HARRY DIAMOND LABORATORIES
STANDING OPERATIONAL/EMERGENCY PROCEDURE
BUILDING 504 COBALT-60 SOURCE, ADELPHI, MD

Revision 5, 27 Feb 85

PURPOSE: To insure the radiological safety of personnel using the Cobalt-60 source and to protect the integrity of the source elements.

PROCEDURE FOR IN-POOL IRRADIATIONS:

1. The Cobalt-60 source control room door and maze entry door will be locked at all times, unless the rooms are occupied.

2. There will be two different keys, #1 which unlocks the control room door, and #2 which unlocks the maze entrance door. In addition, the control room door has a high-security hasp and padlock. This high-security hasp and padlock will be unlocked by HDL security guards during working hours, and will be secured otherwise.

3. Keys #1 and #2 will be kept together in a locked key box in building 504 at HIFX. Only the Facility Supervisor, Chief Operator, Alternate Operator, and the HDL Radiation Protection Officer will have the key to the locked container, and thus access to keys #1 and #2.

4. Experimenters (i.e. everyone participating in an experiment) who desire to use the source during normal duty hours (0800-1630) must enter their name and time of entry in the logbook provided for this purpose in the Cobalt Facility Control Room. One member of the experimental group must sign for keys #1 and #2. Keys #1 and #2 will be issued at Bldg. 504, HIFX by one of the four persons identified in paragraph 3, above. Upon completion of their experiment, he must return the keys to Bldg. 504 and sign out. Under no circumstances may the keys be removed from the immediate vicinity of the Bldg. 500/504 complex. This sign out procedure also applies to lunch breaks and short trips to the HDL main complex. Experimenters who remove the keys from the Bldg. 500/504 area, even for short periods of time, will be removed from the list of authorized experimenters.

5. If an experimenter desires to work later than 1630, he will so notify the HDL guard office (X41100) before 1600. The security guard will then take the Cobalt-60 logbook to the HDL guard office when he locks up Bldg. 504. Upon leaving Bldg. 504 for the night, experimenters will sign out and leave the keys and their film badges at the HDL guard office. The security guard will return the keys, the logbook, and the film badges to Bldg. 504 the next morning.

6. If an experimenter desires to work earlier than 0800 or work on weekends he will so notify the HDL guard office before 1600 of the previous working day. The security guard will then take the keys, the logbook and the experimenter's film badges to the HDL guard office when he locks up Bldg. 504. When the experimenter comes in he will log in at the HDL guard office. The security guard will return the logbook to Bldg. 504 when he unlocks it before 0700.

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7. Experimenters must wear a film badge while they are in the cobalt-60 Facility.

8. At least two persons must be in the Facility when a task requires working around the pool with one or more of the three major grating sections removed. Guard rails will be in place during any such operation.

PROCEDURE FOR FREE-AIR IRRADIATIONS:

1. Free air irradiations will only be undertaken by the following persons:

Facility Supervisor
Chief Operator
Alternate Operator
HDL Radiation Protection Officer

2. Two keys are required to perform free air irradiations: Key #3 which activates the console power, and Key #4 which activates the reset station and controls source elevator motion. There will be only one set of Keys #3 and #4. They will be kept in a locked key box in the Cobalt Facility Control Room. The only persons who will have access to this key box will be the Facility Supervisor, the Chief Operator, the Alternate Operator, and the HDL Radiation Protection Officer.

3. Two people must be present in the Facility whenever sources are moved around in the bottom of the pool. This specifically includes moving sources onto or off the source elevator. One of the people will have a calibrated ionizing radiation detection monitoring instrument to ensure that a hazardous condition is not created by source manipulation procedures.

4. Prior to raising the source elevator, the operator will visually inspect the irradiation room to insure that it is unoccupied. He will then activate the reset switch with Key #4, go out through the maze, and close the maze entrance door.

5. The operator may then raise the source elevator at his convenience, observing the T.V. monitor and control room Remote Area Monitor (RAM) #1. If he detects any unsafe condition such as mechanical interference with source elevator movement or an increase in the radiation exposure rate on RAM #1, he will immediately lower the source elevator.

6. The operator must be in attendance in the control room for the entire time the elevator is raised.

7. After the termination of each free-air irradiation procedure the operator will enter the exposure room with a calibrated ionizing radiation monitoring instrument and determine that no radiation hazard exists before any other personnel are allowed to enter.

8. Any malfunction shall be reported immediately to the HDL Radiation Protection Officer and to the Facility Supervisor.

PROCEDURE FOR OPERATING ELEVATOR FROM COBALT-60 ROOM:

1. Two persons are required to operate the source elevator in the in-cell operating mode.

2. Both persons must visually verify that there is no source element on the elevator platform.

3. When ready to raise the elevator, one person will stand by the pool with a monitoring instrument to detect any increase in the ionizing radiation level while the second person energizes the elevator control.

4. When the elevator is fully raised and it has been verified that there has been no increase in the radiation level, one of the operators may work on the elevator platform while the other operator holds the key switch.

AUTHORIZED EXPERIMENTS:

1. All experiments involving use of the Cobalt Facility must be reviewed and approved by the HDL Radiation Control Committee in accordance with the procedures set forth in HDLM 385-20, Paragraph 11.

2. Irradiation of the following classes of materials is strictly prohibited:

a. Explosives or Flammable Liquids
b. Corrosive materials
c. Any material which could violate the integrity of the source pencil encapsulation.

3. Manipulation of source elements by experimenters is strictly prohibited.

AUTHORIZED EXPERIMENTERS:

1. All experimenters must be supervised by employees of Harry Diamond Laboratories. Non HDL experimenters must have a film badge and an HDL security badge.

2. All experimenters must be approved (once only) by one of the following:

Facility Supervisor
RPO
Alternate RPO

A list of the approved experimenters will be maintained with the Cobalt-60 source logbook.

EMERGENCY PROCEDURES:

1. Panic Button for Emergency Shutdown: Because of the completeness of the procedures and controls outlined above, it is extremely unlikely that an individual would be "overlooked" and the sources raised with the individual in the test cell. But the possibility does exist, as evidenced by the placement of the horn, beacon, and emergency shutdown panic button in the exposure room. In the unlikely event that an experimenter is in the exposure area and hears the horn and sees the magenta beacon rotating, the sources are about to be raised. The source elevator can be instantly disabled by depressing one of the red panic buttons designated as EMERGENCY/SHUTDOWN. One of these switches is located in the exposure room next to the pool, and the other in the entrance maze. The sources begin their ascent 15 seconds after the horn begins sounding, so in the event the horn starts sounding, action must be taken immediately. If an experimenter opts to quickly leave the area without striking the EMERGENCY SHUTDOWN at the pool, he can deactivate the system by opening the maze door, or striking the EMERGENCY SHUTDOWN at the maze entrance. If the experimenter can not reach the EMERGENCY SHUTDOWN at the switch at the pool within a few seconds of the horn beginning, the experimenter should vacate the area for the maze entrance door or EMERGENCY SHUTDOWN switch.

2. Major Emergencies:

a. TYPES: Fire or other hazardous condition.
Continuous actuation of radiation alarms.
Abnormal pool water level.

b. RESPONSE: Evacuate the Cobalt Facility immediately.
Report the nature and location of emergency to the HDL Guard Office (X-41117).
Assemble in Bldg. 504 parking lot.

3. Other Emergencies:

a. TYPE: Object dropped into pool.

b. RESPONSE: Notify Facility Supervisor (X-42290).

4. Use of the Facility shall not resume until the cause of the emergency condition has been determined and corrected to the satisfaction of the HDL Radiation Control Committee.

PREPARED BY: [signature]
KLAUS G. KERRIS, Facility Supervisor

APPROVED BY: [signature]
KLAUS G. KERRIS, Chief (A), Br. 22900

[signature]
MICHAEL BORISKY, RPO, HDL

REVIEWED AND APPROVED BY RCC: 27 Sept 84 (DATE) [initials] (INITIALS)

WEEKLY CHECKLIST

HDL Cobalt-60 Facility
Bldg. 504

1. Verify the status of the following systems:

System Air Pressure:		Air psig
Console Power:		ON ✓
RAM Power	- Ram 1:	ON ✓
	- Ram 2:	ON ✓
	- Ram 3:	ON ✓
Tank-O-Meter	- Air Flow:	ON ✓
	- Water Level:	Water inches

2. Circulating Pump: — ON ✓

Check condition of sediment filter by measuring inlet and outlet pressure. Replace filter if pressure drop exceeds 15 psi.

IN psig
OUT psig
Drop psi

Check [illegible]e-up wat[illegible] deionizer. Replace if Io[illegible]ilite is on.

Lite OFF ✓
Replace ✓

Check pool water resistivity at inlet and outlet of deionizer tanks. Inlet resistivity should not be less than .05MΩ - cm.

IN MΩ·cm
OUT MΩ cm

3. Press UPSCALE button on each RAM in turn. Verify proper functioning of audible and visual alarms.

RAM1 ✓
RAM2 ✓
RAM3 ✓

REMARKS:

MONITOR'S NAME: ____________________

DATE ____________

ANNEX 6-D

PERIODIC MAINTENANCE SCHEDULE
COBALT-60 FACILITY
HDL BLDG. 504

Checked (Initial)

I. ADJUSTMENTS

A. Quarterly

1. Check elevator air system pressure. Adjust to 10 psi greater than that required to lift the required maximum elevator load. ☐

2. Adjust the descent speed valve to limit elevator descent speed when fully loaded. ☐

3. Adjust the ascent speed valve to limit elevator ascent speed with no load. ☐

B. Semiannually

1. Turn off pool water supply valve. ☐

Check trip settings on pool level gauge switches by isolating level gauge from pool and pressurizing it. Switch trip settings should be as follows:

a. High water level alarm:	actuation point:	139	inches	☐
b. Fill valve:	actuation point:	137	inches	☐
c. Pump cutout switch:	reactuation point:	134	inches	☐
d. Low water level alarm:	reactuation point:	133	inches	☐

Adjust all switches to within ± 1 inch.

Turn pool water supply valve back on. ☐

2. Check the console timers for proper functioning and time delay setting. Adjust or replace as necessary. ☐

II. PREVENTIVE MAINTENANCE

A. Quarterly

1. Oil all elevator drive pulleys (except submerged) with light machine oil. ☐

2. Check ethylene bottle reserve and replace if necessary. ☐

3. Check annunciator and interlock system for proper operation in all modes. Replace defective components as required. ☐

4. Inspect entire elevator cable for signs of wear. ☐

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B. Annually

1. Remove air pressure regulator dust and oiler bowls in elevator air control system. Clean bowls and refill oiler bowl with clean oil. ☐

2. Measure the insulation resistance of the dummy control wire in the cable tray. If this wire has less than $1X10^7$ ohms resistance to ground, check all control wires and replace those which are less than $1X10^7$ ohms to ground. ☐

3. Visually inspect wire insulation in cable trays for radiation damage such as brittleness or crumbling in insulation. Replace all defective wiring. ☐

III. REMARKS:

CHECKED BY: ____________________

DATE: ____________________

PERIODIC CALIBRATION SCHEDULE/PROCEDURES

COBALT-60 FACILITY

HDL BLDG. 504

I. CALIBRATION OF REMOTE AREA MONITORS

A. There are three remote area monitors in Building 504. RAM 1 is located in the control room. It has a 4-decade logarithmic meter calibrated from 0.1 mR/hr to 1R/hr. RAMs 2 and 3 are located in the exposure room. They have 5-decade logarithmic scales calibrated from 1.0 mR/hr to 100 R/hr.

B. All RAMs must be calibrated quarterly, following the calibration instructions given in the NMC Model GA-2T instruction manual with the following exceptions and additions:

1) The only function of RAMs 2 and 3 is to detect radiation levels which are significantly above background. It is therefore not necessary to calibrate them over their entire meter range. RAMs 2 and 3 will be calibrated from 0.1mR/hr to 1R/hr. A label will be affixed to RAMs 2 and 3 stating that they are uncalibrated above 1R/hr.

2) All three RAMs have a remote meter readout at the control console. These remote meters are to be included in the calibration procedure.

C. At the same time the RAMs are calibrated, high radiation alarm trip points should be set as follows:

RAM 1:	2.5 mR/hr
RAM 2:	20. mR/hr
RAM 3:	20. mR/hr.

D. The calibration and alarm adjustment procedures are attached.

II. CALIBRATION OF OZONE MONITOR

A. A Bendix Ozone Detector, Model 8002 is installed in the control room. This unit continuously measures the ozone concentration in the exposure room during in-air-irradiation procedures. A sampling tube, extending from the unit to a location adjacent to the source elevator, provides the unit with a representative sample of exposure room air. The detector analyzes the air sample and displays results which lie within a 0.01 to 1.0 PPM O_3 range.

B. This detector must be calibrated semiannually, following the calibration instructions given in the Bendix Ozone Detector, Model 8002 instruction manual with the following additions:

1) The remote meter readout at the control console reproduces the reading displayed at the detector unit. This remote meter is to be included in the calibration procedure.

ANNEX 6-F

2) The high ozone alarm trip point should be set at 0.1 PPM. Therefore, adjust the "range switch" on the ozone detector and the red pointer on the remote meter readout at the control console to 0.1 PPM.

C. The calibration and alarm adjustment procedure for the ozone detector is attached.

CALIBRATION PROCEDURE

To calibrate the Model GA-2TO, the following steps should be followed:

A. Four-Cycle Scale (RAM 1)

1. Before turning on the instrument mechanically reset the indicating meter to mechanical zero by means of the adjusting screw on the meter face. <u>Note</u>: If external recorder is used, it must be connected during calibration.

2. Refer to the diagram showing location of controls before making any adjustment. Turn on the instrument and allow 30 minutes to elapse before making any test except to adjust the regulated B+ to 13.4V DC. <u>Notes</u>: Probes that have just been assembled must be allowed to set 15 hours before attempting to calibrate.

3. Turn artificial background control counterclockwise until it rests against stop. The artificial background control, when advanced clockwise, provides a small amount of current to flow through a #344 lamp, located at the photo-cathode surface of the 4856 tube, to keep the lamp dimly lighted. The lamp provides the up-scale reading in addition to providing an up-scale check of the instrument operation.

4. Connect a high voltage meter (negative to the violet stand-off located on the probe amplifier, positive to gnd) and observe the drop in high voltage when a source corresponding to the lowest indicated level is applied to the probe. This drop should be 80 to 120 volts.

5. Four adjusting points are used to calibrate a 4-cycle GA-2T : a ceramic otentiometer which is used for level shifting, and three color-coded potentiometers, which are:

brown	-	lowest indicated level adjustment	(0.1 mR/hr)
red	-	third cycle adjustment	(10 mR/hr)
orange	-	fourth cycle adjustment	(1 R/hr)

6. Present a 0.1 mR/hr source to the probe and adjust the brown pot until the meter reads correctly.

7. With a 10 mR/hr source, adjust the red pot for the proper meter value.

8. Using a 1R/hr source adjust the ceramic pot for a meter reading of about 1/4" up-scale from the 1R/hr point.

9. Using the orange pot adjust for 1R/hr meter reading.

10. Repeat steps 7 and 9 until correct calibration is achieved.

11. Repeat steps 6, 7 and 9.

12. Check the calibration of the 1 mR/hr and 10 mR/hr points. If these points read too high repeat steps 8, 9, 10, 11 and 12. If the first and second cycle points read too low, then turn the ceramic pot counterclockwise a very small increment. Using the orange pot and a 1 R/hr source, set the meter on the correct reading. Repeat steps 6, 7, 9, 10 and 12.

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B. Five-Cycle Adjustment (RAMs 2 and 3)

1. Same as steps 1-4 on four-cycle adjustment.

2. Using a 10 mR/hr source adjust the brown pot until the meter reads correctly.

3. Using 1 R/hr source adjust the red pot for the correct meter reading.

C. Calibration of Fail-Safe and Alarm System

The following controls are used in the fail-safe and alarm calibration. Refer to the location of the controls diagram before making any adjustment.

1. Alarm limit adjust.

2. Fail-Safe limit adjust.

With no source applied to the photomultiplier tube the fail-safe light will be on.

1. Turn the alarm level pot to 10, the alert level pot to 5 (if one is used), and the fail-safe level pot to zero.

2. Remove any artificial background source if used, or rotate artificial background fully counterclockwise.

3. Push the up-scale check button and hold down.

4. Adjust the up-scale control until the panel meter reads at the beginning of the low end of the meter scale.

5. Rotate the low limit control until the yellow light is lighted. Move the low limit control slowly in the opposite direction until the lamp extinguishes.

6. Turn up-scale check control until the panel meter reads 2.5 mR/hr on RAM 1 or 20 mR/hr on RAMs 2 and 3.

7. Adjust the high limit control until the red lamp extinguishes. Rotate the high limit control slowly in the opposite direction until the red lamp is lighted.

8. Repeat steps 3 through 7 until satisfactory calibration is achieved.

9. Adjust the up-scale check control until the panel meter reads just past full scale.

10. Reposition the artificial background source if used, or turn the artificial background control clockwise until a suitable background reading is obtained.

II. To calibrate the BENDIX Model 8002 Ozone Analyzer, the following steps should be followed:

A. Check the SAMPLE PLUS ETHYLENE flow rate to verify that the flow rate meter indicates 28.5 mm Hg pressure. If necessary, adjust the SAMPLE PLUS ETHYLENE needle valve to obtain the correct flow rate.

B. Place the MODE SELECTOR switch in the ZERO position.

C. Place the TIME CONSTANT SELECTOR switch in the 1 SEC position.

D. Slowly switch the FULL SCALE RANGE SELECTOR switch progressively down scale, allowing the meter to settle at each position, until the switch is in the .01 position.

E. Unlock the ZERO adjustment control and set it for an exact zero indication on the 03 CONCENTRATION meter. Lock the ZERO adjustment control.

F. Place the FULL SCALE RANGE SELECTOR switch to the .5 position.

G. Place the MODE SELECTOR switch to the CALIBRATE position.

NOTE

Wait 15 minutes to allow the unit's ozone generator to stabilize.

H. Unlock the CALIBRATE adjustment control and set it to obtain an 03 CONCENTRATION meter indication of 69.

I. Lock the CALIBRATE adjustment control.

Standard Operating Procedure

For

Use of Nuclear Measurements Corp, Model PC-4

Windowless Proportional Counter

1. Quarterly Calibration Procedure (NRC required)

a. Instrument Operation Check

1. Turn instrument on, allow a few minutes to warm up.

2. SCALER LIGHT TEST. Push button labeled L/T. The scaler should display "8" all the way across. If not, it needs repair.

3. SCALER TEST. Place counter in TEST MODE and run for 1 minute. Should read 3600 at the end of one minute.

4. H-V PLATEAU CHECK. This check is made using a Pb-210 alpha-beta source.

a. Place Pb-210 source in chamber, purge for 30 seconds. Gas presure should read 5-8 psi.

b. Turn high voltage to 300 volts. Make one minute count. Record count.

c. Increase voltage to 400 volts. Take count (Note: following initial purge, further purging is not required between successive counts if drawer is not opened) Record count.

d. Continue increasing voltage in 50 or 100 volt increments, and recording the count observed at each voltage, until full scale on the voltage meter is reached.

e. Plot cpm vs. voltage on linear graph paper. Compare with curve #1 on attached figure 1. Should agree well. If not, instrument may be malfunctioning.

5. OPERATING VOLTAGE DETERMINATION. The operating voltage is taken to be at the midpoints of the plateaus on the curve generated in 4e above. For alpha counting, generally 1000 volts. For alpha and/or beta counting, usually about 1750 volts.

6. BACKGROUND DETERMINATION

a. With chamber empty, at desired operating voltage, and following an initial 30 second purge, make 15 to 20 successive counts. Record the values.

b. Calculate mean and observed standard deviation of the successive counts (sum of squares).

c. Calculate theoretical standard deviation, which equals the square root of the mean.

d. Calculate Reliability Factor.

$$RF = \frac{SD\ obs}{SD\ theo}$$

Compare value to graph on figure 2. It should fall within the P = 0.10 and P = 0.90 curves. If not, instrument may not be functioning properly.

e. Calculate 95% confidence interval for background.

$$95\%\ CI = mean \pm 1.96 \sqrt{mean}$$

7. NUCLIDE EFFICIENCY DETERMINATION

a. Place desired nuclide calibration source in chamber.

b. Following initial 30 second purge, count successively for 15 or 20 counts. Record observed counts.

c. Perform steps 6b through 6d on this data. RF should fall within limits.

d. Calculate efficiency for the nuclide, using the mean value calculated above.

$$\%\ eff = \frac{cpm}{dpm} \times 100$$

e. Calculate lower level of detection (LLD) for each nuclide.

$$LLD = \frac{1.96\sqrt{bkg\ mean}}{nuclide\ efficiency}$$

Note: For high count rates, correction is required for "dead time". In this case, use the following equation to correct observed counts to actual counts.

$$cpm_{actual} = \frac{cpm\ observed}{1-(cpm\ observed)(t_r)}$$

The value of t_r (resolving time) varies with count rate, and is difficult to determine. It is therefore, desirable to calibrate with sources low enough in activity to yield less than 300,000 cpm. Loss at this count rate can be considered insignificant (less than 1%)

f. Compare efficiency to that observed using the same source during previous calibrations. Efficiency should remain within a few percent of previous calibrations with the same source. Failure to remain relatively constant may indicate the counter is developing a progressive problem that must be repaired.

II. Wipe Test Procedure

a. Instrument Operation Check

1. LIGHT TEST. Push LIT button, as in 1a2 above.

2. SCALER TEST. Perform as in 1a3 above.

3. EFFICIENCY/RESPONSE CHECK. Count sources used during efficiency. Compare as in 1a7f above.

b. Background Determination. Perform steps outlined in 1a6 above.

c. Sample Count

1. Count sample. Determine count rate in cpm.

2. Compare to 95% background interval.

3. If count rate within 95% background interval, express test result as less than or equal to the LLD as determined in 1a7e for the particular nuclide.

4. If count rate not within 95% background interval, recount. If recount still outside 95% background interval, express test result as

$$\frac{\text{Sample count rate - mean bkg count rate}}{\text{nuclide eff}}$$

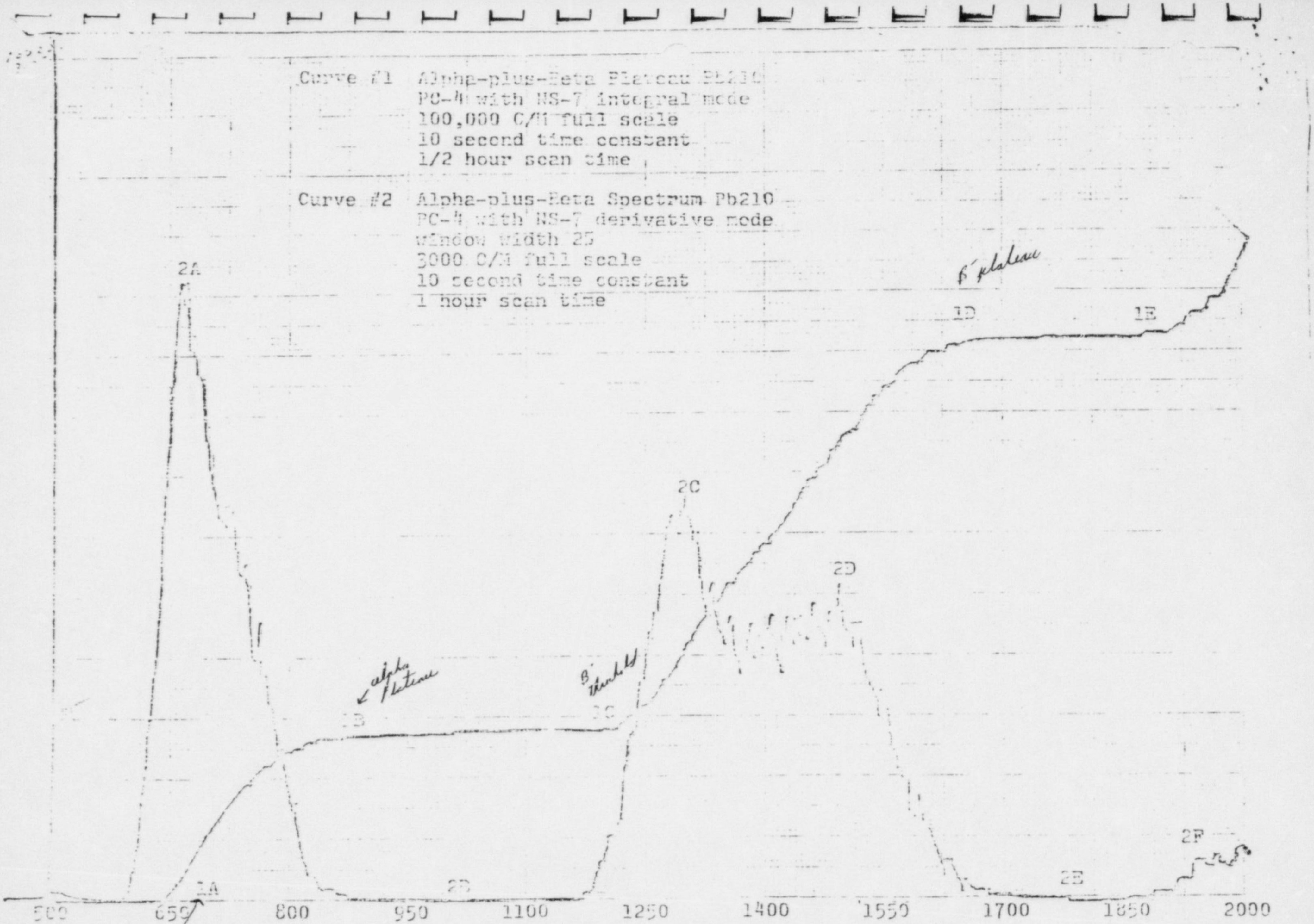

Figure 1

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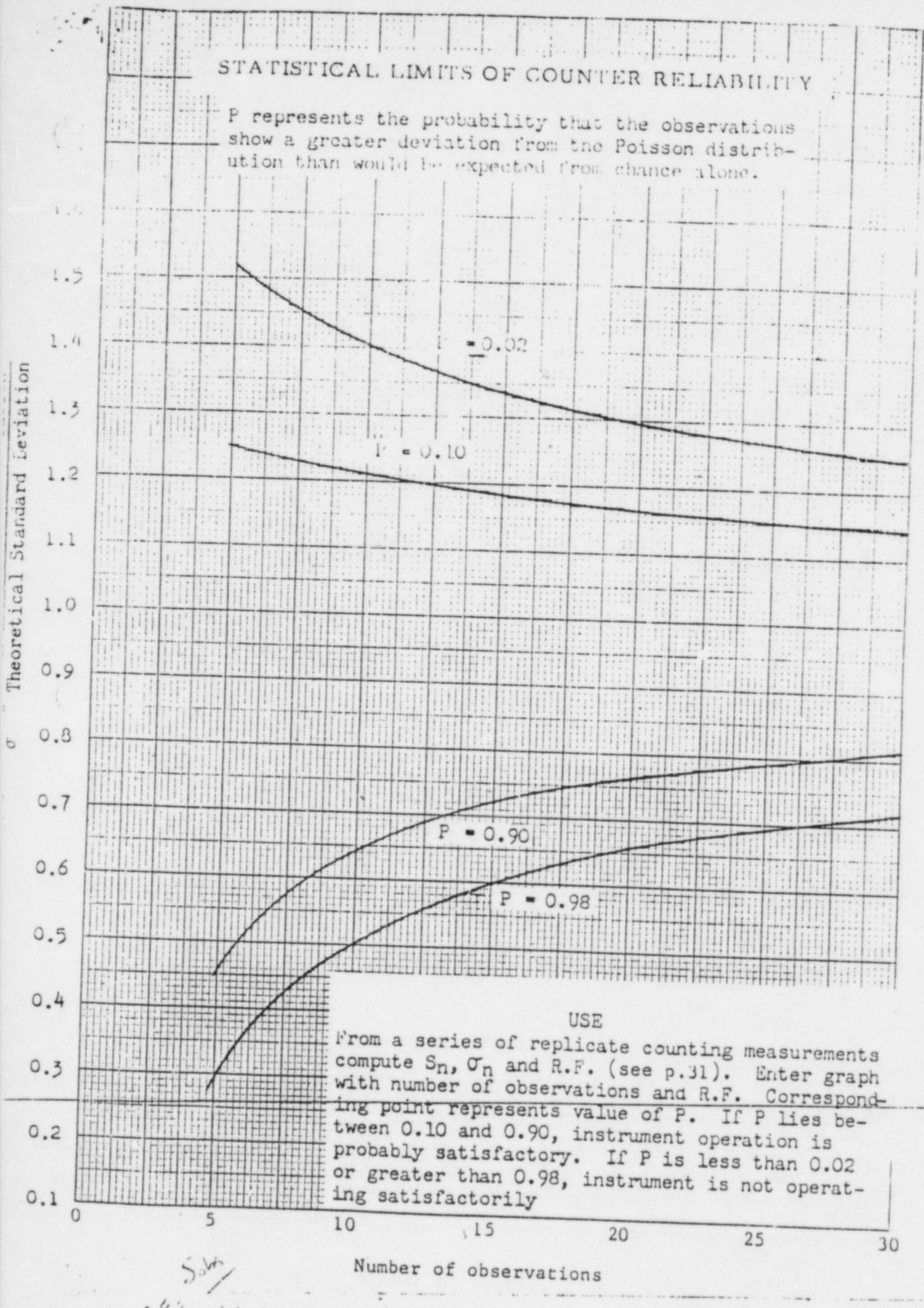
STATISTICAL LIMITS OF COUNTER RELIABILITY
P represents the probability that the observations show a greater deviation from the Poisson distribution than would be expected from chance alone.
P = 0.02
P = 0.10
P = 0.90
P = 0.98
σ Theoretical Standard Deviation
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
5
10
15
20
25
30
Number of observations
USE
From a series of replicate counting measurements compute S_n, σ_n and R.F. (see p.31). Enter graph with number of observations and R.F. Corresponding point represents value of P. If P lies between 0.10 and 0.90, instrument operation is probably satisfactory. If P is less than 0.02 or greater than 0.98, instrument is not operating satisfactorily

LOADING AND UNLOADING PROCEDURE FOR
NPI RADIOACTIVE SHIPPING CONTAINERS

Assuming container is in pool loaded with cobalt-60, the following procedures must be followed in loading tailer and unloading at other end:

1. Lower top cover in place making sure that the gasket is properly in place.

2. Raise top of container to surface of pool, measuring radiation level continuously, and install cover bolts.

3. Raise container completely out of water measuring radiation level continuously and washing outside of container with demineralized water. Should radiation level measure in excess of 5 R/hr at contact, the container shall be lowered back in pool, the cover removed, and enough cobalt removed to lower radiation level to less than 5 R/hr.

4. If the surface radiation level is less than 5 R/hr, allow container to remain over pool until there is no significant amount of water dripping, then place in horizontal position over drains at side of pool.

5. Place lead-wire seal on cover.

6. Connect demineralized water to vent openings and flush container for one hour.

7. Remove water connection and connect helium to container and flush until gas appears dry.

8. Install quick disconnect fitting, pressure gage, and relief valve filter assembly. Pressurize in excess of 45 psig and check relief valve.

9. Vent and pressurize to a minimum of 5 psig maximum of 10 psig with Helium through quick disconnect fitting.

10. Wipe outside of container dry and smear for surface contamination. Allowable surface contamination is 2200 DPM. Decontamination is required for activity in excess of the above.

11. Measure maximum activity 3 feet from container and note on shipping form. Activity must be less than 1 R/hr for shipment.

12. Fill out DOT Radioactive Group III labels and place on both ends of container.

13. Bolt container to trailer and install cage.

14. Measure maximum radiation level at the following points:

    a. Edge of cage.

    b. Edge of trailer (must be less than 200 mr/hr).

    c. Six feet from tailer (must be less than 10 mr/hr).

    d. Tractor cab (must be less than 2 mr/hr).

15. Place DOT "Radioactive" placards on rear and both sides of trailer and on front of tractor.

16. Complete NPI "Radioactive Shipment" form.

17. Prior to departure of a radioactive shipment, the consignee must be notified as to arrival date and time. In addition, the Maryland Radiological Health Authority, Mr. Corcran, Chief (Telephone 301/383-3010) must be notified by telephone and given all of the above information plus the routing in Maryland.

18. While enroute the following must be checked at all stops:

    a. Tractor-trailer tires.

    b. Container hold down bolts.

    c. Container pressure.

    d. Survey container and note any changes in radiation levels.

    Note: Tractor-trailer must not be left unattended at any time while loaded.

19. Upon arrival at destination, check in with consignee and have his Health Physicist survey and accept container for unloading.

20. Upon acceptance by consignee:

a. Remove cage.

b. Remove hold down bolts and container.

c. Vent container through quick-disconnect into pool.

d. Break lead-wire seal on cover and remove bolts.

e. Remove relief valve, pressure gage, and quick disconnect fittings.

f. Lower into pool - remove lid and cobalt.

21. Remove container from pool and have facility Health Physicist conduct internal and external radiation survey of container.

22. Replace container cover, relief valve and pressure gage. Remove DOT "Radioactive" labels and place "EMPTY" placard or sign on either end of container.

23. Remove or cover DOT "Radioactive" signs on tractor-trailer and load container and cage.

NOTE: The following documents must be in NPI driver's possession at all times during a radioactive shipment:

a. DOT Special Permit.

b. AEC License and Cask or Container Analysis.

c. NPI "Radioactive Shipment" form.

d. NPI Operating and Emergency Procedures for Radioactive Shipments.

e. Drivers daily log book (DOT).

f. Copy of latest revision of ICC Motor Carrier Safety Regulations with accident forms.

g. Name, address, and telephone number of consignee.

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EMERGENCY ACTION PROGRAM FOR FIELD OPERATIONS

This program will be initiated in the event of either:

- a situation occurring which in the judgement of the licensed source installer would lead to an exposure to one of the installation teams of greater than 100 mr or to a no-member of the installation team of greater than 50 mr; or,
- a situation occurring in which any person has or may have received in excess of 100 mr.

I. Clear the irradiator area of all personnel.

II. Notify the Harry Diamond Laboratory Radiation Protection Officer (RPO).

III. Post the door to the irradiator area to indicate that no one should enter.

IV. Lock or otherwise prevent the entrance of personnel to the irradiator area.

V. Survey the outside of the irradiator area to be sure that there are no areas in which an individual may receive a dose in excess of 10 mr in the following four hours. If areas are located that exceed this limit, evacuation of the affected area should be undertaken.

VI. Notify one of the following individuals to assist in the planning and evaluating of subsequent action:

Wayne J. Costley, Radiation Safety Officer (RSO), Vice President
Home: 301/468-1681
Dudley G. Woodard, Radiation Safety Officer (RSO), Vice President
Home: 202/484-0779
Jackson A. Ransohoff, President
Home: 301/652-7182
Dale Repp
Home: 301/756-4030
Dwight Glenn, Health Physics Consultant
Home: 301/434-9283

Even when one of the above, other than the RSO, has been notified, the RSO should be notified as soon as it is practical.

VII. Do not reenter the irradiator area room until a corrective action plan has been prepared and approved by Neutron Products and the appropriate Harry Diamond Laboratory officials.

VIII. The applicable licensing authority should be notified by telephone or telegraph within 24 hours of any incident involving any source of radiation which may have caused or threaten to cause:

- dose to the whole body of an individual of 1.25 Rem or more of radiation per quarter;

- dose to the skin of the whole body of any individual of 7.5 Rem or more of radiation per quarter;

- dose to the feet, ankles, hands or forearms of any individual of 18.75 Rem or more of radiation per quarter; or,

- the release of radioactivity to the air in concentrations which, if averaged over a period of 24 hours, would exceed 9.0×10^{-9} uCi/ml of cobalt-60.

WAYNE J. COSTLEY - VICE PRESIDENT

Degrees: Oak Ridge School of Reactor Technology (ORSORT), Nuclear Engineering, 1958
Boston College, M.S., Geophysics, 1956
Boston College, A.B., Mathematics, 1954

1984- Neutron Products, Inc., Quality Assurance Manager, Responsible for development and management of procedure development for cobalt-60 handling and shipping operations and cobalt-60 teletherapy equipment reconditioning. Manages the total quality assurance program for NPI's cobalt-60 teletherapy program.

1978-1984 Dames & Moore, Partner. Successfully directed a variety of multidisciplinary projects; managed, organized and directed firmwide services; responsible for strategic planning.

Participated in major projects for private sector and government clients. These included the development of a computerized uranium mining and milling industry model; development of software and procurement of hardware for a U.S. Navy computer graphics facility and the pollution control technology for a coal-to-methoanol plant for a private client.

As Managing Director of the Energy Technology Center, a firmwide activity directed at the synthetic fuels and alternative energy technolgy market, managed staff efforts of 20 to 30 professionals in providing technical assistance to many of the firm's domestic offices.

Conceived, organized, and directed the firm's Energy Regulatory Service. This group monitored and interpreted Federal and state energy regulations. Other activities included project direction and participation in the nuclear and hazardous waste markets.

1975-1978 NUS Corporation, Senior Vice President of the Energy Resources Group. Responsible for developing and managing multidisciplinary corporate group services in the energy field. These services included the development and extraction of fossil and uranium resources, beneficiation and conversion of raw resources to usable energy supplies, energy resource economic studies, and total energy project feasibility evaluations for industrial, utility, and government clients. As the Goup Vice President, managed and implmented the firms quality assurance program for the Group.

1970-1974 Costley, Miller & Associates, Inc., Partner and Chief Executive Officer. Founded this management consulting firm, with offices in Washington, D.C., New York City, and Atlanta, Georgia.

ANNEX 6-H

1967-1970	Consultec, Inc., Vice President and Director, Management System Division. Directed and participated in the development of structures, processes, and systems to support management decisionmaking in this wholly owned subsidiary of NUS Corporation.
1964-1967	NUS Corporation. Manager, Industrial Consulting
1960-1964	Holmes & Narver, Inc. Chief Project Engineer, Nuclear Facilities
1956-1960	U.S. Atomic Energy Commission (USAEC), Hazards Evaluation Branch, Division of Licensing and Regulation, Physicist

TRAINING - EXPERIENCE

DALE REPP

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB CIRCLE ONE	FORMAL COURSE CIRCLE ONE
a. Principles & practices of radiation protection	National Bureau of Standards Neutron Products, Inc.	2-1/2 years 17 years	(Yes) No	(Yes) No
b. Radioactivity measurement standardization & monitoring techniques & instruments	Same as above	Same	(Yes) No	(Yes) No
c. Mathematics & calculations basic to the use & measurement of radioactivity	Same as above	Same	(Yes) No	(Yes) No
d. Biological effects of radiation	Same as above	Same	(Yes) No	(Yes) No

9. Experience with Radiation. (Actual use of radioisotopes or equivalent experience).

Isotope	Maximum Amount	Where Experience was Gained	Duration of Experience	Type of Use
I-128 & 134	millicuries	National Bureau of Standards	1 month	Tracer
Cobalt-60	400,000 curies	Neutron Products, Inc.	5 years	Irradiator operator
Cobalt-60	1,000,000 Ci.	Neutron Products, Inc.	6 years	Source Fabrication
Cobalt-60 Cesium-137	12,000 curies 3,000 curies	Neutron Products, Inc.	12 years	Teletherapy Source Installer

TRAINING - EXPERIENCE

J. RICHARD DEMORY

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB CIRCLE ONE	FORMAL COURSE CIRCLE ONE
a. Principles & practices of radiation protection	Neutron Products, Inc.	16 yrs.	(Yes) No	Yes No
b. Radioactivity measurement standardization & monitoring techniques & instruments	Neutron Products, Inc.	16 yrs.	(Yes) No	Yes No
c. Mathematics & calculations basic to the use & measurement of radioactivity	Neutron Products, Inc.	16 yrs.	(Yes) No	Yes No
d. Biological effects of radiation	Neutron Products, Inc.	16 yrs.	(Yes) No	Yes No

9. Experience with Radiation. (Actual use of radioisotopes or equivalent experience).

Isotope	Maximum Amount	Where Experience was Gained	Duration of Experience	Type of Use
Cobalt-60	MegaCuries	Neutron Products, Inc.	16 yrs.	Handling, Shipping, Installation, Melting, Cutting,

cc W.C. ✓
File: Shipping Container
sub

JUN - 5 1985

U.S. Department
of Transportation

**Research and
Special Programs
Administration**

400 Seventh St., S.W.
Washington, D.C. 20590

JUN 3 1985

Mr. Marvin M. Turkanis
Vice President
Neutron Products, Inc.
22301 Mt. Ephraim Road
P.O. Box 68
Dickerson, MD 20842

Dear Mr. Turkanis:

As requested, your company has been registered as a user of IAEA Certificate of Competent Authority USA/5939/B( )F.

Enclosed is a copy of the certificate.

Sincerely,

Richard R. Rawl
Chief, Radioactive Materials Branch
Office of Hazardous Materials
Regulation
Materials Transportation Bureau

Enclosure

Annex 6-I

NRC FORM 618
(6-33)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

W.C.

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5939	12	USA/5939/B( )F	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

b. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. THIS CERTIFICATE IS ISSUED ON THE BASIS OF A SAFETY ANALYSIS REPORT OF THE PACKAGE DESIGN OR APPLICATION

a. PREPARED BY (Name and Address):

General Electric Company
P.O. Box 460
Pleasanton, CA 94566

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

General Electric Company application dated February 21, 1980, as supplemented.

c. DOCKET NUMBER 71-5939

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 1500

(2) Description

A steel encased lead shielded shipping cask. The cask is a double-walled steel circular cylinder, 31-inch diameter by 48 inches high with a central cavity 7-inch diameter by 25 inches high. The diameter is reduced from 31 inches to 17-1/2 inches by cone construction at the top 7-1/2 inches of the cask. Approximately 11 inches of lead surround the central cavity. The cask is equipped with a cavity drain line and lifting device. Closure is accomplished by a gasketed and bolted steel lead-filled plug. A protective jacket consisting of an upright circular cylinder with open bottom and a protruding box section diametrically across the top and vertically down the sides attaches to a square pallet. Dimensions of the protective jacket are 60-7/8 inches high by 49-3/4 inches wide across the box section. The outer cylindrical diameter is 36-1/2 inches and the pallet is 59-1/2 inches square. The maximum weight of the packaging is approximately 15,000 pounds.

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.: 129D4748, Rev. 3; 129D4749, Rev. 3; and 129D4750, Rev. 3.

Lifting and/or tie-down devices which are a structural part of the package must be in accordance with the above drawings.

Annex 6-J ~~8505170300~~ 1p.