell Pacific Nuclear Model CPN 131
(10)	Hydrogen 3	Sealed Light Sources	
(11)	Nickel-63	Plated Sources	Hewlett-Packard Model No. 19303 Detector Cells
(12)	Americium 241Be	Sealed Sources	Monsanto Research X-602-04-101 through 106 Gammatron AN-HP Amersham-Am NQ 5478
(13)	Ra-226	Sealed Sources	Gammatron, Inc. GT-CK

(b)(4),(b)(7)(F)

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	E
(1) through (7)	To be used for tracer sand manufacture and liquid isotope supply for field operations.
(3) and (4)	Also used for the manufacture of downhole markers, such as cement plug or collar workers.
(8)	Laboratory testing of decontamination procedures.
(9)	To be used for research, development and manufacture of densometer and density gauging devices.
(10)	For research and development as defined in CFR 10, 30, 30.4(q).
(11)	For use in gas chromatographs for sample analysis.
(12)	To be used for research, development and assembly of downhole logging instruments.
(13)	To be used as gamma calibrator for density gauging sources.
(12) and (13)	Sources are transferred or exported to our International Welex Operations.

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ATTACHMENT #3

Survey Meter Calibration Procedures

Survey meters will be calibrated with a 163 mCi Cesium-137 source model TECH/OPS 77302 contained in a Technical Operations model 773 instrument calibration device. (A brochure is enclosed for your information).

The device will be used at various locations. Only Halliburton or its subsidiaries survey meters will be calibrated. This will not be a customer service. The calibration device is a DOT 7A container and will be secured in the vehicle during transportation to prevent shifting and/or damage to the device. Set up at each location will be in such a fashion that no individual will be permitted to enter the restricted area. The calibration will be used in an area in which the wall is at least sixteen (16) feet from the source. This will insure that the 2 mR/hr area will be under visual surveillance at all times.

The output of the 163 mCi Cesium-137 source is 52.2 mR/hr at 1 meter. The inverse square law will be used to determine the various calibration points to be used in the radiation field. The attenuators provided on the device will also be utilized for point location. Each instrument will be calibrated at two points on each scale. The two points will occur at approximately 30% and 70% of full scale, except when the full scale reading is equal to or less than 0.5 mR/hr that scale will be calibrated at just one point, near mid-range. If the instrument cannot be adjusted to read within ±20% of any correct value, it will be repaired.

Operational Procedures

1. Desired points in the radiation field will be determined by using any needed decay factor and the inverse square law and attenuators provided on the calibration device.

2. When the desired points are determined the calibrator will be set up for use.

3. The detector will be placed in the desired location. It will be insured at this time that the entire detector is located so the sensitive volume is covered by the radiation field.

4. The source will be exposed and the instrument will be read. If the desired reading is obtained the next point on that scale will be tested in the same manner. If the desired reading is not obtained,

the source will be retracted to the shielded position. Then adjustments to the meter will be made. The source will then be exposed again to determine if the reading is now acceptable. This method will continue until the desired reading is obtained or it is determined that the instrument must be repaired before use. Each scale will be checked in the same manner.

A copy of the calibration certificate and meter sticker is enclosed for review.

HALLIBURTON SERVICES
DRAWER 1431, DUNCAN, OKLAHOMA 73533

DEPARTMENT OF GOVERNMENT REGULATIONS
RON BECHTEL
Manager
Writer's Direct Dial Number

Certificate of Calibration

District ____________________

Mfg ____________________ Model ____________________ Ser. No. ____________

Mfg ____________________ Detector Model ____________ Ser. No. ____________

Calibration Date ______________ Cal. Due ____________________

Calibration Interval: 6 months Texas License 7-1835.

Instrument: _____ In Tolerance _____ Out of Tolerance _____ Needed Repair

Instrument Range

- ☐ 0 - 50 m R/hr.
- ☐ 0 - 2.0 r/hr.
- ☐ __________

Instrument Calibrator

Tech/Ops Model 773
CS-137 @ 163.0 mCi @ on 6-29-83
Source S/N S-433
Output 0.0522 r/hr. @ 1 meter

Range Indicator	Measured or (mR/hr) Calculated Field	Instrument Reading (mR/hr)

Halliburton Services certifies that the above instrument has been calibrated by a standard source traceable to NBC.

Calibrated by ____________________

HALLIBURTON SERVICES

CALIBRATION DATE: ____________________

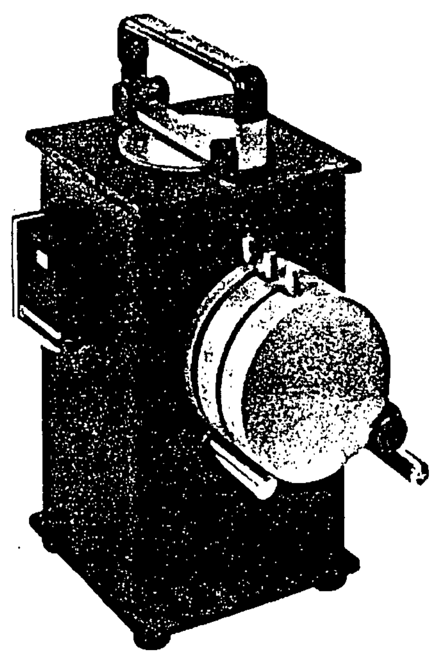
CALIBRATED BY: ____________________

IN ACCORDANCE WITH

TEXAS LICENSE # 7-1835

Tech/Ops Model 773 Instrument Calibration Device Operation Manual

#1831 complete



TECHNICAL OPERATIONS, INC.
Radiation Products Division
Burlington, Mass. 01803
Phone (800) 225-1383 (toll free)
[in Mass. call (617) 272-2000]

Technical Data

Size:	5 in (12.7 cm) wide, 5 in (12.7 cm) deep, 8.5 in (21.6 cm) high
Weight:	(with attenuators) 52 lbs. (24 kg) (without attenuators) 45 lbs. (20 kg)
Source:	Model 77302, ^{137}Cesium, 150 millicuries
Transport Status:	DOT Specification 7A Type A Package
Shielding Material:	Lead Approx. 29 lbs. (13 kg)

General

The Model 773 is a small, portable radiation survey instrument calibration device. The unit consists of a 150 millicurie ^{137}Cesium source permanently attached to a movable source rod which is installed in a lead shield casting. The source is exposed by raising the source rod which positions the source in a 36° x 20° collimated beam port.

The unit is equipped with three attenuators (Transmission of 0.25, 0.10 and 0.10) to allow a survey instrument with three ranges to be calibrated at 20% and 80% of each range without changing the position of the survey instrument. The Model 773 can be used to calibrate survey instruments with ranges up to 2000 milliroentgens per hour.

The unit is equipped with a carrying handle which also serves as a source-locking bar to prevent unauthorized use of the calibrator. A shipping cover is also attached to provide and additional means of securing the source.

Receiving

Survey the device for excessive radiation levels. The device should have radiation levels less than 200 mR/hr at the surface and less than 10 mR/hr at three feet from the surface. Inspect the device for shipping damage and insure that the device is locked.

Safety Precautions

The Model 773 Meter Calibration Device contains a 150 millicurie ^{137}Cesium source that emits gamma radiation which can cause injury if improperly used. Disassembly of the device or removal of the source requires special equipment. We recommend that any service requiring disassembly of the device or removal of the source be performed by the manufacturer.

Instrument Devices

Although the device has radiation levels which are well below the maximum radiation level permitted on storage containers, personnel should not stay close to the device any longer than necessary.

Precautions should be taken to store the instrument calibration device in an area that meets the requirements of Title 10 Code of Federal Regulations 20.202(b) (2), 20.203(b) and 20.203(e).

It is recommended that personnel operating the equipment use a calibrated and operable survey instrument and wear appropriate personnel monitoring devices. The radiation level at the source rod when the source is in the "operate" position is approximately 50 milliroentgens per hour.

Movement of the source rod should be accomplished as expeditiously as practicable. An alternative method of raising the source rod would be the use of a string and pulley arrangement.

In no case should anyone enter the area of the radiation beam or expose any part of his body to the radiation beam.

Preparation for Use

Place the source shield in a restricted area so that the directional port is aimed horizontally. * To minimize the effects of scattered radiation, the unit should be 16 feet from any wall in the direction of the primary beam.

Position a support horizontally from the Model 773 Instrument Calibration Device as shown in Figures 1 and 2.

Restrict access to the area where the radiation level is in excess of 2 milliroentgens per hour. (See Figure 4).

Operation

Note: To properly calibrate a survey instrument it is necessary to check the instruments response at two points on each of the instruments ranges. These points must be separated by at least 50% of the full scale reading. The instruments reading should agree with the actual radiation intensity within 10% to be in proper calibration.

The following procedure is designed for a survey instrument with three scales and a range of 0-1000 mr/hr. For instruments with different ranges, the procedure will be similar but the points will differ.

1. Turn on the survey meter and allow it to "warm up" for approximately 10 minutes.
2. Determine the activity of the source on the date of calibration from the decay chart provided with the source.
3. Determine the distance from the source at which the radiation intensity would be 800 mr/hr (use Figure 3).
4. Using the tape measure attached to the Model 773, place the survey meter such that the axis of the detector is located at the proper distance from the source as determined above.

Note:

The survey meter should be located so that the center of the detector is at the correct distance and centered on the center line of the radiation beam. The axis of the detector should be perpendicular to the centerline of the radiation beam. Depending upon the physical size of your survey instrument, it may be necessary to mount it somewhat higher than the bench surface. When the proper geometry for your instrument has been established, use the same physical arrangement consistently in future calibration operations.

At short distances, using survey instruments with large detector volumes, the radiation intensity will not be uniform across the detector. Consideration should be given to this effect when determining the radiation intensities to be checked.

5. Unlock the handle of the Model 773. Remove the shipping plate. Remove all the attenuators from the radiation beam.
6. Standing away from the radiation beam, expose the source by manually raising the source rod. Note and record the survey meter reading, return the source to the stored position. The actual intensity is 800 mr/hr. If the reading is within ± 10% of the actual intensity, continue checking the instrument. If the instrument reading is not within ± 10% of the actual intensity, the instrument must be adjusted and recalibrated.

   CAUTION: Do not enter the area of the radiation beam while the source is exposed.
7. Place the 0.25 attenuator in the beam. Repeat step 6; the actual intensity is 200 mr/hr.
8. Remove the 0.25 attenuator from the and place a 0.10 attenuator in the beam. Repeat step 6; the actual intensity is 80 mr/hr.
9. Place the 0.25 attenuator in the beam. Repeat step 6; the actual intensity is 20 mr/hr.
10. Remove the 0.25 attenuator from the beam and place the other 0.10 attenuator in the beam. Repeat step 6; the actual intensity is 8 mr/hr.
11. Place the 0.25 attenuator in the beam. Repeat step 6; the actual intensity is 2 mr/hr.

Leak Testing

The Tech/Ops Model 773 Meter Calibration Kit contains a ^{137}Cesium source which must be leak tested at intervals not to exceed six months. This may be accomplished using the Tech/Ops Model 518 leak test kit.

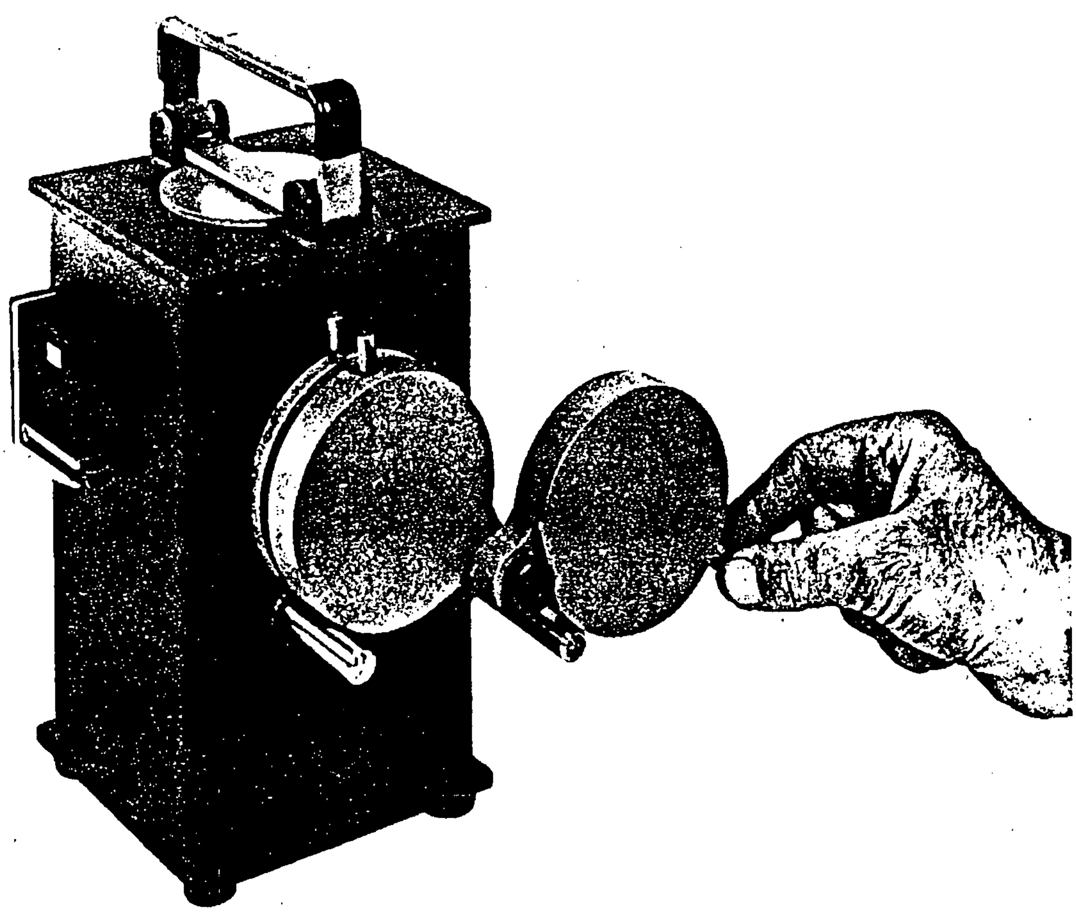
1. Place the Model 773 calibrator in a restricted area.
2. Remove the lock and rotate the handle from the top of the source rod. Remove the shipping cover.
3. Moisten the leak test swab with EDTA solution. Blot off the excess.
4. Wipe around the top of the source rod.
5. Standing away from the beam port, raise the source rod to the open position and

wipe the exposed source rod thoroughly.

6. Place the leak test swab in the plastic envelope.
7. Set the survey meter on its most sensitive range and place the meter in a low background area. Move the swab, in its plastic envelope, to the meter, not the meter to the swab.
8. If the meter indication is less than 0.2 mr/hr above background, place the plastic envelope with the swab into the mailing box and mail to Technical Operations, Inc., Burlington, Massachusetts. BE SURE TO FILL OUT AND RETURN THE IDENTIFICATION SHEET.
9. If the swab should show more than 0.2 mr/hr. DO NOT MAIL. Contact Technical Operations, Inc. for specific instructions.

Note:

The wipe test swab will be subjected to a precise radioassay when received by Tech/Ops and a leak test certificate will be mailed promptly. This certificate must be kept with your records as it is subject to N.R.C. inspection.



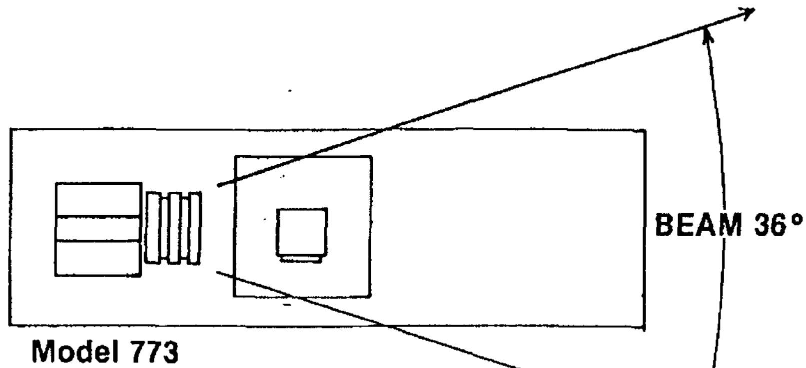


FIGURE 1

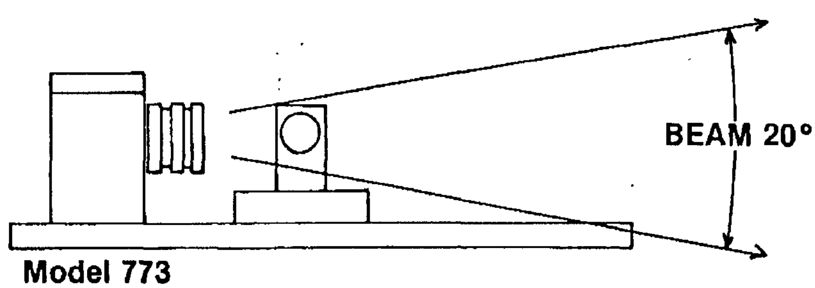
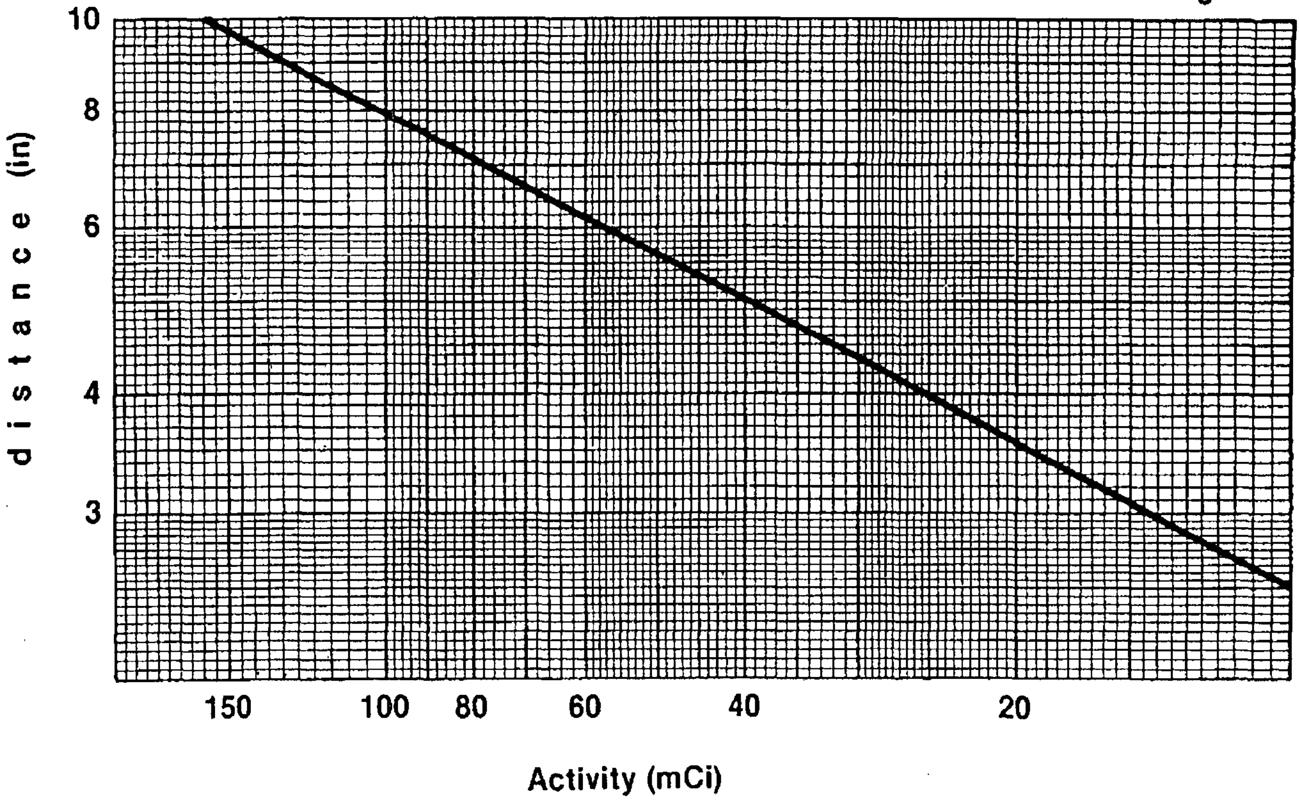


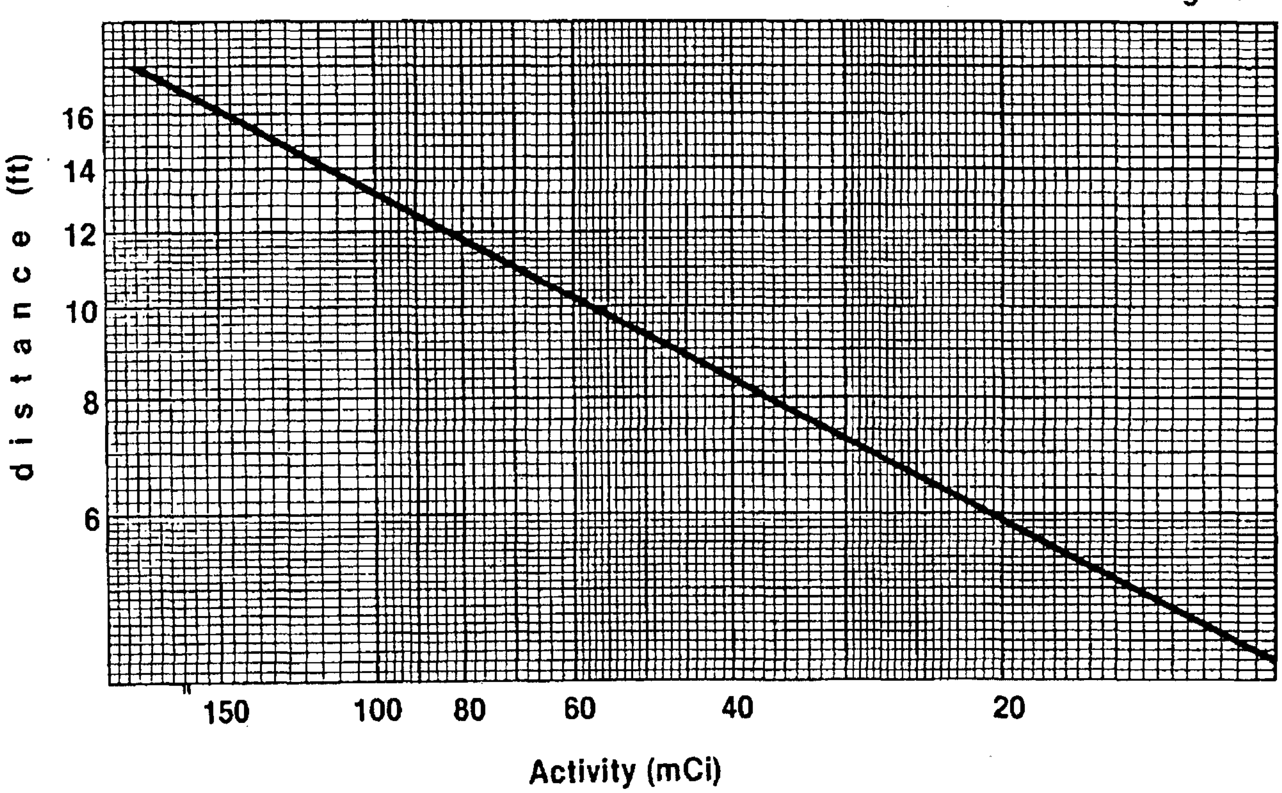
FIGURE 2

Figure 3



Distance to 800mR/hr isodose line as a Function of Activity

Figure 4



Distance to 2mR/hr isodose line as a Function of Activity

HALLIBURTON SERVICES

GOVERNMENT REGULATIONS DEPARTMENT
RON BECHTEL
Manager
DAN KELLY
Regulatory Specialist

Writer's Direct Dial Number

DRAWER 1431, DUNCAN, OKLAHOMA 73536
Senior Environmental Engineers
STEVE BURFORD
RALPH HOUSER
BILL JONES
Environmental Engineer
JOHN PRESGROVE
Radiation Safety Officers
RICHARD LEONARDI
STEVE HOOK

Halliburton Services wishes to submit the following proposal regarding the use of self-reading pocket dosimeters as a primary personnel monitoring device for those employees that are only occasionally exposed to sources of radiation for short periods of time.

Halliburton is currently utilizing TLD personnel monitoring provided by NSSI during routine use of radioactive tracers. Any employee who routinely handles radioactive material is provided and required to wear a TLD device. However, on occasion, a situation may arise involving the transport, or the limited handling of radioactive material at a location where all TLD monitored employees are either on a current job location or obligated for a number of reasons. This infrequent situation creates an unnecessary burden on the local Halliburton field camp during their routine field operations. This situation may involve costly job delays and/or individuals that must travel several miles in order to provide a TLD monitored employee to merely transport radioactive material to a job location or to another Halliburton field camp.

Halliburton requests the Agency's consideration on the following proposal for the use of self-reading pocket dosimeters in lieu of the TLD for personnel who would on occasion transport and/or handle radioactive tracer. The above mentioned occasional user would be instructed in Halliburton's Operating and Emergency Procedures and be trained in the use of radiation survey equipment and have in his possession the following:

1. "Emergency Procedures" in case of an accident and including an Emergency Telephone Number Call List.

2. Completed "Halliburton Shipping Manifest".

3. Appropriate radioactive material receipt, transfer, or disposal record.

4. Current "Vehicle Survey".

5. Recently calibrated survey meter.

The use of self-reading pocket dosimeters under the above conditions would necessitate a quality assurance program to insure the accuracy and operational integrity of each pocket dosimter. Halliburton proposes that each pocket dosimeter in use to be calibrated on a six month interval with a leak rate and calibration/response test being performed with a record of calibration being on file for inspection by the Agency.

Please find the following enclosed documents:

1. Pocket dosimeter User Procedure "Self-Reading Dosimeter Use".

2. "Pocket Dosimeter/Accuracy and Leak Test" procedure.

3. Halliburton's in-house "Daily Dosimeter Reading" report.

4. Copy of TRCR 21-3 form for transcription of quarterly exposure from above item #3.

5. Copy of Halliburton's in-house pocket dosimeter calibration certificate.

Halliburton submits the above procedure for your consideration. Let me reemphasize the intent of Halliburton to use the self-reading pocket dosimeter as a primary personnel monitoring device only on a limited basis and during occasional situations involving limited transport/handling of radioactive material. Halliburton will continue to utilize the TLD monitoring device for all employees routinely handling radioactive material.

Please feel free to contact me regarding any questions you might have.

Sincerely yours,

Richard A. Leonardi

Richard A. Leonardi
Radiation Safety Officer

Enclosures
RAL/sjh

SELF-READING DOSIMETER USE

PURPOSE:

This procedure describes the wearing, handling, and reading of self-reading pocket dosimeters.

PRINCIPLES:

The self-reading dosimeter provides a quick, reasonably accurate and simple method of keeping accumulated radiation dose of individuals working in various levels of radiation fields. The field will determine what range of dosimeter must be worn, generally falling into three categories: 0-200MR, 0-500MR, 0-1000MR, or combination of these three. The dosimeter reading is noted before entry into the radiation area, and upon exit. The difference is the amount of radiation dose the individual received during that work.

EQUIPMENT NEEDED:

- o Victoreen and /or Dosimeter Corporation of America (DCA) self-reading dosimeters of approriate range with valid calibration sticker.
- o DCA Charger/Reader.
- o "Daily Dosimeter Reading" form.

PRECAUTIONS:

- o Insure proper range dosimeter with valid calibration sticker in use.
- o Wear dosimeter on upper trunk of body and cluster dosimeters when used in conjunction with other dosimeters, film badges, or TLD badges.
- o Handle carefully to avoid dropping, which may result in erroneous reading.
- o Exercise care in handling dosimeter to avoid contamination from gloves.

PRECAUTIONS continued...

- o Immediately report any lost, or off scale dosimeters to appropriate personnel.

USER INSTRUCTIONS:

1. Obtain properly calibrated and appropriate range dosimeter as instructed.
2. Zero dosimeter using charger/reader, or align hairline on scale at lower end of scale.
3. Follow charging instructions as posted on dosimeter charger/reader.
4. Read to the nearest half of the small division.
5. Record the initial dosimeter reading on the "Daily Dosimeter Reading" form.
6. Check and read the dosimeter often while in the radiation area. When in a Beta radiation field, the dosimeter should be clipped and taped on the outside of your clothing or Anti-C clothing for correct recording of exposure and ease of reading. If the dosimeter is off-scale, immediately leave the controlled area and report to appropriate personnel.
7. Report any defective dosimeters to approproate personnel.
8. For any dosimeters which go off-scale, the assigned dose received by an individual shall be determined by the Radiation Safety Officer after consultation with the exposed individual and any knowledgeable person involved.

POCKET DOSIMETER ACCURACY/LEAK TEST

PURPOSE:

This procedure describes the method used to check the accuracy of various ranges of self-reading pocket dosimeters.

PRINCIPLE:

Several dosimeters of a given range are irradiated at a predetermined distance for a known time from a gamma source. The dose rate at this distance was determined by using a R-Meter whose calibration is traceable to NBS. After being exposed to a known dose, the dosimeters are checked for proper accuracy. In addition, the dosimeters are set aside in a radiation free location for 24 hours to check for drift.

NEEDED EQUIPMENT:

- o Instrument Calibration - Tech/Ops Model 773
  CS-137@ [redacted] @ on 6-29-83 EX 4, 7F
  Souce S/N S-433
  Output).0522 r/hr. @ 1 meter

- o Victoreen Condenser R-Meter Model 570

- o Dosimeter Calibration board w/geometric jig for instrument calibrator

- o Documented dose rate from calibrator to dosimeters

- o Various range pocket dosimeters

- o "Dosimeter Test Record"

- o Stop watch accurate to the nearest .01 second

PRECAUTIONS:

- o Use normal precautions utilizing the Tech/Ops calibrator.

- o Personnel monitoring required.

PRECAUTIONS continued...

- o The drift check (leak test) may be performed prior to or at the completion of the accuracy test.

LIMIT VALUES:

- o Accuracy test result should be within -10% to +20% of the true exposure.
- o Leak test result should not exceed ±10% of full scale during a 24 hour period.
- o All dosimeters calibrated on 6 months interval.

USER INSTRUCTIONS:

Drift Test

1. Zero dosimeters to remove static charge.
2. Record serial numbers and initial reading on record form.
3. Place dosimeters in a low background area and allow to sit for 24 hours.
4. Record the 24 hour reading, then calculate the difference and per cent error.

Accuracy Check

1. Record initial reading, then place dosimeters on calibration jig.
2. Expose one range at a time and exposure long enough to give a reading of 2/3 to 3/4 of scale range.
3. Stop exposure and record final reading. Calculate difference and per cent error.
4. Following completion of drift and accuracy test, place a dated calibration sticker on each dosimeter.
5. Complete a "Pocket Dosimeter Test Record" form on each dosimeter tested.

HALLIBURTON SERVICES

DAILY DOSIMETER READING

NAME SOCIAL SECURITY # DATE OF BIRTH	DATE		DOSIMETER SERIAL NUMBER	DOSIMETER READING IN MREM		TOTAL DOSE REC'D
				START	FINISH	
	MONDAY					
	TUESDAY					
	WEDNESDAY					
	THURSDAY					
	FRIDAY					
	SATURDAY					
	SUNDAY					
					TOTAL DOSE RECEIVED	

PERSON COMPLETING REPORT ______________________

DATE ________________

TRC FORM 21-3 NO BLANK VRC-3 FORMS AVAILABLE AT TIME OF APPLICATION
(77)

Texas Department of Health

CURRENT OCCUPATIONAL EXTERNAL RADIATION EXPOSURE

(See Instructions)

Identification

1. NAME (Print--Last, First and Middle)	2. SOCIAL SECURITY NO.
3. DATE OF BIRTH (Month, Day, Year)	4. NAME OF LICENSEE OR REGISTRANT

Occupational Exposure

5. DOSE RECORDED FOR (Specify: Whole body; skin of whole body; hands and forearms; feet and ankles).	6. WHOLE BODY DOSE STATUS (rem)	7. METHOD OF MONITORING (e.g., Film Badge--FB; Pocket Chamber--PC; Calculations--Calc.) X or GAMMA ______ BETA ______ NEUTRONS ______

8. PERIOD OF EXPOSURE (From--To)	Dose for the Period (rem)				13. RUNNING TOTAL FOR CALENDAR QUARTER (rem)
	9. X or GAMMA	10. BETA	11. NEUTRON	12. TOTAL	

Lifetime Accumulated Dose

14. PREVIOUS TOTAL (rem)	15. TOTAL QUARTERLY DOSE date rem	16. TOTAL ACCUMULATED DOSE (rem)	17. PERM. ACC. DOSE 5(N-18) (rem)	18. UNUSED PART OF PERMISSIBLE ACCUMULATED DOSE (rem)

HALLIBURTON SERVICES
DRAWER 1431 DUNCAN, OKLAHOMA 73533

DEPARTMENT OF GOVERNMENT REGULATIONS
RON BECHTEL
Manager
Writer's Direct Dial Number

POCKET DOSIMETER TEST RECORD

DOSIMETER RANGE: ______________________

Leak Test Limits	Accuracy Check Limits
± 10 % of FULL Scale	- 10% TO + 20% Of EXPOSURE

EXPOSURE = (mR/hour) (hours exposed) = ______________________ mR.

TIME OFF: __________ DATE OFF: ______________

TIME ON: __________ DATE ON: ______________

HOURS EXPOSED = __________ hours

* For Co^{60} Source use 5.26 Years, for Cs^{137} Source use 30.2 Years

***********	LEAK TEST				SOURCE TEST				*************
SERIAL NUMBER	READINGS ON	READINGS OFF	DELTA READING	% +or-	READINGS ON	READINGS OFF	DELTA READING	% +or-	REMARKS

COMPLETED BY: ______________________________

ATTACHMENT #5

The Halliburton Services Research Center, Duncan, Oklahoma has committed laboratory module, number B311 to serve solely for radioactive research. This module houses the Canberra Multichannel Analyzer with the shielded NaI detector system. A Ludlum Model 2200 Scaler with a Model 44-9 Pancake GM Probe for portability is also maintained at this site. The two fume hoods systems were manufactured by Kewanee. One is an eight (8) foot hood with a 1440 cfm face velocity, the other a six (6) foot hood with a 1070 cfm face velocity.

Anticontamination clothing including, boot covers, zip front coveralls, gloves and hoods are furnished for personnel as needed. Posi-Grip tong 30", 36" and 42", are available. Respirators with disposable charcoal filters are available as needed.

The attached drawings or sketches of the RAYFRAC® Manufacturing area and the RAYFRAC® building.

(b)(4)

(b)(4)

STEPHEN EARL HOOK

(b)(6)

Ex 6

Education:

Southeastern Louisiana University - (b)(6)
B. S. Biological Sciences, Secondary Education

Employment History:

October 1983 - Present	Radiation Safety Officer Halliburton Services
Present Duties:	All aspects of Radiation Safety including handling, use, transportation, and training. Duties also include periodic internal inspections and investigations when needed.
June 1975 - October 1983	Health Physicist Louisiana Nuclear Energy Division
Duties Included:	Supervision of Radioactive Material Program which included both licensing and inspection. Assisted in the coordination of a statewide regulatory program.

Continuing Education Training Courses:

December 1975, "Advanced Medical X-Ray Inspection Procedures", (one week), Baylor Medical School, Houston, Texas

February 1976, "Health Physics and Radiation Protection", (ten weeks), Oak Ridge Associated Universities, Oak Ridge, Tennessee

January 1977, "Gas and Oil Well Logging for Regulatory Personnel", (one week), Schlumberger Well Logging Services, Houston, Texas

May 1977, "Industrial Radiography for State Regulatory Personnel", (one week), Louisiana State University, Baton Rouge, Louisiana

July 1977, "Medical Uses of Radionuclides for Regulatory Personnel", (one week), Baylor Medical School, Houston, Texas

June 1978, "Inspection Procedures", (one week), Nuclear Regulatory Commission, Region 3, Glen Ellyn, Illinois

August 1978, "Medical X-Ray Quality Assurance", (one week), Bureau of Radiological Health, Rockville, Maryland

September 1979, "Orientation to Regulatory Practices", (two weeks), Nuclear Regulatory Commission Headquarters, Silver Springs, Maryland

August 1980, "Radiation Protection Engineering", (one week), Oak Ridge Associated Universities, Oak Ridge, Tennessee

April 1981, "Verification Measurements on Cobalt-60 Irradiators", (three days), M. D. Anderson Hospital and Tumor Institute, Houston, Texas

May 1981, "Radiological Emergency Response Course", (ten days", Reynolds Electric Company, Las Vegas, Nevada

April 1983, "Nuclear Power Plant Off-Site Radiological Accident Assessment" (one week), Federal Emergency Management Administration, Portland, Oregon

Invited Presentations:

"Inspection Procedures", NRC Industrial Radiography Course Inspectors, Louisiana State University, June 1979

"Industrial Radiography Regulations and Licensing", NRC Industrial Radiography Course for State Inspectors, Gamma Industries, Baton Rouge, Louisiana, June, July, August, 1982

"Radiographer Certification and Testing", Non-Destructive Management Association Annual Meeting, Las Vegas, Nevada, February 1982

"Industrial Radiography and Well Logging Inspection Procedures", NRC Inspection Procedures Course for State Inspectors, Atlanta, Georgia, July & August, 1982 and August, 1983

"Industrial Radiography Licensing Procedures", NRC Orientation to Regulatory Practices, Bethesda, Maryland, September 1982 and September 1983

"Contamination in the Oil Field with Ir-192", Bureau of Radiological Health, Region IV Meeting, Shreveport, Louisiana, October, 1982

STEPHEN EARL HOOK
(continued)

Publications:

A Survey of the Uses of Radioactive Materials in Louisiana's Offshore Waters, NUREG/CR-3516, Co-Author, November 1, 1983.

Professional Organizations:

Health Physics Society
Deep South Chapter, Health Physics Society
Conference of Radiation Control Program Directors, Inc.

Military Service:

(b)(6) [redacted]

Ex 6

RUSUME' OF DANNY G. KELLY

EDUCATION: Southwestern Oklahoma State University, Weatherford, Oklahoma, BS, Chemistry, (b)(6)

Ex 6

Received extensive instruction and information on radiation, health safety, isotope applications, etc. from Mr. R. George Mihram, Radiation Safety Officer during the years 1964, 1965 and 1966.

EXPERIENCE: 1955 - 1962: Analytical Chemist, Analytical Section, Chemical Research and Development. Duties included such activities as:

Mineral identification and analysis by Petrographical microscopic and x-ray diffraction techniques.

Chemical analysis and development of analytical procedures for ferrous and non-ferrous metals.

Chemical analysis of waters, brines and aqueous effluents, such a chemical plant effluents, mine waste water, etc.

A member of an API Water Study Committee with the purpose of developing, establishing and recommending analytical procedures for oil field brine analysis 1958 - 1968.

1963 - 1965; Development Chemist
Analytical procedures development for chemical and physical testing of crude oils and refined petroleum products.

Development of analytical procedures for quality control and chemical monitoring of industrial cleaning chemicals and solvents.

Evaluation of isotope concentration and gamma logging equipment made for fracture model study.

Received extensive training in the actual use of radioisotopes in field activities. This included the use of RAYFRAC proppants, RAC-2 and RAC-3, mixing, blending, displacement into the formation, and health safety surveys upon completion of the operations.

1965 - 1974, Group Leader; General Analytical Group, Chemical Research and Development. Duties include all supervision of such activities as:

Those stated above.

Instrumental methods of analysis and procedure development including:

Atomic Absorption Spectroscopy
Infrared Spectroscopy
Gas Chromatography
X-ray Diffractometry
Scintillation Counting Equipment

Radioactive research and field service activities. Research included such projects as:

Evaluation of isotopes and techniques for tracing of waterflood systems.

Chemical cleaning and decontamination of nuclear reactors. This involved the selection of a chemical solvent as well as treatment and disposal of the chemical waste.

1974 - 1976; Radiation Safety Officer for Halliburton Services.

Assumed all duties and responsibilities of this office in compliance with NRC Regulations.

1976 - 1978, Manager; Middle East Technical Center, Manama, Bahrain.

Responsible for the supervision of all Technical Center activities for the Middle East Region of Halliburton Limited in Bahrain. Provided technical testing and advisement with all products and services of Halliburton.

1978 - 1979, Research Chemist with project assignments of solvent system development for decontamination of the primary side of heat exchange in nuclear reactors.

Responsible for compiling and writing analytical procedures for monitoring chemical solvents designed to remove water formed and corrosion products from industrial equipment. Writing and designing technical data sheets for Halliburton Services products and processes used in chemical cleaning of industrial and process equipment.

1980 - Present - Radiation Safety Officer; Regulatory Specialist in the Government Regulations Department of Halliburton Services, Duncan, Oklahoma.

April 14 - 18, 1980 - Attended the "Radiation Safety Specialist Training Program" conducted by Oklahoma State University, Howard M. Johnson, Ph.D., Instructor.

Thorough knowledge of CFR, Titles 10 and 49 and all Agreement States regulations governing radiation control. Responsibilities include preparation of license applications for new radioactive material license as well as license renewal.

Develop procedures and techniques for inventory control of radioactive material for more than 200 District Camps within the USA, to assure compliance with NRC and Agreement States regulations.

Conducting of Radiation Safety Training Schools throughout Halliburton Services domestic operations:

The schools are designed to give field personnel a thorough understanding and knowledge of basic applied physics, the actual field handling and use of radioisotopes, and radiological health surveys of location and personnel for health safety. Primarily those receiving instruction are graduate engineers for Halliburton Services field operations.

Compiled and edited the "Radiation Safety Manual" used by Halliburton Services and Halliburton Industrial Services, Inc., both Halliburton Companies.

Provide health physicist advise, instruction, remote handling devices, protective clothing, survey and measuring equipment for all field locations as well as X-ray inspection personnel and nuclear reactor decontamination teams.

Maintain all records relating to procurement, storage, transport, usage, waste disposal and applications of radioactive materials for both domestic and international operations.

Consultation with Research for product, process and equipment development and design relative to nuclear facility decontamination and oil field tracer services.

Advisement to field service Engineering for tracer applications including isotope and equipment selection on routine and speciality processes as well as consultation with customers for tracer sales and speciality processes employing radioactive materials.

Qualifications of Texas Radiation Control Personnel
Texas Department of Health

Richard A. Leonardi, Jr. (b)(6) [redacted]

Office phone: 214-593-6142

A. Formal Education: (b)(6) [redacted]

- -Grayson County Junior College, 64 hours
- -University of Texas at Arlington, 13 hours
- -Texas Christian University, 28 hours
- -Southeastern Oklahoma State University, B.S. Degree, Biology and Chemistry, (b)(6) [redacted]
- -Health Physics and Radiation Protection Course, February (b)(6) [redacted] Oak Ridge Associated Universities, Oak Ridge, Tennessee, 10 weeks
- -Tyler Junior College, Petroleum Technology, currently enrolled

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B. Short Courses:

U.S. Army Course:

2-week Medical X-ray Survey Techniques

Nuclear Regulatory Commission Courses:

1-week Medical Use of Radionuclides for State Regulatory Personnel
1-week Inspection Procedures Course
1-week Safety Aspects of Industrial Radiography for State Regulatory Personnel
2-week Radiological Emergency Response Operations Course
2-week Orientation Course on Regulatory Practice and Procedures Course
1-week "Gas and Oil Well Logging for Regulatory Personnel" Course
1-week "Telétherapy Calibration Procedures Course"

Bureau of Radiological Health Courses:

2-week Basic Course for investigators - Diagnostic X-ray Survey

C. Associations:

Member, National Health Physics Society
Member, Health Physics Society, South Texas Chapter
Member, The Texas Public Health Association Association
<u>Registered</u>, Professional Sanitarian of Texas

D. 5½ years as the Administrator of the Radiation Control Branch of the Texas Department of Health, Division of Occupational Health and Radiation Control in Public Health Regions 7 and 10, covering 38 counties in East and Southeast Texas. I have been responsible for the Administration of all compliance activities including routine inspections and special investigations. I have supervised the training of inspection trainees in Regions 7 and 10 on a full time basis. I supervised the training both x-ray and radioactive material inspectors.

Perform radiation detection training for local police and fire department's and demonstrate the proper use, care, and handling of radiation detection instruments.

Have logged over 300 hours of reactor health physics experience as I participated in the initial recovery operation at the Three Mile Island (TMI) nuclear facility from May 18, through June 11, 1979, after the unfortunate accident on March 28, 1979. A month's vacation leave from the Texas department of Health obtained and I joined a private TMI contractor, Nuclear Support toward the recovery efforts in the TMI Auxiliary Building. I worked with several other Health Physicist in operating an access control point leading into the badly contaminated auxiliary building. Duties included:

Performance of routine physical radiation surveys and smear radiation surveys in the auxiliary building.

Supervised the processing and insured that proper safety equipment and Anti-C clothing were being worn by the skilled craft workers going into the airborne contaminated auxiliary building.

Escorted workers and Nuclear Regulatory Inspectors into high radiation area and highly contaminated area within the auxiliary building.

Current Address:

Richard A. Leonardi

(b)(6)

EXPERIENCE SUMMARY

1. Texas Department of Health, Division of Occupational Health & Radiation Control, Tyler, Texas

   5½ years as the Administrator of the Radiation Control Branch of the Texas Department of Health, Division of Occupational Health and Radiation Control in Public Health Region 7 & 10, covering 38 counties in East and Southeast, Texas. I have been responsible for the administration of all compliance activities including routine inspections and special investigations. I have supervised the training of inspector trainees in Regions 7 & 10 on a full time basis. I supervise the training of both x-ray and radioactive material inspectors.

2. Safeway Stores, Inc., Brookside Division Plant (Supply Division), Denison, Texas

   I have served in the capacity as both Plant Chemist and Quality Control Supervisor for the introplant departments of Margarine, Shortening, Dressings, and Household Chemical Plant for Safeway Stores, Inc., Brookside Division, Denison, Texas. I am familiar with all lab equipment, statistical quality control methods, sanitation and all company policies related to an FDA regulated environment.

   I supervised all quality control functions for the Margarine, Shortening, and Household Chemical departments. I was responsible for twelve quality control inspectors on a two shift basis, daliy, weekly, and monthly quality control reports, inspection of raw materials, packaging specifications, formulation, and processing audits, sanitation inspection and report, plus interfacing with upper plant and staff management personnel, including purchasing, industrial engineering, production, accounting, and personnel.

3. Safeway Stores, Inc., Retail Stores (Grand Prairie, Ft. Worth, & Lubbock, Texas)

   I worked in four different Safeway Stores as a heavy duty checker--stocker during my college undergraduate work.

4. Summit Oaks Achievement Center, Laneville, Texas

   Summit Oaks is a state licensed private treatment center for boys andgirls emotionally disturbed or with maladjusted behavior. I served as a Couselor and later a Senior Child Care Staff member. I coordinated and supervised recreational activities and later served as a House Parent for thirty-two children.

Addendum

March 1983 - Present: Radiation Safety Officer with Halliburton Services, Tyler, Texas. Present duties and responsibilities include the entire radiation safety program and management of radioactive materials in twenty Halliburton Districts in the North Texas Area, and Bossier City and Haynesville, Louisiana. Established the radioactive materials management program for Halliburton Districts in the State of New Mexico.

Has thorough knowledge and experience in the oil field service industry.