TECHNICAL SPECIFICATIONS

LIST OF FIGURES

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
G. Minimum Low Pressure Cooling and Diesel Generator Availability	G. Minimum Low Pressure Cooling and Diesel Generator Availability
1. During any period when one diesel generator is inoperable, continued reactor operation is permissible only during the succeeding seven days unless such diesel generator is sooner made OPERABLE, provided that the remaining diesel generator and all low pressure core and containment cooling subsystems supported by the OPERABLE diesel generator are OPERABLE. If this requirement cannot be met, an orderly SHUTDOWN shall be initiated and the reactor shall be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	1. When it is determined that one diesel generator is inoperable, the remaining diesel generator shall be demonstrated to be OPERABLE in accordance with Specification 4.8.A.2.a.1.a within the first 24 hours and every subsequent 72 hours thereafter. In addition, all low pressure core cooling and containment cooling subsystems supported by the OPERABLE diesel shall be verified to be OPERABLE.
2. Any combination of inoperable components in the core and containment cooling systems shall not defeat the capability of the remaining OPERABLE components to fulfill the cooling functions.	
3. When irradiated fuel is in the reactor vessel and the reactor is in the COLD SHUTDOWN Condition or REFUEL Mode:	
a. If no work is being performed which has the potential for draining the reactor vessel, both core spray and RHR systems may be inoperable; or	
b. If work is being performed which has the potential for draining the reactor vessel, at least two of any combination of core spray and/or RHR (LPCI or shutdown cooling mode) pumps shall be OPERABLE (including the capability to inject water into the reactor vessel with suction from the suppression pool) except as	

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.8 AUXILIARY ELECTRICAL SYSTEMS	4.8 AUXILIARY ELECTRICAL SYSTEMS
Applicability:	Applicability:
Applies to the auxiliary electrical power systems.	Applies to the periodic testing requirements of the auxiliary electrical power systems.
Objective:	Objective:
To assure an adequate supply of electrical power for operation of those systems required for safety.	Verify the OPERABILITY of the auxiliary electrical systems.
Specification:	Specification:
A. AC Power Systems	A. AC Power Systems
At all times when the reactor is in the RUN Mode or STARTUP Mode and not in a COLD CONDITION, the following AC electrical power sources shall be OPERABLE:	
1. Both offsite sources and the startup and standby transformers are available and capable of supplying power to the 4kV emergency buses.	
2. Operation with Inoperable Components.	1. Surveillance Requirements with Inoperable Components.
a. With one of the offsite sources or startup or standby transformers inoperable, maintain the other offsite source OPERABLE and both emergency diesel generators OPERABLE.	
b. With one of the offsite sources or the startup or standby transformers and one emergency diesel generator inoperable, the requirements of Specification 3.5.G.1 shall be satisfied.	a. With one of the offsite sources or the startup or standby transformers and one emergency diesel generator inoperable, the requirements of Specification 4.5.G.1 shall be satisfied.
c. With both the startup and standby transformers inoperable, maintain both emergency diesel generators, associated buses and all Low Pressure Cooling Systems OPERABLE and either:	b. With both the startup and standby transformers inoperable, verify that both emergency diesel generators are either OPERABLE or operating and the requirements of Specification 4.5.G.1 shall be satisfied.
1) Restore one or both of the transformers to OPERABLE status, or	
2) Be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3. Emergency Diesel Generators The two emergency diesel generators shall be OPERABLE with a minimum of 36,317 gallons of diesel fuel in the diesel fuel oil tank.	2. Emergency Diesel Generators a. Diesel Start Test 1) Once each month both emergency diesel generators shall be: a) Manually started, the speed increased from idle to synchronous, and verified to deliver rated voltage and frequency. b) Manually loaded to rated load. The test shall continue for at least a one-hour period at rated load. c) During the monthly start test the emergency diesel generator starting air compressors shall be checked for operation and their ability to recharge air receivers. The operation of the diesel fuel oil transfer pumps shall also be demonstrated during this test. 2) Once each six months both emergency diesel generators shall be manually started and loaded to demonstrate that they will reach rated frequency and voltage within specified time limits. This test may be run in lieu of the regular monthly test. During the semiannual test the same checks to the Air Start System and fuel oil pumps performed during monthly testing shall be performed. In addition, the emergency diesel generator starting time to reach rated frequency and voltage shall be recorded. b. Once per OPERATING CYCLE the condition under which the emergency diesel generator is required will be simulated and a test conducted to demonstrate that it will start and accept the emergency load within the specified time sequence. The emergency diesel generator shall be operated loaded for a minimum of 5 minutes. The results shall be recorded. c. Once per OPERATING CYCLE, during shutdown, each emergency diesel generator shall be given an inspection in accordance with

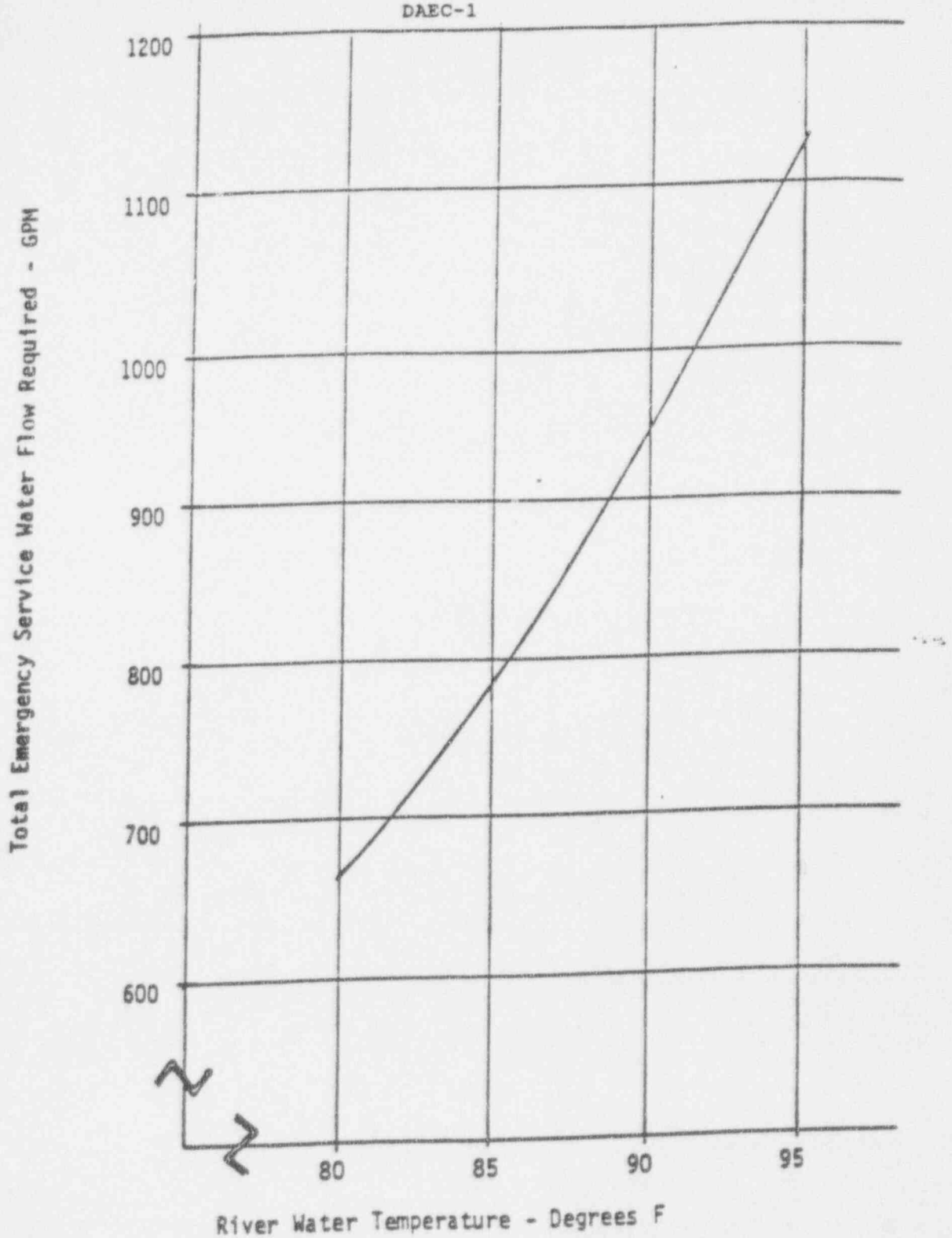
LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
	procedures based on the manufacturer's recommendations.
	d. A sample shall be drawn from each diesel fuel delivery and tested for API gravity, viscosity, and water and sediment prior to addition to the storage tank. Once it is determined that the fuel meets the criteria for these characteristics specified in ASTM-D975-77, the fuel may be added to the tank.
	e. The quantity of diesel fuel available shall be recorded monthly and after each use of the diesels.
	f. Once per month a sample of diesel fuel shall be checked for viscosity, water and sediment. The values for viscosity, water and sediment shall be within the acceptable limits specified in Table 1 of ASTM D975-77 and recorded.
	g. Once each 3 months a sample of diesel fuel shall be checked for particulate accumulation and the amount recorded. The amount of particulates shall not exceed 10 mg/liter when filtered through a 0.8 micron filter.
4. Operation with Inoperable Components.	3. Surveillance Requirements with Inoperable Components.
a. With one of the emergency diesel generators inoperable, the requirements of Specification 3.5.G.1 shall be met.	a. When it is determined that one of the emergency diesel generators is inoperable, the requirements of Specification 4.5.G.1 shall be met.
b. With both of the emergency diesel generators inoperable either:	
1) Restore one or both emergency diesel generators to OPERABLE status, or	
2) Be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	
B. <u>DC Power Systems</u>	B. <u>DC Power Systems</u>
1. At all times when the reactor is in the RUN Mode or STARTUP Mode and not in a COLD CONDITION, the essential station 24, 125 and 250 Volt DC Power Systems shall be OPERABLE. The associated battery	1. The DC Power System surveillance shall be as follows:
	a. Each week the specific gravity, the voltage and temperature of the pilot cell and overall battery

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
chargers for the 24 Volt Systems, two of the three battery chargers for the 125 Volt Systems, and one of the two battery chargers for the 250 Volt System shall be OPERABLE.	voltage shall be measured and recorded. b. Each three months the essential batteries' voltage of each cell to the nearest 0.01 Volt, specific gravity of each cell, and temperature of every fifth cell shall be measured and recorded. c. Once each OPERATING CYCLE, the essential batteries shall be subjected to a Service Discharge Test (load profile). The specific gravity and voltage of each cell shall be determined after the discharge and recorded. d. Once every five years, the essential batteries shall be subjected to a Performance Discharge Test (capacity). This test will be performed in lieu of the Service Test requirement of 4.8.B.1.c above.
2. Operation with Inoperable Components. a. With normal battery room ventilation unavailable, portable ventilation equipment shall be provided. b. With one of the two 125 Volt DC Systems inoperable, verify that Specification 3.5.G is met, and within 3 days either: 1) Restore the inoperable 125 Volt DC System to OPERABLE status, or 2) Be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours. c. With the 250 Volt DC System inoperable, the HPCI System and other affected primary containment isolation valves shall be considered inoperable and the requirements of Specifications 3.5.D and 3.7.D respectively shall be met. d. With one of the 24 Volt DC Systems inoperable, the requirements associated with the affected instruments of Specifications 3.1 and 3.2 shall be met.	2. Surveillance Requirements with Inoperable Components. a. With the battery room ventilation unavailable, samples of the battery room atmosphere shall be taken daily for hydrogen concentration determination.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
C. Onsite Power Distribution Systems	C. Onsite Power Distribution Systems
1. At all times when the reactor is in the RUN Mode or STARTUP Mode and not in a COLD CONDITION the essential AC 4160 volt buses 1A3 and 1A4, and 480 volt buses 1B3, 1B4, 1B9 and 1B20 shall be energized and OPERABLE.	1. Once each 4 OPERATING CYCLES each circuit breaker shall be subjected to inspection and preventive maintenance in accordance with procedures based on the manufacturer's recommendations.
2. Operation with Inoperable Components.	
a. With one of the essential AC 480 volt buses, 1B9 or 1B20, inoperable, restore the bus to OPERABLE status within 7 days, or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	
b. With one of the essential AC 4160 volt buses, 1A3 or 1A4, or 480 volt buses 1B3 or 1B4 inoperable, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	
D. Auxiliary Electrical Equipment - CORE ALTERATIONS	
Refer to Specification 3.9.D.	

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
E. Emergency Service Water System	E. Emergency Service Water System
1. Except as required in Specification 3.8.E.2 below, both Emergency Service Water System loops shall be OPERABLE whenever irradiated fuel is in the reactor vessel and reactor coolant temperature is greater than 212°F.	1. Emergency Service Water System surveillance shall be as follows: a. Simulated automatic actuation test. — Once/OPERATING CYCLE b. Pump and motor operated valve OPERABILITY — Once/3 months c. Flow Rate Test Each Emergency Service Water pump shall deliver at least that flow determined from Figure 4.8.E-1 for the existing river water temperature. — After major pump maintenance and once per 3 months, except weekly during periods of time the river water temperature exceeds 80°F.
2. With one of the Emergency Service Water System pumps or loops inoperable, REACTOR POWER OPERATION must be limited to seven days unless OPERABILITY of that system is restored within this period. During such seven days all active components of the other Emergency Service Water System shall be OPERABLE, provided the requirements of Specification 3.5.G are met.	2. With one Emergency Service Water System pump or loop inoperable, the OPERABLE pump and loop shall be verified to be OPERABLE. In addition, the requirements of Specification 4.5.G.1 shall be met.
3. If the requirements of Specification 3.8.E cannot be met, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	

Amendment No. 10, 32, 129, 143, 160, 197



DUANE ARNOLD ENERGY CENTER
IES UTILITIES INC.
TECHNICAL SPECIFICATIONS

DAEC EMERGENCY SERVICE
WATER FLOW REQUIREMENT
FIGURE 4.8.E-1

3.8 BASES:

The objective of this specification is to assure that adequate power will be available to operate essential equipment. Adequate AC power can be provided by any one of the following sources: The startup transformer, the standby transformer or either of the two emergency diesel generators. The startup transformer provides all auxiliary power during plant startup and until the main generator is synchronized with the system. After synchronization, the plant auxiliary buses 1A1 and 1A2 are manually transferred to the auxiliary transformer. The startup transformer continues to provide the normal source of power to essential AC buses 1A3 and 1A4. The standby transformer is connected to either of the two essential AC buses by automatic switching upon loss of power from the startup transformer.

This Specification assures that at least two offsite and two onsite AC power sources will be available before the reactor is taken beyond "just critical" testing. The two offsite sources are 161 KV and 345 KV power which are supplied to the startup and standby transformers respectively, through the DAEC site switchyard. These power sources are provided through the several transmission lines tied to the regional power grid. In addition to assuring power source availability, all of the associated essential AC switchgear must be operable as specified to assure that the emergency core cooling equipment can be operated, if required, from the power sources.

The minimum diesel fuel supply of 36,317 gallons will supply one emergency diesel generator for a minimum of seven days of operation satisfying the load requirements for the operation of the essential equipment. Additional fuel can be obtained and delivered to the site from nearby sources within the seven day period.

A battery charger is supplied with each of the two 125 volt DC station batteries. In addition, a spare charger is available and can supply power to either 125 Volt DC System. Since this alternative source is available, one battery charger can be allowed out of service for maintenance and repairs. Similarly, one of the two battery chargers provided for the 250 volt DC station battery can be allowed out of service for maintenance and repairs.

Adequate power is available to operate all essential equipment from either the startup transformer or the standby transformer. In addition, each of the emergency diesel generator units is capable of supplying the essential AC-powered loads required under postulated design basis accident conditions. Each unit is physically and electrically independent of the other and of any offsite power source. Therefore, one emergency diesel generator can be allowed out of service for a period of seven days to allow reasonable repairs. In such cases, emergency diesel generator OPERABILITY demonstrations will be limited to an unloaded start test.

In the event that the startup or standby transformer and one emergency diesel generator is inoperable, adequate power is available to operate the essential equipment from either the OPERABLE transformer or the OPERABLE emergency diesel generator. If both the startup and standby transformers are inoperable, either emergency diesel generator is sufficient to operate the essential AC-powered loads.

Each of the two 125 volt DC and the 250 volt DC station batteries has enough capacity to energize its vital buses and supply DC power to the other essential DC-powered equipment for four hours without being recharged. Due to the high reliability of battery systems, one of the two batteries may be out of service for up to three days. This minimizes the probability of unwarranted shutdown by providing adequate time for reasonable repairs. A station battery is considered inoperable if more than one cell is out of service. A cell will be considered out of service if its float voltage is below 2.13 volts and the specific gravity is below 1.190 at 77°F.

The 250 Volt DC System provides power for the HPCI system and other primary containment isolation valves. If the battery is taken out of service, the HPCI system would be inoperable and the requirements of Specification 3.5.D for this condition must be satisfied. Certain primary containment isolation valves would also be inoperable, thus the requirements of Specification 3.7.D must be satisfied.

The 24 Volt DC System provides power for reactor neutron monitoring and process radiation monitoring. The neutron monitoring function is fail-safe in that loss of 24 volt DC power would cause the associated trip to occur (UFSAR Section 8.3.2).

The battery room is ventilated to prevent accumulation of hydrogen gas exceeding 4 percent concentration. On loss of battery room ventilation, the use of portable ventilation equipment and daily sampling provides assurance that potentially hazardous quantities of hydrogen gas will not accumulate.

4.8 BASES:

Offsite power availability and onsite power distribution is continuously monitored by INSTRUMENTATION which alerts operators to any problems so that appropriate action can be taken. In addition to the annunciators, automatic switching occurs to maintain power to the emergency buses at all times. The breakers and distribution panels are subjected to preventive maintenance based on manufacturer's recommendations. The schedule is based on performance of maintenance on one of the buses (1A1, 1A2, 1A3 and 1A4) each Refuel Outage.

The monthly tests of the emergency diesel generators (EDGs) are conducted to demonstrate satisfactory system performance and OPERABILITY. To prevent excessive wear and stress on the diesel engines, the diesels are manually started and the speed incrementally increased to synchronous speed. With one EDG inoperable, the remaining EDG can be demonstrated to be OPERABLE by starting and verifying proper output voltage and frequency. Once every six months, a fast-start test is performed to demonstrate the capabilities of the diesel engines to accelerate to rated speed as required for the design basis for the plant. The test of the automatic starting circuits will prove that each EDG will receive all automatic start signals. The loading of each EDG is conducted to demonstrate proper operation at maximum expected emergency loading and at equilibrium operating conditions. Generator experience at other generating stations, and NRC published guidance (Generic Letter 84-15), indicates that the testing frequency is adequate to assure a high reliability of operation should the system be required.

Each EDG has two independent starting air supply systems. One consists of a motor driven air compressor which automatically recharges two air receivers and the other consists of a diesel driven air compressor which is manually operated to recharge a third air receiver. During the monthly check of the EDG, both air start systems will be checked for proper operation.

Following the tests (at least monthly) or other operation of the EDGs, the fuel volume remaining in the diesel oil storage tank will be checked.

At the end of the monthly load test of the EDG, the fuel oil transfer pump will be operated to refill the day tank and to check the operation of this pump. The day tank level indicator and alarm switches and fuel oil transfer pump control switches will be checked at this time.

The test of the EDGs once each OPERATING CYCLE will be more comprehensive in that it will functionally test the system; i.e., it will check starting of the diesel and closure of electrical breakers and sequencing of essential loads. The test will be initiated by simulation of a loss-of-coolant accident. In addition, a loss of normal AC power condition will be imposed to simulate a loss of offsite power. The essential load sequence timing will be checked to assure proper loading in the time required. Periodic tests check the capability of the units to start in the required time and to deliver the expected emergency load requirements. Periodic testing of the various components plus a FUNCTIONAL TEST each OPERATING CYCLE are sufficient to maintain adequate reliability.

Recording the diesel fuel supply after each operation (at least monthly) assures that the minimum fuel supply requirements will be maintained. New fuel is tested against the specification, ASTM D975-77 (API gravity, viscosity and water and sediment prior to addition, and the other characteristics within 30 days of addition to the storage tank). A monthly test for quality of the diesel fuel oil will be performed to verify that viscosity and water and sediment are within the limits specified in ASTM D975-77. The quality of the diesel fuel oil will be acceptable if the results of the tests are within the limiting requirements for diesel fuel oils shown on Table 1 of ASTM D975-77. Additionally, a quarterly test for particulate accumulation in the

stored fuel oil will provide further assurance that the fuel oil is not deteriorating to the point that EDG operation would be affected. This characteristic is trended so that actions can be taken to restore fuel quality prior to reaching unacceptable levels. Should a test result show unacceptable particulate accumulation which does not fit an established trend, a second sample is allowed to be tested prior to taking actions to restore the fuel.

Although the station batteries will deteriorate with time, utility experience indicates there is almost no possibility of precipitous failure. The type of surveillance described in this specification is that which has been demonstrated over the years to provide an indication of a cell becoming irregular or unserviceable long before it becomes a failure.

The Service Discharge Test provides adequate indication of the batteries' ability to satisfy the design requirements (battery duty cycle) of the associated DC system. This test will be performed using simulated loads at the rates and for the durations specified in the design load profile.

The Performance Discharge Test provides adequate indication and assurance that the batteries have the specified ampere hour capacity. The rate of discharge during this test shall be in accordance with the manufacturer's discharge characteristic curves. The results of these tests will be recorded and compared with the manufacturer's recommendations of acceptability.

The Emergency Service Water System has two loops with one pump each. If one Emergency Service Water System loop becomes inoperable, the other loop provides sufficient cooling to components to assure performance of the safety function after an accident. Continued plant operation with one loop inoperable is restricted to a seven-day period during which time the OPERABLE Emergency Service Water loop is verified to be OPERABLE.

The surveillance test intervals for the Emergency Service Water pumps and associated valves are based on Section XI of the ASME Code.

APPENDIX A

TO

OPERATING LICENSE DRP-49

TECHNICAL SPECIFICATIONS AND BASES

FOR

DUANE ARNOLD ENERGY CENTER

IES UTILITIES INC.

CENTRAL IOWA POWER COOPERATIVE

CORN BELT POWER COOPERATIVE

DOCKET NO. 50-331

FEBRUARY 1974

AMENDMENT NO. 198

TECHNICAL SPECIFICATIONS
LIST OF TABLES

34. VENTING

VENTING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is not provided or required during the process. Vent, used in system names, does not imply a VENTING process.

35. PROCESS CONTROL PROGRAM (PCP)

The PROCESS CONTROL PROGRAM shall contain the current formulas, sampling, analysis, tests, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to ensure compliance with 10 CFR Parts 20, 61, 71, state regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.

36. MEMBER(S) OF THE PUBLIC

MEMBER(S) OF THE PUBLIC are persons who are not occupationally associated with IES Utilities Inc. and who do not normally frequent the DAEC site. The category does not include contractors, contractor employees, vendors or persons who enter the site to make deliveries or to service equipment.

37. SITE BOUNDARY

The SITE BOUNDARY is that line beyond which the land is neither owned, nor leased, nor otherwise controlled by IES Utilities Inc. UFSAR Figure 1.2-1 identifies the DAEC SITE BOUNDARY. For the purpose of implementing radiological effluent controls, the Unrestricted Area is that land (offsite) beyond the SITE BOUNDARY.

38. ANNUAL

Occurring every 12 months.

For the purpose of designating surveillance test frequencies, ANNUAL surveillance tests are to be conducted at least once per 12 months.

39. CORE OPERATING LIMITS REPORT

The CORE OPERATING LIMITS REPORT is the DAEC-specific document that provides cycle-specific operating limits for the current operating reload cycle. These cycle-specific operating limits shall be determined for each reload cycle in accordance with TS 6.11.2. Plant operation within these limits is addressed in individual technical specifications.

40. SHUTDOWN MARGIN

SHUTDOWN MARGIN is the amount of reactivity by which the reactor is subcritical or would be subcritical assuming all control rods are inserted, except for the analytically strongest worth control rod, which is fully withdrawn, with the core in its most reactive state during the OPERATING CYCLE.

TABLE 1.0-1

OPERATING MODES

	OPERATING MODE	REACTOR MODE SWITCH POSITION	AVERAGE REACTOR COOLANT TEMPERATURE
1.	RUN/POWER OPERATION	Run	NA
2.	STARTUP	Startup/Hot Standby or Refuel[a]	NA
3.	HOT SHUTDOWN[a]	Shutdown[c][d]	> 212°F
4.	COLD SHUTDOWN[a]	Shutdown[c][d][e]	≤ 212°F
5.	REFUELING[b]	Shutdown or Refuel[c][f]	NA

(a) Fuel in the reactor vessel with the reactor vessel head closure bolts fully tensioned.

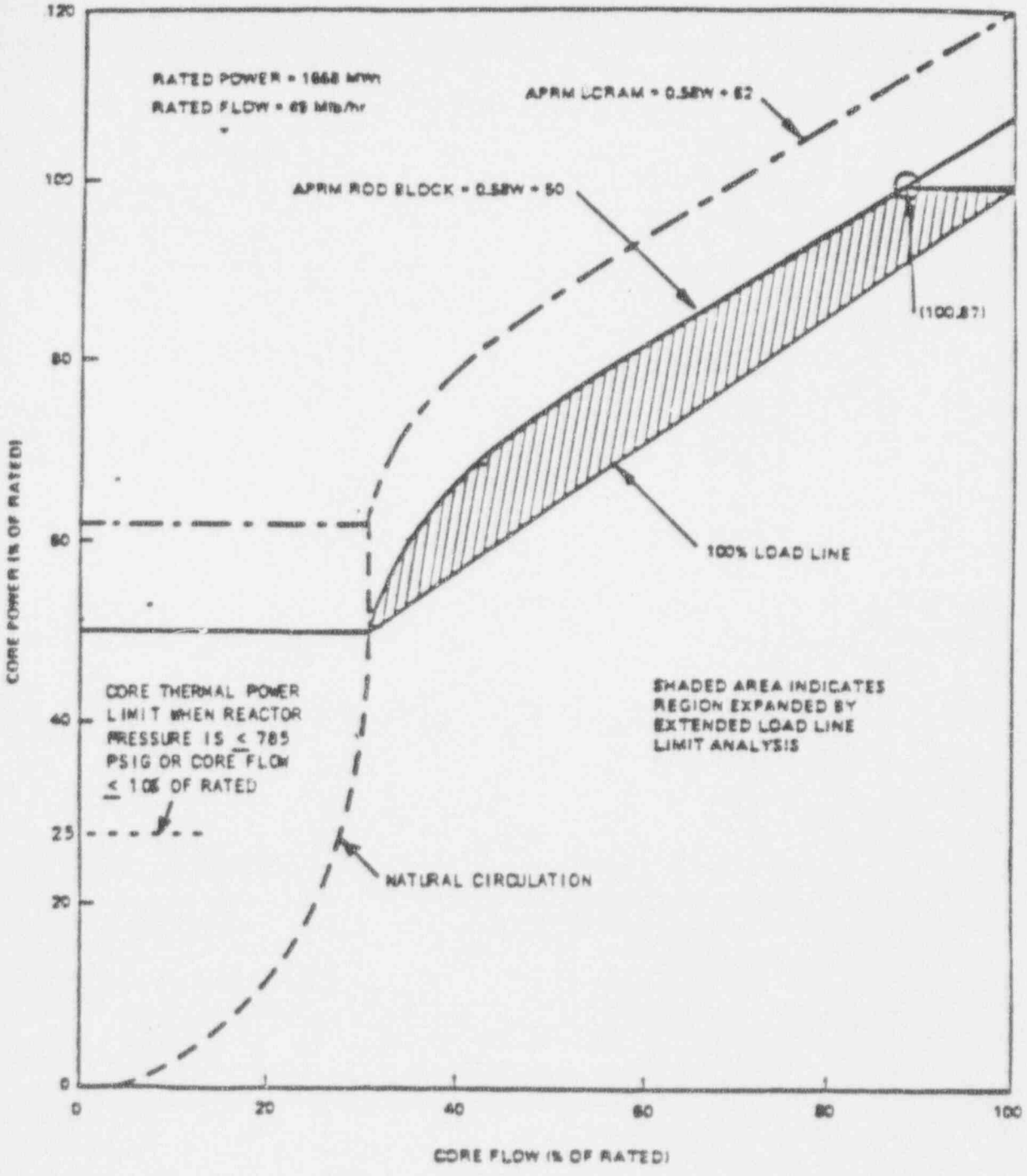
(b) Fuel in the reactor vessel with the vessel head closure bolts less than fully tensioned or with the head removed.

(c) The reactor mode switch may be placed in the Run, Startup/Hot Standby or Refuel position to test the switch interlock functions and related instrumentation provided that the control rods are verified to remain fully inserted by a second licensed operator.

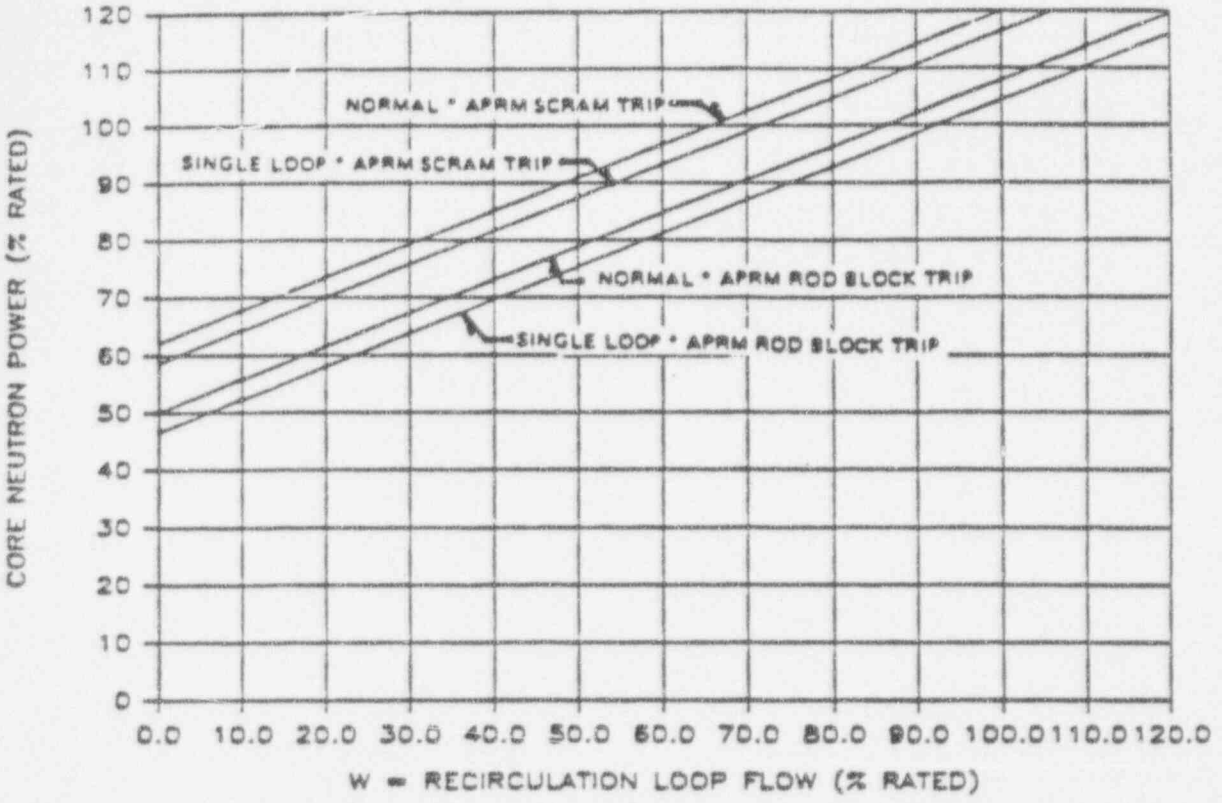
(d) The reactor mode switch may be placed in the Refuel position while a single control rod is being recoupled or withdrawn provided that the one-rod-out interlock is OPERABLE.

(e) The reactor mode switch may be placed in the Refuel position while a single control rod drive is being removed from the reactor pressure vessel per Specification 3.9.A.

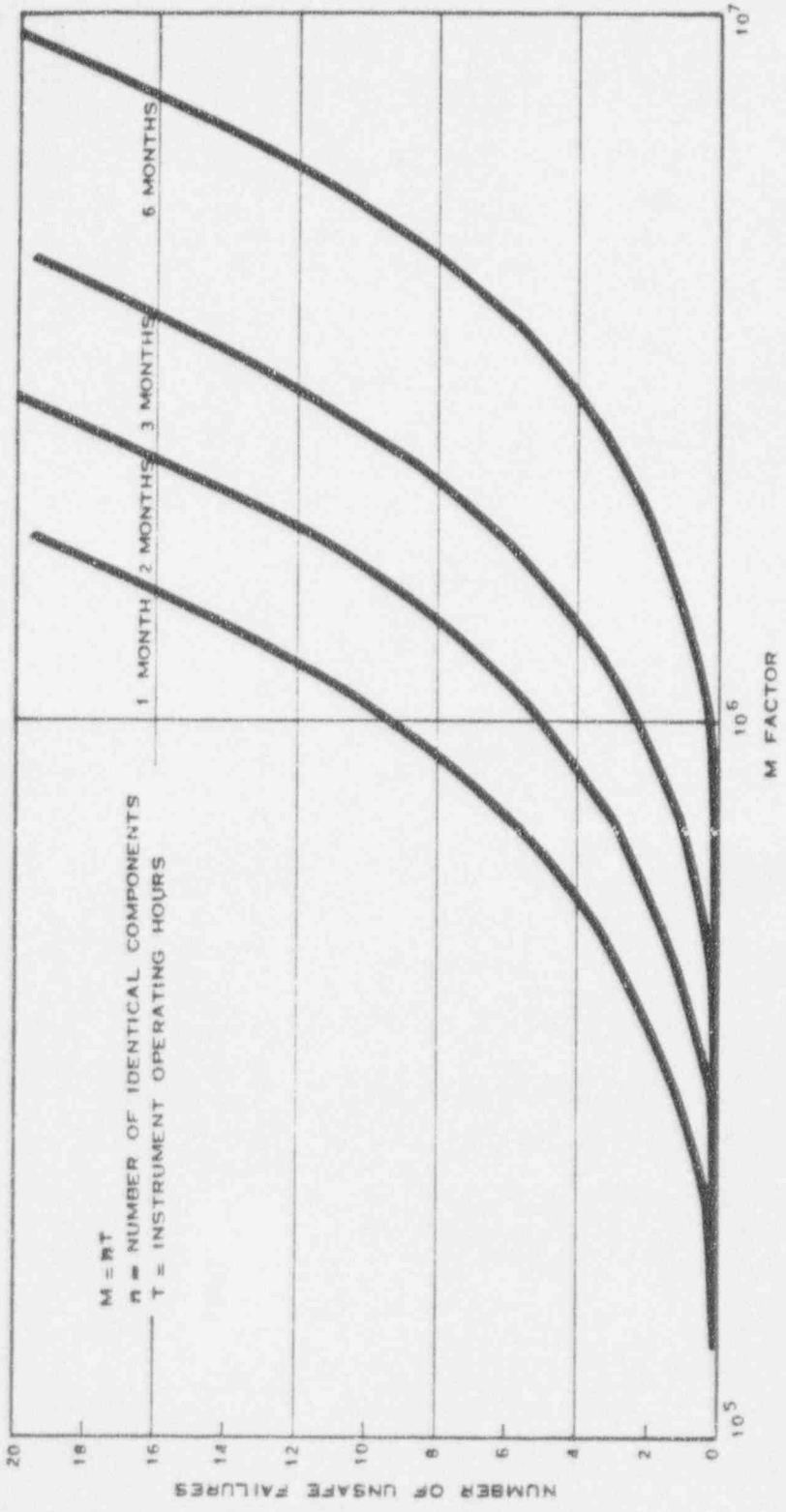
(f) The reactor mode switch may be placed in the Startup position for demonstration of shutdown margin per Specification 4.3.A.1.



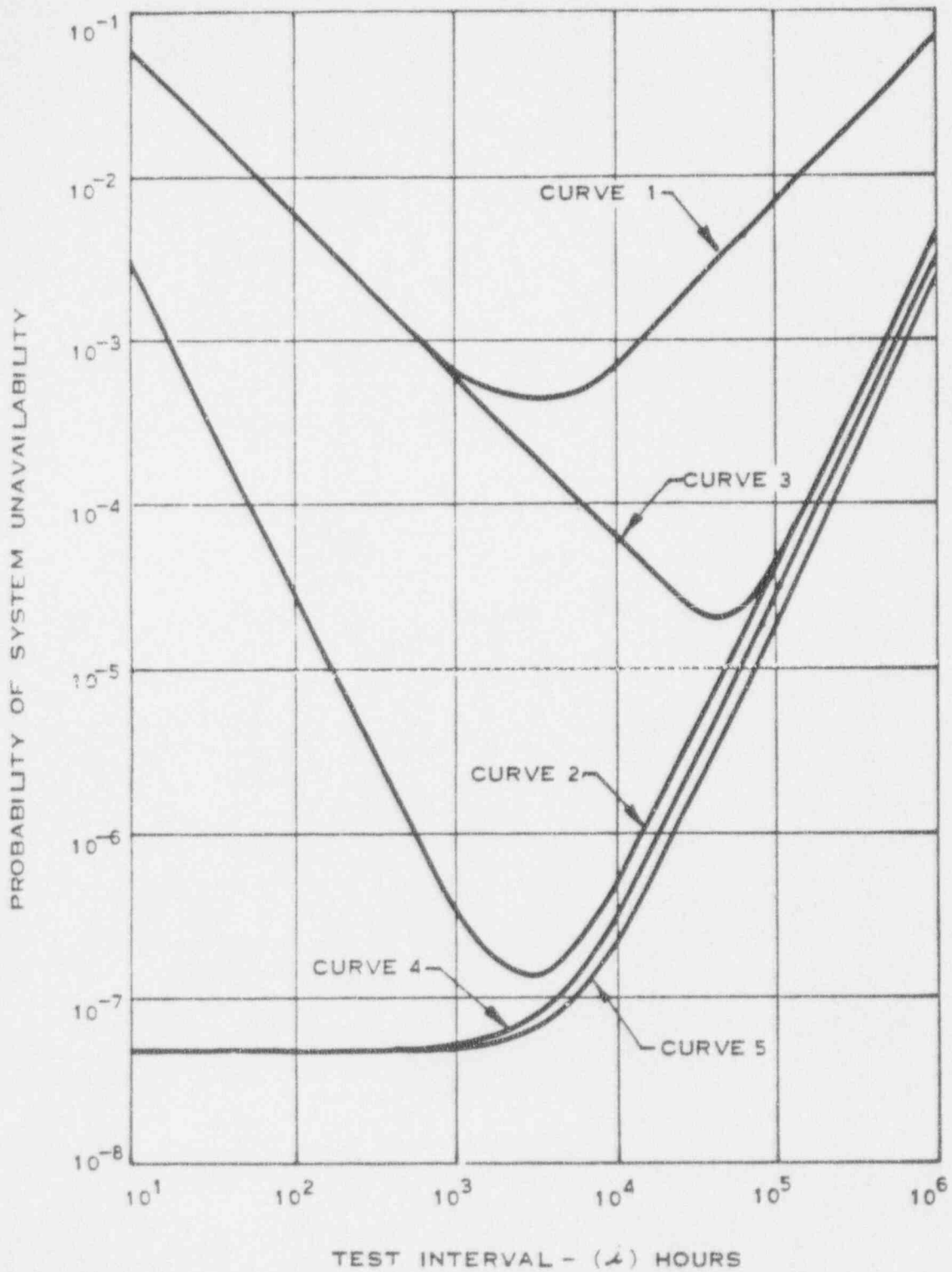
DUANE ARNOLD ENERGY CENTER IES UTILITIES INC. TECHNICAL SPECIFICATIONS
APRM FLOW BIAS SCRAM RELATIONSHIP TO NORMAL OPERATING CONDITIONS FIGURE 1.1-1



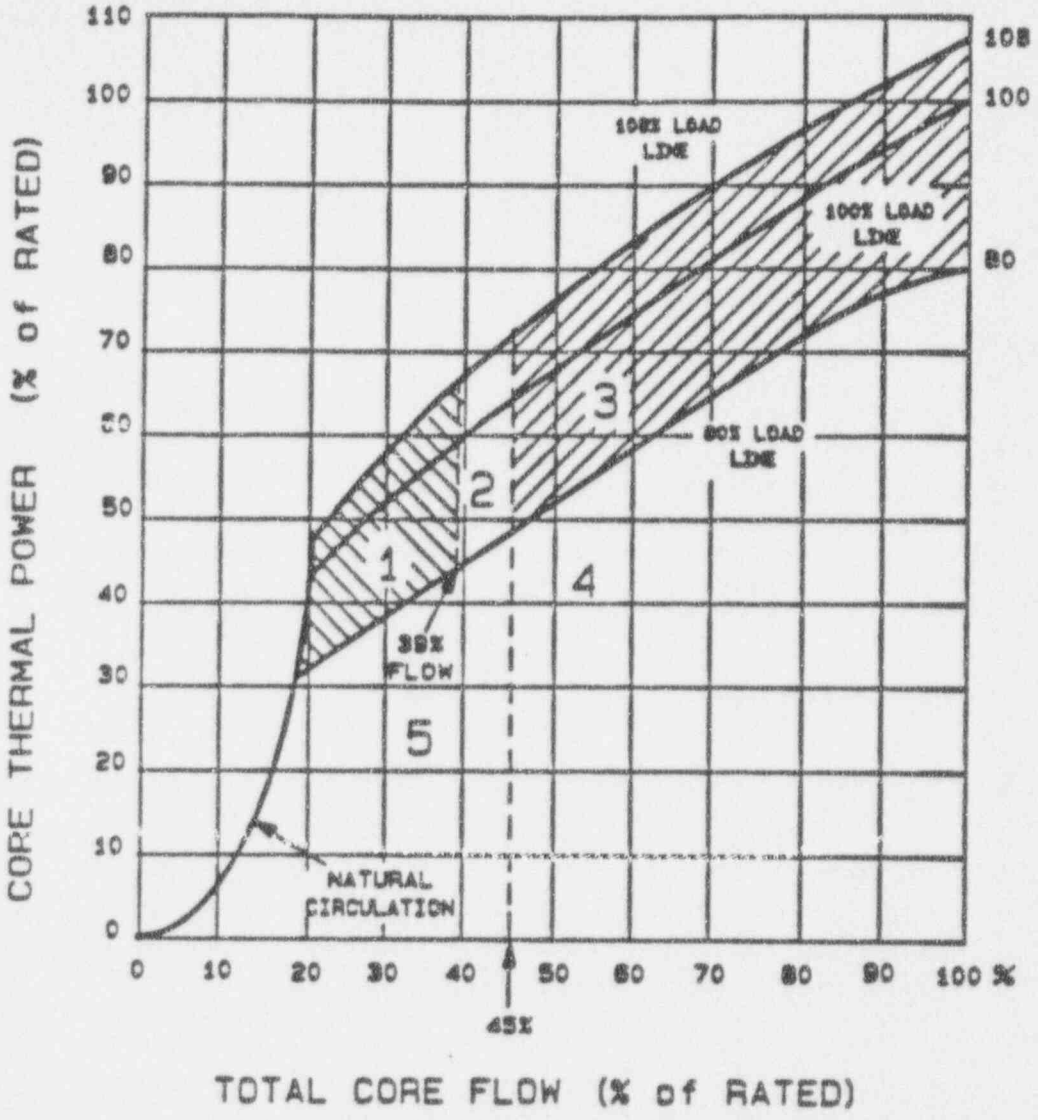
DUANE ARNOLD ENERGY CENTER IES UTILITIES INC. TECHNICAL SPECIFICATIONS
CORE POWER Vs RECIRC LOOP FLOW FIGURE 2.1-1



DUANE ARNOLD ENERGY CENTER IES UTILITIES INC. TECHNICAL SPECIFICATIONS
FAILURE HISTORY
FIGURE 4.1-1



DUANE ARNOLD ENERGY CENTER IES UTILITIES INC. TECHNICAL SPECIFICATIONS
CHANNEL AVAILABILITY FIGURE 4.2-2



Region 1: Two Loop Surv. Region, SLO Prohibited Region
- requires APRM/LPRM noise monitoring

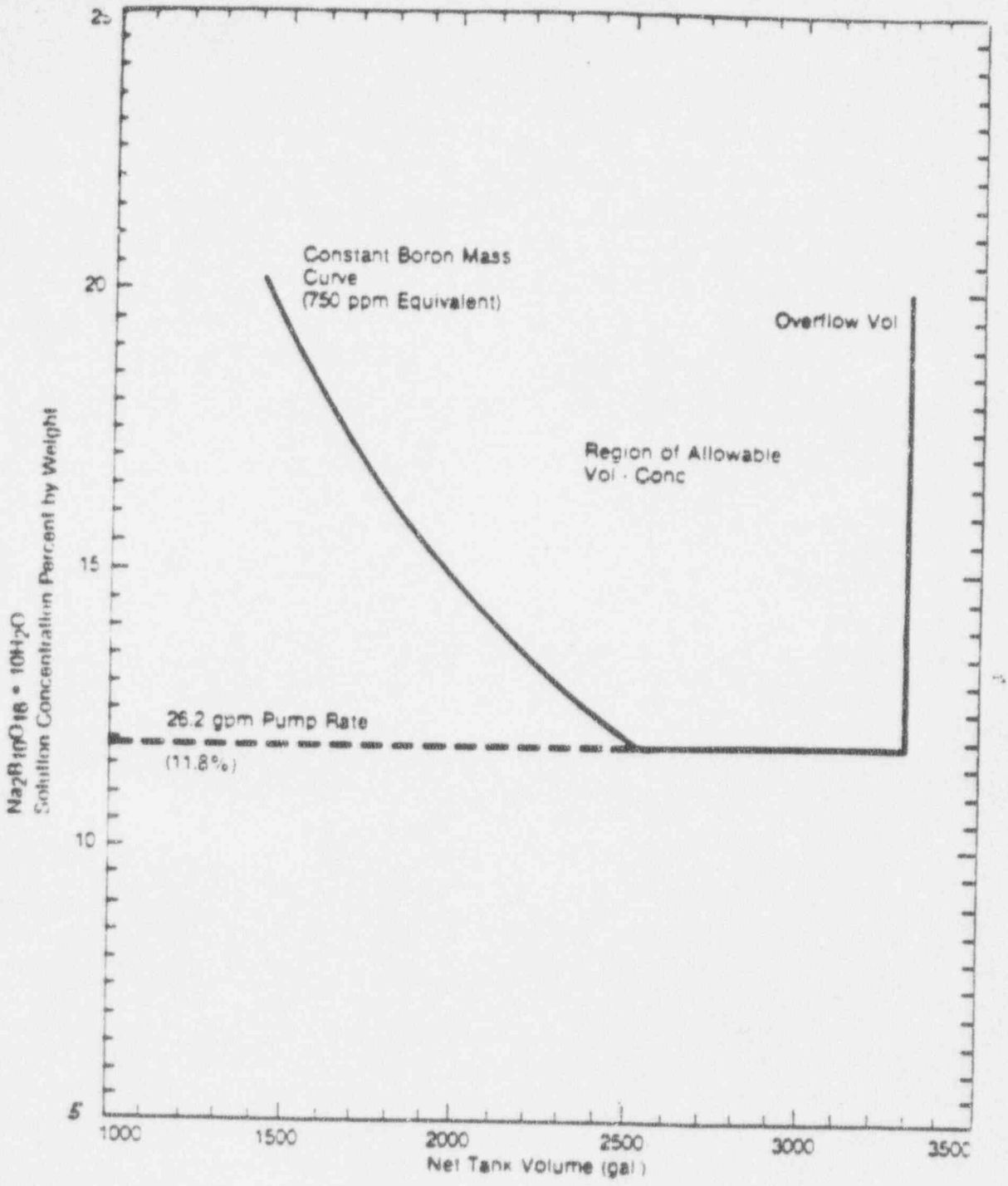
Region 2: Two Loop & SLO Surv. Region
- requires APRM/LPRM noise monitoring

Region 3: SLO Surv. Region
- requires APRM/LPRM & Core Plate D/P noise monitoring

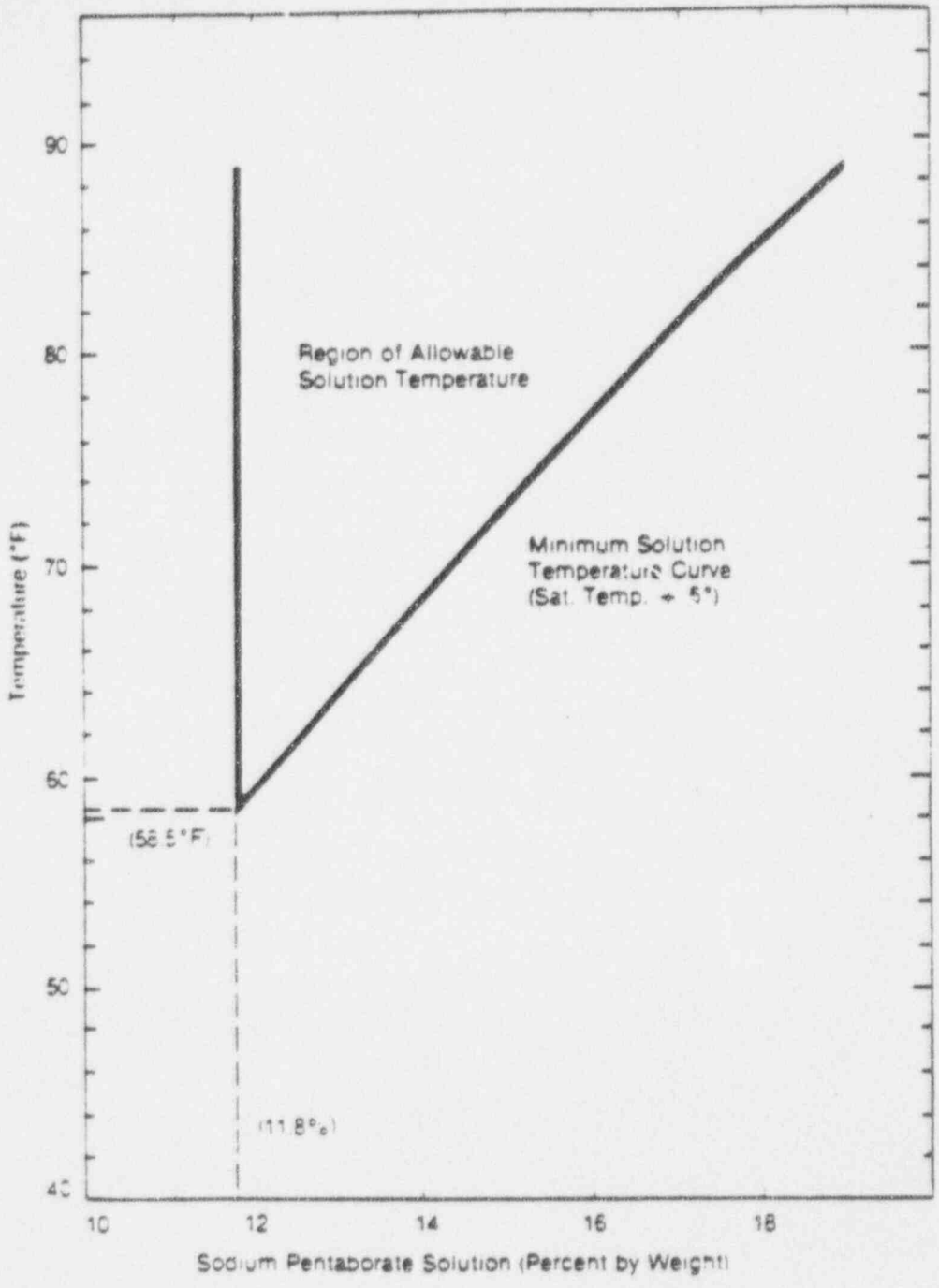
Region 4: Extended SLO Surv. Region
- requires Core Plate D/P noise monitoring

Region 5: Unrestricted Two Loop & SLO Region

DUANE ARNOLD ENERGY CENTER IES UTILITIES INC. TECHNICAL SPECIFICATIONS
THERMAL POWER Vs CORE FLOW LIMITS FOR THERMAL HYDRAULIC STABILITY SURVEILLANCE FIGURE 3.3-1



DUANE ARNOLD ENERGY CENTER IES UTILITIES INC. TECHNICAL SPECIFICATIONS
SODIUM PENTABORATE SOLUTION VOLUME CONCENTRATION REQUIREMENTS FIGURE 3.4-1



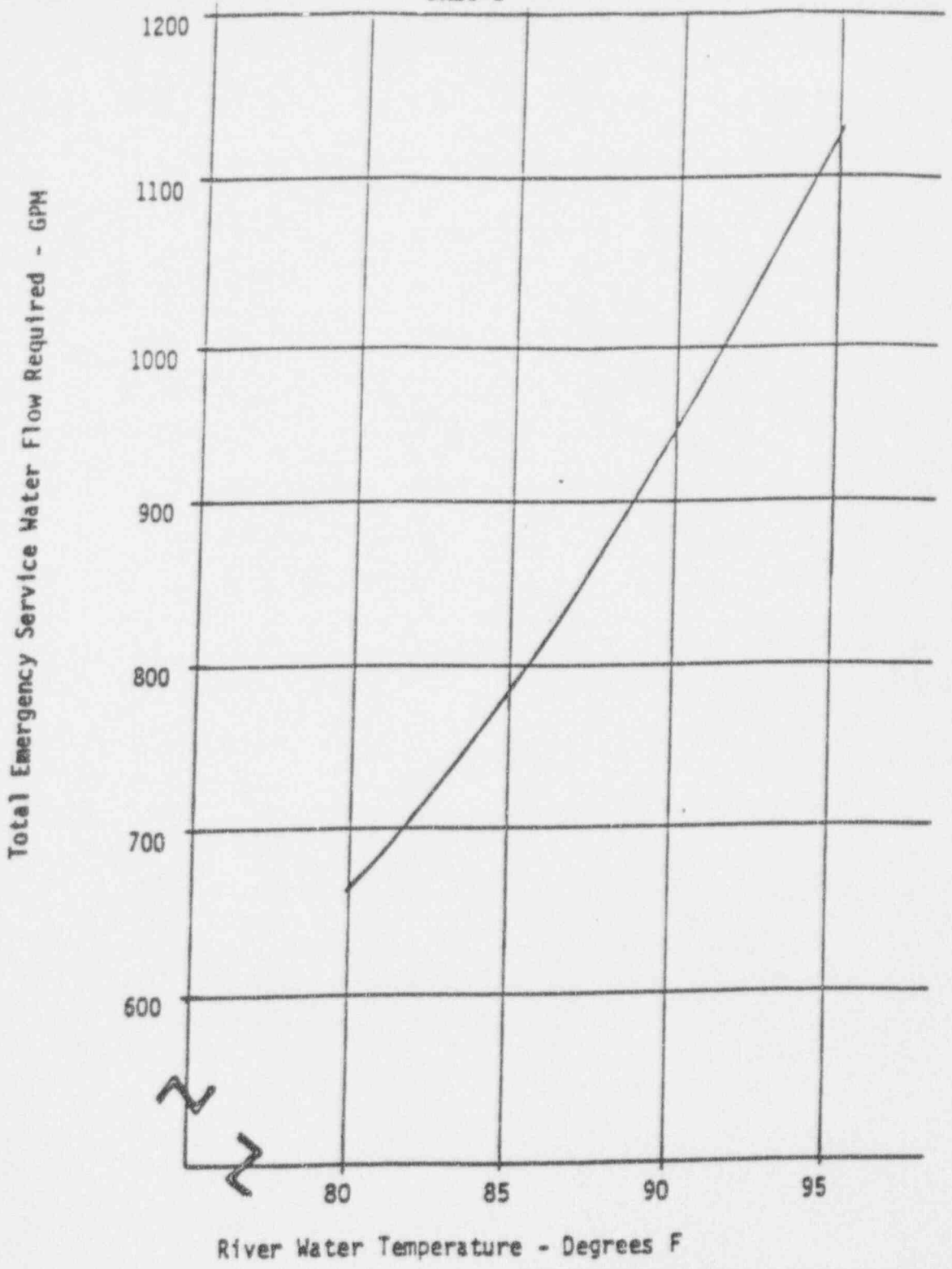
DUANE ARNOLD ENERGY CENTER
IES UTILITIES INC.
TECHNICAL SPECIFICATIONS

MINIMUM TEMPERATURE OF
SODIUM PENTABORATE SOLUTION
FIGURE 3.4-2

The pressure suppression pool water provides the heat sink for the reactor primary system energy release following a postulated rupture of the system. The pressure suppression chamber water volume must absorb the associated decay and structural sensible heat released during primary system blowdown from 1040 psig. Since all of the gases in the drywell are purged into the pressure suppression chamber air space during a loss-of-coolant accident, the pressure resulting from isothermal compression plus the vapor pressure of the liquid must not exceed 62 psig, the suppression chamber maximum allowable pressure. The design volume of the suppression chamber (water and air) was obtained by considering that the total volume of reactor coolant to be condensed is discharged to the suppression chamber and that the drywell volume is purged to the suppression chamber.

Using the minimum or maximum water volumes given in the specification, containment pressure during the design basis accident is approximately 43 psig which is below the design pressure of 56 psig. The minimum volume of 58,900 ft^3 results in a submergence of approximately 3 feet. Based on Humboldt Bay, Bodega Bay, and Marviken test facility data as utilized in General Electric Company document number NEDE-21885-P and data presented in Nutech document, IES Utilities Inc. document number 7884-M325-002, the following technical assessment results were arrived at:

1. Condensation effectiveness of the suppression pool can be maintained for both short and long term phases of the Design Basis Accident (DBA), Intermediate Break Accident (IBA), and Small Break Accident (SBA) cases with three feet submergence.



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TECHNICAL SPECIFICATIONS

DAEC EMERGENCY SERVICE
WATER FLOW REQUIREMENT
FIGURE 4.8.E-1

5.0 DESIGN FEATURES

5.1 SITE

The Duane Arnold Energy Center site is located on the western side of a north-south reach of the Cedar River, approximately 2-1/2 miles nort-northeast of the village of Palo, Iowa. The site consists of approximately 500 acres owned by IES Utilities Inc. The plan of the site is shown on Figures 1.2-1 and 1.2-2 of the Updated FSAR. The minimum distance to the boundary of the exclusion area as defined in 10 CFR 100.3 is approximately 1000 feet.

6.0 ADMINISTRATIVE CONTROLS

6.1 MANAGEMENT - AUTHORITY AND RESPONSIBILITY

6.1.1 The Plant Superintendent-Nuclear has primary responsibility for the safe operation of the DAEC, and reports to the Vice President, Nuclear.

6.1.2 The overall responsibility for the fire protection program for DAEC is assigned to the Vice President, Nuclear. The DAEC Plant Superintendent-Nuclear is responsible for directing the operating plant fire protection program.

6.1.3 The Manager, Corporate Quality Assurance is responsible for implementation of the Quality Assurance Program at DAEC.

6.2 ORGANIZATION

6.2.1 ONSITE AND OFFSITE ORGANIZATION

Onsite and offsite organizations shall be established for unit operation and corporate management, respectively. The onsite and offsite organizations shall include positions for activities affecting the safety of the nuclear power plant.

a. Lines of authority, responsibility, and communication shall be established and defined from the highest management levels through intermediate levels to and including all operating organization positions. These relationships shall be documented and updated, as appropriate in the form of organization charts, functional descriptions of departmental responsibilities and relationships, and job descriptions for key personnel positions, or in equivalent forms of documentation. These requirements shall be documented in the Duane Arnold Energy Center Updated Final Safety Analysis Report and updated in accordance with 10 CFR 50.71(e).

b. The plant Superintendent-Nuclear shall be responsible for overall unit safe operation and shall have control over those onsite activities necessary for safe operation and maintenance of the plant.

c. The Vice President, Nuclear shall have corporate responsibility for overall plant nuclear safety and shall take any measures needed to ensure acceptable performance of the staff in operating,

maintaining, and providing technical support to the plant to ensure nuclear safety.

d. The individuals who train the operating staff and those who carry out health physics and quality assurance functions may report to the appropriate onsite manger; however, they shall have sufficient organizational freedom to ensure their independence from operating pressures.

6.2.2 PLANT STAFF ORGANIZATION

The following manning requirements shall be met:

1. All CORE ALTERATIONS shall be directly supervised by either a Senior Reactor Operator or Senior Reactor Operator Limited to Fuel Handling who has no other concurrent responsibilities during this operation.

2. At all times when there is fuel in the reactor:
   a. A senior reactor operator shall be on the plant site.
   b. A reactor operator shall be in the control room.
   c. Two reactor operators shall be in the control room during startup, scheduled shutdown, and during recovery from trips caused by transients or emergencies.
   d. Minimum operating shift crew compositions shall conform to those shown in Table 6.2-1.
   e. At least one member of each operating shift crew shall be qualified to implement radiation protection procedures.

6.5.1.4 Meeting Frequency

The Operations Committee meet at least once per calendar month and as convened by the Operations Committee Chairman or Vice Chairman.

6.5.1.5 Quorum

A quorum of the Operations Committee shall consist of the chairman or Vice Chairman and five members including alternates.

6.5.1.6 Responsibilities

The Operations Committee shall be responsible for:

a. Review of (1) all procedures required by Specification 6.8, Plant Operating Procedures, and changes thereto, (2) any other proposed procedures or changes thereto as determined by the plant Superintendent-Nuclear to affect nuclear safety.

b. Review of all proposed tests and experiments that affect nuclear safety.

c. Review of all proposed changes to the Technical Specifications.

d. Review of all proposed changes or modifications to plant systems or equipment that affect nuclear safety.

e. Investigation of all violations of the Technical Specifications including the preparation and forwarding of reports covering evaluation and recommendations to prevent recurrence to the Vice President, Nuclear and to the Chairman of the Safety Committee.

f. Review of all Reportable Events.

g. Review of facility operations to detect potential safety hazards.

h. Performance of special reviews, investigations or analyses and reports thereon as requested by the Chairman of the Safety Committee.

i. Review of the Plant Security Plan and implementing procedures.

j. Review of the Emergency Plan and implementing procedures.

k. Review of every unplanned release of radioactivity to the environs for which a report to the NRC is required.

l. Review of changes to the Offsite Dose Assessment Manual and changes to the Process Control Program.

m. Review of the Fire Protection Program and implementing procedures.

6.5.1.7 Authority

The Operations Committee shall:

a. Recommend to the Plant Superintendent-Nuclear written approval or disapproval of items considered under Specification 6.5.1.6 (a) through (d) above.

b. Render determinations in writing with regard to whether or not each item considered under 6.5.1.6 (a) through (e) above constitutes an unreviewed safety question.

c. Provide written notification within 24 hours to the Vice President, Nuclear and the Safety Committee of disagreement between the Operations Committee and the Plant Superintendent-Nuclear; however, the Plant Superintendent-Nuclear shall have responsibility for resolution of such disagreements pursuant to Specification 6.1.1 above.

6.5.1.8 Record

The Operations Committee shall maintain written minutes of each meeting and copies shall be provided to the Vice Present, Nuclear and the Chairman of the Safety Committee.

6.5.2 Safety Committee

6.5.2.1 Function

The Safety Committee shall function to provide independent review and audit of disignated activities in the areas of:

a. Nuclear power plant operations.

b. Nuclear Engineering.

6.6 REPORTABLE EVENT ACTION

6.6.1 The following actions shall be taken for REPORTABLE EVENTS.

a. Each REPORTABLE EVENT shall be reviewed by the Operations Committee, and a report shall be submitted to the Safety Committee and the Vice President, Nuclear and

b. The Commission shall be notified and a report submitted pursuant to the requirements of Section 50.73 to 10 CFR Part 50.

6.7 ACTION TO BE TAKEN IF A SAFETY LIMIT IS EXCEEDED

6.7.1 If a safety limit is exceeded, the reactor shall be shut down and reactor operation shall only be resumed when authorized by the NRC.

6.7.2 An immediate report shall be made to the Vice President, Nuclear and the Safety Committee. The Vice President, Nuclear shall promptly report the circumstances to the NRC as specified in Subsection 6.11, Plant Reporting Requirements.

6.7.3 A complete analysis of the circumstances leading up to and resulting from the situation together with recommendations to prevent a recurrence shall be prepared by the Operations Committee. This report shall be submitted to the Vice President, Nuclear and to the Safety Committee. Appropriate analyses or reports will be submitted to the NRC by the Vice President, Nuclear as specified in Subsection 6.11, Plant Reporting Requirements.

Distribution:
Docket File 50-331
NRC & Local PDR
PDIII-3 Reading
J. Roe
J. Zwolinski
J. Hannon
M. Rushbrook
R. Pulsipher
OGC - OWF 15B18
D. Hagan
G. Hill (2)
C. Morris - OWF 7E4
C. Berlinger - OWF 7E4
ACRS (10)
OPA - OWF 2G5
OC (LFDCB)
E. Greenman, RIII

MATERIALS LICENSE

Amendment No. 16

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, 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	
1. Department of the Army	In accordance with the application dated May 20, 1993,
2. U.S. Army Armament Research Development and Engineering Center Picatinny Arsenal, New Jersey 07806-5000	3. License number 29-00047-06 is amended in its entirety to read as follows:
	4. Expiration date January 31, 1999
	5. Docket or Reference No. 030-05216

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. Cobalt 60	A. Sealed source (Gamma Industries Model A-8-A)	A. 125 curies
B. Cobalt 60	B. Sealed source (American Nuclear Corp. Dwg. No. P-101814)	B. 10,000 curies
C. Cesium 137	C. Sealed source (Oak Ridge National Laboratory Drawing A-RD-1293)	C. 140 curies

9. Authorized use

A. For use in a Gamma Industries Model Gammatron 100A/Bioimaging Research Corporation Computerized Tomography System for research and development as defined in 10 CFR 30.4.

B. For use in custom made Dougherty Box irradiator for irradiation studies of materials for military research and development projects.

C. For storage only in a Ameray Corporation self-shielded irradiator.

CONDITIONS

10. A. Licensed material specified in 6.A. may be used only at Building 908, Army Research and Development Center (ARDEC), Picatinny Arsenal, Dover, New Jersey.

B. Licensed material specified in 6.B. may be used only at Building 312, ARDEC, Picatinny Arsenal, Dover, New Jersey.

C. Licensed material specified in 6.C. shall be stored only at Building 3030, ARDEC, Picatinny Arsenal, Dover, New Jersey.

11. A. Licensed material shall be used by, or under the supervision of, individuals designated by the licensee's Ionizing Radiation Control Committee, Micheal F. Clune, Chairman.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number 29-00047-06

Docket or Reference number 030-05216

Amendment No. 16

(11. Continued) CONDITIONS

B. 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 application dated May 20, 1993 and letter dated October 8, 1993 and have been designated in writing by the Radiation Safety Officer. The licensee shall maintain records of individuals designated as users for five years following the last use of licensed material by the individual.

C. The Radiation Safety Officer for this license is Richard Fliszar.

12. A. Sealed sources and detector cells shall be tested for leakage and/or contamination at intervals not to exceed 6 months or at such other intervals as are specified by the certificate of registration referred to in 10 CFR 32.210, not to exceed 3 years.

B. Notwithstanding Paragraph A of this Condition, sealed sources designed to emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed 3 months.

C. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, a sealed source or detector cell received from another person shall not be put into use until tested.

D. Each sealed source fabricated by the licensee shall be inspected and tested for construction defects, leakage, and contamination prior to any use or transfer as a sealed source.

E. Sealed sources and detector cells need not be leak tested if:

(i) they contain only hydrogen 3; or

(ii) they contain only a gas; or

(iii) the half-life of the isotope is 30 days or less; or

(iv) they contain not more than 100 microcuries of beta and/or gamma emitting material or not more than 10 microcuries of alpha emitting material; or

(v) they are not designed to emit alpha particles, 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 tested within the required leak test interval, they shall be tested before use or transfer. No sealed source or detector cell shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.

(12. continued) CONDITIONS

F. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. Records of leak test results shall be kept in units of microcuries and shall be maintained for inspection by the Commission. If the test reveals the presence of 0.005 microcurie or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission and the source shall be removed from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. The report shall be filed within 5 days of the date the leak test result is known with the U.S. Nuclear Regulatory Commission, Region I, ATTN: Chief, Nuclear Materials Safety Branch, 475 Allendale Road, King of Prussia, Pennsylvania 19406. The report shall specify the source involved, the test results, and corrective action taken.

G. The licensee is authorized to collect leak test samples for analysis by the licensee. Alternatively, tests for leakage and/or contamination may be performed by persons specifically licensed by the Commission or an Agreement State to perform such services.

13. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders by the licensee.

14. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under the license. Records of inventories shall be maintained for 5 years from the date of each inventory.

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

16. The licensee shall not perform repairs or alterations of the irradiators involving removal of shielding or access to the licensed material. Removal, replacement, and disposal of sealed sources in the irradiators shall be performed by a person specifically licensed by the Commission or an Agreement State to perform such services.

17. The procedures contained in the manufacturer's instruction manual for the irradiator authorized by this license shall be followed and a copy of this manual shall be made available to each person using or having responsibility for the use of the device.

18. Notwithstanding the periodic leak test required by 10 CFR 34.25(b), the requirement does not apply to radiography sources that are stored and not being used. The sources excepted from this test shall be tested for leakage before use or transfer to another person. No sealed source shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.

19. The licensee is authorized to receive, possess, and use sealed sources of iridium-192 or cobalt-60 where the radioactivity exceeds the maximum amount of radioactivity specified in this license provided:

A. such possession does not exceed the quantity per source specified in Item 8 by more than 20% for iridium-192 or 10% for cobalt-60; and

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number 29-00047-06
Docket or Reference number 030-05216
Amendment No. 16

(19. Continued) CONDITIONS

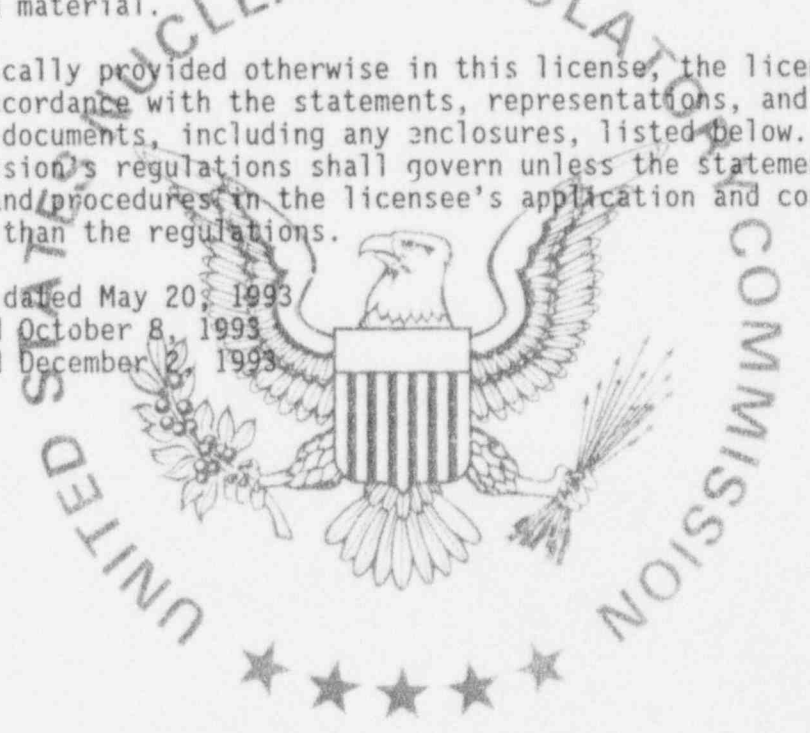
B. records of the licensee show that no more than the maximum amount of radioactivity per source specified in this license was ordered from the supplier or transferor of the byproduct material; and

C. the levels of radiation for radiographic exposure devices and storage containers do not exceed those specified in 10 CFR 34.21.

20. Pursuant to 10 CFR 40, "Domestic Licensing of Source Material," the licensee is authorized to possess, use, transfer, and import up to 999 kilograms of uranium metal used as shielding material.

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. Application dated May 20, 1993
B. Letter dated October 8, 1993
C. Letter dated December 2, 1993



For the U.S. Nuclear Regulatory Commission

Date DEC 14 1993

By Original Signed By:
Duncan White

Nuclear Materials Safety Branch
Region I
King of Prussia, Pennsylvania 19406

DEC 14 1993

License No. 29-00047-06
Docket No. 030-05216
Control No. 116060

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

Dear Commander:

Please review the enclosed document carefully and be sure that you understand all conditions. If there are any errors or questions, please notify the U.S. Nuclear Regulatory Commission, Region I office, the Licensing Assistance Section, (215) 337-5093 or 5239, so that we can provide appropriate corrections and answers.

Please be advised that your license expires at the end of the day, in the month, and year stated in the license. Until your license is terminated, you must conduct your program involving byproduct materials in accordance with the conditions of your NRC license, representations made in your license application, and NRC regulations. In particular, note that you must:

1. Operate in accordance with NRC regulations 10 CFR Part 19, "Notices, Instructions and Reports to Workers; Inspections," 10 CFR Part 20, "Standards for Protection Against Radiation," and other applicable regulations.

2. Not possess and use materials authorized in Items 6, 7, and 8, on the license until:

   a. you have constructed the facilities and obtained the equipment described in the license application and supporting documentation; and

   b. you have notified the U.S. Nuclear Regulatory Commission, Region I, ATTN: Chief, Nuclear Materials Safety Branch, 475 Allendale Road, King of Prussia, Pennsylvania 19406 in writing, that activities authorized by the license will be initiated.

3. Notify NRC, in writing, within 30 days:

   a. when an authorized user or Radiation Safety Officer, permanently discontinues performance of duties under the license or has a name change; or

   b. when the licensee's mailing address changes (no fee is required if the location of byproduct material remains the same).

4. In accordance with 10 CFR 30.36(b) and/or license condition, notify NRC, promptly, in writing, and request termination of the license:

   a. when you decide to terminate all activities involving materials authorized under the license; or

   b. if you decide not to complete the facility, acquire equipment, or possess and use authorized material.

5. Request and obtain a license amendment before you:

   a. permit anyone to work as an authorized user under the license;

   b. change Radiation Safety Officers;

   c. order byproduct material in excess of the amount, or radionuclide, or form different than authorized on the license;

   d. add or change the areas of use or address or address of use identified in the license application or on the license; or

   e. change ownership of your organization.

6. Submit a complete renewal application with proper fee or termination request at least 30 days before the expiration date of your license. You will receive a reminder notice approximately 90 days before the expiration date. Possession of byproduct material after your license expires is a violation of NRC regulations. A license will not normally be renewed, except on a case-by-case basis, in instances where licensed material has never been possessed or used.

In addition, please note that NRC Form 313 requires the applicant, by his/her signature, to verify that the applicant understands that all statements contained in the application are true and correct to the best of the applicant's knowledge. The signatory for the application should be the licensee or certifying official rather than a consultant.

You will be periodically inspected by the NRC. Failure to conduct your program in accordance with NRC regulations, license conditions, and representations made in your license application and supplemental correspondence with NRC will result in enforcement action against you. This could include issuance of a notice of violation, or imposition of a civil penalty, or an order suspending, modifying or revoking your license as specified in the General Policy and Procedures for NRC Enforcement Actions, 10 CFR Part 2, Appendix C. Since serious consequences to employees and the public can result from failure to comply with NRC requirements, prompt and vigorous enforcement action will be taken when dealing with licensees who do not achieve the necessary meticulous attention to detail and the high standard of compliance which NRC expects of its licensees.

Thank you for your cooperation.

Sincerely,

Original Signed By:
Duncan White

Duncan White
Nuclear Materials Safety Branch
Division of Radiation Safety
and Safeguards

Enclosures:
1. Amendment No. 16
2. Requirements for Materials Licensees

DRSS/RI
White/cmm

11/19/93

OFFICIAL RECORD COPY - G:\WPS\MLTR\L2900047.06 - 11/18/93

DEPARTMENT OF THE ARMY
U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NJ 07806-5000

M516
Q-4

December 2, 1993

REPLY TO
ATTENTION OF

Safety, Surety, & Environmental Office
Installation Safety Division
Health Physics Branch

030-05216

SUBJECT: Update to 29-00047-06 License Renewal Application

U.S. Nuclear Regulatory Commission -
Region I
Attention: Mr. Duncan White
Nuclear Materials Safety Branch
Division of Radiation Safety and Safeguards
475 Allendale Road
King of Prussia, Pennsylvania 19406

Gentlemen:

Enclosed are pages to be inserted into the May 20, 1993 license renewal for NRC License No. 29-00047-06 as was discussed in several telephone conversations between Mr. Duncan White and Messrs. Lawrence D'Aries and Richard Moss of this office over the past few weeks. These pages are to replace the correspondingly numbered pages in the application submitted on the above-mentioned date.

Also discussed was the fact that no serial number or model number for the Co-60 source for the Tomography system is available at this time since no decision has been made on a specific source to purchase. When a decision is made, a license amendment will be sought at that time.

Any questions concerning this submission should be directed to Messrs. D'Aries or Moss at (201)724-3742.

Michael F. Clune
Acting Chief, Safety, Surety,
and Environmental Office

Enclosures

Copies Furnished:
Commander, U.S. Army Materiel Command, ATTN: AMCSF-P
(Mr. John Manfre), Alexandria, VA 22333-0001
Commander, U.S. Army Armament, Munitions, and Chemical
Command, ATTN: AMSMC-SFS (Ms. Betty Peterson), Rock
Island, IL 61299-6000

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DEC 0 8 1993

OFFICIAL RECORD COPY ML 10

ITEM 8

ARDEC, Picatinny Arsenal, NJ 07806-5000

ITEM 8 - Training for Individuals Working In or Frequenting Restricted Areas

Prior to working in a radiation area, new radiation workers receive formal training from the ARDEC Radiation Protection Officer (RPO) or his alternate.

Those ARDEC radiation workers who will further be designated as radiographers will either receive radiation safety training given by an outside contractor who will be approved by the American Society for Nondestructive Testing (ASNT), or receive radiation safety training given in-house by an appropriate member of the ARDEC Health Physics Branch. Training will be about 40 hours long, and will culminate in a comprehensive written examination. A mandatory field examination on safety procedures will also be offered and administered by either the appropriate immediate supervisor or the ARDEC RPO, but always with the approval of the RPO. All of the ARDEC health physicists who will have oversight over radiographic operations will also have the classroom training and pass the written examination.

OUTLINE OF RADIOGRAPHY SAFETY TRAINING
AND PROPOSED APPROXIMATE TIMES TO BE SPENT ON EACH TOPIC

I. Fundamentals of Radiation Safety (16 hrs)
   A. Characteristics of gamma radiation
   B. Units of radiation dose (mrem) and quantity of radioactivity (curie)
   C. Hazards of exposure to radiation
   D. Levels of radiation from licensed material
   E. Methods of controlling radiation dose

II. Radiation Detection Instrumentation to be Used (6 hrs)
   A. Use of radiation survey instruments
   B. Survey techniques
   C. Use of personnel monitoring equipment

III. Radiographic Equipment to be Used (6 hrs)
   A. Remote handling equipment
   B. Radiographic exposure devices
   C. Storage containers

IV. Inspection/Maintenance Performed by the Radiographers (4 hrs)

V. Case Histories of Radiography Accidents (4 hrs)

VI. SOP, Reg (19, 20, 34), Emergency Procedures (4 hrs)

ITEM 8

ARDEC, Picatinny Arsenal, NJ 07806-5000

ITEM 8 - Training for Individuals Working In or Frequenting Restricted Areas (cont'd)

DESCRIPTION OF RADIOGRAPHY FIELD EXAMINATION

The field examination will be a test of the radiographer's familiarity with the Standing Operating Procedure (SOP) that covers that particular operation, as well as a thorough test of all safety procedures associated with that operation.

IDENTIFICATION AND QUALIFICATIONS OF INDIVIDUAL GIVING RADIOGRAPHY TRAINING

Mr. Lawrence J. D'Aries will give the radiography safety training, as appropriate, but the other ARDEC health physicists who have radiography operations oversight are equally qualified to give this training, since they have completed an ASNT-approved 40-hour radiography safety course, and have successfully passed the accompanying written exam. All of their resumes are listed in Item 7.

New ARDEC radiation workers receive a minimum of four hours of basic radiation safety training, and advanced (isotope specific) training which includes, but is not limited to:

a. Basic nuclear theory adequate to ensure worker understanding of nuclear decay, decay pathways, and the radiation hazards associated with such;

b. Radiation units and measurements;

c. Operation and procedures for using radiation detection and monitoring instruments available;

d. Biological effects of ionizing radiation;

e. The precautions and procedures to minimize radiation exposure IAW ALARA principles, and to control radioactive contamination;

f. Responsibility of individuals to report unsafe acts or conditions observed in restricted areas;

g. The rights of employees under provisions of 10 CFR 19;

h. The successful completion of a written exam.

ITEM 8

ARDEC, Picatinny Arsenal, NJ 07806-5000

ITEM 8 - Training for Individuals Working In or Frequenting Restricted Areas (cont'd)

In addition to the formal training provided by the Health Physics Branch staff, the supervisors of all new radiation workers will conduct on-the-job training and instruction specific to the particular operations conducted at that job site. This includes requiring the employee to:

a. Review and understand the Standing Operating Procedures (Sops);

b. Have demonstrated how the operations are performed, where possible;

c. Practice the steps, and constructively criticize the employee's performance.

Only following successful completion of all of these steps, in addition to having a pre-placement medical examination, will an employee be allowed to work with radioactive material. In addition, yearly training is provided to all ARDEC radiation workers by the ARDEC RPO, or his alternate. Records of all training are maintained as required by NRC and Army regulations.

The licensee will not permit any individual to act as a radiographer until the individual has:

a. Been instructed in the subjects outlined in 10 CFR 34, Appendix A;

b. Received copies of, and instruction in, NRC regulations contained in 10 CFR, Part 34, and in the applicable sections of 10 CFR Parts 19 and 20; NRC license(s) under which the radiographer will perform radiography; and the licensee's operating and emergency procedures. A written examination which will cover 10 CFR 34, Appendix A, and Parts 19 and 20, as well as emergency and operating procedures will be administered. Some of the sample questions are as follows:

1. What are the three aspects of exposure to radiation which must be carefully examined when considering controlling/limiting the dose to a radiation worker/radiographer?

Answer: Time, distance, and shielding.

ITEM 8

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 8 - Training for Individuals Working In or Frequenting Restricted Areas (cont'd)

2. Put the following radiations in order of increasing penetration ability in a typical exposure scenario: beta, alpha, and gamma.

Answer: alpha, beta, and gamma.

3. Of the following devices, (TLD, Ion chamber, pocket dosimeter), which measure dose, and which measure dose rate?

Answer: Dose-TLD, pocket dosimeter; dose rate-ion chamber.

4. Pocket dosimeters must be checked to read correct response at periods not to exceed how many months?

Answer: 12.

5. Which NRC form lists the NRC toll-free telephone hotline number; contains information on the reporting of violations; and must be posted for all radiation workers and radiographers to see?

Answer: NRC Form 3.

6. If at any time during operation of the Tomographic system with Cobalt-60 source, the self-reading pocket dosimeter is found to be off scale, what is the operator to immediately do?

Answer: Operations are to be immediately curtailed and, if possible, the source is to be cranked back into the Gammatron-100 storage position, and applicable emergency procedures are to be followed.

7. How high must the radiation level be in a posted "radiation area"?

Answer: Two milliroentgens per hour.

8. What do the signs that are posted at the entrance to Bay 19 in building 908 state?

Answer: "CAUTION (OR DANGER) HIGH RADIATION AREA".

ITEM 8

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 8 - Training for Individuals Working In or Frequenting Restricted Areas (cont'd)

9. 10 CFR 20 allows a maximum occupational dose to the whole body of a radiation worker in one calendar year of how many millirems?

Answer: 5,000.

10. The 10 CFR 20 permissible level of dose to the whole body in an unrestricted area for a calendar year is how many rems?

Answer: 0.5.

c. Has demonstrated competence to use the licensee's radiographic exposure devices, sealed sources, related handling tools, and survey instruments;

d. Has demonstrated understanding of the instructions above by successful completion of a written test, and a field (practical) examination on the subjects covered.

In addition, no individual shall work as a radiographer's assistant until that individual:

a. Has received copies of, and instruction in the operating and emergency procedures contained within this license;

b. Has demonstrated competence to use, under the supervision of the radiographer, the radiographic exposure devices, sealed sources, related handling tools, and radiation survey instruments that the assistant will use;

c. Has demonstrated understanding of the above by successfully completing a written or oral test, and a field exam on the subjects covered.

ITEM 10

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 10 - Radiation Safety Program (cont'd)

due dates are staggered so that there are a sufficient number of portable ionizing chamber instruments available for use at all times. The instruments: (1) are calibrated so that the readings are no more than 20 percent of the actual values over the range of the instrument(s); (2) have a calibration chart that shows the results of the calibration; (3) have the date of last calibration, and the due date for the next calibration affixed to the survey meter. Calibration records for the instruments are retained for a minimum of two years after each calibration, and identify who calibrated the instrument(s). Reference attached Table for listing of pertinent radiation detecting equipment presently on hand within the ARDEC Health Physics Branch of SSEO. Equivalent type equipment may be purchased and used in substitution in the future without requiring license amendment.

10.3 Internal Inspection Program: Radiographers and their assistants who operate the Gammatron-100 system will be inspected for compliance with 10 CFR 34 regulations, and license conditions, as well as specific operating and emergency procedures at intervals not to exceed three months, by the health physics staff of the Health Physics Branch within SSEO, or by one of the authorized radiographers for this system. A radiographer may not assess his/her own actions in order to comply with this license condition. Should a radiographer or assistant not have operated the Gammatron-100 system for more than three months since the last inspection, that individual's performance will be observed and assessed prior to the next time that individual participates in the operation. Inspection records on the performance of radiographers or their assistants will be retained a minimum of three years.

Any critical deficiencies discovered during the course of the inspection are to be immediately reported to the Radiation Protection Officer (RPO), and the operation stopped, if that deficiency cannot be corrected at that moment. Operation of the Gammatron-100 alone, or in conjunction with the Bioimaging Research Corporation Computerized Tomography (BIRC-CT) system will not be started up again until the deficiency is corrected, and approval is obtained from the RPO.

Personnel who are to conduct the internal inspections regarding the operation of the Gammatron-100 system will be either health physicists from the Health Physics Branch of SSEO, or one of the ARDEC radiographers.

TELEPHONE CONVERSATON RECORD	**Date:** 11/30/93	**Time:** 1:30 pm
Mail Control No.: 116060	**License** : 29-00047-06	**Docket No.:** 030-05216
Person Called: Larry DeArsy	**Organization:** US Army - Picatinny Arsenal	**Telephone Number:** (201) 724-3742
Person Calling: Duncan White		
Subject: Additional changes to license		
Summary: The licensee will be senting a letter to Region I to allow them the flexibility to either use an ANST certified course or train in-house. They will seek an amendment to incorporate a change in source model number for the Tomography system at a later time.		
Action Required/Taken: MS 15		
Signature: Duncan White Duncan White	**Date:** November 30, 1993	

OFFICIAL RECORD COPY ML 10

030-05216

NRC FORM 314 (5-92)
10 CFR 30.36(d)(1)(iv)
10 CFR 40.42(d)(1)(iv)
10 CFR 70.38(d)(1)(iv)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0028
EXPIRES: 05/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 30 MINUTES. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0028), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

CERTIFICATE OF DISPOSITION OF MATERIALS

INSTRUCTIONS: ALL ITEMS MUST BE COMPLETED -- PRINT OR TYPE
SEND THE COMPLETED CERTIFICATE TO THE NRC OFFICE SPECIFIED ON THE REVERSE

LICENSEE NAME AND ADDRESS
Department of the Army
U.S. Army Armament Research, Development & Engineering Center (ARDEC)
Picatinny Arsenal, NJ 07806-5000

LICENSEE NUMBER
29-00047-06

LICENSE EXPIRATION DATE
License Renewal Application Submitted May 20, 1993

A. MATERIALS DATA *(Check one and complete as necessary)*

THE LICENSEE OR ANY INDIVIDUAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE LICENSEE CERTIFIES THAT:
(Check and/or complete the appropriate item(s) below.)

[ ] 1. NO MATERIALS HAVE EVER BEEN PROCURED OR POSSESSED BY THE LICENSEE UNDER THIS LICENSE.

OR

[X] 2. ALL MATERIALS PROCURED AND/OR POSSESSED BY THE LICENSEE UNDER THE LICENSE NUMBER CITED ABOVE HAVE BEEN DISPOSED OF IN THE FOLLOWING MANNER. *(If additional space is needed, use the reverse side or provide attachments.)*

Cobalt-60, Sealed Sources (Neutron Products, Inc. Serial Numbers T265, T266, T269)

Describe specific material transfer actions and, if there were radioactive wastes generated in terminating this license, the disposal actions including the disposition of low-level radioactive waste, mixed waste, Greater-than-Class-C waste, and sealed sources, if applicable.

ARDEC designated Source No. 27B. The referenced Cobalt-60 sources were returned to the manufacturer on October 5, 1993 to remake, along with similar sources, irradiation processing sources. Sources referenced in ARDEC '06' NRC license as "Sealed Source (Neutron Products, Inc. Model NPI-XX-XXXXW)"

For transfers, specify the date of the transfer, the name of the licensed recipient, and the recipient's NRC license number or Agreement State name and license number.

Date of transfer (October 5, 1993). Licensed recipient: Neutron Products, Inc., Dickerson, Maryland 20842. Recipient's License No. MD-31-025-03, Amendment No. 44.

If materials were disposed of directly by the licensee rather than transferred to another licensee, licensed disposal site or waste contractor, describe the specific disposal procedures *(e.g., decay in storage)*.

B. OTHER DATA

[ ] 1. OUR LICENSE HAS NOT YET EXPIRED; PLEASE TERMINATE IT.

2. WAS A RADIATION SURVEY CONDUCTED TO CONFIRM THE ABSENCE OF LICENSED RADIOACTIVE MATERIALS AND TO DETERMINE WHETHER ANY CONTAMINATION REMAINS ON THE PREMISES COVERED BY THE LICENSE? *(Check one)*

[ ] NO *(Attach explanation)*
[X] YES, THE RESULTS *(Check one)*
  [X] ARE ATTACHED, or
  [ ] WERE FORWARDED TO NRC ON *(Date)*

3. THE PERSON TO BE CONTACTED REGARDING THE INFORMATION PROVIDED ON THIS FORM	NAME	TELEPHONE NUMBER *(Include Area Code)*
	Richard W. Fliszar, ARDEC RPO	(201)724-3126

4. MAIL ALL FUTURE CORRESPONDENCE REGARDING THIS LICENSE TO
Department of the Army
U.S. Army Armament Research, Development and Engineering Center
ATTN: SMCAR-SEF, Bldg 320 (Mr. Richard W. Fliszar)
Picatinny Arsenal, NJ 07806-5000

CERTIFYING OFFICIAL

I CERTIFY UNDER PENALTY OF PERJURY THAT THE FOREGOING IS TRUE AND CORRECT

PRINTED NAME AND TITLE	SIGNATURE	DATE
Richard W. Fliszar, Supervisory Health Physicist/ARDEC RPO	Richard W. Fliszar	28 Oct. 1993

WARNING: FALSE STATEMENTS IN THIS CERTIFICATE MAY BE SUBJECT TO CIVIL AND/OR CRIMINAL PENALTIES. NRC REGULATIONS REQUIRE THAT SUBMISSIONS TO THE NRC BE COMPLETE AND ACCURATE IN ALL MATERIAL RESPECTS. 18 U.S.C. SECTION 1001 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.

NRC FORM 314 (5-92)

OFFICIAL RECORD COPY

ML 10

116060

NOV 0 1 1993

FILE CERTIFICATES AS FOLLOWS:

IF YOU ARE A DISTRIBUTOR OF EXEMPT PRODUCTS, SEND TO:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHERS, IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

LICENSING ASSISTANT SECTION
NUCLEAR MATERIALS SAFETY BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

NUCLEAR MATERIALS SAFETY SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION II
101 MARIETTA STREET NW, SUITE 2900
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

MATERIAL RADIATION PROTECTION SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
600 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-8064

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVADA, OREGON, WASHINGTON, AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:

NUCLEAR MATERIALS SAFETY SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION V
1450 MARIA LANE
WALNUT CREEK, CA 94596-5368

HEALTH PHYSICS RADIOLOGICAL MATERIALS OPERATIONS CLOSEOUT LEAK TEST SURVEY REPORT

Principal User: Emmett Barnes Date: October 5, 1993
Organization: AMSMC-QAH-T Surveyor(s): Joseph A. Fabiano
Bldg. No.: 1090 Survey Meter(s): Ludlum/Victoreen/Eberline
Room No.: AIDECS SOURCE ROOM Model No.(s): 3,450,E250
Phone No.: 4-4238 SN: 15760,1338,5248
Activity: LONG TERM STORAGE OF INACTIVE COBALT 60 SOURCE Calib Due Date: Oct 20, 12 '93; Dec 8, '93
ISOTOPE (S): COBALT-60

SMEAR ANALYSIS

NON-CONTROLLED AREA(S)

____ All smears show removable contamination of <100DPM/100cm^2.

____ The following smears show removable contamination >100 DPM/100cm^2

1. _____ 5. _____
2. _____ 6. _____
3. _____ 7. _____
4. _____ 8. _____

CONTROLLED AREA(S)

X All smears show removable contamination of <1000 DPM /100cm^2

____ The following smears show removable contamination >1000 DPM/100cm^2

1. _____ 5. _____
2. _____ 6. _____
3. _____ 7. _____
4. _____ 8. _____

TYPE OF ANALYSIS

____ Liquid Scintillation
X Alpha-Beta Gas Flow Proportional
____ Gamma Spectroscopy
____ GM Laboratory Counting System

Date of Analysis: October 5, 1993 Analysis By: Joseph A. Fabiano

CHECKLIST

YES	NO	N/A	
X	___	___	1. NRC Form # 3
X	___	___	2. Notice To Employees
X	___	___	3. Emergency Nos.Posted
X	___	___	4. Caution Sign Post
X	___	___	4.a Radioac Material
X	___	___	4.a.1 At Entrance
X	___	___	5. Personnel Dosimetry
X	___	___	6. Surv Meters Calib
X	___	___	7. ALARA Followed

REMARKS:
ARDEC License Nr: 29-00047-06

Neutron Products Radioactive Materials License MD-31-025-03

Cobalt-60 Sealed Sources:
Model Nr NPI-XX-XXXW
Serial Nos: T-265,T-266, and T-269

Comments: Results of the four smears taken are seen on the attached sheet. Various readings and measurements were taken and the results entered into the tables on the other side. Caution sign at the entrance to the AIDECS Source Room was removed after the Cobalt-60 sources had been transferred into its shipping cask and into its overpack and loaded onto the truck. Labels were properly affixed to the shipping cask and overpack.

The truck arrived at its destination with everything fine on October 7, 1993 at approximately 1400 Hours.

Reviewed By: Richard W. Filipps

SWIPE #	DESCRIPTION	RESULTS (DPM)	SURFACE RDG (mR/hr)	At 1 Meter (mR/hr)
11-14	INACTIVE CO-60 SOURCE NUMBER 27B	.935 Highest Reading	See Below	See Below

1 curie = 3.7E10dps = 2.220E12 dpm
Multiply # of dis/min 0.935 by 4.505E-7 to obtain microcuries
0.935 DPM x 4.505E-7 = 4.21E-7 microcuries

Reference: Radiological Units In The Radiological Health HandBook Page 23

Information gathered during the double transfer of the Cobalt-60 Source from the Automated Inspection Device For Explosive Charges (AIDECS) Shield to the Transfer Cask and From the Transfer Cask to the Shipping Cask.

Smears were taken by the undersigned. Measurements were taken by Mr. Fliszar. ARDEC Whole body badges and finger rings were issued to the members of the team performing the transfers and forwarded to the Ionizing Radiation Dosimetry Center in Lexington BlueGrass Kentucky upon completion of the project.

ARDEC/IRT Direct Reading Pocket Dosimeters Used

Barcode	Serial NR	Wearer	Initial Rdg mR	Final Rdg mR	mR
R6234	16214	Fabiano	1	1	0
M3964	9030139	Fliszar	1	4	3
M3960	101053	Eastman	2	2	0
-	-	Schwoerer	-	-	20
-	-	Repp	-	-	10
-	-	Koontz	-	-	10
-	-	Crosbie	-	-	10
-	-	Tusch	-	-	20

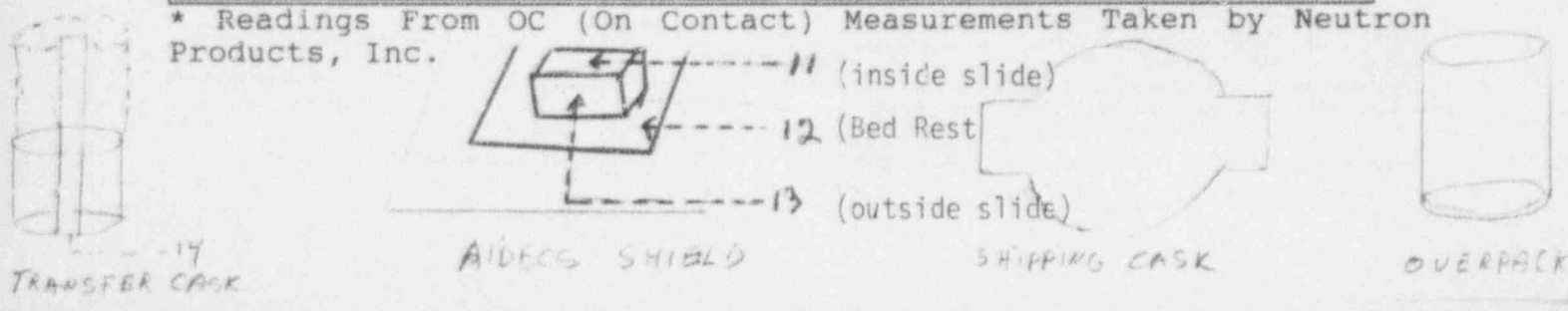
Portable Meters Used

Model NR	Serial NR	Barcode	Nomenclature	Calib Void Date
3	15760	M3111	Ludlum	October 20, 1993
450	1338	O4731	Victoreen	October 12, 1993
E520	5248	O4864	Eberline	December 8, 1993

Measurements Taken by Mr. Fliszar

Item	Location	Surface	@ 1M	Label	TI
Transfer Cask	Bottom of Side Plate	>2 R/Hr *1.5R/Hr		-	-
	Top,Middle,Side	Approx 20mR/Hr		-	-
Shipping Container	Center of Top Hat closest to source Center of Top Hat furthest from source	>300mR *450mR *10-15mR		-	-
	Center of Container	5mR/hr		III	15
Overpack		40mR/hr *35mR/Hr	3mR/Hr	III	3

* Readings From OC (On Contact) Measurements Taken by Neutron Products, Inc.



Efficiency Alpha 0.354 Beta .427

TUE OCT 05, 1993
GROUP C CLOSEOUT LEAK TEST SURVEY OF THE AIDECS CO-60 SOURCE IN BLDG 1090 (SEE DESCRIPTION OF LOCATIONS BELOW)

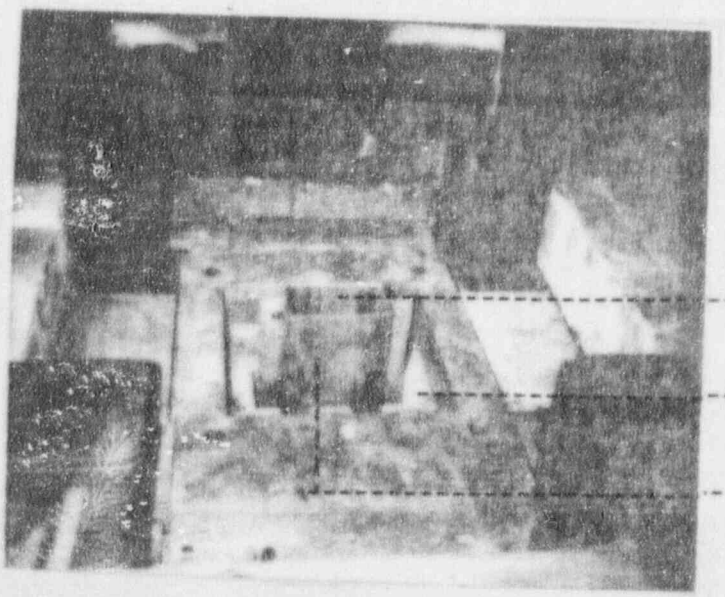
SAMPLE SN	CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED	TOD CLOCK HR:MN:SEC	
99	CO-60	5.00	0	13	0	0	0	0	11:33:42	
100	CO-60	5.00	4085	9876	817.00	1972.60	2388.8889	4608.8785	11:38:56	
11	CO-60	5.00	1	10	0.20	-0.60	.58479532	-1.4018692	11:44:09	Inside sleeve of Aidecs after source removal
12	CO-60	5.00	1	13	0.20	0	.58479532	0	11:49:22	on base for pigtail after Source was removed
13	CO-60	5.00	1	8	0.20	-1.00	.58479532	-2.3364486	11:54:35	Outside Protruding sleeve after Source removal
14	CO-60	5.00	1	15	0.20	0.40	.58479532	.93457944	11:59:47	Sleeve on Bottom end of Transfer Cask

$LLD_{NET\ ALPHA\ DPM} = \frac{4.66\sqrt{0}}{Time\ (EFF)} = 0$

$LLD_{NET\ BETA\ DPM} = \frac{4.66\sqrt{17}}{Time\ (EFF)} = \frac{4.66\ (3.6)}{5\ (.427)} = \frac{16.8}{2.135} = 7.87$

LEGEND FOR ABOVE SMEAR LOCATIONS

11. Inside sleeve of The AIDECS Source System after the sources were removed
12. On the base of reset (BED OF LEAD PLUG) on AIDECS CASTLE TOP
13. Outside the protruding sleeve after the sources were removed (AIDECS)
14. Sleeve hole on the bottom end of the transfer cask



TOP OF AIDECS SOURCE SYSTEM CASTLE

DEPARTMENT OF THE ARMY
U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NJ 07806-5000

October 8, 1993

REPLY TO
ATTENTION OF

M516
Q-4

Safety, Surety, & Environmental Office
Installation Safety Division
Health Physics Branch

030-05216
29-00047-06

SUBJECT: Mail Control No. 116060

U.S. Nuclear Regulatory Commission -
Region I
Attention: Mr. Duncan White
Nuclear Materials Safety Branch
Division of Radiation Safety and Safeguards
475 Allendale Road
King of Prussia, Pennsylvania 19406

Gentlemen:

In reference to your letter dated August 19, 1993, a copy of which is enclosed, that contains questions which arose during an initial review of the May 20, 1993 license renewal application, No. 29-00047-06, the following responses are provided.

The response to Question No. 1 is the ARDEC Sample Radiography Safety Training Exam with Answers, also enclosed.

The response to Question No. 2, enclosed, is detailed calculations of the radiation levels on the roof of building 908, and control procedures to limit exposures to personnel who may attempt to gain access to the roof.

The response to Question No. 3, enclosed, is more detailed calculations of the radiation levels outside the cell, roof, and adjacent bays during a worst-case set-up with a fully replenished 100 Curie Cobalt-60 source.

In response to Question No. 4, this Center has reviewed the attendance and contributions of the membership of the Ionizing Radiation Control Committee (IRCC), and has decided to reorganize the IRCC. Enclosed are details of the reorganization, in which the military member, the union representative, and the fire chief are re-classified as non-voting adjunct members. This office has also modified the IRCC Charter to reflect

116060

OCT 18 1993

this reorganization, and is included as enclosure. The resume of the one new plenary IRCC member is also enclosed for the record. Please substitute the revised IRCC Charter along with the one new resume in place of the old Charter and resume currently on file at your office.

As discussed with Mr. White on October 8, 1993, this Center transferred three sources from this license to Neutron Products, Incorporated License MD-31-025-03. The sources, with a total original activity of 15,000 Curies, Cobalt-60, were used with this Center's AIDECS system, and were so described on the license. A copy of the Neutron Products, Incorporated source transfer certification document is enclosed.

Any questions concerning this submission should be directed to either Mr. Richard W. Fliszar, ARDEC RPO, at (201) 724-3126, or to Messrs. Lawrence J. D'Aries, and Andy Kung, at (201) 724-3742.

Michael F. Clune
Acting Chief, Safety, Surety,
& Environmental Office

Enclosures

Copies Furnished:
CDR, AMCSF-P (Mr. John Manfre), Alexandria, VA
22333-0001
CDR, AMSMC-SFS (Ms. Betty Peterson), Rock Island, IL
61299-6000

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

AUG 19 1993

License No. 29-00047-06
Docket No. 030-05216
Control No. 116060

Department of the Army
Army Armament Research
and Engineering Center
ATTN: Richard Fliszar
Radiation Safety Officer
Picatinny Arsenal, New Jersey 07806-5000

Dear Mr. Fliszar:

This is in reference to your request in an application dated May 20, 1993 to renew License No. 29-00047-06. In order to continue our review, we need the following additional information:

1. We recommend that a radiographer's examination contain at least 50 questions. Please submit a copy of your radiographer's examination including answers to all the questions.

2. Please indicate what radiation levels are present on the roof of Building 908. If physical measurement is not possible, then calculations may be used. Radiation levels must be less than 100 milliroentgens per hour (mR/hr) on the roof. If radiation levels are less than 100 mR/hr but greater than 2 mR/hr, then describe your controls to limit exposure to personnel who may attempt to gain assess to the roof. If it is necessary to limit exposure device orientation or time of use to maintain the roof at less than 100 mR/hr, then specify the controls that you will use.

3. In your application, you indicate that a new radiation source for the tomography device could be up to 100 curies of cobalt 60. Please provide detailed calculations (with references for values used in the calculation) of the radiation levels outside the cell, including the roof and adjacent bays. These calculations should be for "worst case" set-up.

4. Your application did not include the qualifications of the following individuals on your Ionizing Radiation Control Committee: Susanne Bernhardt, Michael Lucas, and SSG Michael Ferrell. Please submit their qualifications.

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. 116060. If you have any technical questions regarding this deficiency letter, please call me at (215) 337-5042.

In order to continue prompt review of your application, we request that you submit your response to this letter within 30 calendar days from the date of this letter.

Sincerely,

Duncan White

Duncan White
Nuclear Materials Safety Branch
Division of Radiation Safety and
Safeguards

SAMPLE RADIOGRAPHY SAFETY TRAINING EXAM

---

1. Materials exposed to gamma and/or X-radiation become radioactive themselves:
   a. true
   b. false

2. The basic difference between gamma and X-radiation is:
   a. their QF (quality factor)
   b. their origin
   c. their ability to damage cells of human tissue
   d. gamma is electromagnetic radition, X is particulate

3. The primary hazard associated with industrial radiography is:
   a. external radiation
   b. internal radiation
   c. beta particles
   d. alpha particles

4. The most penetrating radiation from radioisotopes is:
   a. alpha radiation
   b. beta radiation
   c. gamma radiation
   d. all the radiations above are equally penetrating

5. Radioactive (or physical) half-life is defined as the time it takes for:
   a. one half of the atoms of a radioisotope to transform
   b. one half of the atoms of a radioisotope to be passed through the human body
   c. one half of the atoms of a radioisotope to be passed through the human body by a combination of biological elimination and radioactive decay

6. The unit that compares the biological effectiveness (damage) of the different types of radiations on human tissue is:
   a. the rem
   b. the rad
   c. the Roetgen
   d. the QF (quality factor)

7. The most serious radiation exposure is to:
   a. the whole body
   b. the feet and ankles
   c. the hands and forearms
   d. the skin

8. Some body cells are more radiosensitive than others:
   a. true
   b. false

9. The earliest indications of radiation damage to the body may be found in:
   a. the nerve cells (neurons)
   b. the skin cells
   c. bone cells
   d. blood cells

10. The physical effects of radiation on the body of an individual receiving the radiation are called:
   a. somatic effects
   b. latent effects
   c. genetic effects
   d. neurotic effects

11. The MLD (median lethal dose) for humans is the radiation dose:
   a. that causes the first death
   b. that causes the entire population exposed to die
   c. that causes 50% of those exposed to die
   d. all of the above

12. The MLD whole body dose for humans for acute exposure is about:
   a. 200 rem
   b. 400 rem
   c. 800 rem
   d. 2,000 rem

13. Film badges operate on the principle that film is exposed by:
   a. light
   b. heat
   c. ionizing radiation
   d. alpha particles

14. The intensity at 1 foot from a 100 curie source of Ir-192 is 590 R/hr. The intensity at the same distance from a 20 curie Ir-192 source would be:
   a. 118 R/hr
   b. 590 R/hr
   c. 20 R/hr
   d. dependent on the room temperature

15. The Geiger-Mueller counter operates on the principle of using a GM tube to:
   a. amplify the effects of the radiation
   b. slow down the ion flow to make detection more efficient
   c. provide electrical power for meter operation
   d. read extremely high levels of radiation

16. The three means of providing personnel protection from radiation are:
   a. minimizing time, distance and shielding
   b. maximizing time, distance and shielding
   c. minimizing time, and maximizing distance and shielding

17. A person is exposed to a radiation source with intensity at a given distance of 2.8 mR/hr. If he stays at that position for 18 min. what is his exposure ?

18. The standard dose rate (emissivity) at 1 foot distance for Co-60 is 14.0 R/hr/Ci. What is the intensity at a distance of 3 feet for a 1 curie source ?

At a distance of 6 inches for the same 1 curie source ?

19. In the previous question, if the source were replenished up to 18.5 curie, answer the above two questions again:

At 3 feet ?

At 6 inches ?

20. Which of the following radioisotopes are commonly used for radiographic purposes: (Choose all that apply)
    a. Cobalt-60
    b. Iridium-192
    c. Cesium-137
    d. Uranium-238

21. A Curie is defined as the decay rate of 1 gram of Radium-226. This rate is:
    a. 37 million (3.7 X 10(7)) disintegrations per second
    b. 37 billion (3.7 X 10(10)) disintegrations per second
    c. 37 zillion (3.7 X 10(Z)) disintegrations per second

22. An element is defined by the number of what in its nucleus ?
    a. protons
    b. neutrons
    c. electrons

23. Isotopes of the same element differ in the number of what in their nucleus ?
    a. protons
    b. neutrons
    c. electrons

24. The activity of a given radioactive source is measured in units of:
    a. Roentgens
    b. Curies
    c. Rems
    d. Kilograms

25. The specific activity of radioactive isotopes is measured in:
    a. MeV
    b. Ci/gr
    c. R/hr
    d. counts/min

26. The half-life of Co-60 is 5.3 years. How much will an 85.00 Ci Co-60 source decay down to in 10.6 years ?
    a. 21.25 Ci
    b. 42.50 Ci
    c. 10.63 Ci
    d. none of the above

27. The gamma radiation from a Co-60 source has an average energy of 1.25 MeV. What will be the energy of the radiation at the end of one half-life ?

28. A source of Ir-192 has an activity of 40 Ci today. What will be its activity at the end of 5 months ? (the half-life of Ir-192 is 2.5 months)
    a. 10 Ci
    b. 20 Ci
    c. 30 Ci
    d. 38 Ci

29. An exposure of 15 R of gamma or X-radiation equals:
    a. 15 rem
    b. 15 Ci
    c. 30 rem
    d. 30 Ci

30. The time rate at which dose is received is called:
    a. activity
    b. absorbed dose
    c. dose equivalent
    d. dose rate

31. A person who is 10 years old would be subject to greater radiation damage from a given exposure than a person of age:
    a. 2 years
    b. 35 years

32. Radiation energy is usually expressed in terms of:
    a. Kev or MeV
    b. Curies or grams
    c. R/hr

33. As the frequency of gamma or X-radiation increases, the energy:
    a. increases
    b. decreases
    c. remains the same

34. Greater penetration will be obtained by using _____ energy gamma or X-radiation.
    a. lower
    b. higher
    c. neither, because the energy does not affect penetration

35. The speed at which gamma and X-radiation travel in a vacuum is:
    a. the speed of sound
    b. the speed of light
    c. faster than the speed of light
    d. it varies with the wavelength of the radiation

36. A beam of radiation consisting of a single wavelength is termed:
    a. microscopic
    b. fluoroscopic
    c. heterogeneous
    d. monochromatic

37. The 10 CFR 20 limit on the whole body dose that a radiation worker may be subjected to in a one year period is:
    a. 1.25 rem
    b. 2.5 rem
    c. 5.0 rem
    d. 15.0 rem

38. A person must be at least _____ years old according to Army Regulations to be allowed to work as a radiation worker.
    a. 18
    b. 21
    c. 19
    d. there is no age specified

39. Inventory of all radioactive sources must be performed at least on a:
    a. quarterly basis
    b. semi-annual basis
    c. monthly basis
    d. yearly basis

40. Radiography safety training is required on a:
    a. yearly basis
    b. biennial basis
    c. quarterly basis

41. Each licensee must post NRC form number:
    a. 1
    b. 2
    c. 3
    d. 4

42. During the course of an NRC inspection, do employees have the right to meet with an inspector privately, either orally or in writing if they suspect a violation of regulations, of license conditions or any unnecessary exposure of an individual from radiation from licensed radioactive material?
    a. yes
    b. no

43. The demarcation lines for a restricted area, a radiation area, and a high radiation area are, respectively:
    a. 1 mR/hr, 2 mR/hr and 5 mR/hr
    b. 2 mR/hr, 5 mR/hr and 100 mR/hr
    c. 5 mR/hr, 10 mR/hr and 100 mR/hr

44. When operating a tomography system, radiation workers are required to wear which of the following: (choose all that are appropriate)
    a. direct reading pocket dosimeter
    b. TLD and film badge
    c. TLD or film badge

45. If at any time during the operation of the tomography system the user notices that his direct reading pocket dosimeter is reading off scale, he should:
    a. recharge it only after he is done with operations
    b. immediately curtail operations and see that the source is cranked back into its storage position if plausible
    c. assume that it wasn't charged properly and continue his operations as if there is no problem

46. The most desirable survey instrument to employ when measuring very low levels of radiation is:
    a. ionization chamber type
    b. G-M counter type
    c. alpha-beta gas flow proportional type

47. Shielding around a tomography system is usually made of lead or depleted uranium because:
    a. they are metal
    b. their atoms have few electrons
    c. they are very dense materials

48. Almost all gamma radiography today is done with artificially activated:
    a. X-ray machines
    b. radium
    c. isotopes
    d. particles

49. If the source becomes detached from the cable in the guide of a tomography system, what is the first thing that should be done?
    a. try to reattach it by hand immediately
    b. leave the area, get your supervisor and contact the RPO immediately
    c. continue with operation of the system as if nothing had happened

50. When doing gamma radiography the best type(s) of surveys instrument(s) to use are:
    a. ionization chamber type
    b. G-M counter type
    c. alpha-beta gas flow proportional type
    d. low energy gamma probe

51. Regulations require that in addition to personal radiation detection (TLDs, self reading pocket dosimeters, film badges, etc.) all radiographic operations will only take place in the presence of:
    a. an area monitor
    b. a liquid scintillation counting system
    c. an alpha-beta gas flow proportional counting system

52. The self reading pocket dosimeter must be charged how often ?
    a. once a week
    b. at the start of each day
    c. monthly

ANSWER KEY BY PAGE:

1. b
2. b
3. a
4. c
5. a
6. d
7. a
8. a

9. d
10. a
11. c
12. b
13. c
14. a
15. a
16. c

17. 0.84 mR/hr
18. 1.56 R/hr, 56 R/hr
19. 28.8 R/hr, 1036 R/hr
20. a,b & c
21. b
22. a
23. b

24. b
25. b
26. a
27. the same
28. a
29. a
30. d
31. b

32. a
33. a
34. b
35. b
36. d
37. c
38. c
39. b

40. a
41. c
42. a
43. b
44. a & c
45. b
46. b
47. c

48. c
49. b
50. b
51. a
52. b

Response to USNRC Questions 2 and 3

Since the roof of Building 908 is a soft, inclined surface made of paneled aluminum, radiation measurements on the roof of Bldg 908 is impractical. The radiation levels on the roof of building 908 due to the use of the Cobalt-60 source in the tomography system can be calculated according to the following:

Facts:

Height of Roof from Floor in Bay 19: 28 feet
Length of Guide Tube from Gammatron to Tomography System: 16 feet
Maximum height of Guide Tube from Floor: 8 feet

Premise: The radiatior field on the roof when the source is in its Gammatron-100 pig is negligible (background levels). The radiation field on the roof when the source is in the tomographic collimator also amounts to only background levels. The only time when there might be a concern about the radiation field on the roof is when the Cobalt-60 source is in transit between the Gammatron-100 pig and the tomographic collimator. And even during times of the source transit, the amount of time it takes for the source to go from the Gammatron-100 pig to the tomographic collimator or from the collimator back to the Gammatron-100 comes to no more than thirty (30) seconds.

Calculations: The radiation field on the roof of bldg 908, I_2, using the present source strength of 6.32 Curies (as of 10/20/93), comes to about:

$I_2 = I_1 \times D_1^2/D_2^2$ Inverse Square Law

where the Emissivity Value for Cobalt-60 = 14.0 R/hr/Ci @ 1 foot
I_1 = 14.0 R/hr/Ci x 6.32 Ci= 88.48 R/hr @ 1 foot
D_1 = 1 foot
D_2 = 20 feet (Height of Roof- Maximum height of Guide Tube)

To be conservative, the shielding effect provided by the guide tube, air and the aluminum roof have not been taken into consideration in this calculation. The maximum radiation field on the roof, during the brief transit of the cobalt source would be:

$I_2 = (88.48 R/hr) \times (1 ft)^2/(20 ft)^2 = 0.2212$ R/hr or 221.2 mR/hr

Even though this level (221.2 mR/hr) is definitely more than 100 mR/hr, the actual time this level of exposure remains in effect is no more than 30 seconds. This being the case, 221.2 mR/hr equals 3.68 mR/min, and during the thirty seconds of exposure, a person on the roof would receive a dose of only 1.84 mR.

In addition to this low level of exposure, controls to limit exposures to maintenance/service personnel who may gain access to the roof involves work coordination between the maintenance personnel and the building manager. Anytime maintenance/repair of the roof is required, a service order is submitted and its scheduling coordinated in advance with the building manager in bldg 908, who in turn, coordinates with the radiographer(s). This assures that no work with the Cobalt-60 Tomography System is done when there are personnel on the roof. As a added precaution, the Standing Operating Procedure (SOP) for the Cobalt-60 Tomography System shall incorporate a procedure whereby the radiographer(s) must go outside of the building and perform a visual check of the roof prior to commencing any radiographic operation with the Cobalt-60 Tomography System.

The present activity level for the Cobalt-60 Tomography Source is 6.32 Ci. If it is to be replenished back to 100 Ci, the following calculations shows the levels of radiation outside Bay 19, the two adjacent bays and on the roof. Per your request, the calculations are for a "worst case" set-up which would, in this case, be the 100 Ci Cobalt-60 source getting stuck inside the guide tube, at its maximum height of eight feet off the ground. The "worst-case" set-up would also include the times when the Gammatron-100 would be used by itself for the purpose of conducting radiography, density gauging, or scattering measurements.

a. Calculations: The radiation field on the roof of bldg 908, I_2, using an activity of 100 Ci comes to:

$I_2 = I_1 \times D_1^2/D_2^2$ Inverse Square Law

where the Emissivity Value for Co-60 is 14.0 R/hr/Ci @ 1 foot
I_1 = 14.0 R/hr/Ci x 100 Ci = 1400 R/hr @ 1 foot
D_1 = 1 foot
D_2 = 20 feet (Height of Roof - Maximum Height of Guide Tube)

Again, to be conservative, the shielding factors of the guide tube, the air between the tube and the roof, and the aluminum roof have been omitted from this calculation. The maximum radiation field on the roof from a 100 Ci Co-60 source stuck in the guide tube would be:

$I_2 = (1400 \text{ R/hr}) \times (1 \text{ foot})^2/(20 \text{ feet})^2 = 3.5 \text{ R/hr or } 3500 \text{ mR/hr}$

Again, using the reasoning that the exposure would last no more than thirty seconds, the exposure rate would be 58.3 mR/min, and a person on the roof would receive a dose of 29.17 mR during the thirty second exposure period.

b. Calculations: The radiation field outside the cell (Bay 19), in the hallway, due to a 100 Ci Co-60 source stuck in the guide tube would be:

Reference: See Figure 9.a.2. (page 46) in license renewal application for set-up.

Distance from Guide Tube to surface of inner bay wall = 2 feet.
Thickness of inner bay wall = 2 feet
Width of walkway into bay = 3 feet
Thickness of outer bay wall = 2 feet

The following calculation does not take into account "skyshine" radiation. Skyshine radiation (the scattered radiation bouncing off the inside of the roof), adds to the overall radiation levels detected outside Bay 19 in the hallway.

Calculating the radiation level out in the hallway, we use the total distance between the source and the hallway of 9 feet:

I_1= 14.0 R/hr/Ci @ 1 foot x 100 Ci = 1400 R/hr @ 1 foot
D_1= 1 foot
D_2= 9 feet

$I_2 = I_1 \times D_1^2/D_2^2 = (1400) \times (1)/(81) = 17.28$ R/hr

The exposure rate of 17.28 R/hr would then be subjected to a total of 4 feet of concrete shielding. Using the shielding formula yields:

I_o= 17.28 R/hr
u=ln 2/HVL= ln 2/2.6 inches= 0.267/in.(for average 1.25 MeV Co-60)
t= 48 inches

$I = I_o \times e^{-ut} = (17.28) \times e^{-(0.267)(48)} = 0.047$ mR/hr

This radiation level is at the surface of the outer bay wall. The levels in the middle of the hallway would have to be increased to account for skyshine. Since there is no formula to calculate the amount of skyshine radiation, we assume a linear proportionality. Therefore, since the actual radiation level of 0.15 mR/hr was measured in the hallway when the source was at 8.22 Ci, we multiply 0.15 mR/hr by 100/8.22 or a factor of 12.17. Doing so, we get:

0.15 mR/hr x 12.17 = 1.83 mR/hr

Therefore, the radiation level in the hallway from a 100 Ci source, during a "worst-case" scenario would be 1.83 mR/hr.

c. Calculations: The radiation field in Bay 20, during a worst-case scenario, in which a 100 Ci Cobalt-60 source would get stuck in the guide tube, would be:

Distance from source to wall = 14 feet
Thickness of Concrete Wall = 3 feet (36 inches)
Using the Inverse Square Law yields:

$I_2 = (1400\ R/hr)(1)^2/(17)^2 = 4.84\ R/hr$
To account for the concrete wall, we then use the shielding equation: $I=I_o \times e^{-ut}$

where $I_o = 4.84$ R/hr
$u=0.267$/in.
$t=36$ inches

$I=(4.84\ R/hr) \times e^{-(0.267)(36)} = 0.000324$ R/hr or 0.32 mR/hr.
This is at the surface of the wall in Bay 20. To account for the skyshine in the middle of the bay, we take the measured level of 0.5 mR/hr done when the source was at 8.22 Ci and multiply that by 100/8.22 or 12.17.

0.5 mR/hr x 12.17 = 6.09 mR/hr

The radiation level in the middle of Bay 20 during a worst-case scenario with a 100 Ci Cobalt-60 source would then be 6.09 mR/hr.

d. Calculations: The radiation field in Bay 18, during a worst-case scenario, in which a 100 Ci source would get stuck in the guide tube would be:

Distance from source to wall = 12 feet
Thickness of Concrete Wall = 3 feet (36 inches)
Using the inverse square law yields:

$I_2 = (1400\ R/hr)(1)^2/(15)^2 = 6.22\ R/hr$
To account for the concrete wall, we use the shielding equation:
$I=I_o \times e^{-ut}$

where $I_o = 6.22$ R/hr
$u=0.267$/in.
$t=36$ inches

$I=(6.22\ R/hr) \times e^{-(0.267)(36)} = 0.000416$ R/hr or 0.42 mR/hr.
This is at the surface of the wall in Bay 18. To account for the skyshine in the middle of the bay, we take the measured level of 0.5 mR/hr done when the source was at 8.22 Ci and multiply that by a factor of 100/8.22 or 12.17.

0.5 mR/hr x 12.17 = 6.09 mR/hr

The radiation level in the middle of Bay 18, during a worst-case scenario where the 100 Ci Cobalt-60 source gets stuck in the guide tube, would be 6.09 mR/hr.

SMCAR-SE (385-11) 29 Sep 93

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Active Membership in the Ionizing Radiation Control Committee (IRCC)

1. Authority:

a. AR 40-14, Control and Recording Procedures for Exposure to Ionizing radiation and Radioactive Materials, para 5e(4);

b. AR 385-11, Ionizing Radiation Protection, para 1-25;

c. AMCR 385-25, Radiation Protection, para 6a(2);

d. ARDECR 385-3, Radiation Protection Program, para 4b, and 5c.

2. The drawdown of the active military and civilian personnel at ARDEC, retirements, and transfers over the past one-and-a-half years have changed the active membership of the IRCC. The personnel changes, in addition to several members not regularly attending the IRCC meetings, have adversely affected the Committee's ability to hold meetings, approve minutes, and to vote on radiation safety issues.

3. In an effort to correct these deficiencies, this office has decided to streamline the active membership of the IRCC, from eight active members down to five active members. The five IRCC members who shall remain as full, voting members shall be the Radiation Protection Officer, the Tritium Technical Expert, the Depleted Uranium Technical Expert, the Radiography and Sealed Source Technical Expert, and the Medical Officer. All of the above members have full plenary powers and responsibilities as outlined in the IRCC Charter, and the regulations in para 1a thru 1d, above.

4. The remaining members of the Committee, which include the Union Representative, the Fire Chief, and the Military Officer, shall be reassigned as adjunct members of the IRCC. Adjunct members may attend IRCC meetings as observers. They may give input to the IRCC during meetings, but hold no voting powers, or any other powers and responsibilities as outlined in the IRCC Charter, and the regulations in para 1a thru 1d, above.

5. Due to this reorganization, a new minimum of three plenary members is needed to constitute a quorum for future IRCC meetings.

SMCAR-SE
SUBJECT: Active Membership in the Ionizing Radiation Control Committee (IRCC)

6. This reorganization of the IRCC is effective immediately.

7. The POC for this action is Mr. Andy Kung, SMCAR-SEF, extension 43742.

MICHAEL F. CLUNE
IRCC Chairman
Acting Chief, Safety, Surety
& Environmental Office

DISTRIBUTION:

SMCAR-GS (Mrs. Peggy Tufano)
SMCAR-AET-M (Dr. Sheldon Cytron)
SMCAR-FSF-D (Mr. Grunde Haugeto)
SMCAR-QAH-T (Mr. Emmett Barnes)
SMCAR-ISE-F (Mr. Frank Avila)
SMCAR-RMP-R (Ms. Susanne Bernhardt)
SMCAR-LST (SSG Michael Ferrell)
SMCAR-SEF (Messrs. Richard W. Fliszar/Richard L. Moss/
Lawrence J. D'Aries/Joseph A. Fabiano)

HSXS-HC-P (Mrs. Barbara Clark)

30 SEP 1993

CHARTER

1. NAME OF COMMITTEE Ionizing Radiation Control Committee

2. CATEGORY AND TYPE OF COMMITTEE: Advisory, continuing committee

3. PURPOSE To advise on command policies for safe use, handling, storage, receipt, shipment and disposal of sources of ionizing radiation and radiation-producing devices.

4. SPECIFIC RESPONSIBILITIES

a. Review and provide comment on new radiation programs, new radiation facilities, and new/revised standard operating procedures.

b. Review any license/DA Authorization submitted to the Nuclear Regulatory Commission (NRC) Army for renewal or amendment.

c. Review, provide comment, and approve potential radiation workers.

d. Provide "Expert" advice during incident/accident investigations.

e. Review incident/accident reports and recommend ARDEC policy changes, as appropriate.

5. DIRECTION AND CONTROL Acting Chief, Safety, Surety & Environmental Office holds the position of IRCC Chairman.

a. Acts as the Commander's representative.

b. Presides at meetings but does not vote except in a split decision situation.

c. Appoints subcommittees as needed.

d. Reports minutes of the meetings to the Command Staff.

6. AUTHORITY

a. AR 40-14, Control and Recording Procedures for Exposure to Ionizing Radiation and Radioactive Materials, para 5e(4).

b. AR 385-11, Ionizing Radiation Protection, para 1-25.

c. AMCR 385-25, Radiation Protection, para 6a(2).

7. ADMINISTRATIVE SUPPORT AND STAFF ARRANGEMENTS

Administrative support will be provided by the Health Physics Branch of the ARDEC Safety, Surety & Environmental Office utilizing existing assets and current budget.

8. COMPOSITION

Chairman: Michael F. Clune, Actg C, Safety, Surety & Environmental Office

Plenary Members: Richard W. Fliszar, RPO
Mrs. Barbara Clark, OHN, Health Clinic
Dr. Sheldon Cytron, Technical Expert-DU
Grunde, Haugeto, Technical Expert-Tritium
Emmett Barnes, Technical Expert, Radiography/
Sealed Sources

Adjunct Members: Frank Avila, Acting Fire Chief
Susanne Bernhardt, Union Representative
SSG Michael Ferrell, Military Representative

9. CORRESPONDENCE All correspondence to and from the IRCC will be thru the ARDEC Safety, Surety & Environmental Office.

10. OTHER INFORMATION

a. The committee will meet at least quarterly upon the call of the chairman.

b. Day-to-day direction by the committee will be coordinated and carried out by the RPO and health physics staff and will not require unscheduled committee meetings unless areas of disagreement/confusion arise.

c. Minutes will be taken either by a secretary or a member of the health physics staff. Minutes will be reviewed by the health physics staff for accuracy (although the RPO is the only IRCC member the health physics staff is obligated to attend the meetings and provide technical input). The minutes will then be reviewed by the chairman and sent to the Commander for approval. Copies of the approved minutes will then be sent to the membership for acceptance at the next meeting.

d. The IRCC ensures that the program is adhering to the conditions set forth in the NRC licenses/DA Authorization by reviewing all current aspects of the ARDEC Radiation Protection Program at these meetings.

Mr. Barnes is the radiographer responsible for the operation of the Gammatron-100/Tomography system. Operation of these systems by any radiographer's assistants will be under the direct supervision of Mr. Barnes. The RPO/alternate RPOs of the ARDEC Safety, Surety, & Environmental Office, Health Physics Branch, provide radiation safety oversight of all radiation operations on Post.

SMCAR-FSF-D (SMCAR-SEF/8 Sep 93) (385-11) 1st End
SUBJECT: Resumes of Recent Members of the Ionizing Radiation Control Committee (IRCC)

SMCAR-FSF-D SEP 16 1993

FOR SMCAR-SEF

1. As requested in the original memorandum, the following resume of training and experience for Mr. Grunde R. Haugeto is provided.

2. Mr. Haugeto has a Bachelors Degree in Physics. From 1964 to 1976, Mr. Haugeto was responsible for the initial nuclear warhead section (WHS) safety and reliability (S&R) system engineering analyses for almost all of the Army's major long and short range nuclear missile systems. He designed and conducted instrumented Pershing 1 and Nike Hercules WHS simulated stockpile-to-target tests at environmental extremes. He also provided S&R training to WHS scientists and engineers so that they could perform their own preliminary S&R analyses and optimize their state of the art WHS sub-component design hardware for the normal and abnormal tactical environments. He also conducted WHS nuclear threat analyses. He received commendations and awards for his contributions to these missile R&D programs. From 1980 until the present, Mr. Haugeto has been engaged in the development of tritium illuminated fire control systems for the new light weight mortar and artillery systems. He has received commendations and awards for his contributions and his fiscal and technical management of these programs. Mr. Haugeto is a tritium worker and has taken the required tritium worker training courses.

3. The POC for this matter is Mr. G. Haugeto, SMCAR-FSF-D, x6927.

JOHN EDW. GULOW
C, Design Producibility Branch

SMCAR-SE (385-11) 29 Sep 93

MEMORANDUM FOR SEE DISTRIBUTION

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1. Authority:

a. AR 40-14, Control and Recording Procedures for Exposure to Ionizing radiation and Radioactive Materials, para 5e(4);

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SMCAR-SE
SUBJECT: Active Membership in the Ionizing Radiation Control Committee (IRCC)

6. This reorganization of the IRCC is effective immediately.

7. The POC for this action is Mr. Andy Kung, SMCAR-SEF, extension 43742.

MICHAEL F. CLUNE
IRCC Chairman
Acting Chief, Safety, Surety
& Environmental Office

DISTRIBUTION:

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SMCAR-LST (SSG Michael Ferrell)
SMCAR-SEF (Messrs. Richard W. Fliszar/Richard L. Moss/
Lawrence J. D'Aries/Joseph A. Fabiano)

HSXS-HC-P (Mrs. Barbara Clark)

SOURCE TRANSFER

This is to certify that three cobalt-60 sources:

Model Number:
Serial Numbers: T-265, T-266, and T-269
Containing 1950 curies as of October 1, 1993

and which have been determined by wipe test to be leak free, have been removed from a A,DEC unit located at U. S. Army ARDEC, Building ~~320~~ 1090, Picatinny Arsenal, New Jersey.

These sources are hereby transferred from U. S. Army ARDEC, Picatinny Arsenal's Radioactive Materials License 29-00047-06 to Neutron Products' Radioactive Materials License MD-31-025-03.

Joseph A. Fabiano

Date October 5, 1993

Frank Schwarcen
Neutron Products, Inc.

Date 10/5/93

T. KIRKWOOD

US Army Armament Research, Development and
Engineering Center
ARDEC SAFETY, SURETY, & ENVIRONMENTAL OFFICE
HEALTH PHYSICS BRANCH
Picatinny Arsenal, New Jersey 07806-5000

DATAFAX NUMBER: DSN 880-2563 COMM NUMBER: (201)724-2563

FACSIMILE TRANSMITTAL HEADER SHEET

FROM	NAME/OFFICE SYMBOL	TELEPHONE NUMBER
ARDEC INSTALLATION SAFETY DIVISION PICATINNY ARSENAL, N.J.	Joseph A. Fabiano SMCAR-SEF	(201) 724-3742 DSN 880-3742
TO: U.S. Nuclear Regulatory Commission ATTN: Industrial Applications Division 475 Allendale Road King of Prussia, Pa 19406-1415	Section Chief	(215) 3375050
DATE August 27,1993	NO. PAGES 3 with Header Sheet	DATAFAX NO. (215) 337-5269

REMARKS:

Sir,

A copy of the correspondence mailed on August 26, 1993 informing Region I of the dates for the transfer of the Cobalt-60 source storage container from Building Number 3021 to Building Number 312 (September 1, 1993) and the transfers and shipping of the three Cobalt-60 sources in the Automated Inspection Device For Explosive Charges In Shells (AIDECS) with the hookup of the Cobalt-60 Source Storage Container to the Dougherty Box System (October 5, 1993) is being faxed for your information. If for whatever reason there is a change in the dates described your office will be verbally notified.

Joe

DEPARTMENT OF THE ARMY
U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NJ 07806-5000

August 26, 1993

REPLY TO
ATTENTION OF

030-12535
29-00047-08

Safety, Surety, and Environmental Office
Installation Safety Division
Health Physics Branch

U.S. Nuclear Regulatory Commission
ATTN: Industrial Applications Section
Section Chief
475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

Dear Sir:

In reference to your original letter dated May 28, 1992, Docket No. 030-12535, Control No. 116558, that contains questions which arose during an initial review of the May 1, 1992 amendment request for this facility's license, No. 29-00047-08, and the responses provided by this Branch on June 9, 1992:

a. ARDEC riggers are tentatively scheduled to move the Cobalt-60 "Dougherty Box Irradiation Facility" source storage container from building 3021 to building 312 on September 1, 1993.

b. Neutron Products, Inc., and Instrumentation Research Technology Corp. will be arriving on October 5, 1993 to remove the three Cobalt-60 sources from the Automated Inspection Device for Explosive Changes in Shells (AIDECS) facility in building 1090, ship the sources to Neutron Products at Dickerson, Maryland, and reassemble and performance test the "Dougherty Box" Irradiation Facility with its Cobalt-60 source in place.

Please contact Mr. Joseph A. Fabiano, ARDEC Health Physicist, at (201)724-3742, FAX (201)724-2563 for any questions which might arise from this correspondence.

Sincerely,

Richard W. Fliszar

Richard W. Fliszar
Chief, Health Physics Branch

Copies Furnished:

Neutron Products, Inc., ATTN: Project Manager, Mr. Frank Schwoerer, 22301 Mt. Ephraim Road, Dickerson, Maryland 20842
Instrumentation Research Technology Corp., ATTN: Corporate Safety Director, Mr. Kay L. Crosbie, P.O. Box 85317, San Diego, California 92121
Chem-Nuclear Systems, Inc., Defense Consolidation Facility, ATTN: Mr. John Meyers, Highway 64, Snelling, South Carolina 29812
Commander, U.S. Army AMCCOM, ATTN: AMSMC-SFS (Mr. Kelly Crooks), Rock Island, Illinois 61299-6000
SMCAR-AEE-W (Mr. Norman Slagg)
SMCAR-QAH-T (Mr. Emmett Barnes)
SMCAR-ISE-C (Mr. Richard Havrisko)

AUG 19 1993

License No. 29-00047-06
Docket No. 030-05216
Control No. 116060

Department of the Army
Army Armament Research
and Engineering Center
ATTN: Richard Fliszar
Radiation Safety Officer
Picatinny Arsenal, New Jersey 07806-5000

Dear Mr. Fliszar:

This is in reference to your request in an application dated May 20, 1993 to renew License No. 29-00047-06. In order to continue our review, we need the following additional information:

1. We recommend that a radiographer's examination contain at least 50 questions. Please submit a copy of your radiographer's examination including answers to all the questions.

2. Please indicate what radiation levels are present on the roof of Building 908. If physical measurement is not possible, then calculations may be used. Radiation levels must be less than 100 milliroentgens per hour (mR/hr) on the roof. If radiation levels are less than 100 mR/hr but greater than 2 mR/hr, then describe your controls to limit exposure to personnel who may attempt to gain assess to the roof. If it is necessary to limit exposure device orientation or time of use to maintain the roof at less than 100 mR/hr, then specify the controls that you will use.

3. In your application, you indicate that a new radiation source for the tomography device could be up to 100 curies of cobalt 60. Please provide detailed calculations (with references for values used in the calculation) of the radiation levels outside the cell, including the roof and adjacent bays. These calculations should be for "worst case" set-up.

4. Your application did not include the qualifications of the following individuals on your Ionizing Radiation Control Committee: Susanne Bernhardt, Michael Lucas, and SSG Michael Ferrell. Please submit their qualifications.

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ML 10

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. 116060. If you have any technical questions regarding this deficiency letter, please call me at (215) 337-5042.

In order to continue prompt review of your application, we request that you submit your response to this letter within 30 calendar days from the date of this letter.

Sincerely,

Original Signed By;
Duncan White

Duncan White
Nuclear Materials Safety Branch
Division of Radiation Safety and
Safeguards

DW
RI:DRSS
White/gc

08/19/93

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TELEPHONE CONVERSATON RECORD	**Date:** 8/17/93	**Time:** 9:00 am
Mail Control No.:	**License** : 29-00047-06	**Docket No.:** 030-05216
Person Called: Richard Fliszar Radiation Safety Officer	**Organization:** Picatinny Arsenal	**Telephone Number:** (201) 724-3742
Person Calling: Duncan White		
Subject: Letter dated July 28, 1993		

Summary: The licensee clarified their July 28, 1993 letter regarding the relocation of the Dougherty Box from Building 3021 to 312 and the disposal of sources in IRT irradiator. Neutron Products is providing source removal and replacement as well as disposal of IRT sources. The following time line was provided by the licensee:

August 24th: Source from Dougherty Box to be removed and placed in transport container by NPI.
August 31st: Move Dougherty Box from Building 3021 to 312 by Army.
Early September: Move Dougherty Box source to Building 312.
Late September or Early October: NPI will re-install source back into Dougherty Box and remove sources from IRT irradiator and place into shipping casks for transfer.

I requested that the licensee contact Region I when a date is set for the re-installation of the source and removal of the IRT sources in September/October in order to give Region I the opportunity to observe the source replacement and source removals. The licensee agreed.

Action Required/Taken: Scott Moore (Acting Chief, Section C) was notified on 8/17/93

Signature: Duncan White	**Date:** August 17, 1993

 ML 10 1/6060

DEPARTMENT OF THE ARMY
U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NEW JERSEY 07806-5000

July 28, 1993

REPLY TO
ATTENTION OF

030-05216

Safety, Surety, and Environmental Office
Installation Safety Division
Health Physics Branch

U.S. Nuclear Regulatory Commission
ATTN: Industrial Applications Section
Section Chief
475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

Dear Sir,

In reference to your original letter dated May 28, 1992, Docket No. 030-12535, Control No. 116558, that contains questions which arose during an initial review of the May 1, 1992 amendment request for this facility's license, No. 29-00047-08, and the responses provided by this Branch on June 9, 1992, personnel from Neutron Products, Inc. of Maryland, License No. MD-31-025-03 (a copy of which is enclosed), and from Instrumentation Research Technology are scheduled to arrive at Picatinny Arsenal on August 24, 1993 to:

a. Attend a preliminary meeting on the procedure for removal of the three Cobalt-60 sources from the AIDECS facility, building 1090;

b. Free sticky mechanisms and loosen rusted parts of components to be used in the removal of the AIDECS Cobalt-60 source;

c. Disconnect the Cobalt-60 source lifting mechanism and source position indicating system located in building 3021, and put the source storage container in safe storage. A copy of PROCEDURE NR-5017, clarified in REV 3, 07/27/93 is enclosed.

OFFICIAL RECORD COPY ML 10

116060

AUG 0 3 1993

Please contact Mr. Joseph A. Fabiano, ARDEC Health Physicist, at (201)724-3742, FAX (201)724-2563 for any questions which might arise from this correspondence.

Sincerely,

Kendal M. Duncan
Chief, Installation
Safety Division

Enclosure

Copies Furnished:
Neutron Products, Inc., ATTN: Project Manager, Mr. Frank Schwoerer, 22301 Mt. Ephraim Road, Dickerson, Maryland 20842
Instrumentation Research Technology Corp., ATTN: Corporate Safety Director, Mr. Kay L. Crosbie, P.O. Box 85317, San Diego, California 92121
Chem-Nuclear Systems, Inc., Defense Consolidation Facility, ATTN: Mr. John Meyers, Highway 64, Snelling, South Carolina 29812
Commander, U.S. Army AMCCOM, ATTN: AMSMC-SFS (Mr. Kelly Crooks), Rock Island, Illinois 61299-6000
SMCAR-AEE-W (Mr. Norman Slagg)
SMCAR-QAH-T (Mr. Emmett Barnes)
SMCAR-ISE-C (Mr. Richard Havrisko)

State of Maryland

DEPARTMENT OF THE ENVIRONMENT

RADIOLOGICAL HEALTH PROGRAM

RADIOACTIVE MATERIAL LICENSE

Page 1 of 1 pages

Supplementary Sheet

License No.	MD-31-025-03	Amendment No.	64

CORRECTED COPY

Neutron Products, Inc.
22301 Mt. Ephraim Road
P.O.Box 68
Dickerson, MD 20842

In accordance with letters and facsimiles dated May 7, May 21, June 10, September 16, September 18, and December 16, 1992 with all attachments, Radioactive Material License Number MD-31-025-03
is amended as follows:

TO ADD:

6. Radioactive material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
E. Cobalt-60	E. Irradiator sealed sources	E. Total possession of both [redacted] not to exceed 100,000 curies.

Item 9E. For possession, storage, use, and transfer of sealed irradiator sources during source installation or transfer in the following irradiator models: ARDECS Engineering Prototype System and an ARDEC "Dougherty Box".

FOR THE MARYLAND DEPARTMENT OF THE ENVIRONMENT

Roland L. Fletcher

Date June 11, 1993

REFERENCE jf3095 CHANGE 1

PROCEDURE FOR MOVING THE "DOUGHERTY BOX" FACILITY FROM BUILDING 3021 TO BUILDING 312 AT PICATINNY ARSENAL.

PROCEDURE NR-5017, REV 3, 07/27/93

This procedure covers the disassembly, the move to another building within the confines of the Picatinny Arsenal, the reassembly, and subsequent performance testing of an irradiation facility known as the "Dougherty Box."

As shown in the attached photographs, the facility consists of a large shielded box, resting on top of a welded structure of steel beams. Underneath the box is a lead filled steel cylinder (source storage container) that contains a cobalt-60 source, with a current activity of about 300 curies. The source shield is illustrated in Figure 1. The source shield rests on a steel dolly that has been jacked off the floor so that the top of the source shield is in contact with the bottom of the shielded box. Within the box, the source is raised, by a stainless steel cable, out of the shield to a position inside the vertical tube in the shielded box. When the irradiation is complete, the lifting cable is lowered and the source is returned to the storage container by gravity. There are mechanical interlocks that prevent the source from being raised when the door to the box is open and prevent the source from being raised when the door to the box is open and prevent the door from being opened when the source is up.

The U.S. Army Armament Research, Development and Engineering Center (ARDEC) is the operator of the "Dougherty Box: facility. ARDEC's riggers and heavy equipment trades have most of the capabilities needed to move the source containing storage container from Building 3021 to Building 312, a distance of about one mile within the confines of the base and the Dougherty Box and H frame, unless otherwise decided at the time of transportation, down navy hill through the main gate onto route 15 north and through the truck gate for a distance of about seven miles. The latter route is chosen because the load bearing capacity of the bridges may be exceeded by the transport of the Dougherty Box/H Frame over those structures.

ARDEC has prepared a procedure for the move, that is reproduced in Appendix I. Neutron Products is to perform and/or provide radiation safety guidance for Steps 1.2, 1.5, 1.7 (removal of the source and shield from the facility in Building 3021) 2.0 (transport of the source and shield to Building 312), 3.3, 3.4, 3.5 (reassembly of source and shield into the facility in Building 312), and 3.6 Performance Test the System to verify A-1 operability.

REFERENCE jf3095 CHANGE 1

PROCEDURE FOR MOVING THE "DOUGHERTY BOX" FACILITY FROM BUILDING 3021 TO BUILDING 312 AT PICATINNY ARSENAL.

PROCEDURE NR-5017, REV 3, 07/27/93

The main part of this procedure addresses the steps itemized above. At least two Neutron representatives, a project manager and an engineer/technician, with the joint capabilities and experience listed below, shall be present during the steps identified in this procedure..

- knowledge of the principles and regulations for radiation safety,
- hands-on experience with dry, shielded transfers of cobalt-60 sources, as for example in teletherapy source changes;
- familiarity with self-contained irradiator designs; and,
- familiarilty with the regulations of the U.S. Department of Transportation for shipment of radioactive material.

REFERENCE jf3095 CHANGE 1

PROCEDURE FOR MOVING THE "DOUGHERTY BOX" FACILITY FROM BUILDING 3021 TO BUILDING 312 AT PICATINNY ARSENAL.

PROCEDURE NR-5017, REV 3, 07/27/93

PARTICIPATING ORGANIZATIONS AND LICENSING COVERAGE

Neutron Products, Inc., - contractor and licensee for source removal, safe packaging of the source for transport to Building 312, source replacement, and performance testing of the source after reassembly of the "Dougherty box" facility.

ARDEC* Installation Safety Division - owner's representative and licensee for transport of the source (in the source storage container) to Building 312, and responsible party for rigging and moving the Dougherty box, its foundation structure, and appendages

*ARDEC - U.S. Army Armament Research, Development and Engineering Center

REQUIRED EQUIPMENT - RESPONSIBLE PARTY

"Dougherty Box" Irradiation Facility - ARDEC
including: source storage container, cover, shield plate, dolly and jacks
Rigging equipment and operators - ARDEC
Transport vehicle(s) and driver(s) - ARDEC
Miscellaneous tools for source removal, reinstallation , and performance testing - Neutron
Replacement source cables - Neutron
Radiation survey and personnel monitoring devices -
consisting of: radiation survey meters, wipes for measuring radioactive contamination, pocket dosimeters (0-200mR, to be worn by all persons in the area), pocket dosimeters (0-1R, 0-5R, to be worn by persons performing the source transfers), and whole body TLD badges and TLD wrist badges (to be worn by persons performing the source transfers)
NOTE: ARDEC will provide TLD whole body badges and TLD ring badges in addition to, not in lieu of, NPI badges

PREREQUISITES

Neutron Products shall be licensed to perform the source transfer and testing operations, described under Step-by-Step Procedure.

The U.S. Army shall be licensed to move the source and "Dougherty Box" facility from the existing location in Building 3021 to the new location in Building 312.

STEP-BY-STEP PROCEDURE (the step numbers correspond to Appendix (I)

REFERENCE jf3095 CHANGE 1

PROCEDURE FOR MOVING THE "DOUGHERTY BOX" FACILITY FROM BUILDING 3021 TO BUILDING 312 AT PICATINNY ARSENAL.

PROCEDURE NR-5017, REV 3, 07/27/93

1.2 Disconnect the Cobalt-60 source lifting mechanism and the source position indicating system.

-Ensure by a radiation survey that the source is in its shield
-Note the size of the steel cables and how they are routed
-Determine how the replacement cables will be installed, before removing the existing cables.

1.5.1 Lower the source storage container (shield) to determine if it can come out clear from beneath the "Dougherty Box."

-Measure the height off the floor of the dolly's platform
-Add grease to ports in each wheel to facilitate movement
-Add lubricant to free sticky mechanisms and loosen rusted parts
-Use the floor jack to take the load off the jack screws, then turn the jack screws to allow the dolly with the source shield to be lowered so that its wheels contact the floor.
-Remove the four metal pieces from under each jack
-Continuously monitor the radiation dose rates
-If the dolly and source shield cannot be rolled out from under the "Dougherty Box, wait until the box is lifted in Step 1.8.

1.5.4 Place and secure the existing cover over the source storage container to retain and shield the source (Immediately if enough clearance is available between the top of the source storage container and the Dougherty Box when jacks are unscrewed).

-Put the 2" thick supplemental lead shielding in place
-Bolt the cover to the source storage container to positively retain the source within the container.
-Plug, or otherwise seal, all drain and vent lines.

1.5.3 Remove the source storage container (shield).

-Roll the dolly and shield to a clear spot in the building.
-Wipe test the top of the storage container and the inside of the tube in the "Dougherty Box" for evidence of source leakage.
-If there is evidence of source leakage, ensure that the source is safely secured in its storage container, then stop and evaluate whether and how to proceed.
- Disposition of the Dougherty Box will be established by ARDEC

REFERENCE jf3095

PROCEDURE FOR MOVING THE "DOUGHERTY BOX" FACILITY FROM BUILDING 3021 TO BUILDING 312 AT PICATINNY ARSENAL.

PROCEDURE NR-5017, REV 3, 07/27/93

1.7 Place a temporary cover over the opening at the bottom of the "Dougherty Box"

-The purpose is to keep dirt out of the tube that contains the source during irradiations.

2.0 Safe Delivery of the System to Building 312.

-As the transportation of the source storage container is within the confines of the base, an NRC licensed shipping container is not necessary.
-Ensure that the source is positively confined within the storage container
-Ensure that the storage container is tied down firmly to the transport vehicle, and that the transport vehicle is suitable for the load.
Perform a radiation survey of the source container and the transport vehicle. Readings should not exceed 200 mR/hour at contact or 10mR/hour at one meter. If these dose rates are exceeded, ensure that all involved persons are notified and are kept at a safe distance.
-Ensure that ARDEC and Picatinny riggers move the source container and the other parts of the facility slowly and deliberately, and that persons not participating in the move are kept at a distance.

3.2.2.1 Roll source storage container with dolly into place close to the "Dougherty Box"; remove the cover and shield plate; and, roll the source storage container under the "Dougherty Box."

-Before doing this it may be necessary to thread new source hoist and position indicating cables through the center tube in the box.
-The dolly and shield must be properly located relative to the centerline of the tube that runs vertically through the box.

3.4 Adjust height of source storage container.

-This requires lifting the source container until it contacts the box. The shield can be lifted with either the BlackHawk floor jack or the screw jacks on the dolly.

3.5 Reconnect the cables for raising and lowering the source and for the source position indicating device.

REFERENCE jf3095

PROCEDURE FOR MOVING THE "DOUGHERTY BOX" FACILITY FROM BUILDING 3021 TO BUILDING 312 AT PICATINNY ARSENAL.

PROCEDURE NR-5017, REV 3, 07/27/93

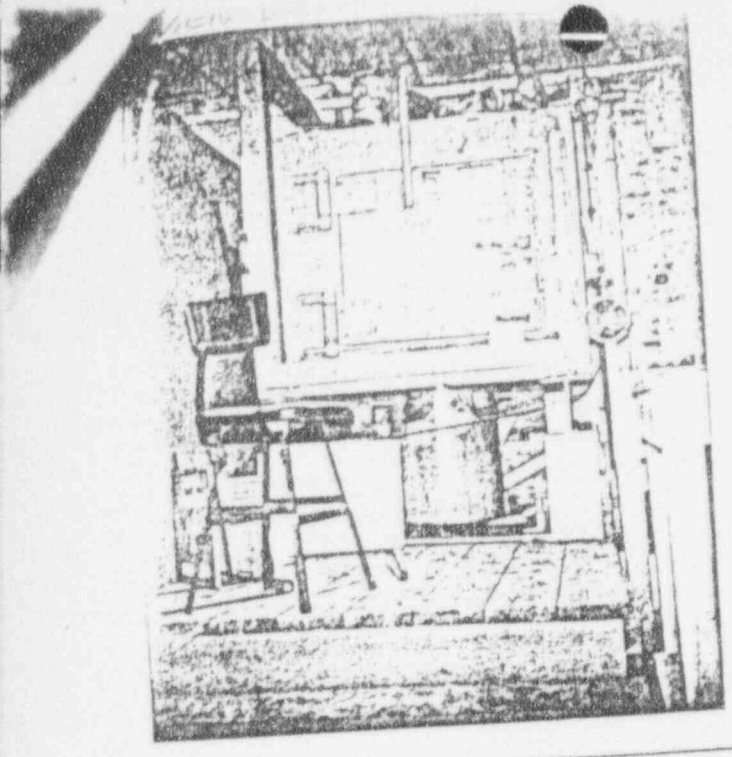
-This may better be done at Step 3.2.2.1 as noted above. At this point the slack should be taken out of the cables.

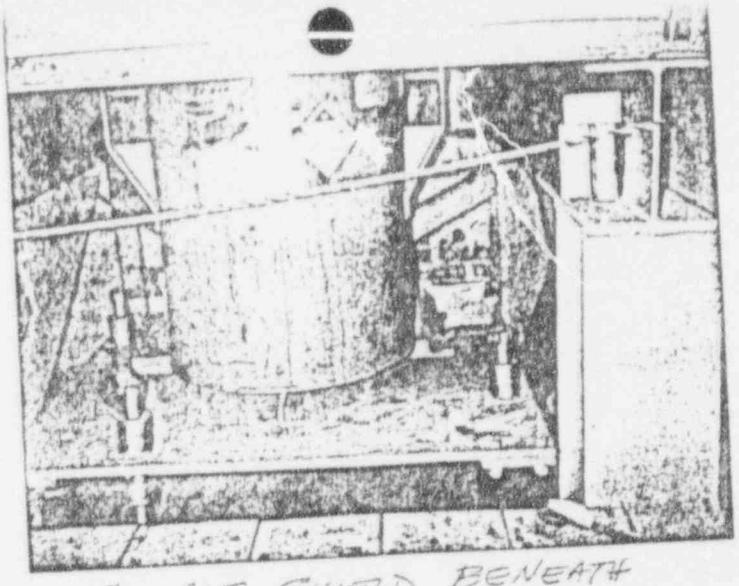
3.6 Performance test the system

-The performance test should include: with the door to the "Dougherty Box" closed, raise and lower the source; verify source position by radiation measurements; ensure that the interlocks are functioning properly

-Check for radiation leakage between the source storage container and the "Dougherty Box" as the source is transferred from the storage container to the irradiation position.

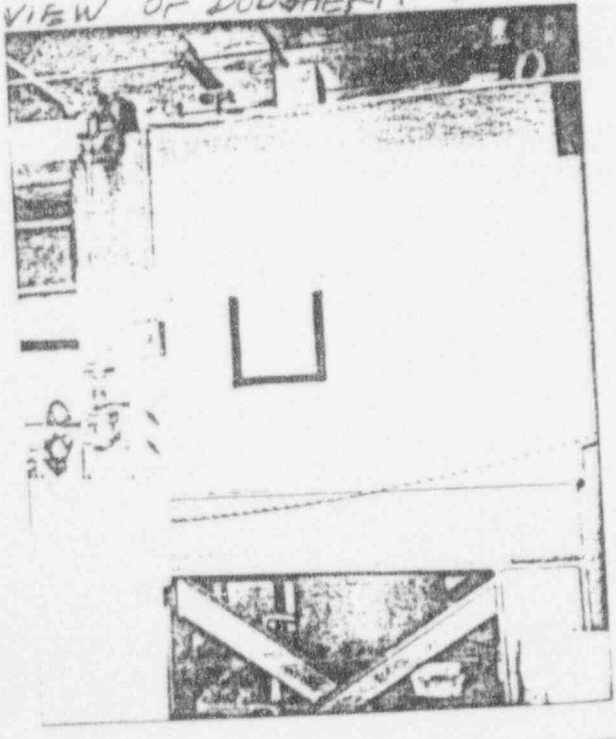
Attachments:
Photographs of the "Dougherty Box" Facility
Figure 1 - Source Storage Container
Appendix I - ARDEC's Procedure for Moving the "Dougherty Box" Facility

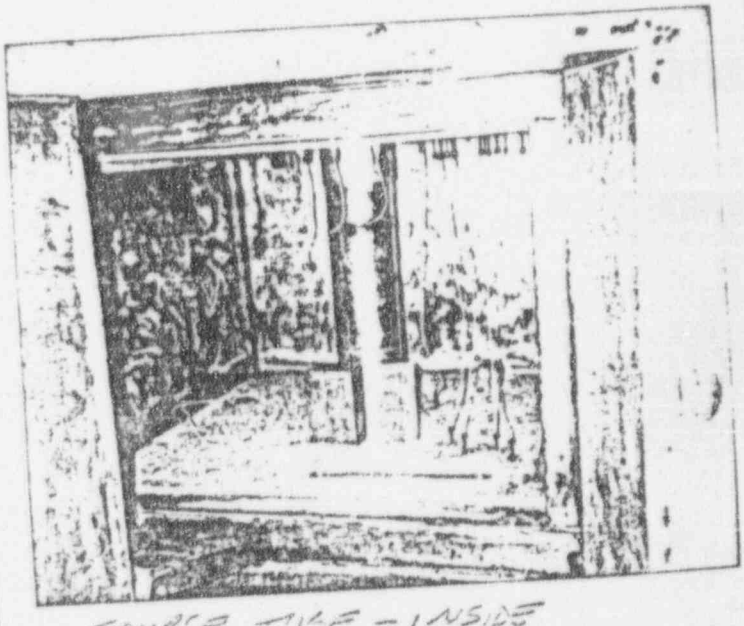




SOURCE SHIELD BENEATH
DOUGHERTY BOX

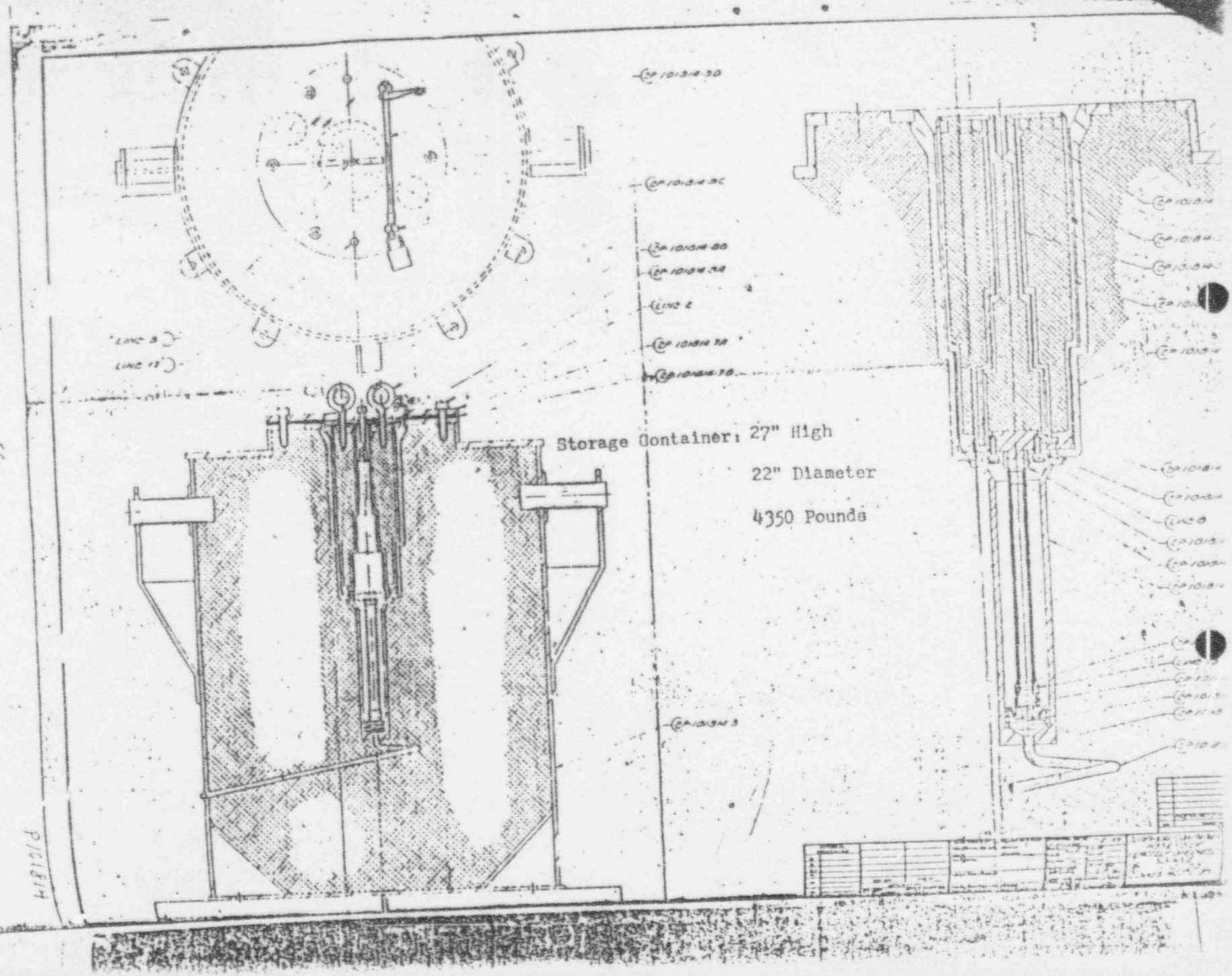
SIDE VIEW OF DOUGHERTY BOX





SOURCE TUBE - INSIDE
DOUGHERTY BOX

FIGURE 1



APPENDIX I TO PROCEDURE NR-5017 CHANGE 1

ADDENDUM JF3097

DESCRIPTION OF WORK TO BE ACCOMPLISHED PRIMARILY BY ARDEC IN MOVING AND INSTALLING THE DOUGHERTY BOX, H FRAME AND SOURCE CONTAINING BARREL IN BLDG 312

1.0 SAFE REMOVAL OF THE RADIATION MATERIALS TESTING (RMT) SYSTEM FROM BUILDING NUMBER 3021 (IN-HOUSE/CONTRACTOR)

1.1 Remove cosmetics such as disconnecting the electrical exhaust fan and separating the duct work (In-House)

1.2 Disconnect the Cobalt-60 source lifting mechanism (Contractor)

1.3 Create a large enough opening in the roof of building number 3021, centered over the Dougherty Box, to lift the Dougherty Box and H frame components of the Radiation Materials Testing System up and out of the laboratory (In-House)

1.3.1 Remove one or more panels
1.3.2 Cut a metal beam if required to lift system out through ceiling and reweld after removal
1.3.3 Remove and repair a localized section of the ceiling and gridwork.
1.3.4 Remove asbestos covering pipes in the vicinity of the Dougherty Box below and above the drop ceiling.
Action: Complete

1.4 Remove wooden step and platform from in front of the Dougherty Box and put on loading dock for transport to building 312. (In-House)

1.5 Place Blackhawk floor jack under roller tray and prop up while unscrewing the jacks for dropping the roller tray with barrel containing the source on its wheels. (In-House/Contractor)

1.5.1 Check to see if barrel with source comes down and clears the Dougherty Box (In-House/Contractor)
1.5.2 Dougherty Box may have to be lifted a few inches for the clearance required to "roll" or "jack" the source containing barrel away from the lift area.
1.5.3 "Roll" or "jack" the barrel and roller tray out of the way on its wheels or using the blawkhawk jack as required (In-House/Contractor)
1.5.3.1 Ensure that the Source containing barrel is never under either the Dougherty Box or H Frame as they are being lifted through the roof.
1.5.4 Place and secure the existing coverplate over the barrel to retain and shield the source. (In-House/Contractor)

1.6 Secure the barrel to the roller tray (In House/Contractor)

1.6.1 Barrel must be securely strapped to roller tray before moving
1.6.2 Measurements to determine the amount of radiation from the source in its transport configuration will be taken to confirm Department of Transportation limits for an open vehicle.

1.6.2.1 Radiation levels shall not exceed 200 mrem/hr on any external surface of the package and the transport index does not exceed 10.

1.6.3 If exposure is unacceptable the source containing barrel will be jacked or rolled into the vault of Building Number 3021 and stored until such time as the system installed in Bldg 312 is ready to accept the source.
1.6.4 "Roll" or "jack" the source containing barrel and roller tray on its wheels or using the blackhawk jack, as appropriate, through the double doors onto the loading dock and load onto a transport vehicle, in accordance with paragraph 1.8.5, together with the wooden step and platform for transport to building 312.
1.6.6 Block and brace securely for transport to building 312 (In-House)

1.7 Place a temporary cover over the opening at the bottom of the Dougherty Box (In House/Contractor)

1.8 Drop the cable from the crane, through the roof, and attach metal slings to the eye bolts welded to the Dougherty Box (In House) and to the H frame respectively.

ADDENDUM JF3097

DESCRIPTION OF WORK TO BE ACCOMPLISHED PRIMARILY BY ARDEC IN MOVING AND INSTALLING THE DOUGHERTY BOX, H FRAME AND SOURCE CONTAINING BARREL IN BLDG 312

1.8.1 Ensure the source containing barrel is out of the way when lifting begins
1.8.2 Pick and remove the Dougherty Box through the roof and place it on the flatbed.
1.8.3 Make a second pick of the H frame and lift it through the roof and place it on the flatbed
1.8.4 Deleted
1.8.5 "Pick" or use a forklift to get the source containing barrel secured to the dolly from the loading dock to the transport vehicle
1.8.6 Block, Brace, and Secure all items on flatbed and transport vehicle as required
1.8.7 Repair openings in ceiling and roof as required

2.0 SAFE DELIVERY OF THE RADIATION MATERIALS TESTING SYSTEM TO BUILDING 312 UNDER ARDEC LICENSE NUMBER 29-00047-08 Docket or Reference No. 030 12535 (IN-HOUSE/CONTRACTOR)

2.1 Transport Source containing barrel and the platform with the step on the transport vehicle approximately one and a half miles to Building 312. (In-House)

2.2 Transport Dougherty Box with H Frame on the flatbed, unless otherwise decided at the time of transportation, down navy hill through the main gate onto route 15 north and through the truck gate for a distance of about seven miles. (In-House)

2.2.1 A Tarp for covering the Dougherty Box and H Frame is optional (In-House)
2.2.2 This route avoids stress damage caused by exceeding the weight capacity limits of the bridges between the two buildings. (In-House)

2.3 Service and Equipment Required (In-House)

2.1.1 Riggers
2.1.2 Mobile Crane with long reach and a >25 ton lifting capacity
2.1.3 >4 Ton Floor Jack
2.1.4 Flatbed Truck for Dougherty Box and H Frame
2.1.5 Transport vehicle for Source Containing Shield, wooden step and platform
2.1.6 Ramp for difference in height between glassblower's lab and loading dock.
2.1.7 Other heavy equipment or supplies as required

3.0 SAFE TRANSFER AND INSTALLATION OF THE RADIATION MATERIALS TESTING SYSTEM IN BUILDING 312, REVERSE OF THE REMOVAL FROM BUILDING 3021 (IN-HOUSE/CONTRACTOR)

3.1 Make an opening in the roof centered over the established location of the radioactive materials testing system. (In-House)

3.1.1 Cut through the membrane and insulation of the roof [26 feet from the front (east side) of building 312] making the surface opening larger than the opening cut through the metal
3.1.2 Cut through the corrugated metal. The hole should be smaller than the cut through the membrane and insulation so that the former can be tacked back onto the metal
3.1.3 Remove a trues to create a large enough opening to drop the H frame and Dougherty box into place.

3.2 Back Truck with components into a position where the crane can double pick the H frame and Dougherty Box from the flatbed drop them in Building Numbered 312 and pick the source containing barrel with dolly from the transport vehicle and gently drop it either on the loadin dock at the single door or onto the lift dock at the double door. (In-House/Contractor)

3.2.1 Remove tarp from H frame and Dougherty Box if used
3.2.2 Lower them through the roof and into the designated location in the building

3.2.2.1 Once the source containing shield with dolly is "rolled", "pushed" and/or "pulled", into the building care must be taken to keep the source containing barrel with dolly away from the drop point area of the H frame and Dougherty Box to eliminate any possiblity of the two objects dropping onto the source containing barrel with dolly.

ADDENDUM JF3097

DESCRIPTION OF WORK TO BE ACCOMPLISHED PRIMARILY BY ARDEC IN MOVING AND INSTALLING THE DOUGHERTY BOX, H FRAME AND SOURCE CONTAINING BARREL IN BLDG 312

3.2.2.2 Deleted.
3.2.2.3 Location was established to equally distribute the weight on the floor
3.2.3 The door to the Dougherty Box will be facing West
3.2.4 Remove temporary covering over the opening at the bottom of the Dougherty Box.

3.3 Remove the hardware and cover plate from the source containing barrel and "jack" or "roll" under the Dougherty Box (In-House/Contractor).

3.3.1 The overhead crane with a 5 ton capacity in Building 312 is available for use in supporting this effort.

3.4 Raise the dolly off the ground with the blackhawk floor jack so that the top of the barrel is butted against the Dougherty Box and adjust the height of the barrel with the screws on the jacks attached to the roller tray and remove the floor jack. (In-House/Contractor)

3.5 Reconnect the cable for raising and lowering the source (Contractor)

3.6 Performance Test the System to verify A-1 operability. (Contractor)

4.0 BASIC INFORMATION

4.1 SOURCE (SOURCE CONTAINING BARREL)

4.1.1 Identification number 27A
4.1.2 Cobalt-60
4.1.3 Activity (Curies) Original 10,000 ap Present 400

4.2 Cobalt-60 source containing barrel [barrel welded to Dolly]

4.2.1 Approximately 5000 pounds

4.3 Dougherty Box (Estimated Values)

4.3.1 Use: Damage From Radiation To Materials Testing
4.3.2 Hand Receipt Holder: Richard Fliszar 43126
4.3.3 Serial Number: 511
4.3.4 Safety ID: 27A
4.3.5 Property Book Number: 662U30-03-01

		Pounds	Feet	Inches
4.3.6	Dougherty Box	50,000	-	-
4.3.7	Height (with raceway)		5.08	61
4.3.8	Height (without raceway)		3.75	45
4.3.9	Front Width		4.58	55
4.3.10	Side Depth		4.83	58
4.3.11	Color Gray			
4.3.12	Composition Lead			
4.3.13	Total Operational Height (Dougherty Box without raceway plus Stand)		7.41	89

4.3.14 Unremoved Door To Chamber 29.5"H 33.5"W 11.5"D Estimated Weight 4674.1 pounds (Density of Lead 11.35 gm/cm3) 1pound=453.59 gms and 1cm3=0.0610in3

4.4 Dougherty Box H Frame (Gray)

4.4.1	All steel		
4.4.2	Height	3.56	43

DESCRIPTION OF WORK TO BE ACCOMPLISHED PRIMARILY BY ARDEC IN MOVING AND INSTALLING THE DOUGHERTY BOX, H FRAME AND SOURCE CONTAINING BARREL IN BLDG 312

4.4.3	Width	4.85	58
4.4.4	Depth	ap 4.8	

4.5 Platform Leading To Dougherty Box

4.5.1	Length (without step)	5.08	61
4.5.2	Length (with Step)	6.25	75
4.5.3	Height	1.416	17
4.5.4	Step Height	0.854	10.25

4.6 In-House Support Groups

4.6.1 Safety Office Health Physics Branch specialized support to include ARDEC License coverage for transfer onto and off the truck, transport from Building 3021 North to Building 312 approximately 1.5 miles and use of the radiation materials testing system in B312, issuance of whole body badges and extremity badges in addition to, not in lieu of, contractor dosimeters, monitoring, use of counting equipment, coordination between the various trades and organizations involved in carrying out the transfer of the Cobalt-60 sources.
4.6.2 Line Crew (Power Company) Provide sleeves for power lines
4.6.3 Electricians Disconnect (remove if required) blower motor and accessories on top of Dougherty Box
4.6.4 Carpenters Make openings in the roof for lifting and dropping the OPTION 1 dolly secured source containing barrel, H frame and Dougherty Box and Removing and repairing localized sections of ceiling and gridwork.
4.6.5 Riggers Hitch attachments to components of the radiation materials testing system and prepare laboratory equipment for maximum safety in transportion, delivery and nonmechanical installation, as required.
4.6.5.1 Provide manual cribbing, as required, to maintain the stability of the crane.
4.6.6 Tinsmiths for disconnecting and reconnecting the ductwork on the Dougherty Box and repairing metal components of roof and ceilings

030-05216

DEPARTMENT OF THE ARMY
U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NJ 07806-5000

May 20, 1993

MS-16
9-4

REPLY TO
ATTENTION OF

Safety, Surety, & Environmental Office
Installation Division
Health Physics Branch

U.S. Nuclear Regulatory Commission-Region I
Attention: Mr. Francis M. Costello
Nuclear Materials Safety Section B
Division of Radiation Safety and Safeguards
475 Allendale Road
King of Prussia, Pennsylvania 19406

Gentlemen:

Enclosed please find license renewal application 29-00047-06 for the U.S. Army Armament Research, Development and Engineering Center's (ARDEC) radiography/irradiator operations. The operations/sources contained in this renewal application are a consolidation from three previous ARDEC licenses---29-00047-06, -08, and -09. Please also note that completed Form 314 is also included in this submittal in order to provide formal notification to your Agency of the safe disposal of Cobalt-60 source, Automation Industries, Model Co-60-GS (ARDEC-designated source Number 27C), which is listed on the -06 license.

Based upon telephone discussions between your staff, and Mr. Richard Fliszar, ARDEC RPO, and written correspondence submitted to your office in January 1993, it is the understanding of this office that the present -06 license remains in effect until this renewal application is acted upon, due to its receipt prior to the agreed upon extended suspense (expiration) date extension of May 28, 1993.

Any questions concerning this transmittal should be directed to Mr. Fliszar at (201)724-3126.

Michael F. Clune
Acting Chief, Safety, Surety,
& Environmental Office

Enclosure

Copies Furnished:
CDR, AMCSF-P (Mr. John Manfre), Alexandria, VA 22333-0001
CDR, AMSMC-SFS (Ms. Betty Peterson), Rock Island, IL 61299-6000

116060

OFFICIAL RECORD COPY ML 10

MAY 27 1993

NRC FORM 313
(9 90)
10 CFR 30, 32, 33,
34, 35 and 40

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIAL LICENSE

APPROVED BY OMB NO 3150-0120
EXPIRES 6 30 93

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 3 75 HRS FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714) U S NUCLEAR REGULATORY COMMISSION WASHINGTON DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0120) OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON DC 20503

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATIONS FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY, NMSS
WASHINGTON, DC 20555

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS, IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION I
NUCLEAR MATERIALS SAFETY SECTION B
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION II
NUCEAR MATERIALS SAFETY SECTION
101 MARIETTA STREET, SUITE 2900
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION III
MATERIALS LICENSING SECTION
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
MATERIAL RADIATION PROTECTION SECTION
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TX 76011

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVADA, OREGON, WASHINGTON, AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION V
NUCLEAR MATERIALS SAFETY SECTION
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CA 94596

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTION.

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

- [ ] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER _____
- [x] C. RENEWAL OF LICENSE NUMBER 29-00047-06

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include Zip Code)*

Department of the Army
U.S. Army Armament Research, Development and Engineering Center (ARDEC)
Picatinny Arsenal, NJ 07806-5000

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Picatinny Arsenal, NJ 07806-5000

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Richard W. Fliszar

TELEPHONE NUMBER: (201)724-3126

SUBMIT ITEMS 5 THROUGH 11 ON 8½ x 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSEE FEES *(See 10 CFR 170 and Section 170.31)*
FEE CATEGORY | AMOUNT ENCLOSED $

13. CERTIFICATION. *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, AND 40 AND THAT ALL INFORMATION CONTAINED HEREIN, IS TRUE AND CORRECT TO THE BEST OF THEIR 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.

SIGNATURE, CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
Richard Palaschak for	HARVEY E. BROWN	Brigadier General, USA Commanding	20 MAY 1993
RICHARD G. PALASCHAK Colonel, OD			

FOR NRC USE ONLY

TYPE FEE	CONFIRMATORY	FEE CATEGORY	COMMENTS

AMOUNT RECEIVED	CHECK NUMBER	

APPROVED BY | DATE

NRC FORM 313 (9 90)

OFFICIAL RECORD COPY ML 10

116060

MAY 27 1993

MAY 20 1993

ITEM 5

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 5 - Radioactive Material

a. Gamma Industries, Gammatron 100 Model A-8-A/Bioimaging Research Corp. Computerized Tomography System

(1) Cobalt-60;

(2) Original source strength: 100 Ci on 10/20/72: Gamma Industries S. N. 855;

(3) Current source strength: 6.68 Ci in 5/93 (S. N. 27D);

(4) Solid metal, sealed source;

(5) Maximum amount of radioactive material: 125 Ci. Maximum anticipated combined activity during any time of source transfer. Depending on the performance of the new tomography system in relation to the strength of the Cobalt-60 source, replenishment of the Cobalt-60 into the Gammatron 100 will be at an activity $\leq$ 100 Ci (to be determined at a later date).

b. Dougherty Box

(1) Cobalt-60;

(2) Solid metal, sealed source;

(3) 10,000 curies;

(4) Source manufaccured by American Nuclear Corp., Oak Ridge, TN; per dwg P-101814;

(5) Irradiation chamber (Dougherty Box) manufactured by John Dougherty Co. (see drawing SK80872 enclosed).

c. AIDECS (Automatic Inspection Device for Explosive Charge in Shell)

(1) Cobalt-60;

(2) Solid metal, sealed sources;

(3) 15,000 curies: 3 sources of 5000 curies each;

(4) Source manufactured by Neutron Products, Inc., Model NPI-XX-XXXXW;

(5) Irradiation device by IRT Corporation, San Diego, CA;

ITEM 5

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 5 - Radioactive Material (cont'd)

(6) NOTE: Arrangements are underway to transfer these sources to Neutron Products, Inc., MD with an anticipated time-frame for this transfer of September 1993. Reference previous correspondence dated 1 May 1992 concerning this transfer.

d. Self-shielded irradiator

(1) Cesium-137;

(2) Solid metal, sealed source;

(3) 140 curies;

(4) Mfg and model number of sealed source - DRNL drawing A-RD-1293;

(5) Mfg and model number of irradiator - Ameray Corporation, Route 46, Kenvil, NJ; model number: job number 1453.

e. Automation Industries Model Co-60-GS

(1) Cobalt-60 (source number 27C)

(2) Solid metal, sealed source

(3) Source transferred to Chem-Nuclear Inc., Snelling, SC for radioactive waste disposal on 24 November 1992. Reference NRC Form 314 submitted to the NRC at the time of submittal of this renewal application (copy enclosed). Source strength at time of transfer was 192 mCi.

MAY 20 1993

NRC FORM 314
(5-90)
10 CFR 30.36(c)(1)(iv)
10 CFR 40.42(c)(1)(iv)
10 CFR 70.38(c)(1)(iv)

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF DISPOSITION OF MATERIALS

INSTRUCTIONS: SEND THE COMPLETED CERTIFICATE TO THE NRC OFFICE SPECIFIED ON THE REVERSE. *(All items MUST be completed--print or type)*

APPROVED BY OMB: 3150-0028
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 30 MIN. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB-7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0028), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20603.

LICENSEE NAME AND ADDRESS

Department of the Army
U.S. Army Armament Research, Development and Engineering Center (ARDEC)
Picatinny Arsenal, NJ 07806-5000

LICENSE NUMBER

29-00047-06

LICENSE EXPIRATION DATE

License Renewal Submittal Extension to 28 May 1993

THE LICENSEE OR ANY INDIVIDUAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE LICENSEE CERTIFIES THAT: *(Check and/or complete the appropriate item(s) below.)*

A. MATERIALS DATA *(Check one and complete as necessary)*

☐ 1. NO MATERIALS HAVE EVER BEEN PROCURED OR POSSESSED BY THE LICENSEE UNDER THIS LICENSE.

OR

☑ 2. ~~XXX~~ MATERIAL ~~X~~ PROCURED AND/OR POSSESSED BY THE LICENSEE UNDER THE LICENSE NUMBER CITED ABOVE ~~HAVE~~ has BEEN DISPOSED OF IN THE FOLLOWING MANNER. *(If additional space is needed, use the reverse side or provide attachments.)* Cobalt-60 sealed source, (Automation Industries Model Co-60-GS); ARDEC designated source No. 27C.

Describe specific material transfer actions and, if there were radioactive wastes generated in terminating this license, the disposal actions, including the disposition of low-level radioactive waste, mixed waste, Greater-than-Class-C waste, and sealed sources, if applicable.

The referenced Cobalt-60 source was transferred as radioactive waste to Chem-Nuclear Inc. on 24 November 1992 for subsequent burial at a low level radioactive waste burial site.

For transfers, specify the date of the transfer, the name of the licensed recipient, and the recipient's NRC license number or Agreement State name and license number.

Date of Transfer (24 November 1992); Licensed Recipient (Chem-Nuclear Systems, Inc. Snelling, SC); Recipient's NRC License Number (SC DHEC License #287-04)

If materials were disposed of directly by the licensee rather than transferred to another licensee, licensed disposal site or waste contractor, describe the specific disposal procedures *(e.g., decay in storage)*.

B. OTHER DATA

☐ 1. OUR LICENSE HAS NOT YET EXPIRED, PLEASE TERMINATE IT.

2. WAS A RADIATION SURVEY CONDUCTED TO CONFIRM THE ABSENCE OF LICENSED RADIOACTIVE MATERIALS AND TO DETERMINE WHETHER ANY CONTAMINATION REMAINS ON THE PREMISES COVERED BY THE LICENSE? *(Check one)* for this item.

☐ NO *(Attach explanation)*

☑ YES, THE RESULTS *(Check one)*

- ☑ ARE ATTACHED, or
- ☐ WERE FORWARDED TO NRC ON *(Date)*

3. THE PERSON TO BE CONTACTED REGARDING THE INFORMATION PROVIDED ON THIS FORM

NAME	TELEPHONE NUMBER
Richard W. Fliszar, ARDEC RPO	(201)724-3126

4. MAIL ALL FUTURE CORRESPONDENCE REGARDING THIS LICENSE TO

Department of the Army
U.S. Army Armament Research, Development and Engineering Center
ATTN: SMCAR-SEF, Bldg 320 (Mr. R. Fliszar)
Picatinny Arsenal, NJ 07806-5000

CERTIFYING OFFICIAL

I CERTIFY UNDER PENALTY OF PERJURY THAT THE FOREGOING IS TRUE AND CORRECT.

SIGNATURE	DATE
Richard W. Fliszar	18 May 1993

PRINTED NAME AND TITLE

Richard W. Fliszar, Supervisory Health Physicist, ARDEC RPO

WARNING: FALSE STATEMENTS IN THIS CERTIFICATE MAY BE SUBJECT TO CIVIL AND/OR CRIMINAL PENALTIES. NRC REGULATIONS REQUIRE THAT SUBMISSIONS TO THE NRC BE COMPLETE AND ACCURATE IN ALL MATERIAL RESPECTS. 18 U.S.C. SECTION 1001 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.

MAY 20 1993

HEALTH PHYSICS RADIOACTIVE MATERIAL OPERATIONS SPECIAL SURVEY REPORT

Principal User: HP STAFF
Organization: SMCAR-SEF
Bldg. No.: 312
Room No.: NA
Phone No.: 4-3742/3126
Activity: LLRW STORAGE AND HANDLING FACILITY

Date: April 19, 1993 and May 19, 1993
Surveyor(s): JOSEPH A. FABIANO
Survey Meter (s): LUDLUM
Model No. (s): 3
SN: 16264 Safety ID 27C
Calibration Due Date: 21 Apr 93

ISOTOPE (S): Cobalt-60

SMEAR ANALYSIS

NON-CONTROLLED AREA(S)

____ All smears show removable contamination of <100DPM/100cm^2.

____ The following smears show removable contamination >100 DPM/cm^2

1._____ 5._____
2._____ 6._____
3._____ 7._____
4._____ 8._____

CONTROLLED AREA(S)

✓ All smears show removable contamination of <1000 DPM /100cm^2

____ The following smears show removable contamination > 1000 DPM/100cm^2

1._____ 5._____
2._____ 6._____
3._____ 7._____
4._____ 8._____

TYPE OF ANALYSIS

____ Liquid Scintillation
X Alpha-Beta Gas Flow Proportional
____ Gamma Spectroscopy

CHECKLIST

	YES	NO	N/A	
1.	✓	___	___	NRC Form # 3
2.	✓	___	___	Notice To Employees
3.	✓	___	___	SOPs/RWPs Posted
4.	✓	___	___	Emergency Nos.Posted
5.	✓	___	___	Caution Sign(s) Posted
5. a.	✓	___	___	Radi Mat at or on
5.a.1	✓	___	___	Entrance(s)
5.a.2	✓	___	___	Work Area (s)
5.a.3	✓	___	___	Waste Area(s)
5.a.4	✓	___	___	Radiation Hood
5.a.5	✓	___	___	Storage Area(s)
6.	✓	___	___	Personnel Dosimetry
7.	✓	___	___	Survey Mete Calibr
8.	✓	___	___	IOPs/SOPs/RWP's Foll
9.	✓	___	___	ALARA Followed
10.	IOP#,SOP#/RWP#_____			
11.	___	___	✓	NRC Not of Viol

Date of Analysis: May 21, 1993 Analysis By: Joseph A Fabiano
Comments: Smears were taken of the barrel (lead container) and components to determine the degree of contamination for disposal.
Reviewed By: Richard L Moore

The Barrel (26 inches High and 24 inches diameter, was the shield for the 6.2 Curie, original Activity 06/03/66, Cobalt-60 Radiography Source, used and stored in Building Number 221 and moved to Building Number 312 for temporary storage and disposal. It was left behind when the source was transferrred into a smaller lead container and both were then transferred into a molded cement lined 55 gallon drum shipped for disposal on November 24, 1992 to the Defense Consolidation Facility, South Carolina.

April 19, 1993

Swipe NR	Location
58	"U" plate with hole in center
59	"T" Bar
60	Bar with lock
61	Pulley chain
62	Blue (lead) cap
63	Template
64	Four Bolts
65	Top of pig
66	Circumference of barrel
67	Bottom of well (Punctured paper divider with white dust evident on withdrawal of pole with smear at tip)
68	White dust (Dropped onto top of barrel after removing pole with smear from well)
69	Sides of well

May 19, 1993

Smear Nr	Location
72	Exterior Top
73	Exterior Surface of Barrel
74	Inner Top Wall Surfaces of Round Hole
75	Inner Middle and Lower Wall Surfaces of Round Hole
76	Bottom of Round Hole

SMEAR NR	Location
70	EMPTY CAN OF COUNT OFF FROM BUILDING NUMBER 3021

MAY 2 v 1993

MON APR 19, 1993
GROUP C RESULTS OF RADIOLOGICAL OPERATIONS SURVEY OF THE BARREL SHIELD THAT ONCE HELD THE BUILDING NUMBER 221 CO-60 SOURCE

SAMPLE SN	CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED	TOD CLOCK HR:MN:SEC	
99	CO-60	5.00	2	12	0	0	0	0	14:15:19	
100	CO-60	5.00	3764	9205	752.40	1838.60	2396.1783	4528.5714	14:20:31	
58	CO-60	5.00	3	6	0.20	-1.20	.63694268	-2.955665	14:25:44	U-Plate with hole in center
59	CO-60	5.00	0	8	-0.40	-0.80	-1.2738854	-1.9704433	14:30:56	T Bar
60	CO-60	5.00	2	12	0	0	0	0	14:36:08	Bar with Lock
61	CO-60	5.00	0	7	-0.40	-1.00	-1.2738854	-2.4630542	14:41:21	Pulley Chain
62	CO-60	5.00	3	14	0.20	0.40	.63694268	.98522167	14:46:33	Blue (lead) cup
63	CO-60	5.00	1	7	-0.20	-1.00	-.63694268	-2.4630542	14:51:45	Template
64	CO-60	5.00	4	11	0.40	-0.20	1.2738854	-.49261084	14:56:58	Four Bolts
65	CO-60	5.00	1	13	-0.20	0.20	-.63694268	.49261084	15:02:10	Top of Pig
66	CO-60	5.00	6	15	0.80	0.60	2.5477707	1.4778325	15:07:22	Circumference of Barrel
67	CO-60	5.00	1	6	-0.20	-1.20	-.63694268	-2.955665	15:12:34	Bottom of well
68	CO-60	5.00	0	10	-0.40	-0.40	-1.2738854	-.98522167	15:17:47	White Dust
69	CO-60	5.00	0	10	-0.40	-0.40	-1.2738854	-.98522167	15:22:59	Sides of hole
70	CO-60	5.00	0	7	-0.40	-1.00	-1.2738854	-2.4630542	15:28:11	Empty Can of Count OFF

EFFICIENCY = 0.406
LLD net DPM = 8 Disintegrations per minute

The efficiency for the beta emitting daughters of U-238 were used to calculate the lower limit of detection and activity of the counts because this laboratory has no calibration standard for the CO 60 beta radiation

FRI MAY 21, 1993
GROUP C RESULTS OF THE SAMPLES TAKEN FROM THE HP RADIOLOGICAL MATERIALS PRE-RELEASE SURVEY OF THE DETECTOR TABLE AND THE EMPTY LEAD SHI

SAMPLE SN	CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED	TOD CLOCK HR:MN:SEC	
99		5.00	0	11	0	2.2	0	0	09:34:45	
100		5.00	3651	9219	730.20	1841.60	2325.4777	4547.1605	09:39:58	
69		5.00	5	11	1.00	0	3.1847134	0	09:45:11	Top Surface of Table
70		5.00	3	11	0.60	0	1.910828	0	09:50:23	Bottom Platform of Table
71		5.00	1	7	0.20	-0.80	.63694268	-1.9753086	09:55:36	Outside Angle Iron
72		5.00	1	13	0.20	0.40	.63694268	.98765432	10:00:48	Exterior Top
73		5.00	7	29	1.40	3.60	4.4585987	8.8888889	10:06:01	Exterior Surface of Barrel
74		5.00	1	13	0.20	0.40	.63694268	.98765432	10:11:14	Inner Top Wall surface of Round Hole
75		5.00	3	9	0.60	-0.40	1.910828	.98765432	10:16:26	Inner Middle to lower wall Surface of H
76		5.00	1	10	0.20	-0.20	.63694268	-.49382716	10:21:39	Bottom of Round Hole

EFFICIENCY = .405
LLD net DPM = 7.6 Disintegrations per second

MAY 20 1993

ITEM 6

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 6 - Purpose for Which Licensed Material Will Be Used

a. Gammatron 100 Model A-8-A/Bioimaging Research Corporation Computerized Tomography System - For use in research and development projects as defined in 10 CFR 30.4. The work involving the use of the source is for the experimental development of feasible methods to analyze various items, including that of munitions. The research and development work is for that of non-destructive testing including, but not limited to tomography (when the Gammatron-100 is used in conjunction with the Bioimaging Research Corporation Computerized Tomography System), radiography, gamma gauging (such as assessments of density, thickness, defects, etc.).

b. Dougherty Box. This Category I Gamma Irradiator has been, and will be used to study the effects of gamma radiation materials of interest to the U.S. Army. The source is used in or for military research and development projects as defined in 10 CFR 30.4(q). All of the work involving the source is experimental. It may involve procedures or processes not done before, or not done on the materials being studied.

c. AIDECS System* - "storage only". The three Cobalt-60 sources are soon to be transferred to Neutron Products Inc. (NPI), MD with transfer occurring under an amendment issued to NPI by the State of Maryland. (For information on this system, please reference previous ARDEC license 29-00047-08. No further information regarding this system is provided in this application, since it is assumed that the sources will have been transferred to NPI prior to review of this application.)

d. Ameray Corporation Irradiator - For storage in a self-shielded irradiator in a high security building.

*The AIDECS system had been used as an engineering prototype model used to study the feasibility of using a computer controlled photon scattering gauge to look for flaws in the explosive charge in ammunition items of interest to the U.S. Army. The initial phase of this study is complete, and neither the sources nor system are needed any longer. The NRC Form 314 will be submitted following transfer of the sources to NPI.

MAY 20 1993

ITEM 7

ARDEC, Picatinny Arsenal, NJ 07806-5000

ITEM 7 - Individuals Responsible For Radiation Safety Program (Training and Experience)

a. Richard W. Fliszar - Radiation Protection Officer (RPO)/ Member IRCC * **

b. Michael F. Clune - Chairman, IRCC

c. Richard L. Moss - Alternate RPO

d. Andy Kung - Alternate RPO

e. Lawrence J. D'Aries - Alternate RPO

f. Sheldon Cytron - Member IRCC

g. Wallace Walker, Jr. - Member IRCC

h. Emmett Barnes - Member IRCC, Radiographer

i. Joseph Argento, Radiographer

j. Susanne Bernhardt - Member IRCC

k. Michael Lucas - Member IRCC (Acting Fire Chief)

l. Barbara Clark - Member IRCC

m. SSG Michael Ferrell - Member IRCC

The following submission contains excerpts from the Charter for the Ionizing Radiation Control Committee. This Charter may be changed to add or delete members, or to modify subsections, as appropriate, which do not affect the intent of that presented herein, without requiring amendment to this broad scope license, nor any other notification to the U.S. NRC.

* IRCC - Ionizing Radiation Control Committee
** A resume for pertinent individuals can be found on the following pages.

MAY 20 1993

CHARTER

1. NAME OF COMMITTEE Ionizing Radiation Control Committee

2. CATEGORY AND TYPE OF COMMITTEE: Advisory, continuing committee

3. PURPOSE To advise on command policies for safe use, handling, storage, receipt, shipment and disposal of sources of ionizing radiation and radiation-producing devices.

4. SPECIFIC RESPONSIBILITIES

a. Review and provide comment on new radiation programs, new radiation facilities, and new/revised standard operating procedures.

b. Review any license/DA Authorization submitted to the Nuclear Regulatory Commission (NRC) Army for renewal or amendment.

c. Review, provide comment, and approve potential radiation workers.

d. Provide "Expert" advice during incident/accident investigations.

e. Review accident/incident reports and recommend ARDEC policy changes, as appropriate.

5. DIRECTION AND CONTROL Chief, Safety, Surety & Environmental Office holds the position of IRCC chairman.

a. Acts as the Commander's representative.

b. Presides at meetings but does not vote except in a split decision situation.

c. Appoints subcommittees as needed.

d. Reports minutes of the meetings to the Chief of Staff.

6. AUTHORITY

a. AR 40-4, Control and Recording Procedures for Exposure to Ionizing Radiation and Radioactive Materials, para 5.e.(4).

b. AR 385-11, Ionizing Radiation Protection, para 1-25.

c. AMCR 385-25, Radiation Protection, para 6.a.(2).

MAY 20 1993

7. ADMINISTRATIVE SUPPORT AND STAFF ARRANGEMENTS

Administrative support will be provided by the Health Physics Branch of the ARDEC Safety, Surety & Environmental Office utilizing existing assets and current budget.

8. COMPOSITION

Chairman: Michael F. Clune, Actg C, Safety, Surety & Environmental Office

Primary Members: Rich Fliszar, RPO
Ms. Barbara Clark, OHN, Health Clinic
Michael Lucas, Acting Fire Chief
Dr. Sheldon Cytron, Technical Expert-DU
Wally Walker, Technical Expert-Tritium
Emmett Barnes, Technical Expert, Radiography/ Sealed Sources
Susanne Bernhardt, Union Representative
SSG Michael Ferrell, Military Representative

9. CORRESPONDENCE All correspondence to and from the IRCC will be thru the ARDEC Safety, Surety & Environmental Office.

10. OTHER INFORMATION

a. The committee will meet at least quarterly upon the call of the chairman.

b. Day-to-day direction by the committee will be coordinated and carried out by the RPO and health physics staff and will not require unscheduled committee meetings unless areas of disagreement/confusion arise.

c. At the present time, a minimum of 5 members is needed to constitute a quorum (i.e., 8 primary members presently).

d. Minutes will be taken either by a secretary or a member of the health physics staff. Minutes will be reviewed by the health physics staff for accuracy (although the RPO is the only IRCC member the health physics staff is obligated to attend the meetings and provide technical input). The minutes will then be reviewed by the chairman and sent to the chief of staff for approval. Copies of the approved minutes will then be sent to the membership for acceptance at the next meeting.

e. The IRCC ensures that the program is adhering to the conditions set forth in the NRC licenses/DA Authorization by reviewing all current aspects of the ARDEC Radiation Protection Program at these meetings.

Mr. Barnes is the radiographer responsible for the operation of the Gammatron-100/Tomography systems. Operation of these systems by any radiographer's assistants will be under the direct supervision of Messrs. Barnes/Joseph Argento. The RPO/alternate RPOs of the ARDEC Safety, Surety, & Environmental Office, Health Physics Branch, provide radiation safety oversight of all radiation operations on Post.

MAY 20 1993

NAME (Last, First, MI)	AUTOVON NUMBER	SOCIAL SECURITY NUMBER	CAREER PROGRAM (CP)
CLUNE, MICHAEL F.	880-4561	132-36-9431	
U.S. Army ARDEC	COMMERCIAL AND AREA CODE	EXT	MACOM
ATTN: SMCAR-ISE	(201) 724-4561	2308	AMC
Picatinny Arsenal, NJ 07806-5000	NAME (Last, First, MI) OF IMMEDIATE SUPERVISOR		
	ELDRIDGE, MARK E.		
MESSAGE ADDRESS AND OFFICE SYMBOL	AUTOVON AND COMMERCIAL NUMBER OF IMMEDIATE SUPERVISOR		DATE
	880-3000 (201) 724-3000		

PART I - EXPERIENCE

Describe general and previous positions held in government, industry, or military service. Start with PRESENT position and work back. List separately those positions characterized by differences in grade or in major duties or in employing office. Include significant temporary promotion or detail for periods over 30 days (clearly identify as such in experience block words). In space provided for block 5, identify and summarize additional periods of relevant career field related experience. If needed, additional experience blocks are provided on DA Form 2302-1 R (Continuation Sheet).

	FROM (Mo. Yr.)	TO (Mo. Yr.)	SERIES	GRADE	POSITION TITLE	ORGANIZATIONAL TITLE (If Different)
1	02-87	PRESENT	801	GM-14	General Engineer	U.S. Army ARDEC

DESCRIPTION OF WORK: Serves as Chief, Division of Engineering and Housing. Responsible for a 35 plus million dollar program. Maintains, repairs, alters and constructs additions to 1200 buildings, 85 miles of roadway, 31 bridges, 36 miles of steam line similar other utility lines as well as maintenance of 6800 acres of property inclusive of two lakes. Facilities engineering relating to the Arsenal's mission requires integration of research and development equipment for armaments and some SDI work into a facilities contract. Responsible for the operation of all utilities inclusive of power generation, sewage treatment and potable water, and air conditioning. Responsible for Military Family Housing and the Environmental & Energy Resources Office. Division has approximately 320 employees.

	FROM (Mo. Yr.)	TO (Mo. Yr.)	SERIES	GRADE	POSITION TITLE	EMPLOYING OFFICE AND LOCATION
2	11-86	02-87	801	GM-14	General Engineer	U.S. Army ARDEC

DESCRIPTION OF WORK: Serves as Chief, Engineering Plans & Services Branch, Division of Engineering and Housing. Responsible for the design, contracting and construction of all facilities at Picatinny Arsenal inclusive of the Military Construction Program. Annual program for maintenance, repairs and alteration is about eight to 10 million dollars. Branch has approximately 54 employees of which approximately 35 are mechanical, electrical or civil engineers.

	FROM (Mo. Yr.)	TO (Mo. Yr.)	SERIES	GRADE	POSITION TITLE	EMPLOYING OFFICE AND LOCATION
3	07-81	11-86	810	GM-13	Civil Engineer	USAEDH, Huntsville, AL

DESCRIPTION OF WORK: Attached to the USAEDH Proj Ofc at the Production Base Modernization Agency (MPBMA). Served as Actg Chief of the project office for six months during this period while awaiting new military chief. Responsibilities include surveillance over the development of design criteria, equipment interfaces, technical planning and equipment/construction scheduling problems. Designed facilities utilize state-of-the-art technologies for chemical processes, metal forming, load, assemble & packaging processes; wastewater, chemical, and air pollution treatment. Furnish technical & managerial advice on advance planning, design, procurement & construction to Huntsville Div & the using agency. Possesses the authority to commit the Corps Engrs to design criteria, funding requirements, and design.

	FROM (Mo. Yr.)	TO (Mo. Yr.)	SERIES	GRADE	POSITION TITLE	EMPLOYING OFFICE AND LOCATION
4	09-79	07-81	810	GS-12	Civil Engineer	USAEDH, Huntsville, AL

DESCRIPTION OF WORK: Serves as the contracting Officer's technical representative in a Dept of Energy sponsored high BTU coal gasification project. This project represented a 40 million dollar design effort utilizing both foreign & domestic technologies represented by nine individual contractors & subcontractors. The program stretched from pilot plant work thru final design & bid package preparation. Headed the government's technical office within which both government & industrial consultants reviewed the concept & final designs, special studies & pilot work. Monitored the design architect engineering firm and the prime technical vendors for progress, technical accuracy, expenditures, and contract compliance.

MAY 20 1993

MICHAEL F. | 132-36-9431 | 8 Feb 69

PART I EXPERIENCE

FROM (Mo. Yr.)	TO (Mo. Yr.)	SERIES	GRADE	POSITION TITLE	EMPLOYING OFFICE AND LOCATION
07 76	04-78	801	GS-11	General Engineer	PM MPBME, Dover, NJ

Project Engineer MPBMA - Responsible for value engineering, support facilities, environmental impact statement, prove-out, and system engineering to include product assurance, quality control, reliability, maintainability, and life cycle analysis, and development of procedures for operation and maintenance, master equipment and recommended spare parts list for a one half billion dollar project.

PART II EDUCATION

FROM (Mo. Yr.)	TO (Mo. Yr.)	HOURS		DEGREE	MAJOR	SCHOOL AND LOCATION (City and State)
09 72	06 74	060		BS	Mechanical Engineer	Union Col. Sch, NY
06 75	04 76	036		ME	Industrial Engineer	Tex A&M Col Sta TX
09 76	12 76	005		NN	Propel & Explosive	Stevens Inst Tech NJ
01 78	Pres	030		NN	I.E. PHD Candidate	Columbia Univ, NY NY

PART III TRAINING, SELF DEVELOPMENT, SKILLS AND ACCOMPLISHMENTS

FROM (Mo. Yr.)	TO (Mo. Yr.)	DAYS	TITLE OF COURSE OR SUBJECT	LOCATION (City and State)
06 88	06 88	001	In Plant Spill Response	ARDEC
02 88	02 88	005	DEH Executive Management Course	ARDEC
07 86	07 86	0003	How to Motivate Effectively	ARDEC
06 86	06 86	0001	Reviewing & Editing Performance Plan	ARDEC
11 86	11 86	0004	Managing the Engr & Scientist Workforce	Cincinnati, OH
02 85	05 85	0001	Competition in Contracting	Parsippany, NJ
05 85	05 85	0005	Advance Construction Management	Ft Worth, TX
12 85	12 85	0003	Mgt the Engr & Scientist Workforce	Cincinnati, OH
12 83	12 83	0004	AE Contracting	Ft Worth, TX
12 79	12 79	0004	MC Project Management	Huntsville, AL
01 78	01 78	0005	Fund of Process Control	Foxboro, MA
03 77	03 77	0010	Munitions Safety, FSA	Charleston, IN
11 74	00 00	0000	Auth Tech Art, Jr. of ASME	New York, NY
09 74	00 00	0000	Certified Intern Engineer	New York

PART IV AWARDS AND RECOGNITION

FROM (Mo. Yr.)	TO (Mo. Yr.)	KIND OF AWARD OR NATURE OF ACHIEVEMENT	AWARDING AGENCY (City and State)
11 88	00 00	Merit Pay $1155	ARDEC, Picatinny Ars
11 87	00 00	Merit Pay Award $1642	ARDEC, Picatinny Ars
04 87	00 00	Special Act Award $1000	ARDEC, Picatinny Ars
09 86	00 00	Merit Pay Award $1600	USAEDH, Huntsville AL
11 85	00 00	Merit Pay Award $1500	USAEDH, Huntsville AL
09 84	00 00	Merit Pay Award $1800	USAEDH, Huntsville AL
08 84	00 00	Merit Pay Award $750	MPBMA, Dover NJ
07 82	00 00	Merit Pay Award $750	USAEDH, Huntsville AL
03 77	00 00	US Pat 4011601	US Patent Ofc Wash DC
05 74	00 00	Assoc Member Sigma XI	Union C Schnectady NY

STATEMENT OF EMPLOYEE

THE INFORMATION I HAVE FURNISHED ON THIS FORM IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND HAS BEEN SUBMITTED IN GOOD FAITH

DATE: 2/14/89 | SIGNATURE OF EMPLOYEE: Michael F. Clow

A FORM 2302 R, Apr 84

CIVILIAN CAREER PROGRAM QUALIFICATION RECORD

MAY 20 1993

SYSTEM SAFETY EXPERIENCE
MICHAEL F. CLUNE

Radford AAP:

a. 1978/1979 - Part of investigation team looking into cause of nitrocellulose detonation in centrifuge. Mr. John Mola team leader. Looked at all aspects of process line for safety and hazard classification.

b. Worked on process control system for the CAMBL multi-base propellant facility at Radford. Responsible for ensuring process safety through computer monitoring of process.

c. In 1978/1981 - Served as the government Contracting Officer's Technical Representative on a 40 million dollar design of a high BTU synthetic gas facility. Responsible for all aspects of design, including system safety.

d. 1981/1986 - Worked with the PBMA on the RDX/HMX facilities to include all areas of process and facilities integration to include prototype HMX process. System Safety was integrated.

e. Headed special investigation team to correct oil cleaned electrostatic precipitator fires at Mississippi and Scranton AAP.

f. Served as Project Manager for the Corps of Engineers on the QL Binary Facility Program. System Safety was not limited to QL portion of project, but to both the munitions item and the manufacturing process.

MAY 20 1993

RESUME
OF
RICHARD W. FLISZAR

Present Position: ARDEC Health Physicist

College Education:
- AA Biology (Chemistry), Union College, Cranford, NJ, June 1973
- BS Environmental Science (Chemistry), Rutgers University, New Brunswick, NJ, June 1975
- MS Radiation Science - Health Physics, Rutgers Graduate School, New Brunswick, NJ, January 1983

Relevant Work Experience:

ARDEC Health Physicist, U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ

From: 9/91 To: Present

Work Description: Supervisor of Health Physics Branch of the Safety, Surety and Environmental Office

From: 11/87 To: Present

Work Description: Radiation Protection Officer (RPO) for operations involving four U.S. NRC licenses at the Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ. Pertinent radioisotopes include, but are not limited to tritium, depleted uranium, special nuclear materials, Cobalt-60, Cs-137, and Californium-252; coordinate and oversee technical functions carried out by the health physics staff, in support of the license requirements.

From: 9/85 To: 6/90

Assigned to assist another Army Command in the development and testing of a major conventional weapon system, the development of radioactive armor for the M1A1 Abrams Main Battle Tank. Assigned duties included write-up of an Environmental Assessment Report (EIA); calculate shielding requirements for system design; obtain radiation profiles from extensive radiation measurements of the initial weapon systems that were built to verify shielding sufficiency and manufacture reproductability; plan and conduct extensive environmental tests on this weapon system to provide supporting documentation for the previously written EIA; designated Army RPO to oversee the development of the radiation protection program for the manufacturer of the weapon system in order to fulfill the U.S. NRC license requirements for that facility.

From: 3/83 To: Present - ARDEC Health Physicist, U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ

Work Description: (System Safety) Develop/coordinate/conduct/evaluate necessary field/laboratory tests to provide documentation that is to be included in support of NRC license applications for approval on weapons containing radioisotopes currently in R&D stages. Pertinent radioisotopes include, but are not limited to, Depleted Uranium, Tritium, Americium. Evaluate effectiveness of contractor's Radiation Safety Program as it relates to the manufacture of R&D weapon components that contain radioactive material, such as, but not limited to, evaluation of contractor submitted pre/post contract hazard analyses and related documents personnel exposure data, and periodic visitations to the contractor facility. Support all system safety aspects that involve items containing radioactive material, in development of large/small caliber weapons, proposed procedures for weapon manufacture or inspection, and ultimate transportation/storage requirements. Formulate SOPs for emergency situations at various Army installations that would be included in Army technical manuals and provide input to Hazardous Material Safety Data Sheets.

Industrial Hygienist, U.S. Occupational Safety and Health Administration, Philadelphia, PA/Wilkes-Barre, PA/Belle Mead, NJ

From: 5/76 To: 3/83

Work Description: Perform OSHA compliance safety and health inspections in general industry and construction. The inspections fall into various catagories: Imminent danger, fatality/ catastrophy investigations, complaint investigations, and general schedule inspections. An inspection entailed an opening conference with management and union representatives, a walkaround to recognize hazardous safety and health conditions; determine sampling strategy and conduct air contaminant, noise, or radiation sampling, if needed, to determine compliance with applicable standards; have samples analyzed; write report; hold closing conference with management and union discussing sampling results, apparent violations, if any, employer/employee rights, and feasible abatement controls or provisions. Also, testified in court to support documentation on a contested case.

MAY 20 1993

Non-College Training:

From (Mo/Yr)	To (Mo/Yr)	Days	Description	Location
6/76	6/76	5	NIOSH Intro Industrial Hygiene (IH Course)	Cincinnati, OH
9/76	10/76	15	OSHA Initial IH Course	Chicago, IL
4/77	5/77	15	OSHA Advanced IH Course	Chicago, IL
4/78	4/78	5	OSHA Respirator Course	Belle Mead, NJ
8/78	8/78	9	OSHA Safety Hazard Recognition	Chicago, IL
5/79	5/79	9	OSHA Noise Course	Chicago, IL
1/81	1/81	9	OSHA Ventilation Course	Chicago, IL
3/81	3/81	5	Toxicology Course	E. Brunswick, NJ
1/83	1/83	9	OSHA Hazardous Material Course	Chicago, IL
1/84	1/84	5	Radiation Emergency Planning & Management Course	Ft. Belvoir, VA
3/84	3/84	5	Health Physics Aspects of Depleted Uranium Course	Ft. Belvoir, VA
11/84	11/84	5	Laser Safety	Pica. Ars., NJ
4/85	4/85	5	Radioactive Waste Management & Disposal Course	Ft. Belvoir, VA
8/86	8/86	5	X-ray/Gamma Ray Radiation Protection Course	Ft. Belvoir, VA
10/87	10/87	5	Internal Dose Assessment Course	Chicago, IL (Technical Management Services, New Hartford, CT)
2/88	2/88	5	Nuclear Weapons Orientation	Pica. Ars., NJ
5/89	5/89	5	DOE Radioactive Material Transportation Workshop	Albuquerque, NM
8/89	9/89	5	Environmental Monitoring for Radioactivity	Oak Ridge, TN
10/89	10/89	5	Leadership Education, and Development (LEAD)	Pica. Ars., NJ
1/90	1/90	5	Radioactive Sample Analysis	Ft. Lauderdale, FL
5/90	5/90	5	Nondestructive Radiographic Testing Course	Pica. Ars., NJ
10/91	10/91	3	Management of Nonionizing Electromagnetic Energy Hazards	Cook College, Rutgers Univ., New Brunswick, NJ
1/92	1/92	3	Effective Implimentation of the New 10 CFR 20	San Diego, CA
1/93	1/93	6	Basic Supervisory Training	Pica. Ars., NJ
3/93	3/93	2	Laser Safety	Pica. Ars., NJ

Organization Membership:

1. Health Physics Society
2. American Conference of Governmental Industrial Hygienists
3. Ionizing Radiation Control Committee (IRCC)

RESUME FOR RICHARD L. MOSS, HEALTH PHYSICIST

DATE OF RESUME: 10 JUNE 1991

EDUCATION:

DATES	NAME OF COURSE	INSTITUTION
SUMMER 1964	BACTERIOLOGY 101 (ADVANCED PLACEMENT PROGRAM)	CORNELL UNIVERSITY, ITHACA, NY
1965-1970	PHYSICS AND SECONDARY EDUCATION (BACHELOR OF SCIENCE)	PENN STATE UNIVERSITY UNIVERSITY PARK, PA
14-25 APR 1975	INDUSTRIAL SAFETY	US ARMY MATERIEL COMMAND FIELD SAFETY ACTIVITY, CHARLESTOWN INDIANA
1-12 DEC 1975	FUNDAMENTALS OF ARMY ACCIDENT PREVENTION	US ARMY MATERIEL COMMAND FIELD SAFETY ACTIVITY, CHARLESTOWN, INDIANA
20-24 SEP 1976	ACCIDENT PREVENTION FOR SUPERVISORS	UNIVERSITY OF OKLAHOMA CENTER FOR CONTINUING EDUCATION, NORMAN OK
6-10 JUNE 1977	OCCUPATIONAL SAFETY AND HEALTH COURSE FOR SAFETY PERSONNEL	US ARMY ACADEMY OF HEALTH SCIENCES, FORT SAM HOUSTON, TX
8-19 JAN 1979	MUNITIONS SAFETY	US ARMY MATERIEL COMMAND FIELD SAFETY ACTIVITY, CHARLESTOWN, INDIANA
5 APR 1979	HAZARDOUS MATERIALS TRAINING	US ARMY ARMAMENTS RESEARCH AND DEVELOPMENT COMMAND, DOVER NJ
23-27 APR 1979	PRINCIPLES OF MOTOR VEHICLE ACCIDENT PREVENTION	US ARMY MATERIEL COMMAND FIELD SAFETY ACTIVITY, CHARLESTOWN, INDIANA
21-25 APR 1979	APPLIED SAFETY IN INDUSTRIAL HEALTH AND HYGIENE	US ARMY MATERIAL COMMAND FIELD SAFETY ACTIVITY CHARLESTOWN, INDIANA
10-12 OCT 1979	LASER SAFETY	US ARMY MATERIEL COMMAND FIELD SAFETY ACTIVITY CHARLESTOWN, INDIANA

(DATE UNKNOWN)	FEDERAL HAZARDOUS WASTE REGULATIONS	NEW JERSEY INSTITUTE OF TECHNOLOGY DIVISION OF CONTINUING EDUCATION, MIDDLESEX COUNTY COLLEGE, NEW JERSEY
22-31 JUL 1980	RANGE SAFETY	US ARMY SAFETY CENTER FORT RUCKER, ALABAMA
23-27 MARCH 81	SYSTEM SAFETY	US ARMY MATERIAL COMMAND FIELD SAFETY ACTIVITY, CHARLESTOWN, INDIANA
28 SEP-6 OCT 81	OCCUPATIONAL SAFETY	US ARMY MATERIEL COMMAND FIELD SAFETY ACTIVITY CHARLESTOWN, INDIANA
15-17 MAR 1983	LABORATORY SAFETY & HEALTH	NORMAN STEELE ASSOCIATES (ON SITE AT PICATINNY ARSENAL, NJ)
14-19 APR 85	LASER MICROWAVE SAFETY HAZARDS	US ARMY ENVIRONMENTAL HYGIENE AGENCY, EDGEWOOD ARSENAL, MARYLAND
14 SEP-6 OCT 87	APPLIED HEALTH PHYSICS	OAK RIDGE ASSOCIATED UNIVERSITIES, OAK RIDGE TENNESSEE
5-9 JUNE 1989	MANAGEMENT OF RADIATION ACCIDENT AND EMERGENCY PREPAREDNESS TRAINING COURSE	U.S. ARMY BELVOIR R&D CENTER, FORT BELVOIR, VIRGINIA
21-25 MAY 1990	LEVEL I RADIOGRAPHERS COURSE	HELLIER ASSOCIATES ON-SITE AT PICATINNY ARSENAL, NEW JERSEY
6-10 AUG 1990	DEPLETED URANIUM MUNITIONS RADIATION SAFETY COURSE	U.S. ARMY BELVOIR R&D CENTER, FORT BELVOIR, VIRGINIA

WORK EXPERIENCE:

DATES: MARCH 1987 TO PRESENT
TITLE: HEALTH PHYSICIST, GS-1306-12
LOCATION:
US ARMY ARMAMENT RESEARCH DEVELOPMENT AND ENGINEERING CENTER (ARDEC)
PICATINNY ARSENAL, NEW JERSEY

MAY 20 1993

DUTIES:

HEALTH PHYSICIST FOR A LARGE RESEARCH AND DEVELOPMENT ARMY INSTALLATION. OPERATED UNDER SIX LICENSES INCLUDING A BROAD SCOPE LICENSE, AND A SPECIAL NUCLEAR MATERIAL LICENSE. WORKED WITH SCIENTISTS AND ENGINEERS ON THE HEALTH PHYSICS AND RADIATION SCIENCE ASPECTS OF VARIOUS RESEARCH PROGRAMS.

PROJECT EXPERIENCE:

1. US ARMY/ALLIED SIGNAL JOINT RESEARCH PROJECT IN EXTREMELY HIGH RATE COOLING OF DEPLETED URANIUM ALLOYS TO DEVELOP NEW URANIUM ALLOYS WITH EXTREMELY FINE CRYSTAL STRUCTURE.
2. METALLOGRAPHIC WORK WITH URANIUM INCLUDING MACHINING, CORROSION TESTING (SALT SPRAY, ETC), ETCHING, POLISHING AND ELECTRON MICROGRAPHY OF URANIUM SAMPLES.
3. EXPERIMENTAL NEUTRON RADIOGRAPHY SYSTEM UTILIZING A CALIFORNIUM 252 NEUTRON SOURCE AND NEUTRON MULTIPLIER CONSISTING OF A NEAR CRITICAL URANIUM 235 PILE.
4. VARIOUS OPERATIONS INVOLVING EXPERIMENTAL INSTALLATION AND QUALITY CONTROL OF TRITIUM POWERED LAMPS IN DIFFERENT TYPES OF MILITARY EQUIPMENT.
5. POWDER LEVEL GAUGING OF PROPELLANT LOADED AMMUNITION USING A CESIUM 137 POWDER LEVEL GAUGE.
6. INDOOR RANGE OPERATIONS IN WHICH HIGH VELOCITY URANIUM PENETRATORS WERE FIRED THROUGH ARMOR PLATE.
7. ROBOTICS LASER VISION SYSTEM APPLICATIONS PROJECTS.
8. LASER COMBUSTION AND ANALYSIS OF PROPELLANTS.
9. NON-LINEAR OPTICAL CHARACTERISTICS STUDIES OF MATERIALS USING YAG PUMPED DYE LASERS.
10. LASER EVALUATION OF MULTI LAYERED VACUUM DEPOSITED SEMICONDUCTOR INTERFERENCE FILTERS.
11. RAMEN SPECTROSCOPY.
12. LASER RANGE SETUP AND EVALUATION.
13. X-RAY DIFFRACTION ANALYSIS OF MATERIALS.
14. RADIOGRAPHY USING INDUSTRIAL XRAY EQUIPMENT RATED UP TO 30 MILLION ELECTRON VOLTS
15. FLASH X-RAY RADIOGRAPHY OF HIGH VELOCITY STANDARD PROJECTILES AND ELECTROMAGNETIC GUN (STRATEGIC DEFENSE INITIATIVE PROJECT) PROJECTILES.
16. EVALUATION OF ELECTROMAGNETIC PULSE SIMULATION RANGE.
17. TRANSMISSION ELECTRON MICROSCOPY.

STANDARD HEALTH PHYSICS DUTIES:

1. OPERATION OF A WELL EQUIPPED HEALTH PHYSICS LAB USING A GAS FLOW PROPORTIONAL COUNTER, A GEIGER MUELLER TUBE COUNTER AND A LIQUID SCINTILLATION COUNTER AS WELL AS VARIOUS HAND HELD METERS USED TO MEASURE ALPHA, BETA AND GAMMA RADIATION.
2. MAINTENANCE OF A LARGE INVENTORY OF MANY ISOTOPES AND DEVICES.
3. MONITORING FOR URANIUM, TRITIUM AND OTHER ISOTOPES IN THE ENVIRONMENT AND WORK AREA.
4. DEVELOPMENT OF SEVERAL TEST PROTOCOLS INCLUDING WATER SAMPLING FOR SOLUBLE URANIUM USING LIQUID SCINTILLATION AND DISCRIMINATION BETWEEN URANIUM AND ITS DAUGHTERS ON AIR FILTERS BY DECAY DIFFERENTIAL ANALYSIS.
5. PREPARATION OF SHIPPING PAPERS FOR PYROPHORIC URANIUM, TRITIUM AND A NUMBER OF OTHER ISOTOPES.

DATES: MAY 1978 THOROUGH MARCH 1987
TITLE: SAFETY AND OCCUPATIONAL HEALTH SPECIALIST, GS-018-11 & GS-018-12
DUTIES: PROVIDED SAFETY SERVICES AT A LARGE ARMY RESEARCH, DEVELOPMENT AND ENGINEERING CENTER EMPLOYING 5000+ PEOPLE. SERVED ON THE OSHA INSPECTION TEAM. PROVIDED SAFETY SERVICES TO EXPLOSIVES/MUNITIONS MANUFACTURING LINES (MIXING, CASTING AND PRESSING OF EXPLOSIVES COMPOSITION) AND TEST FACILITIES, CHEMICAL RESEARCH LABORATORIES, PHYSICS RESEARCH LABORATORIES AND PYROTECHNIC LABORATORIES, MANUFACTURING LINES AND TEST FACILITIES. SERVED AS LASER SAFETY OFFICER. PROVIDED SAFETY SERVICES TO ADMINISTRATIVE AREAS EMPLOYING APPROXIMATELY 4000 PEOPLE.

DATES: MAY 1976 TO MAY 1978
TITLE: SAFETY SPECIALIST, GS-018-09
LOCATION: FORT SILL, OK
DUTIES: SAFETY SPECIALIST AT A LARGE ARMY ARTILLERY TRAINING CENTER. PERFORMED GENERAL SAFETY DUTIES INCLUDING OSHA AND ARMY SAFETY INSPECTIONS, RAN SAFETY PROMOTIONAL PROGRAMS, SERVED AS A MEMBER OF THE INSPECTOR GENERAL INSPECTION TEAM.

DATES: MAY 1974 TO MAY 1976
TITLE: OCCUPATIONAL SAFETY AND HEALTH SPECIALIST, GS-018-05 & GS-018-09
LOCATION: FORT DIX, NJ
DUTIES. SAFETY INTERN TRAINING AT AN ARMY BASIC TRAINING CENTER.

DATES: JULY 1970 TO JUNE 1973
TITLE: RADIO TRAFFIC ANALYST (ARMY MOS 98C), SPECIALIST 5 (FINAL RANK)
LOCATION:
US ARMY SECURITY AGENCY INSTALLATIONS AT FORT DIX NJ, FORT DEVENS MASS, PHU BAI VIET NAM, TAIPEI TAIWAN AND UDORN THAILAND.
DUTIES:
COMMUNICATIONS INTELLIGENCE ANALYSIS OF ENEMY COMMUNICATION PATTERNS. TOP SECRET WORK. RECEIVED A BRONZE STAR MEDAL FOR WORK IN VIET NAM. PERIOD STATED ALSO INCLUDES TRAINING TIME.

DATES: SUMMERS OF 1967 AND 1968
TITLE: DAIRY LABORATORY TECHNICIAN (SUMMER WORK DURING COLLEGE)
LOCATION: SYLVAN SEAL MILK INCORPORATED, PHILADELPHIA PENNSYLVANIA
DUTIES:
DAIRY LABORATORY QUALITY CONTROL TESTING OF MILK AND MILK PRODUCTS FOR ACIDITY, BUTTERFAT, MOISTURE, PHOSPHOTASE, PENICILLIN AND BACTERIAL CONTENT AND TYPE. RESPONSIBLE FOR ACCEPTANCE OR REJECTION OF INCOMING TANK TRUCKS OF RAW MILK BASED ON SUBJECTIVE EVALUATION OF ODOR, FLAVOR, TEMPERATURE AND GENERAL CONDITION. RESPONSIBLE FOR ANALYSIS AND SOLUTION OF PLANT PROBLEMS.

ANDY KUNG

College Education: BS Bachelor of Science (Cum Laude) January 1987

Radiological Health Sciences
Manhattan College, Riverdale, NY

AAS Associate in Applied Science January 1984

Nuclear Technology and Health Physics
Queensborough Community College of CUNY, NY

Grade Point Average: 3.35 Overall
3.95 Major Courses

Honors: Dean's List - Queensborough Community College
Dean's List - Manhattan College
Phi Theta Kappa - National Honor Society for Junior Colleges
Epsilon Sigma Pi - Manhattan College Honor Society
American Association of Physics Teachers Award for Outstanding Physics Student of the Year - 1982

Professional Work Experience:

Dates: December 1987 to Present
Title: Health Physicist GS-1306-12
Location: US Army Armament Research, Development & Engineering Center
Installation Safety Division - Health Physics Branch
Picatinny Arsenal, New Jersey

Duties: Periodic radiation protection surveys of depleted uranium operations at ARDEC, utilizing state of the art portable and laboratory instrumentation. QA/QC for non-portable health physics instrumentation. Coordinator for Ionizing Radiation Control Committee (IRCC) meetings. Prepare outgoing radioactive materials shipments. Prepare radiation work permits for unique, short-term radiation operations not covered by SOPs. Management and implementation of the x-ray safety program at ARDEC. Provide health physics support for various R&D operations.

Dates: February 1987 to May 1987
Title: Health Physics Technician
Location: Columbia Presbyterian Medical Center
New York City, New York

Duties: Periodic surveys of laboratories utilizing various radioisotopes. Preparation/decontamination of patient rooms after I-131 therapy. Consolidation and preparation of radioactive wastes for ultimate disposal. Inventory control/survey of incoming radioisotope shipments.

Professional Training:

Laser Safety: Hazards, Inspection & Control
26 Jan - 1 Feb 1989, Atlanta, GA

In-Place Filter Testing Workshop
12-16 Jun 1989, Boston, MA

Environmental Monitoring for Radioactivity
28 Aug - 1 Sep 1989, Oak Ridge, TN

Radioactive Material Transportation Workshop
5-8 Feb 1990, Oakland, CA

Depleted Uranium Munitions Radiation Safety
6-10 Aug 1990, Fort Belvoir, VA

System 100/Gamma AT Gamma Spectroscopy
25 Feb - 1 Mar 1991, Meriden, CT

Industrial Radiation & Gamma Radiation Protection
6-10 May 1991, Fort Belvoir, VA

Internal Dosimetry - RBD Code
18-21 Jun 1991, Fort Belvoir, VA

Nuclear Weapons Orientation
15-19 Jul 1991, Picatinny Arsenal, NJ

Health Physics Instrumentation and Air Sampling
27-31 Jul 1992, Fort Belvoir, VA

Management of Radiation Accidents and Emergency Preparedness
3-7 Aug 1992, Fort Belvoir, VA

Advanced Workshop on Occupational and Environmental Radiation Protection
10-14 May 1993, Boston, MA

MAY 20 1993

Appointments: ARDEC Alternate Radiation Protection Officer
Clearances: US Department of Defense Security Clearance - Secret
US Army Special Access Program - Level III
US Army Critical Nuclear Weapons Design Information (CNWDI) Access

Computer Skills: FORTRAN, BASIC, Turbo-PASCAL, DOS

LAWRENCE J. D'ARIES

EDUCATION: The Pennsylvania State University, University Park,PA.
M.S. Degree in Physics, August 1986
Overall GPA 3.45

Drew University, Madison, NJ.
B.A. Degree in Applied Mathematics, May 1983
Minor in Physics, 16 credits in Chemistry
Overall GPA 3.33

WORK EXPERIENCE: United States Army Armament, Research, Development and Engineering Center (ARDEC), Safety, Surety and Environmental Office (SSEO), Picatinny Arsenal, NJ. From Nov.,1991

Health Physicist/Alternate Radiation Protection Officer-
Responsibilities include management of the dosimetry program, introductory and advanced training for all radiation workers on post, oversight of the program to calibrate all radiological monitoring instruments, decontamination surveys of instruments and areas.

Battelle Foundation Contract Employee- Summers 88-91
Installation and use of a Varian GenII Molecular Beam Epitaxy (MBE) Laboratory System. Use of an Amray 1000 Scanning Electron Microscope (SEM) and a Digital Vax computer system to model super-lattice crystalline structures of optically transparent thin films of GaAs and GaAlAs.

Delbarton School, Morristown,NJ. 1987-1991
Chairman, Department of Science- Physics, mathematics and astronomy teacher and in charge of all policy, budgeting and management of the Science Department. Middle School assistant soccer coach.

Drew University, Governor's School in the Sciences Program, Team Project instructor- Summers 87-91
Directed student projects in applications of the Fast Fourier Transform (FFT) to music sampling and the visualization of sound waves and ultra high-speed flash photography.

Kean College of New Jersey, Union, NJ. Summer 1987
Physics Instructor-
Introductory course and laboratory in physics during the summer program at Kean.

The Pennsylvania State University, 1984-1986
University Park, PA.
Graduate Student/Teaching Assistant/Research Assistant
Full time graduate student pursuing the M.S. while doing undergraduate teaching in physics and later research using Spectroscopic Ellipsometry (S.E.) to non-destructively characterize optically transparent thin films of various semi-conductor materials as to their thickness, purity, void content and surface roughness.

PUBLICATIONS, PAPERS, AND PRESENTATIONS:

Characterization of Thin Films by Spectroscopic Ellipsometry, 1986, M.S. Thesis.

Non-destructive Depth Profiling of Transparent Thin Films by Spectroscopic Ellipsometry, K. Vedam and L. D'Aries, The Pennsylvania State University, and A.H. Guenther, Air Force Weapons Laboratory, 1986. Paper presented at the American Optical Society Annual meeting, Seattle, WA., 1986.

Neutron Activation Analysis of Rainwater, Graduate Research Paper, L. D'Aries and A. Heyd, 1985.

Modeling of Thin Films of GaAs/GaAlAs by Reflectance Measurements, 1988 Report for Battelle Laboratories, Scientific Services Program, Army Research Office.

CLEARANCE LEVEL: United States Department of Defense Secret Level Security Clearance.

AWARDS AND HONORS: Recipient of the 1983 Arnold S. Boxer Memorial Prize in Physics for Dedication, Diligence and Distinction in the study of Physics; presented at graduation.

Memorandum of Appreciation from Joseph T. Lehman, Chief, Fire Control Division, FSAC, Picatinny Arsenal for outstanding performance during summer employment at ARDEC, 1990.

CAREER COURSES: Depleted Uranium Munitions' Radiation Safety Course, 11-15 May, 1992, Ft. Belvoir, VA.

Fundamentals of Radiation Safety Course, 20-24 April, 1992, Atlanta, GA.

Radioactive Materials Transportation Course, 2-5 March, 1992, Pleasanton, CA.

25 Mar

NAME: EMMETT G. BARNES, PAD SSN: 157-32-3

RESUME FOR IONIZING RADIATION CONTROL COMMITTEE

EDUCATION

SCHOOL - LOCATION	MAJOR	DATES	DEGREE
(1) Stevens Institute of Technology	Physics	Sep 58-Jun 62	B.S.
(2) West Texas State University	Mathematics	Sep 64-Jan 65	-
(3) Stevens Institute of Technology	Physics	Feb 66-Jan 67	-

TRAINING RELATED TO IONIZING RADIATION

(1) "GAMMATRON-100" Cobat-60 Radiographic Operation F. L. Clifford Associates Picatinny Arsenal, 1-5 Mar 76.

(2) Neutron Radiography, Gulf General Atomics, San Diego, CA, Mar 68 (40 hour

(3) Disaster Control Officers, U.S. Air Force; Denver, Col., Feb - Mar 63 (1 month).

(4) On-Job Training in Industrial Radiograph & Radiation Safety Procedures A. Silvestro at Picatinny Arsenal, 1965-1970.

(5) Nuclear Physics Lab (College Course)
Stevens Institute of Technology, Hoboken, NJ 1961.

(6) Operation of CFX Neutron Flux Multiplier
IRT Corporation, San Diego, CA, 8 hrs orientation, 19 Jan 77.

(7) Hazardous Materials Course (DOT Regulations); UNZ & Co., Picatinny Arsenal Apr 79.

(8) Refresher Training for Radiation Workers (Neutrons): 17 Sep 86 and 25 Sep 87; Picatinry Arsenal

EXPERIENCE RELATED TO IONIZING RADIATION

(1) Radiological Protection Officer for License #29-00047-06
Picatinny Arsenal, Jul 74 - Apr 76

(2) Project Leader for Radiography and Radiological Testing Technology Development, Product Assurance Directorate, Nov 82 - Present.

(3) Supervisor, Radiographic Facility, PAD, Picatinny Arsenal, Oct 73 - Mar 77

(4) Physicist, Radiographic Section, PAD (Principal Investigator for Experimental Neutron & X-Ray Programs), Picatinny Arsenal, Jul 65 - Oct 77

(5) Member, ARRADCOM Ionizing Radiation Control Committee (formerly Radiant Energy Board), Dec 69 - Jan 76; Jan 78 - Present

(6) Disaster Control Officer (Included protection from Radioactive Fallout)
U.S. Air Force, Kalispell, Montana; Dec 62 - Jun 63

(7) Registered Professional Engineer (California Number 3150) May 78 - Present

(8) Level 3 Certification in Radiographic Inspection under DARCOM Regulation 707-22, Oct 77 - Present

PERSONAL RESUME RELATED TO IONIZING RADIATION (Print or Type) MAY 20 1993

(See Privacy Act Statement on Reverse Side.)

1. Name	2. Extension	3. Job Title
WALKER WALLACE A. JR. (Last, First, MI)	6276 ~~2188~~	Engineer

4. Directorate	5. Division	6. Branch	7. Building
FC&SCWSL	SCF Fire Control	~~SMCAR-FSS-EO~~ ~~DRDAR-SCF-I~~	18

8. Responsibility (check all appropriate)

☐ First Line Supervisor ☒ Chief Operator ☒ Operator

9. Source Type(s)

☐ X-Ray Device ☒ Radioisotopes ☒ Radioactive Material

10. Principle Emission(s)

☐ X-Ray ☐ Gamma ☒ Beta ☐ Alpha ☐ Neutron

11. Source Location(s)

Building(s)	18	18	18
Room(s)	A	B	C

12. Purpose and Description of Proposed or Current Work : Testing and assembly of radioactive sealed self-luminous sources and illuminated fire control components and equipment. Source assembly into holders/subassemblies to be performed in the luminous Source Lab (LSL), Bldg 18. Sources, components, and instruments will be stored in this LSL. Leak testing is to be monitored with equipment located in the Radiation Counting Room, Bldg 18. Photometry measurements of sources and equipment are to be made in the Photometry Lab, Bldg. 18.

13. Educational Background (highest level)

School, Location: Univ. of RI

Major-Minor: - Degree: BSEE Dates: 1960

14. Training (formal and informal on radiation safety, ionizing radiation, on-the-job training & orientation, and/or other subjects)

	Subject	Organization & Location	Dates
1.	Radiological Safety	USA ORD CTR & SCHOOL, APG, MD	Aug/Sep 1978
2.	RAD Safety 1	Army TNG Supt Ctr, Newport News, VA	Aug 1978
3.	RAD Refresher Tng	ARRADCOM, Dover, NJ	Nov 1978
4.			

15. Pertinent Experience Related to Ionizing Radiation

	Organization & Location	Description of Work	Dates
1.	FC, ARRADCOM	Safety office to provide adequate on-the-job training as required	Pending - To conform with completion of facilities.
2.			
3.			
4.			
5.			

16. Use Other Side If Additional Space Is Required

17. Return This Form To: Radiological Protection Officer, Safety Office

18. Signature W. A. Walker, Jr.

19. Date 1-15-1979 ~~1-18-1989~~

DRDAR-SF FORM 367 MAR 78 REPLACES SARPA-S FORM 2771 DEC 75 WHICH IS OBSOLETE

PROFESSIONAL BACKGROUND

I. PERSONAL DATA:

Name and Grade: Dr. Sheldon Cytron, GM-14

Title: Supervisory Metallurgist

II. EDUCATION:

B. Chem. Eng., City College of New York (1958)
Ph.D. (Applied Sci.), Univ. Delaware (1967)

III. EMPLOYMENT HISTORY:

Feb. 1958 - Aug. 1959
Assoc. Eng. - Westinghouse Atomic Power Div.
Pittsburgh, PA.
Conducted corrosion test on nuclear reactor materials.

Feb. 1961 - Feb. 1963
Staff Assoc. - General Atomic Div.
San Diego, CA.
Conducted in-pile irradiation tests on HTGR systems.

Feb. 1967 - Apr. 1968
Project Eng. - Philco-Ford Microelectronics Div.
Blue Bell, PA.
Conducted research on semi conductor processing.

July 1968 - Oct. 1984
Metallurgist - ARRADCOM, Dover, N.J.
Frankford Arsenal
Conducted alloy process development.

Oct. 1984 - Present
Supervisory Metallurgist - Chief
Metals Processing Section
U.S. Army, ARDEC
Supervises a group of scientists and engineers on alloy development and process engineering in heavy metals (depleted uranium, tungsten, tantalum).

IV. PROFESSIONAL SOCIETIES:

American Vacuum Society
American Society for Metals
Materials Research Society (past)

MAY 20 1993

HSXS-HC-P

19 Apr 89

MEMORANDUM FOR Richard Fliszar
SMCAR-SF

SUBJECT: Curriculum Vitae Barbara Clark Occupational Health Nurse

1. Education Prior to Government Employment:

a. Cathedral High School, New York, NY

b. County College of Morris, Randolph, NJ - RN Degree (AAS)

2. Employed At:

a. Dover General Medical & Trauma Center, Dover, NJ Emergency Dept., Feb. 1981-March 1983

b. Basic Arrhythmia Course: Dover General Medical & Trauma Center Sept. 1982-Oct. 1982, Certification

c. Triage: Concepts & Skills for Emergency and Industrial Nurse: Rutgers College of Nursing, Trenton, NJ Feb. 25, 1983, Certification

d. Abdominal Trauma: Resource Application Inc., Certification

e. Critical Care Nursing: Dover General Hospital

3. Education Since Government Employment:

a. CPR Certification: May 1988-May 1989

b. Allergy Certification: Aug. 1988

c. Occupational Health Basic Course: Nov. 1988

d. MIM Computer Course: June 1988

e. Headache Theories: Aug. 1988

f. Military Hearing Conservationist: March 31, 1989

RÉSUMÉ

Joseph M. Argento
Chief, Technology Development Branch, Tech Div
PA & TD

EDUCATION

Major: Physics
Ph.D. Degree

TRAINING

1. Nuclear Physics, Laboratory and Theory; Rennsalear Polytechnic Institute (RPI) and Stony Brook (September 1969-January 1973).

2. Elementrary Particle Physics; RPI-SONY Stony Brook-Adelphi University (January 1970 to present).

3. Radiographic Inspection; On-the-job-training, bldg. 908, Picatinny Arsenal (January 1975-March 1978, periodicaly).

EXPERIENCE

1. Physicist, Radiographic Inspection, Gamma Ray Gaging Inspection Experiments, Theoretical Analysis of Compton Scattering, X-Ray Inspection Experiments, Neutron Gaging Program, Radiographic Section, PAD, Bldg. 908 (January 1975-March 1979).

ITEM 8

ARDEC, Picatinny Arsenal, NJ 07806-5000

ITEM 8 - Training for Individuals Working In or Frequenting Restricted Areas

Prior to working in a radiation area, new radiation workers receive formal training from the ARDEC Radiation Protection Officer (RPO) or his alternate. Those radiation workers who will also be designated as ARDEC radiographers will receive radiation training given initially by an outside contractor who will be approved by the American Society for Nondestructive Testing, Inc. (ASNT). The training will be IAW the final ruling in Federal Register Vol. 56, No. 53 so that the workers will be certified through the certification program for Industrial Radiography Radiation Safety Personnel (IRRSP) of ASNT in radiation safety, as isotope users. All of the ARDEC health physicists will also obtain this certification, who have radiation safety oversight of the Gammatron-100/Tomography system operation. Future training of radiographers will be by either an ASNT-approved outside contractor, or by an in-house health physicist who has previously received ASNT radiation safety certification.

New ARDEC radiation workers receive a minimum of four hours of basic radiation safety training, and advanced (isotope specific) training which includes, but is not limited to:

a. Basic nuclear theory adequate to ensure worker understanding of nuclear decay, decay pathways, and the radiation hazards associated with such;

b. Radiation units and measurements;

c. Operation and procedures for using radiation detection and monitoring instruments available;

d. Biological effects of ionizing radiation;

e. The precautions and procedures to minimize radiation exposure IAW ALARA principles, and to control radioactive contamination;

f. Responsibility of individuals to report unsafe acts or conditions observed in restricted areas;

g. The rights of employees under provisions of 10 CFR 19;

h. The successful completion of a written exam.

ITEM 8

ARDEC, Picatinny Arsenal, NJ 07806-5000

ITEM 8 - Training for Individuals Working In or Frequenting Restricted Areas (cont'd)

In addition to the formal training provided by the Health Physics Branch staff, the supervisors of all new radiation workers will conduct on-the-job training and instruction specific to the particular operations conducted at that job site. This includes requiring the employee to:

a. Review and understand the Standing Operating Procedures (Sops);

b. Have demonstrated how the operations are performed, where possible;

c. Practice the steps, and constructively criticize the employee's performance.

Only following successful completion of all of these steps, in addition to having a pre-placement medical examination, will an employee be allowed to work with radioactive material. In addition, yearly training is provided to all ARDEC radiation workers by the ARDEC RPO, or his alternate. Records of all training are maintained as required by NRC and Army regulations.

The licensee will not permit any individual to act as a radiographer until the individual has:

a. Been instructed in the subjects outlined in 10 CFR 34, Appendix A;

b. Received copies of, and instruction in, NRC regulations contained in 10 CFR, Part 34, and in the applicable sections of 10 CFR Parts 19 and 20; NRC license(s) under which the radiographer will perform radiography; and the licensee's operating and emergency procedures. A written examination which will cover 10 CFR 34, Appendix A, and Parts 19 and 20, as well as emergency and operating procedures will be administered. Some of the sample questions are as follows:

1. What are the three aspects of exposure to radiation which must be carefully examined when considering controlling/limiting the dose to a radiation worker/radiographere

Answer: Time, distance, and shielding.

ITEM 8

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 8 - Training for Individuals Working In or Frequenting Restricted Areas (cont'd)

2. Put the following radiations in order of increasing penetration ability in a typical exposure scenario: beta, alpha, and gamma.

Answer: alpha, beta, and gamma.

3. Of the following devices, (TLD, Ion chamber, pocket dosimeter), which measure dose, and which measure dose rate?

Answer: Dose-TLD, pocket dosimeter; dose rate-ion chamber.

4. Pocket dosimeters must be checked to read correct response at periods not to exceed how many months?

Answer: 12.

5. Which NRC form lists the NRC toll-free telephone hotline number; contains information on the reporting of violations; and must be posted for all radiation workers and radiographers to see?

Answer: NRC Form 3.

6. If at any time during operation of the Tomographic system with Cobalt-60 source, the self-reading pocket dosimeter is found to be off scale, what is the operator to immediately do?

Answer: Operations are to be immediately curtailed and, if possible, the source is to be cranked back into the Gammatron-100 storage position, and applicable emergency procedures are to be followed.

7. How high must the radiation level be in a posted "radiation area"?

Answer: Two milliroentgens per hour.

8. What do the signs that are posted at the entrance to Bay 19 in building 908 state?

Answer: "CAUTION (OR DANGER) HIGH RADIATION AREA".

ITEM 8

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 8 - Training for Individuals Working In or Frequenting Restricted Areas (cont'd)

9. 10 CFR 20 allows a maximum occupational dose to the whole body of a radiation worker in one calendar year of how many millirems?

Answer: 5,000.

10. The 10 CFR 20 permissible level of dose to the whole body in an unrestricted area for a calendar year is how many rems?

Answer: 0.5.

c. Has demonstrated competence to use the licensee's radiographic exposure devices, sealed sources, related handling tools, and survey instruments;

d. Has demonstrated understanding of the instructions above by successful completion of a written test, and a field (practical) examination on the subjects covered.

In addition, no individual shall work as a radiographer's assistant until that individual:

a. Has received copies of, and instruction in the operating and emergency procedures contained within this license;

b. Has demonstrated competence to use, under the supervision of the radiographer, the radiographic exposure devices, sealed sources, related handling tools, and radiation survey instruments that the assistant will use;

c. Has demonstrated understanding of the above by successfully completing a written or oral test, and a field exam on the subjects covered.

ITEM 9

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 9 - Facilities and Equipment

Item 9.a. - Building 908 - Gammatron-100/Bioimaging Research Corporation Tomography System

Item 9.b. - Building 312 - Dougherty Box Irradiatior System

Item 9.c. - Building 3030 - Ameray Corp Self-Shielded Irradiator

Item 9.d. - Building 320 - Health Physics Office/Laboratory

ITEM 9

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 9.a. - Facilities and Equipment

Building 908 - Gammatron-100/Bioimaging Research Corporation Tomography System

The Gammatron-100 Exposure Device, manufactured by Gamma Industries, Inc., Baton Rouge, LA has a capacity of 100 curies of Cobalt-60. The source strength was 100 Ci on October 20, 1972 (present activity 6.75 Ci on April 20, 1993), Source #855, Source Model #S16, Device Serial #100-3). The Gammatron-100 has a steel jacketed housing containing approximately 335 pounds of depleted uranium, acting as a shield which in turn, is completely enveloped in polyurethane. The source capsule is stainless steel encapsulated.

The Gammatron-100 will be used in Bay 19 of building 908 either by itself for the purpose of conducting radiography, density gauging, scattering measurements, etc., or in conjunction with the Bioimaging Research Corporation Tomography System for tomographic work. The guide tube used with the Gammatron-100 will be connected to the collimator for transfer of the Cobalt-60 to the tomographic system. The Cobalt-60 source will be secured in place within the collimator by means of a threaded tungsten rod that is turned by hand. (The tungsten rod actually compresses a spring-loaded brass plunger, in order to preclude excess pressure on the source capsule.)

The computerized Tomography system was designed for the automated inspection of such things as artillery shells. It will be used in research for determining the plausibility of automated inspection of various components. The system uses approximately 40 photomultiplier tube detectors for photon detection. The gantry features a "pig" radiation shield (referred to here as the collimator) which has a slit-type beam port for the directed emission of the Cobalt-60 source photons. Tomographic slice selection is achieved by raising and lowering the collimator and photomultiplier detectors. The object being inspected translates and rotates. When the tomographic scan is completed, the system is designed for the collimator to automatically rotate, such that the slit area on the collimator comes to rest facing a lead beam stop and lead bricks, which act as a shield. (The lead beam stop is part of the Tomography system. The lead bricks were added atop of the beam stop in order to reduce the emission of scatter radiation). This allows for the safe exchange of items to be examined. The slit on the collimator also faces the lead beam stop and lead brick shield whenever the Cobalt-60 source is cranked into, or out of the collimator, and when the tungsten rod is to be turned by hand to secure or free the Cobalt-60 source within the collimator.

ITEM 9

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 9.a. - Facilities and Equipment (cont'd)

The area within building 908 in which the Gammatron-100 and Tomography system are located does not have a basement, or anything above the bays other than the roof. The roof is a soft, inclined surface made of paneled aluminum. In order to prevent dents when walking, planks are placed on the roof. If maintenance/repair of the roof is required, a request for service is made, and its schedule coordinated in advance with the building 908 building manager who, in turn, coordinates matters with the radiographer(s) for these systems. This assures that no work will be conducted with this Cobalt-60 source if personnel are to be on the roof for whatever reason. The same coordination would apply if maintenance or repair of the overhead crane system were required.

The use of either the Gammatron-100 alone, or in conjunction with the Tomogrphy system, complies with 10 CFR 20.203(c)(2)(ii) [10 CFR 20.1601 (a)(2)] by use of an audible alarm signal; and 10 CFR 20.203(c)(2)(iii) [10 CFR 20.1601(a)(3)]. In addition, compliance with 10 CFR 34.29(b) is achieved by use of the Victoreen Vamp Area Monitor which provides the required visible signal whenever the high radiation area condition is attained, as well as the use of the built-in room interlock system which provides the audible signal when an attempt is made to enter the facility, following the activation of that system (see Sections 10.4a&b).

Figures 9.a.1. thru 9.a.8. depict various diagrams of pertinent features of the Tomography system; Gammatron-100, locations of interlock systems, alarms, timer, warning lights, and wall thicknesses for Bay 19; as well as a layout of building 908.

The following readings were taken to ascertain the dose rates in the facility under various scenarios using both the Gammatron-100, and the Bioimaging Research Corporation Tomographic system (the source strength at the time of these readings was 8.22 Ci). The accompanying sketch (Figure 9.a.9.) depicts the locations within Bay 19 of building 908 where dose rate readings at coded designations were made in relation to the Gammatron-100, and the Tomographic system (i.e., A-5, D-6, etc.).

Gammatron-100 (Cobalt-60 source in storage position):

mR/hr	mR/hr
1.6 - Surface below plug	1.6 - Left side above tire
2.0 - Top of Gammatron	0.2 - B-5
4.2 - Rear near handles	0.2 - B-2
1.0 - Right side tire	0.6 - A-3
1.5 - Right side above tire	0.15 - D-3
0.9 - Left side tire	0.1 - G-7

ITEM 9

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Item 9.a. - Facilities and Equipment (cont'd)

Gammatron-100 (Cobalt-60 source in storage, but guide tube connected):

mR/hr

Background - At gate entrance (main corridor)
4.0 - Guide tube and Gammatron pig interface

Gammatron-100 (NOTE: 23-1/2 hand cranks needed to transfer Cobalt-60 source from storage position in Gammatron-100 to resting point in Tomographic collimator).

o Source in guide tube (5-1/2 hand cranks movement of Cobalt-60 source out of Gammatron):

mR/hr*

0.1 - Tomographic control console (main corridor)
0.4 - Gate (front entrance)
2.5 - Three feet into entrance
2.0 - six feet into entrance
15 - Before corner into Bay
27 - At corner into Bay
140 - Halfway around corner into Bay
1.5 R/hr - Just around corner into Bay
0.3 - Bay 18
0.1-0.2 - Back corridor
0.35 - Rear gate entrance of Bay 19
0.2 - Bay 20

o Source in guide tube (11-1/2 hand crank movement of Cobalt-60 source out of Gammatron):

mR/hr*

0.15 - Tomographic control console
0.4 - Gate (front entrance)
1.0 - Three feet into entrance
1.3 - Six feet into entrance
30 - Before corner into Bay
120 - Halfway around corner into Bay
1.4 R/hr - Just around corner into Bay
0.5 - Middle of Bay 18

*Unless otherwise noted

ITEM 9

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 9.a. - Facilities and Equipment (cont'd)

mR/hr*

0.25 - Back corridor
0.4-0.5 - Rear gate entrance of Bay 19
0.5 - Middle of Bay 20

o Source in guide tube (17-1/2 hand crank movement of Cobalt-60 source out of Gammatron):

mR/hr*

0.2 - Tomographic control console
0.5 - Gate (front entrance)
1.4 - Three feet into entrance
0.1 - Halfway into entrance
24 - Before corner into Bay 19
220 - Halfway around corner into Bay
1.2 R/hr - Just around corner into Bay
0.25 - Bay 18 (closest wall)
0.55 - Middle of Bay
Background - Entrance to Bay 18
Background - Bay 17
Background - Corridor
0.1 - Entrance to Bay 20
0.3 - Bay 20 (closest wall)
0.4 - Middle of Bay 20
0.4 - Bay 20 (far wall)
0.3 - Rear gate entrance to Bay 19
0.45 - Back corridor

Tomographic collimator (Cobalt-60 source at resting point in collimator. Collimator slit opening facing lead brick shield).

mR/hr

0.25 - Just around corner into Bay 19
0.3 - A-10
0.45 - A-7
0.9 - A-5
2.2 - A-3

*Unless otherwise noted

ITEM 9

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 9.a. - Facilities and Equipment (cont'd)

mR/hr

0.25 - B-6
0.4 - B-4
1.9 - B-2
10 - <B-1
Background - D-6
0.2 - D-3
0.2 - E-4
0.2 - F-4
0.1 - F-6
0.25 - G-4
0.15 - G-7
0.15 - G-8
0.8 - Above Tomographic detectors' housing
40 - Above Collimator w/nut screwed down
38-40 - Collimator area
6 - Above lead bricks
2.8 - Head height above Collimator
12 - Above and inside lead brick area
40 - Above Collimator

Tomographic Collimator (Cobalt-60 source at resting point in Collimator. Collimator in scanning position. Eight inch diameter empty metal shell in place being scanned 23-3/8" from top of base of Tomography system platform to bottom surface of detector housing):

mR/hr

Background - Tomographic control console
Background - Entrance to Bay 19
Background - Halfway into entrance to Bay 19
Background - End of entranceway to Bay
0.1 - Just into Bay
0.1 - A-10
0.1 - A-7
0.15 - A-5
0.4 - A-3
0.1 - B-8
0.15 - B-6
0.3 - B-3
0.5 - B-2

ITEM 9

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Item 9.a. - Facilities and Equipment (cont'd)

mR/hr

0.2 - C-5
0.3 - C-4
1.4 - D-3
2.8 - E-4
2.0 - F-7
4.0 - F-5
6.4 - F-4
0.4 - G-8
12.5 - G-4 (Adjacent to beam direction on back side of detector housing)
8.0 - Near top of shell
155.0 - On shell at beam center to side
1.3 - Between wall and Tomography system
32.0 - End of detector housing
42.0 - Toward center of detector housing
120 - Behind detector housing with shell moved away from beam by location G-4

Tomographic Collimator (Cobalt-60 source at resting point in Collimator. Collimator in scanning position. Measurements taken with, and without empty metal shell in place for scanning. Forty-eight and one quarter inches from top of base of Tomography system platform to bottom surface of detector housing, or 53.75" from top of base of Tomography system platform to beam slit in tomographic Collimator). NOTE: Dose Rate 1 was with an empty shell casing in place; Dose Rate 2 was without the shell casing.

Dose Rate 1 (mR/hr)	Dose Rate 2 (mR/hr)	
Background		- Entrance to Bay 19
Background		- Halfway into entrance to Bay 19
Background		- At end of entrance to Bay 19 before turning corner
0.5		- A-3
0.5		- B-2
1.3	6.0	- D-3
2.5		- E-4
8.4		- F-4
11.5	65.0	- G-4
15	135	- Directly in front of beam on back side of detector housing

ITEM 9

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Item 9.a. - Facilities and Equipment (cont'd)

Dose Rate 1 (mR/hr)	Dose Rate 2 (mR/hr)	
46	34	- Front inner surface of detector housing at corner to left of shell casing being scanned
70	150	- Front inner surface of Tomography system to right of shell casing being scanned and adjacent to Collimator
2.6		- F-6
0.4	0.4	- C-4
5.0		- G-7

At the time of Cobalt-60 replenishment in the Gammatron-100, prior to re-starting radiographic-type operations, a complete series of radiation measurements will be taken again to characterize the radiation environment. These readings will include measurements taken with the Collimator of the Tomographic system in the scanning position at various heights above its lowest scanning position in order to ensure that an accurate assessment of the radiation environment during Tomographic operation is again made.

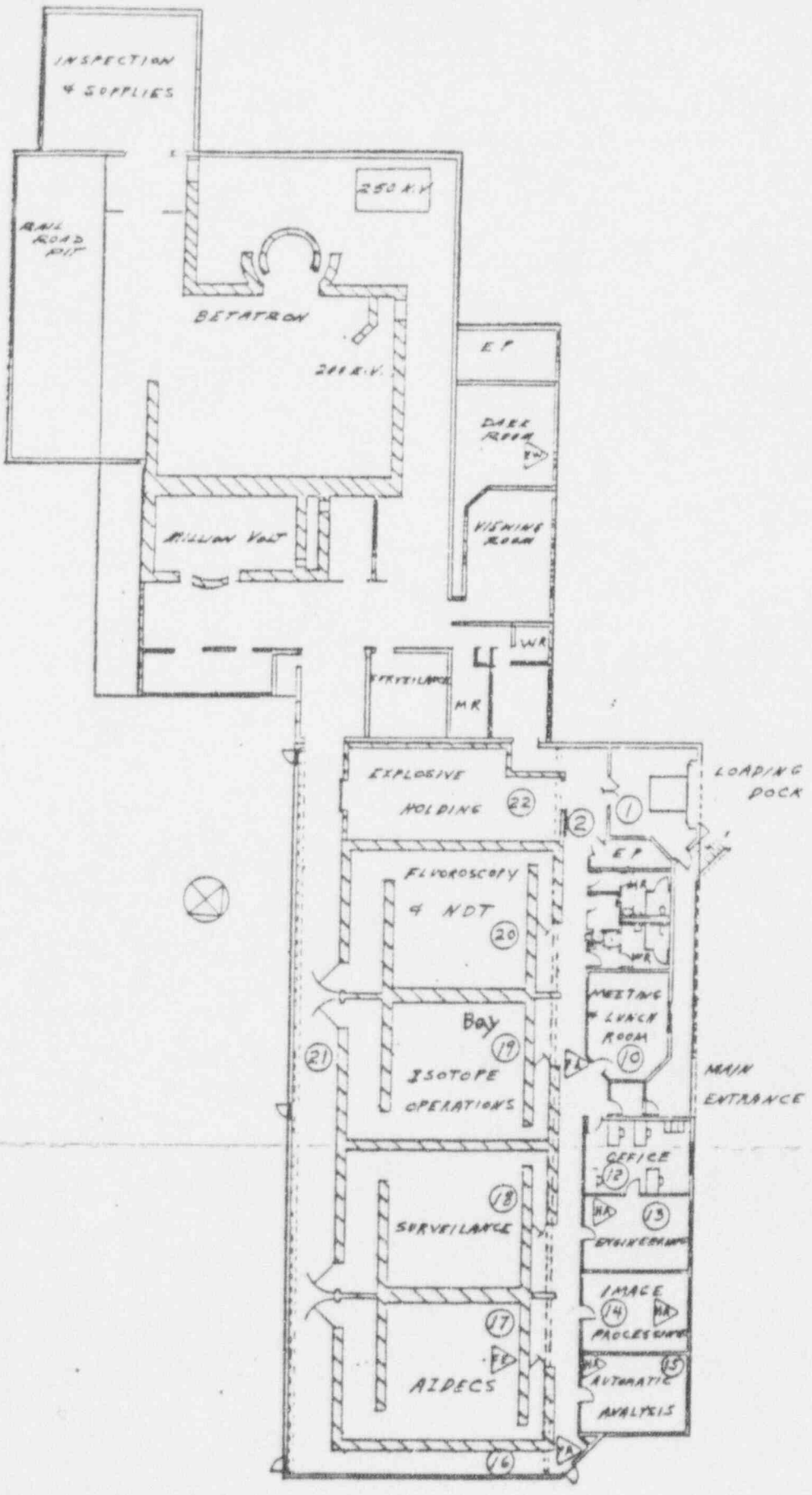


Figure 9.a.1.

Bldg 908/Bay 19

MAY 20 1993

Legend

S1, S5 : Door interlock switches
S2, S6 : Lock interlock switches (on Door Locks)
S3, S4 : Manual Push Button Switches
L1, L2, L3 : Warning Lights
M1, M2 : Mechanical Locks
A : Audible Alarm
T : Timer Switch
B : Gammatron - 100 unit
C : Tomography System
D : Californium - 252 source

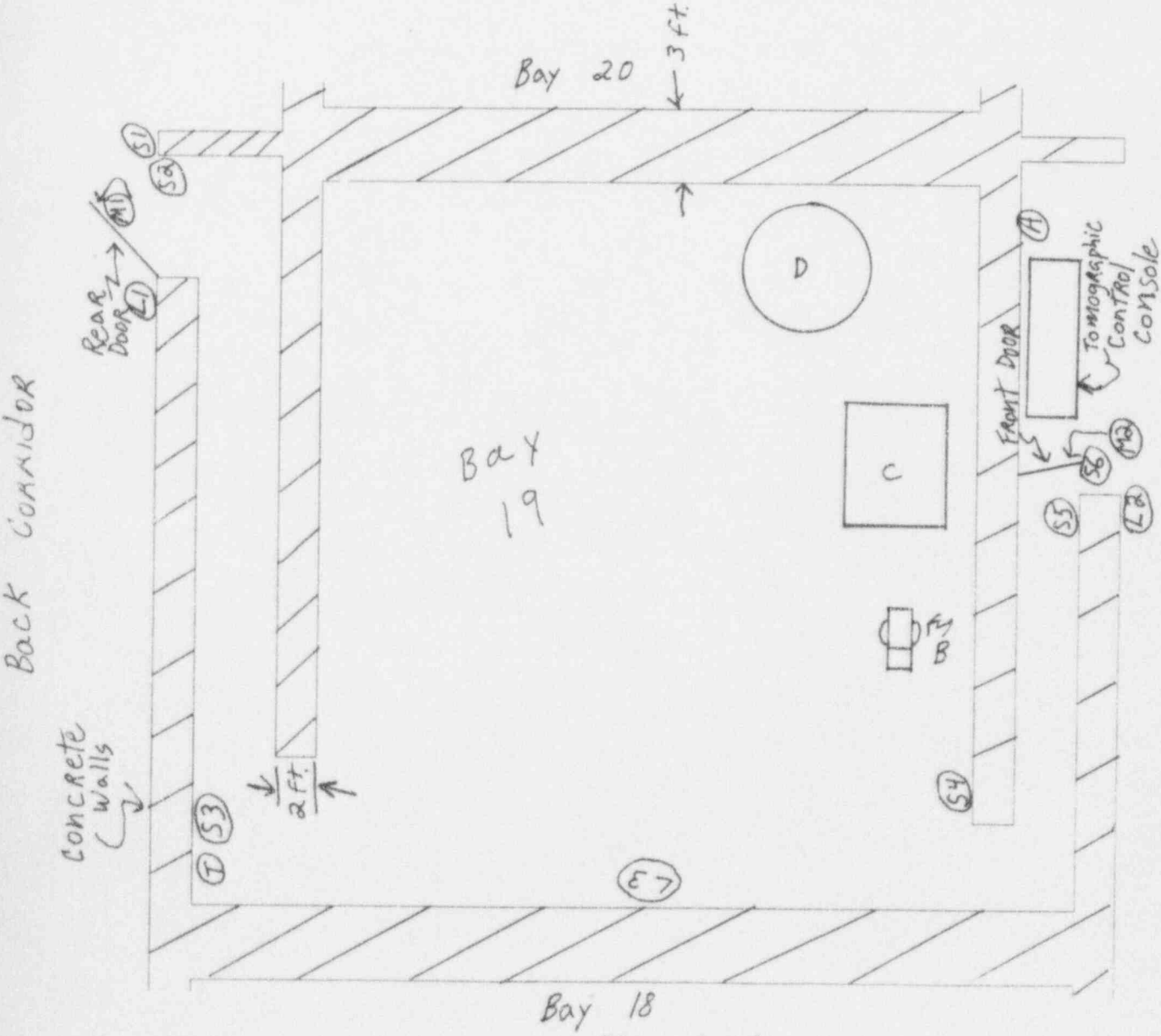
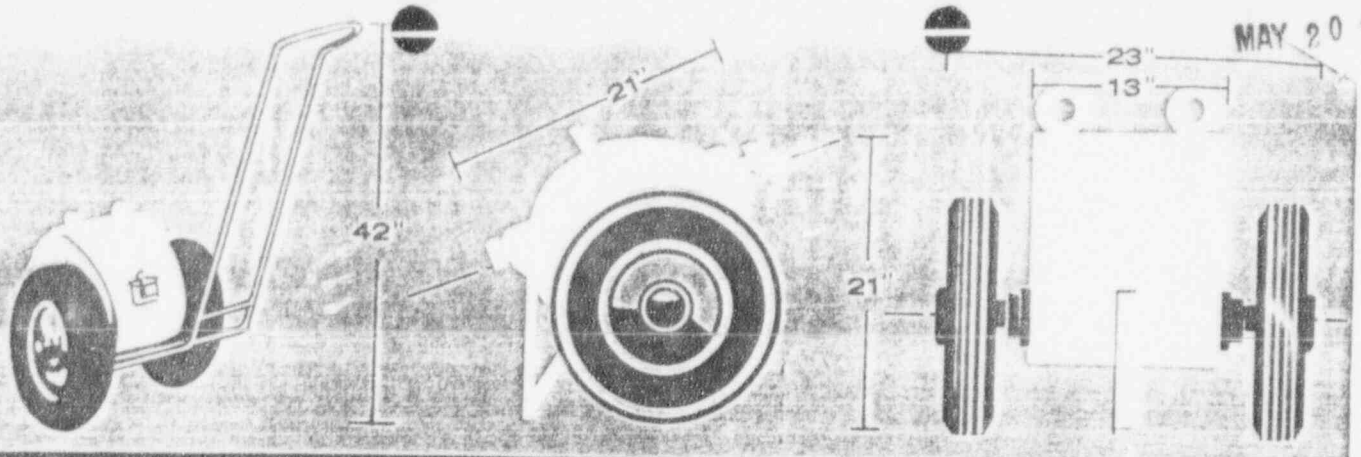


Figure 9.a.2.

Bay 19 - Interlocks, Alarms, Locks, General Layout



SPECIFICATIONS

MODEL	Gammatron 20A	Gammatron 50A	Gammatron 100A	Gammatron 100A*
Capacity	20 Curies Cobalt-60	50 Curies Cobalt-60	100 Curies Cobalt-60	200 Curies Cobalt-60
Approximate total weight	300 Lbs.	335 Lbs.	450 Lbs.	475 Lbs.
Approximate shield weight	175 Lbs.	200	345	370 Lbs.
Source Model	A-7-A	A-7-A	A-8-A	A-8-A

* 100A with 200 Curie capacity must be special ordered.

RADIATION LEVEL

Surface radiation levels in accordance with all applicable state and Federal regulations.

CONTAINER

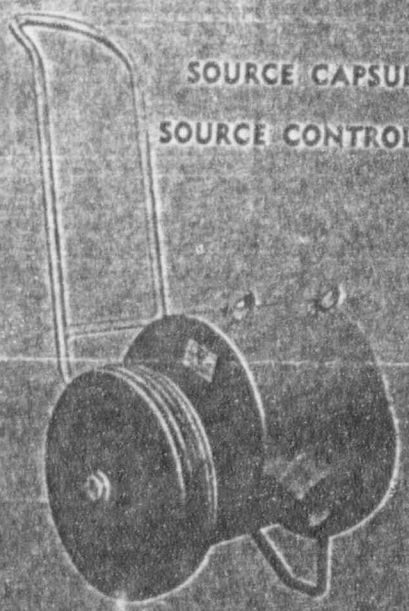
Steel jacketed housing.
Depleted uranium shield casting is completely enveloped in polyurethane, providing an excellent cushion in case unit is dropped. The polyurethane also acts as a moisture barrier and completely contains the uranium in case of flaking or oxidation. For added safety, uranium casting is encased in asbestos insulation.
Fabrication approved by all state and Federal regulatory agencies.
Unit may be shipped loaded under DOT regulations.

SOURCE CAPSULE

Stainless steel encapsulation.
Approved by all state and Federal regulatory agencies.

SOURCE CONTROLS

Source tubes of flexible metal, 23' long.
Plunger type lock prevents removal of source from back end of unit and makes operation impossible unless source is properly connected to control cable.
Source tube equipped with quick disconnect couplings instead of threaded couplings. Quick disconnect couplings are precise, easy to use, and REUSABLE.
30' control cable standard equipment.
The improved Saf-T-Key coupling requires no special tools for connecting — the result of our years of experience in the radiography field.
It has no keys, pins, springs, or other component parts that may cause field problems.
Complete with all necessary controls.
COMPLIES WITH AEC REGULATIONS.



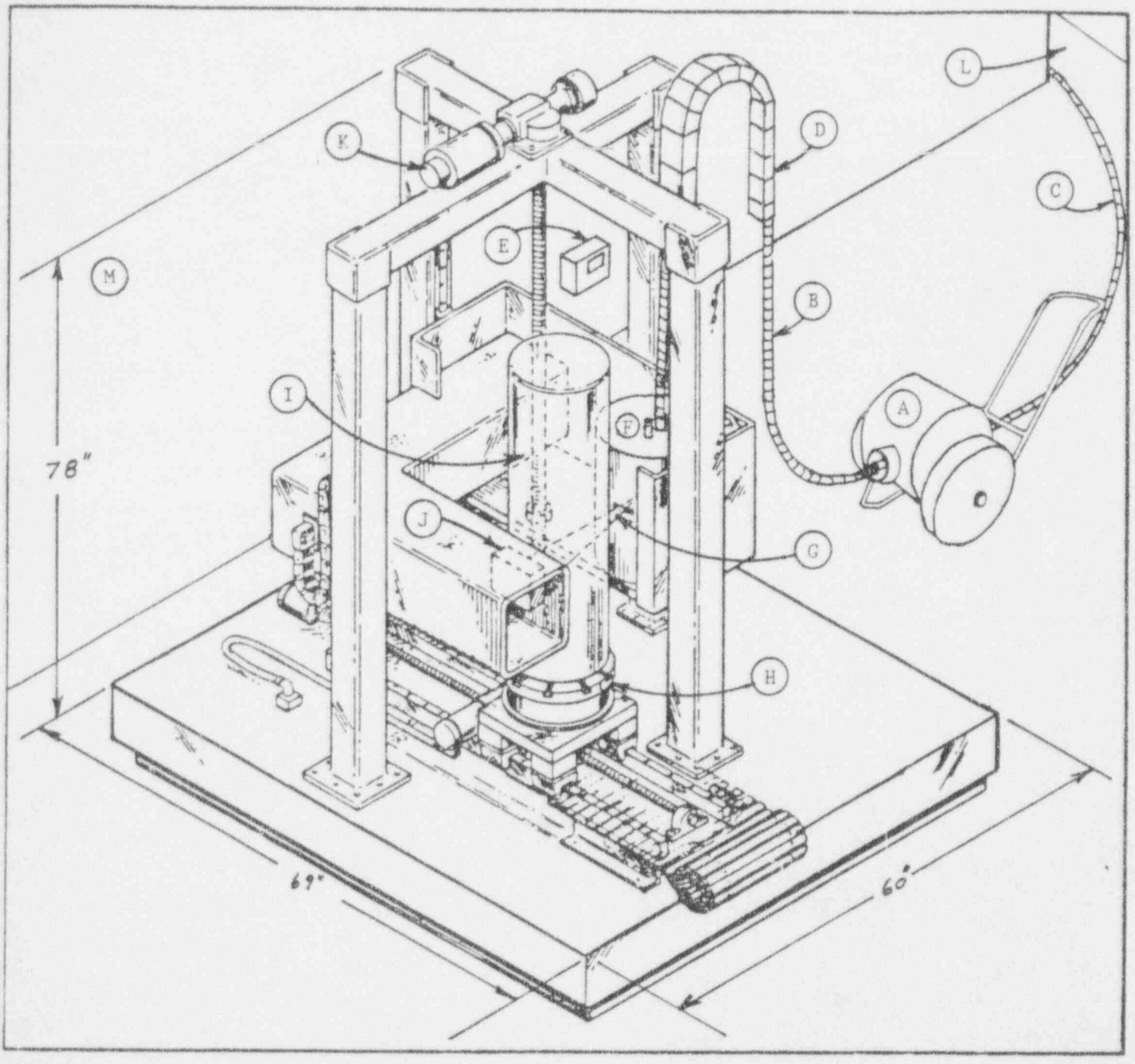
Due to GAMMA INDUSTRIES' continuing program of research and engineering development, all specifications subject to change without notice and may be varied at manufacturer's discretion.

A DIVISION OF NUCLEAR SYSTEMS INCORPORATED

GAMMA INDUSTRIES

Figure 9.a.3.
Gammatron-100 (100 Curies Cobalt-60)

P. O. Box 2543, 2255 Ted Dunham Ave., A.C. 504 - 342-7791, Baton Rouge, La. 708

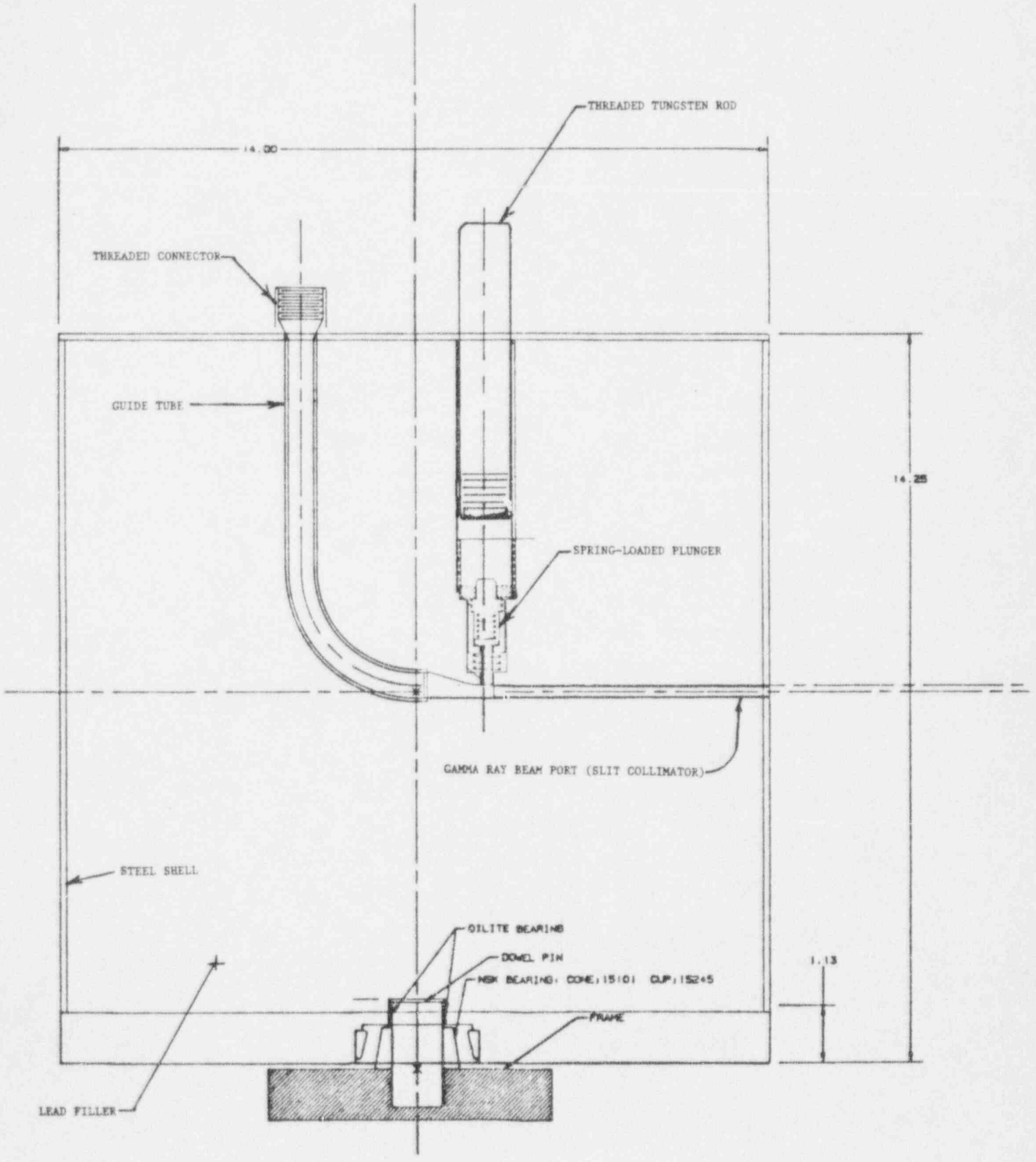


U.S. ARMY ARDEC COMPUTED TOMOGRAPHY SYSTEM

A - GAMMATRON-100
B - SOURCE GUIDE TUBE
C - DRIVE CABLE TUBE
D - SUPPORT CONDUIT
E - AREA MONITOR
F - ROTATABLE Co-60 COLLIMATOR
G - GAMMA RAY BEAM
H - TURNTABLE
I - ITEM BEING EXAMINED
J - DETECTORS
K - LIFT DRIVE MOTOR
L - ROOM ENTRANCE
M - CONCRETE WALL

Figure 9.a.4.

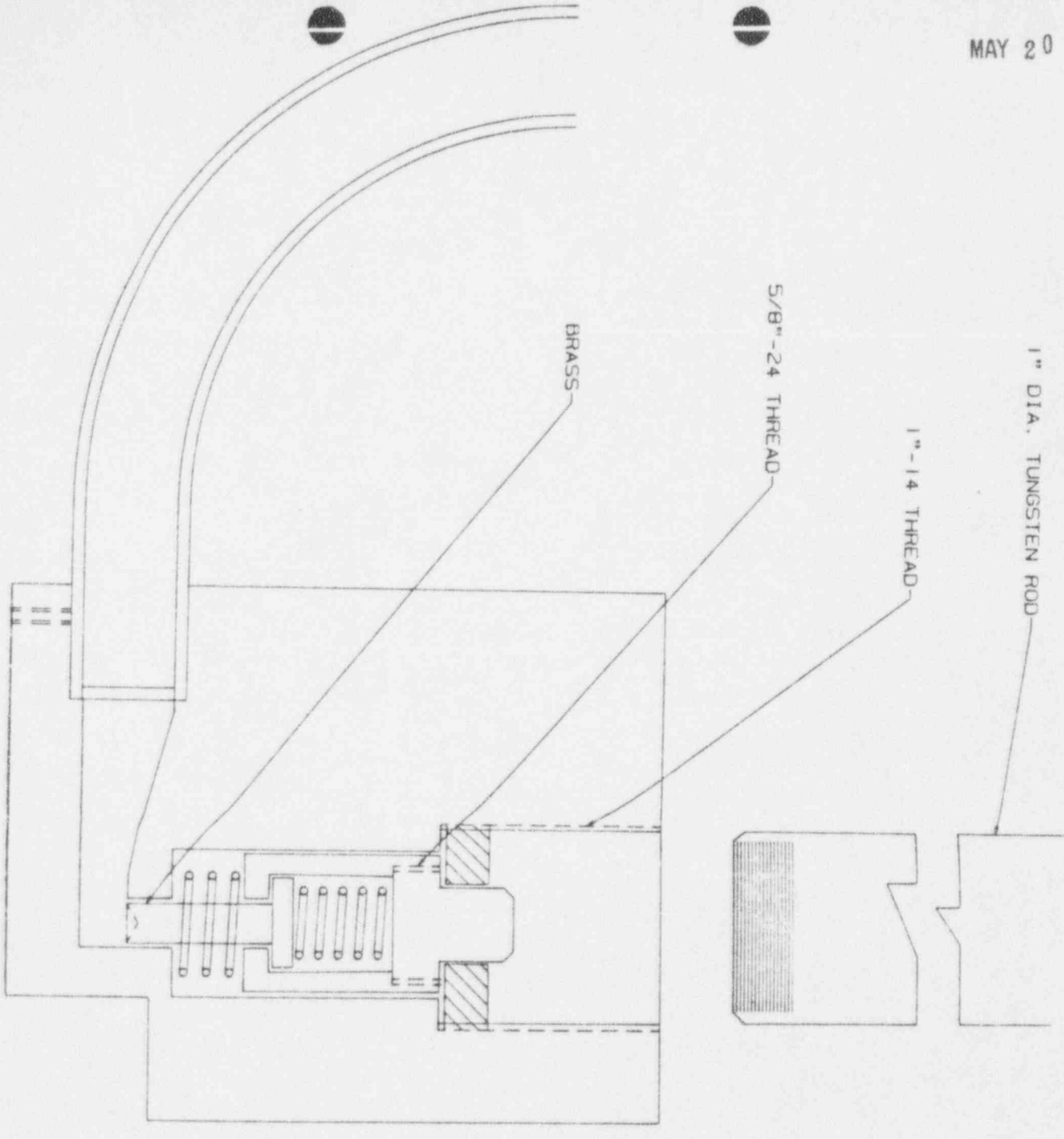
Sketch of Gammatron-100 in Conjunction With Tomography System



CT SYSTEM - ROTATABLE Co-60 COLLIMATOR

Figure 9.a.5.

Interior View of Tomography System Collimator & System for Securing Sealed Source in Place



METHOD OF LOCATING SOURCE

Figure 9.a.6.
Blow-up of Device for Securing Sealed Source in Tomography Collimator

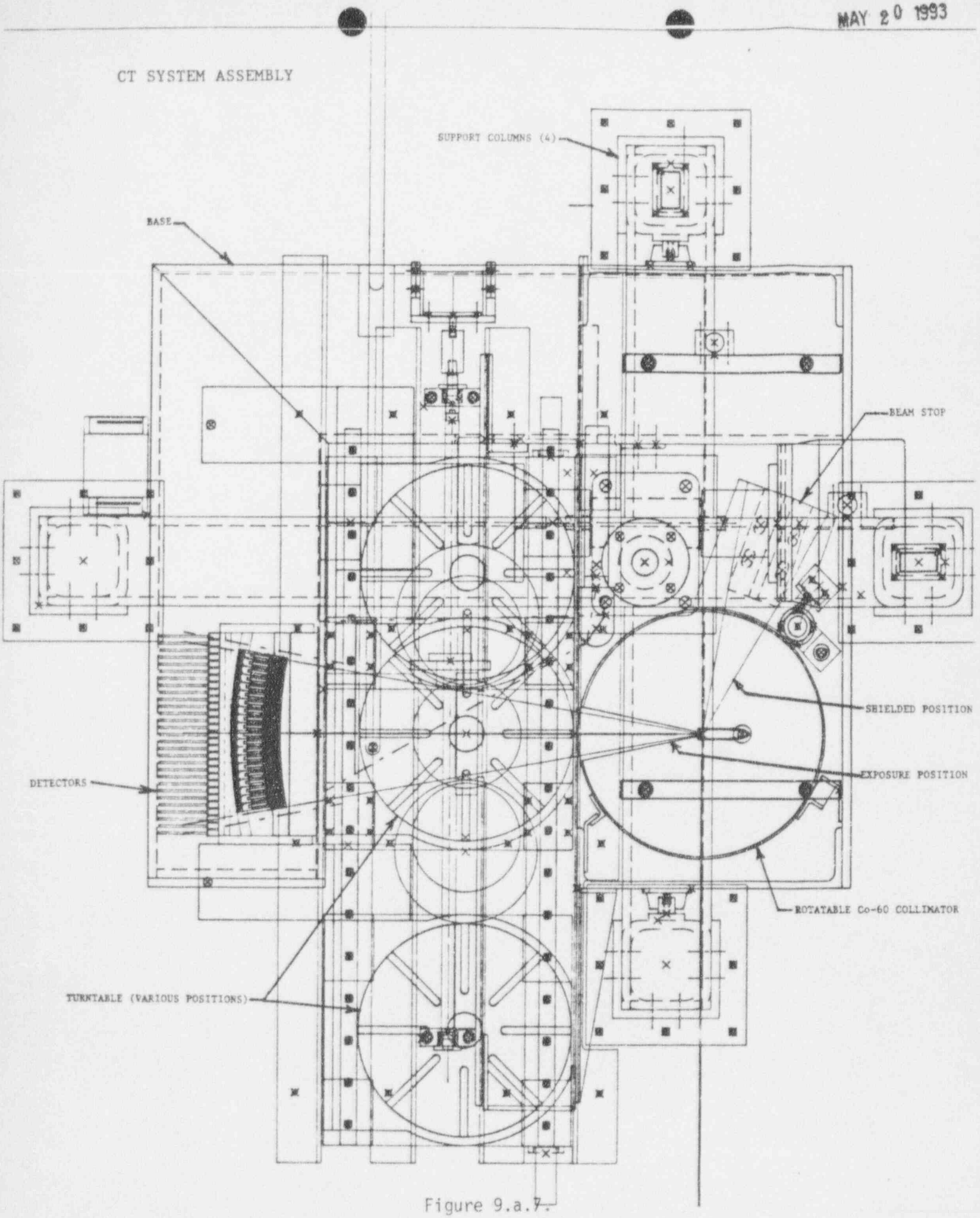
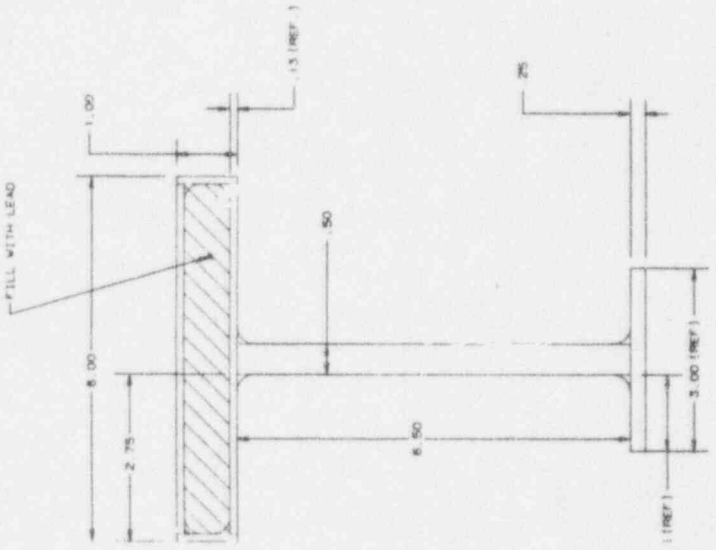


Figure 9.a.7.

Overhead Schematic of Tomography System



CT SYSTEM
BEAM STOP

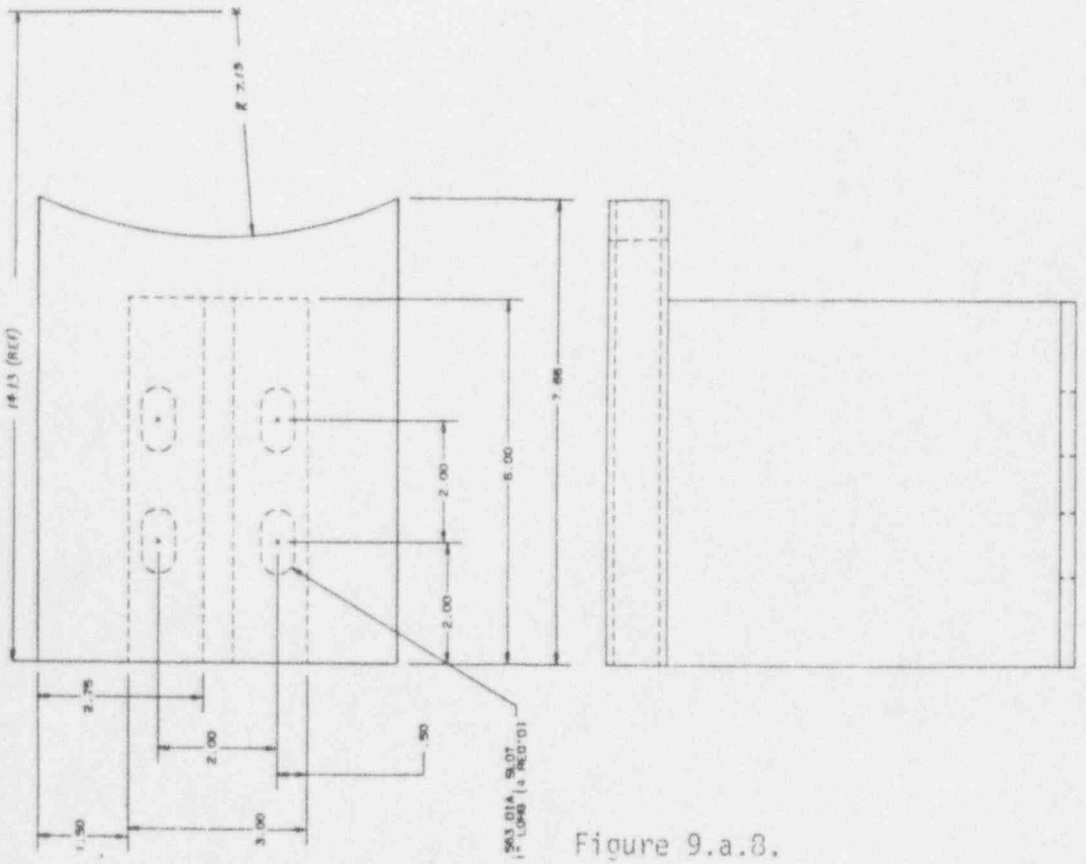


Figure 9.a.8.
Tomography System Leaded Beam Stop

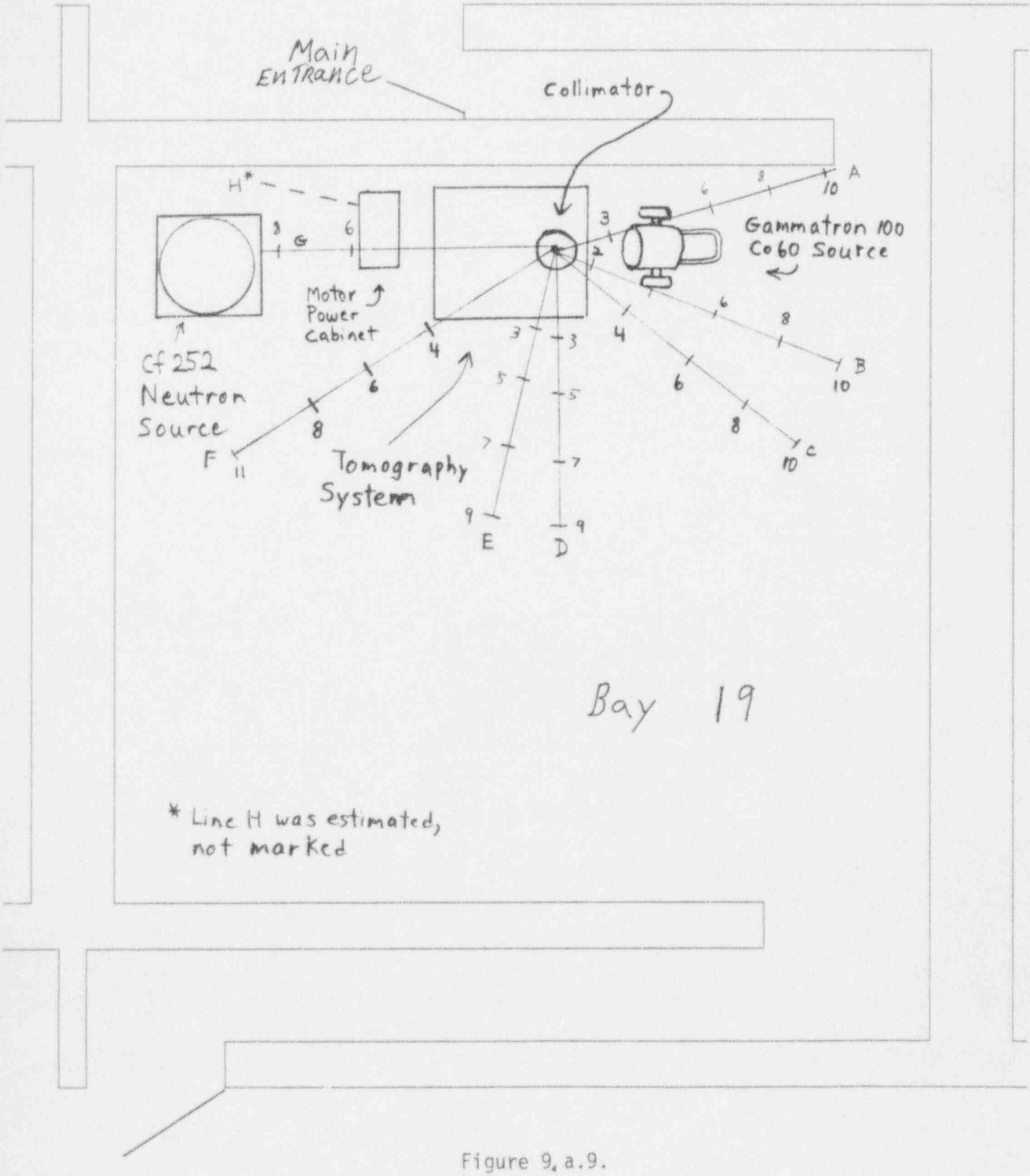


Figure 9, a.9.

Contours for Reported Radiation Survey Measurements (A3=3 feet from middle of Collimator; A8=8 feet, etc.).

ITEM 9

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 9.b. - Facilities and Equipment

Building 312 - Dougherty Box Irradiator System

This building is a storage facility for radioactive materials and radioactive waste. The size of the building is approximately 30 feet by 60 feet. The floor and wall areas, extending several feet up from the floor, are covered with an epoxy sealant. The facility has heavy duty shelving, an overhead crane, and a loading dock and docklift. The crane has a forklift and drum-handling adapters for moving items about. There is a dedicated tritium storage cabinet for tritium-contaminated items, as well as a dedicated exhaust hood for performing R&D-related work on tritium-contaminated items, which is authorized under ARDEC license number 29-00047-02. The Dougherty Box system containing the Cobalt-60 source is also to be located within this building (reference Amendment 10 to prior license number 29-00047-08 for this system, dated August 7, 1992, along with amendment request documentation from ARDEC dated May 1, 1992 and June 9, 1992). The Dougherty Box system is still present within the confines of building 3021 at the time of submittal of this renewal application, but its move to building 312 is imminent.

The Dougherty Box system is a self-contained, dry-source storage irradiator used to study the effects of high doses of radiation on materials of interest to the U.S. Army, or possibly other defense agencies. The location chosen within building 312 for situating the Dougherty Box gamma irradiator system is believed to be the most appropriate from a radiation safety standpoint. The area behind the back wall of the building, which the Dougherty Box irradiator door is to face, is a wooded hill that is unoccupied. The back wall of the irradiator box is to face the entrance to building 312. In addition, the Dougherty Box system is to be located in the location depicted because of floor load considerations, as well as the fact that extensive heavy duty storage shelving is already located at the other end of the building, as well as the proximity of the next nearest occupied building, which is essentially the upper floor of building 320, that is situated to the left of the front entrance to building 312.

Drawing number P101814 is of the source shipping and storage container.

Drawing number SK80872 is of the irradiation chamber, i.e., the Dougherty Box, consisting of approximately 22 tons of lead enclosed in a steel jacket, with a mechanical interlock, and a heavy duty locking handle latch.

ITEM 9

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 9.b. - Facilities and Equipment (cont'd)

The building, which is in a remote location from other facilities, but directly behind the Health Physics Laboratory (building 320), has door locks approved by the ARDEC Security Office. The building is always locked, except when either doing work within the facility, or for incoming or outgoing shipments. Occupancy is controlled by the health physicists in the Health Physics Branch of SSEO. (See Figures 9.b.1. thru 9.b.4).

The following are radiation readings with the Cobalt-60 source in either the irradiator box, or the storage container:

a. Background - Door perimeter of Dougherty Box with source down;

b. 1.5 mR/hr - Door perimeter of Dougherty Box with source up;

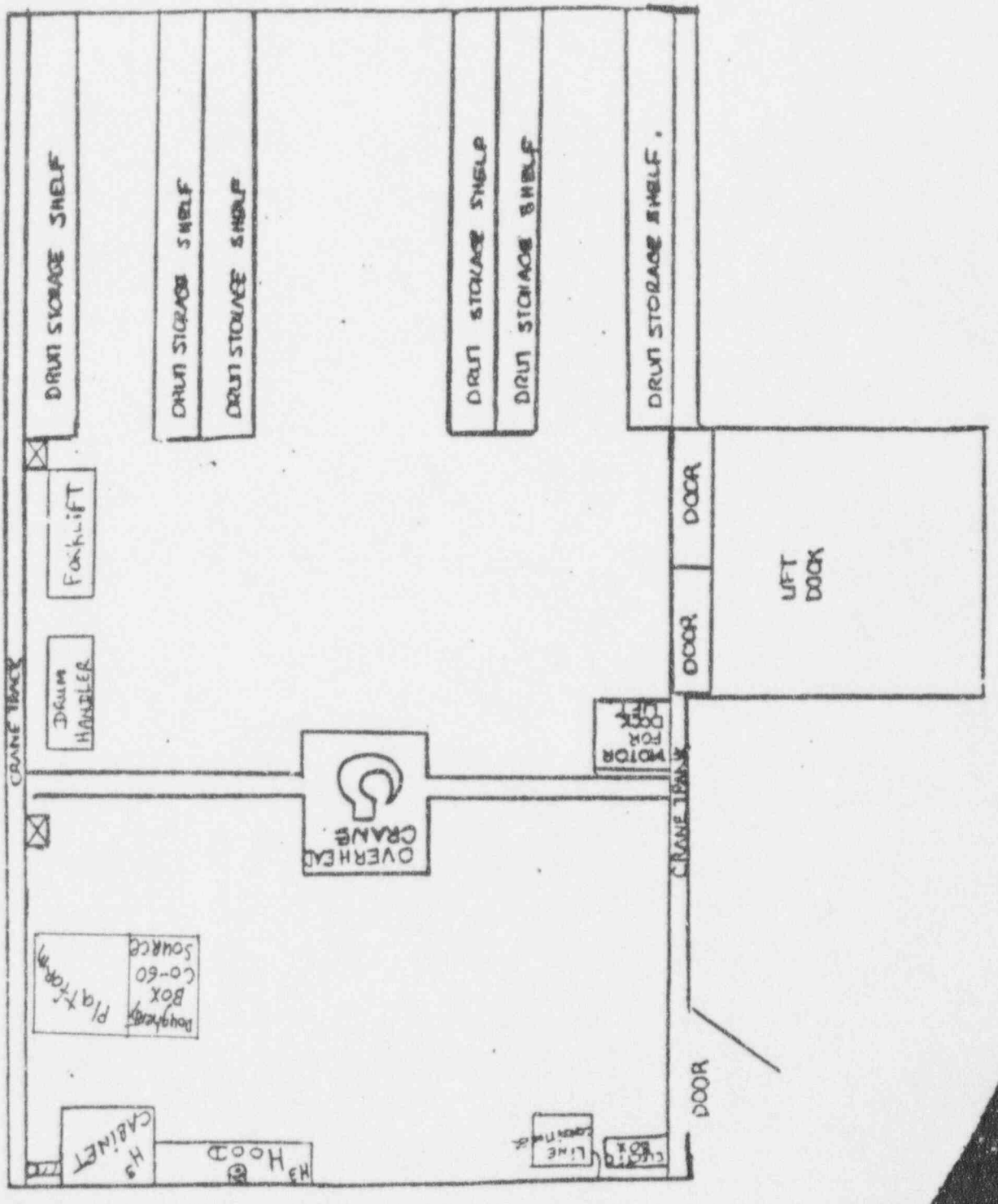
c. 0.5 mR/hr - Two feet from Dougherty Box with source in irradiator chamber in line with door perimeter;

d. 0.1 mR/hr - Center of Dougherty Box door with source in irradiator chamber;

e. 0.1 mR/hr - Storage container with source up in irradiator box;

f. 1.6 mR/hr - Storage container with source contained within it.

When the Dougherty Box system is transferred to building 312, additional radiation readings will be taken and documented at the time the system is re-assembled, and proper functioning of the system determined.



BUILDING 312

Figure 9.b.1.
Bldg 312 Layout/Location of Dougherty Box System

MAY 20 1993

Legend

A. Dougherty Box IRRadiator Chamber
B. Co-60 STorage Container
C. Wooden Platform

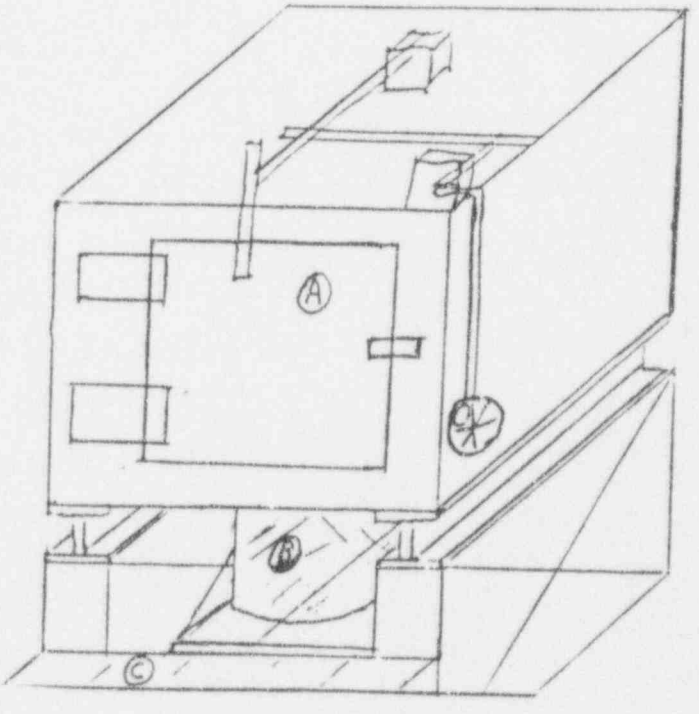


Figure 9.b.2.
Sketch of Dougherty Box Irradiator System

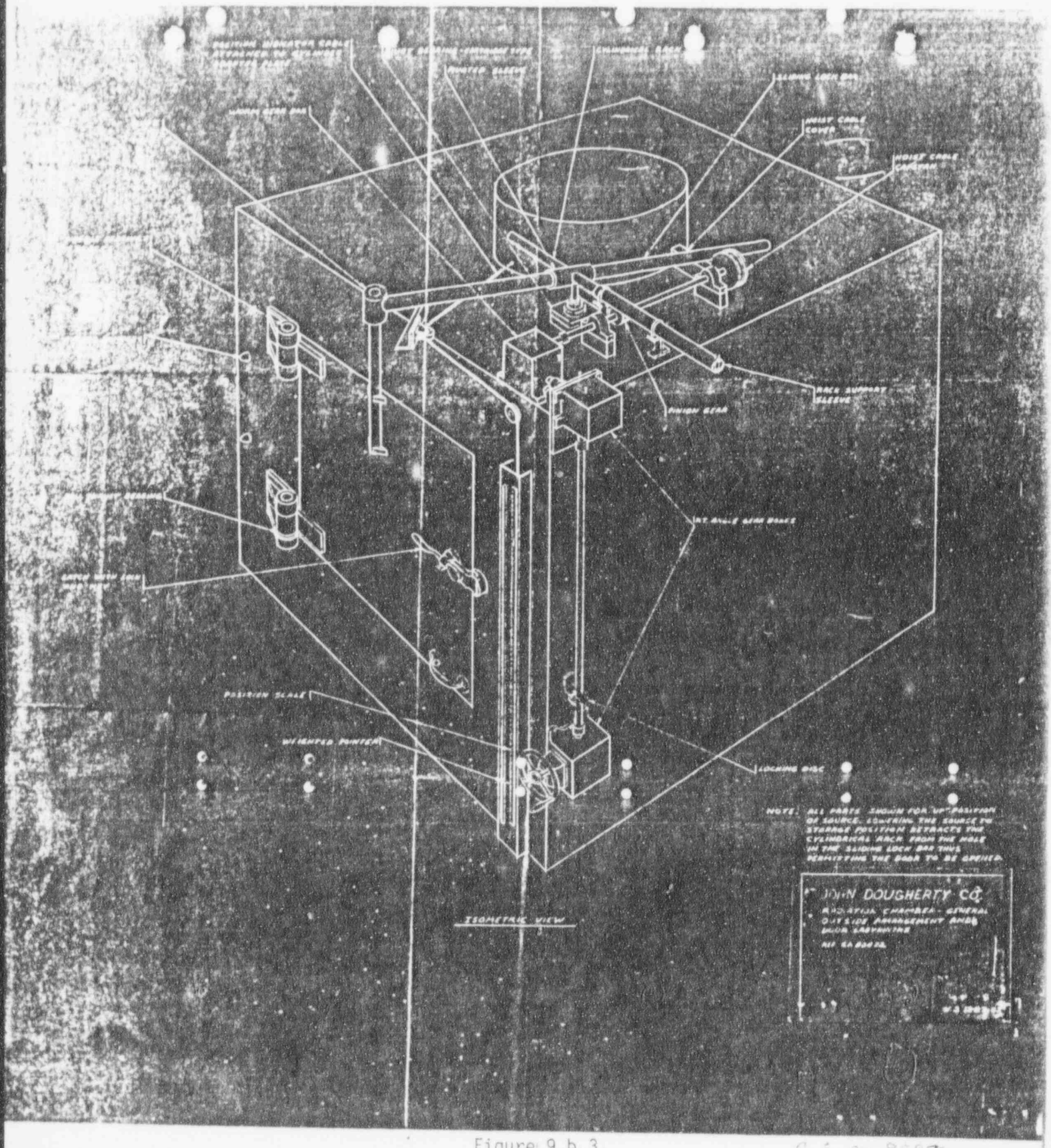


Figure 9.b.3.

Dougherty Box Irradiator Chamber

Ref: SK 80872

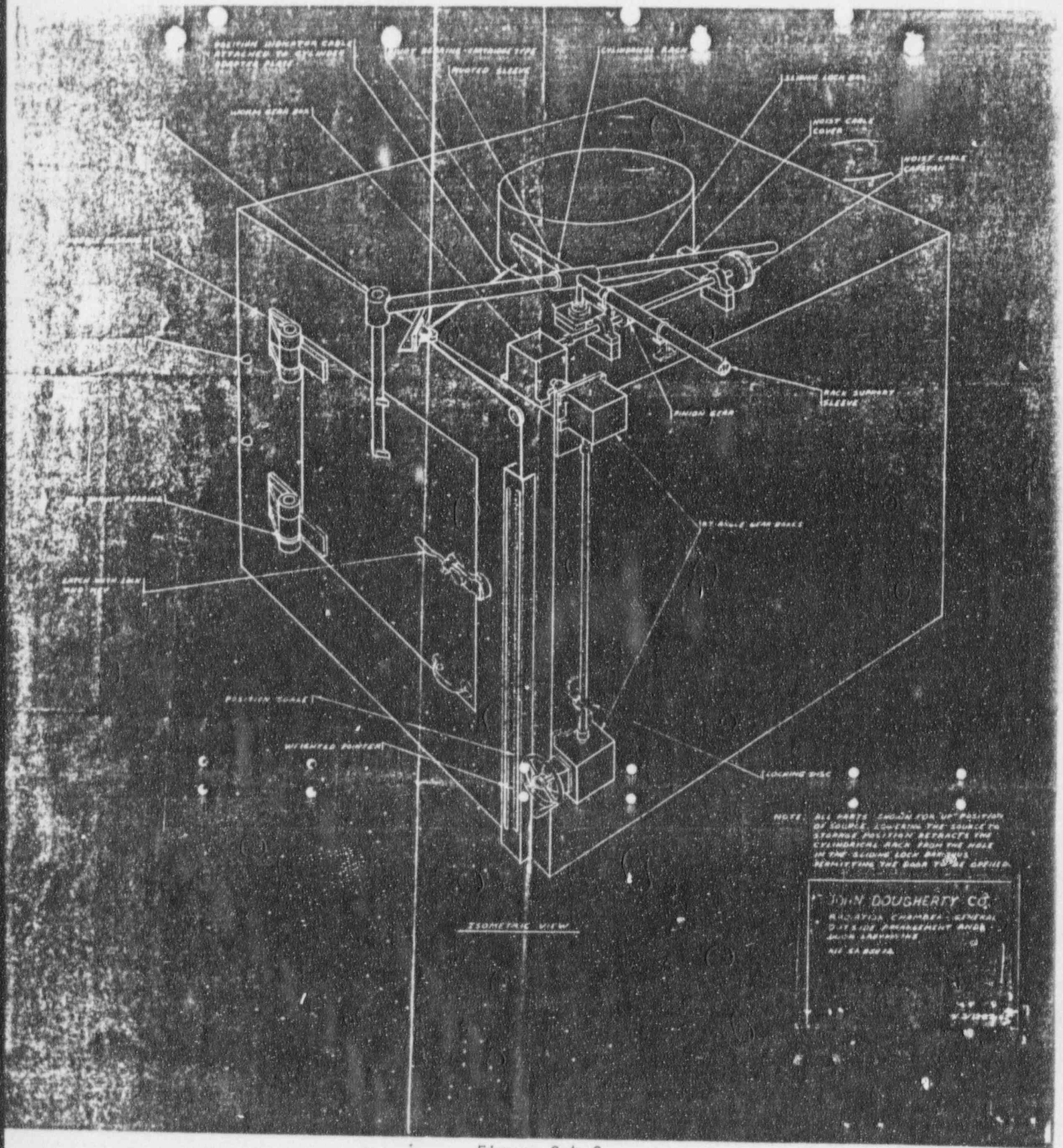


Figure 9.b.3.

Ref. SK 80872

Dougherty Box Irradiator Chamber

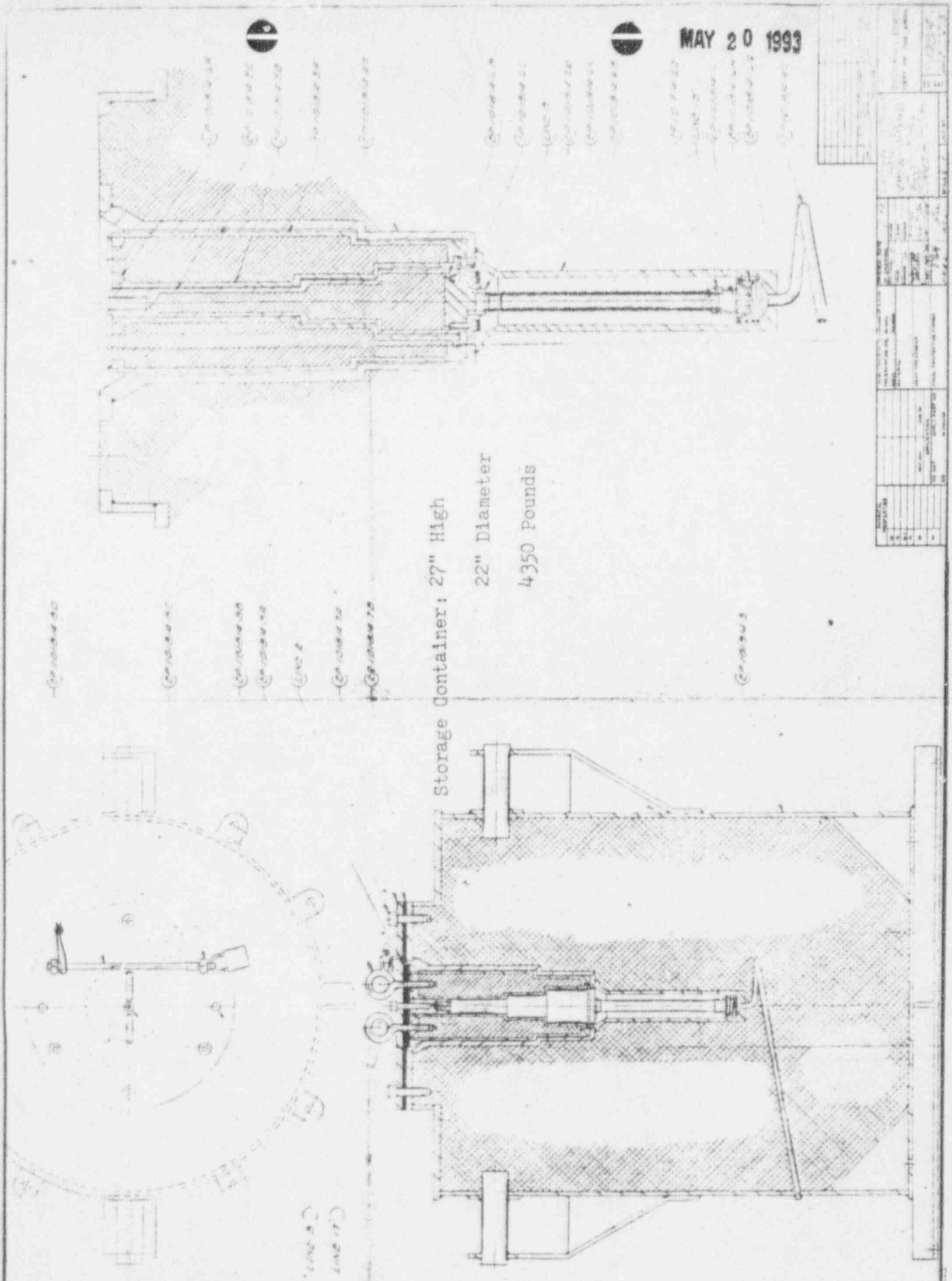


Figure 9.b.4.
Cobalt-60 Storage Container for Dougherty Box Irradiator System

MAY 20 1993

ITEM 9

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 9.c. - Facilities and Equipment

Building 3030 - Ameray Corp Self-Shielded Irradiator

The Cs-137 sealed source presently (May 1993) decayed down to 122 Ci from its original activity of 250 Ci, is housed in an interlocked self-shielded container in its storage position.

Equipment -

The source is stored in a Pb shipping container and irradiation unit as shown in drawings numbered C-560-138 thru C-560-142 drawn by Ameray Corporation, Route 46, Kenvil, NJ on August 1, 1960 (Figures 9.c.1 thru 9.c.5. in this renewal application).

When the source is in this raised, safe position in the shipping container, the plug rotated closed, and the locking mechanism key removed, the source cannot be lowered into the irradiation chamber.

Conversely, when the three keys are in the three key locks, and the keys are turned to remove the locking bolt and to allow the plug to be rotated, the three keys are held captive in the lock mechanism, and cannot be removed to be used to open the irradiation chamber doors. The rotating plug prevents the lock bolt from being thrown to enable the keys to be removed from the lock. With this dual configuration, personnel cannot be exposed to the source without physical damage to, or destruction of the locking mechanism.

The highest radiation reading on the surface of the unit is 2.3 mr/hr at the hinges on the door into the sample irradiation chamber. All other readings are below 2 mr/hr on the surface, whether the source is in the raised safe position in the shipping container, or in the lowered irradiation position in the irradiation chamber.

Facility -

The self-shielded container is located in building 3030. Building 3030 is licensed under NRC License number SNM-561 for the storage of special nuclear material. In addition, this storage facility is operated under an approved Physical Security Plan titled, "Physical Security Plan for SNM-561 CFX Uranium-235 Sources (Rev. 1)", dated August 7, 1992. As such, building 3030 is constantly locked when authorized personnel* are not present, to prevent access by unauthorized persons.

*Authorized Personnel - Health Physicists in the Health Physics Branch, Installation Safety Division of the ARDEC Safety, Surety and Environmental Office

ITEM 9

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 9.c. - Facilities and Equipment (cont'd)

Building 3030 has a single door made of one inch thick steel armor plate. It is covered by a reinforced concrete ceiling covered with earth for a total thickness of at least five feet. The rear and side walls are similarly constructed, but protected by more earth. The front wall in which the door is mounted is made of reinforced concrete, 12 inches thick. The door, weighing nearly 1300 pounds, is designed so that it cannot be removed from its hinges when closed. This door is connected to an intrusion detection system. About five feet in front of the door is a reinforced concrete wall which is four feet thick at the base, one foot thick at the top, and 13.5 feet high. This wall effectively limits the approach of large equipment. An overhead light illuminates the doorway area during darkness. The structure itself is surrounded by a FE-5 fence with a single gate. The gate is secured by a padlock. The storage facility is within a controlled access military installation.

MAY 20 1993

AMERAY CORPORATION
ROUTE 46 KENVIL N.J.

PICATINNY ARSENAL
IRRADIATION UNIT 250 Cs 137

DRAWN | CHECKED | SCALE

DWG. NO. C-560-138

JOB NO. 1453

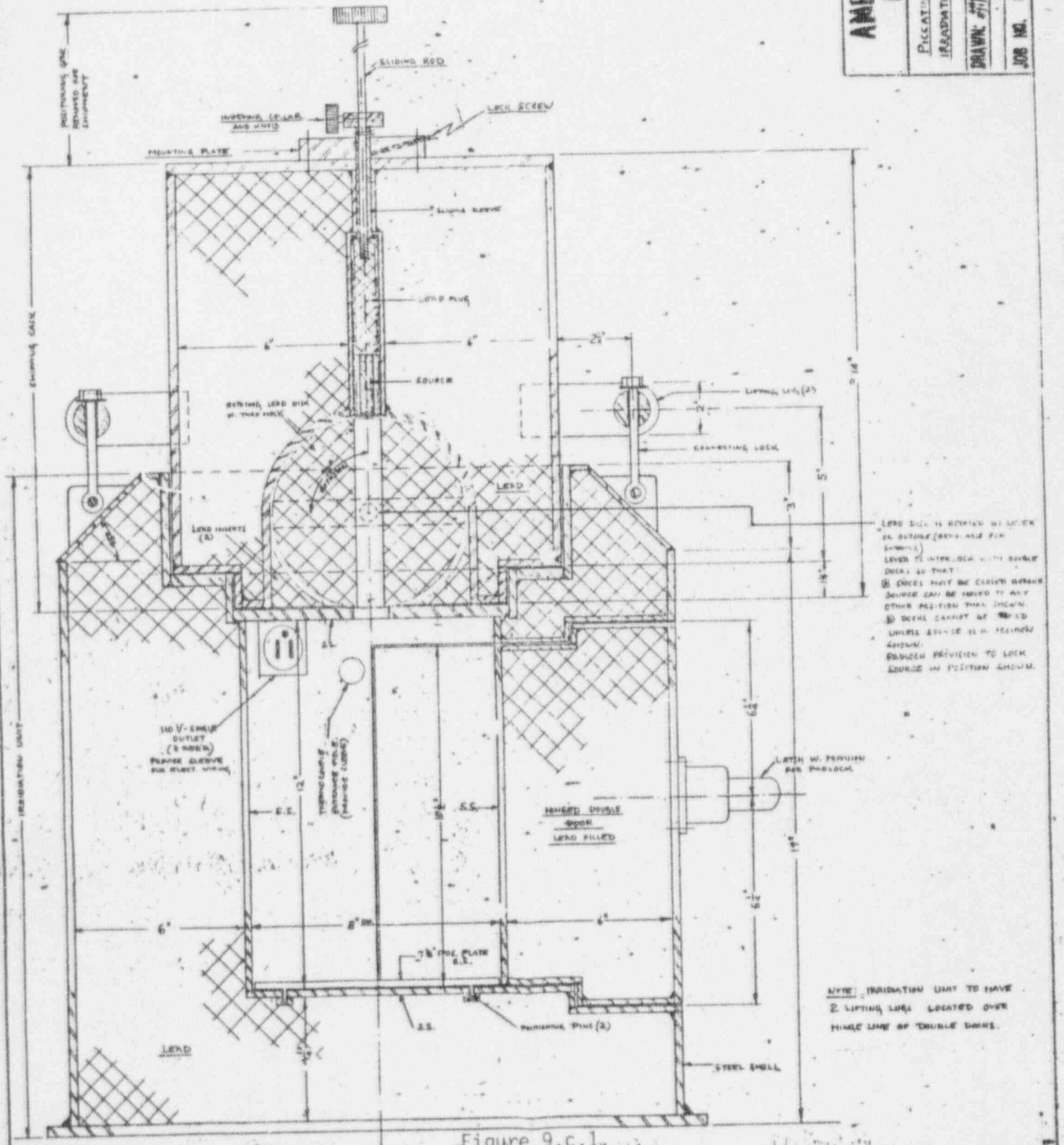


Figure 9.c.1

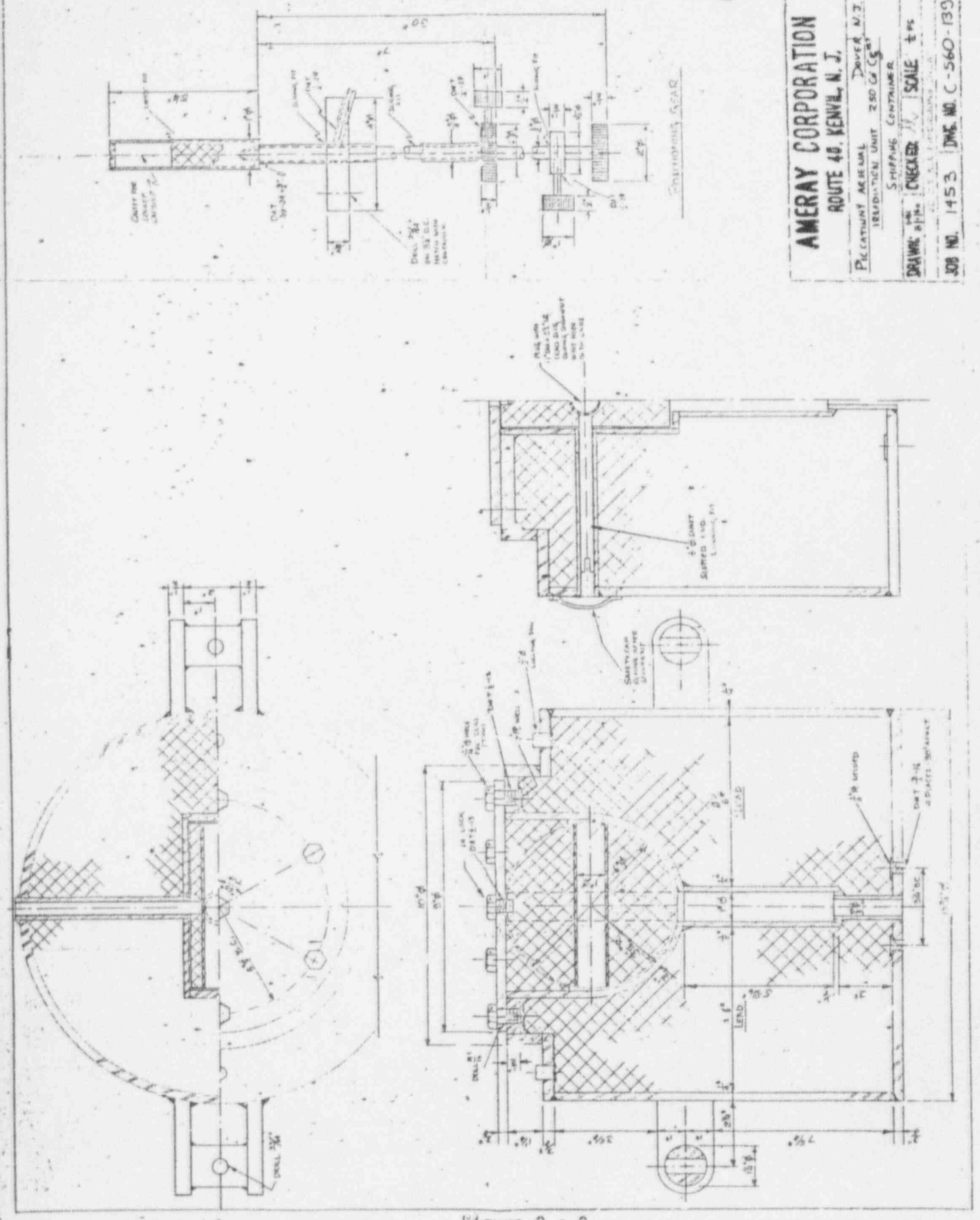


Figure 9.c.2.

MAY 20 1993

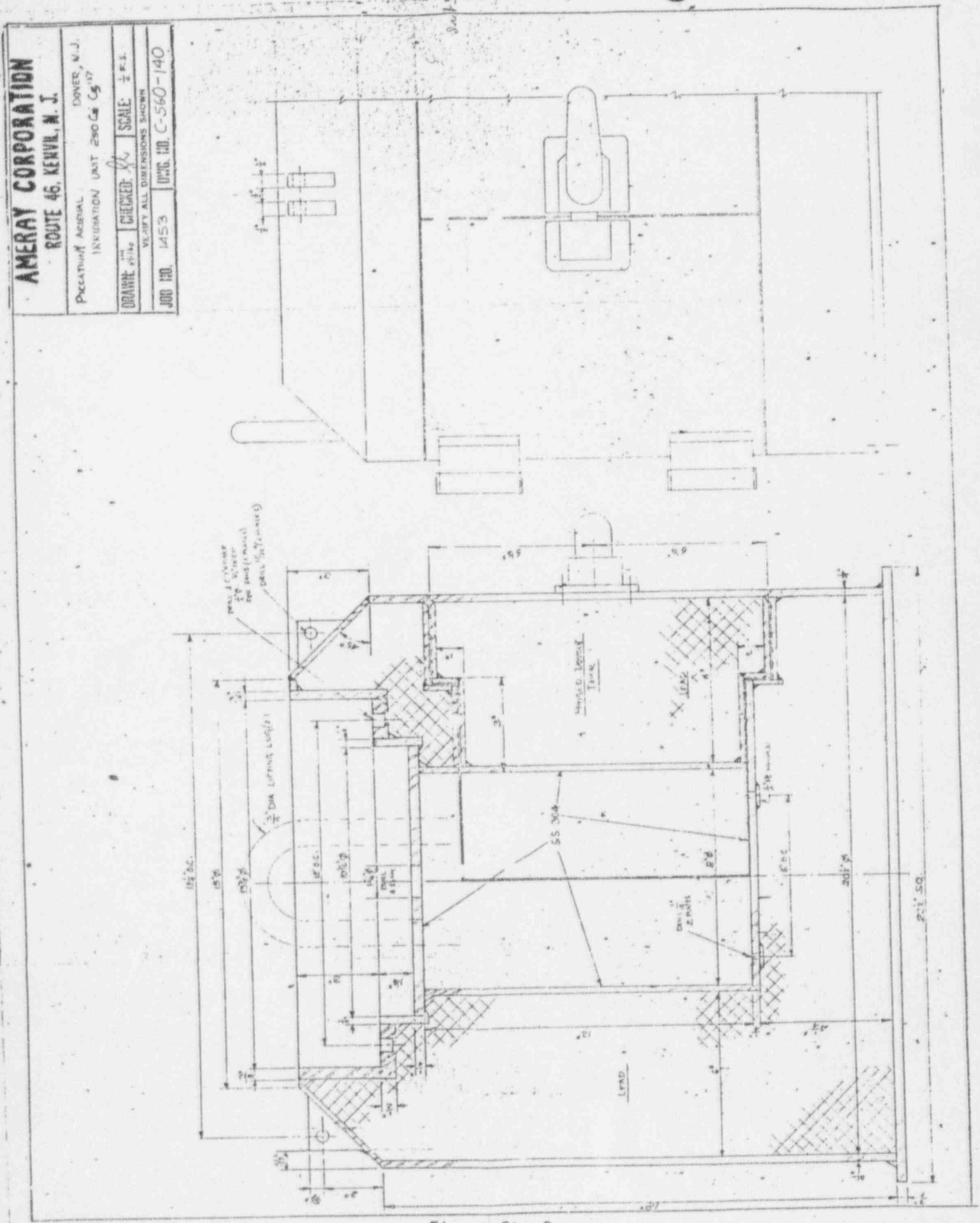


Figure 9.c.3.

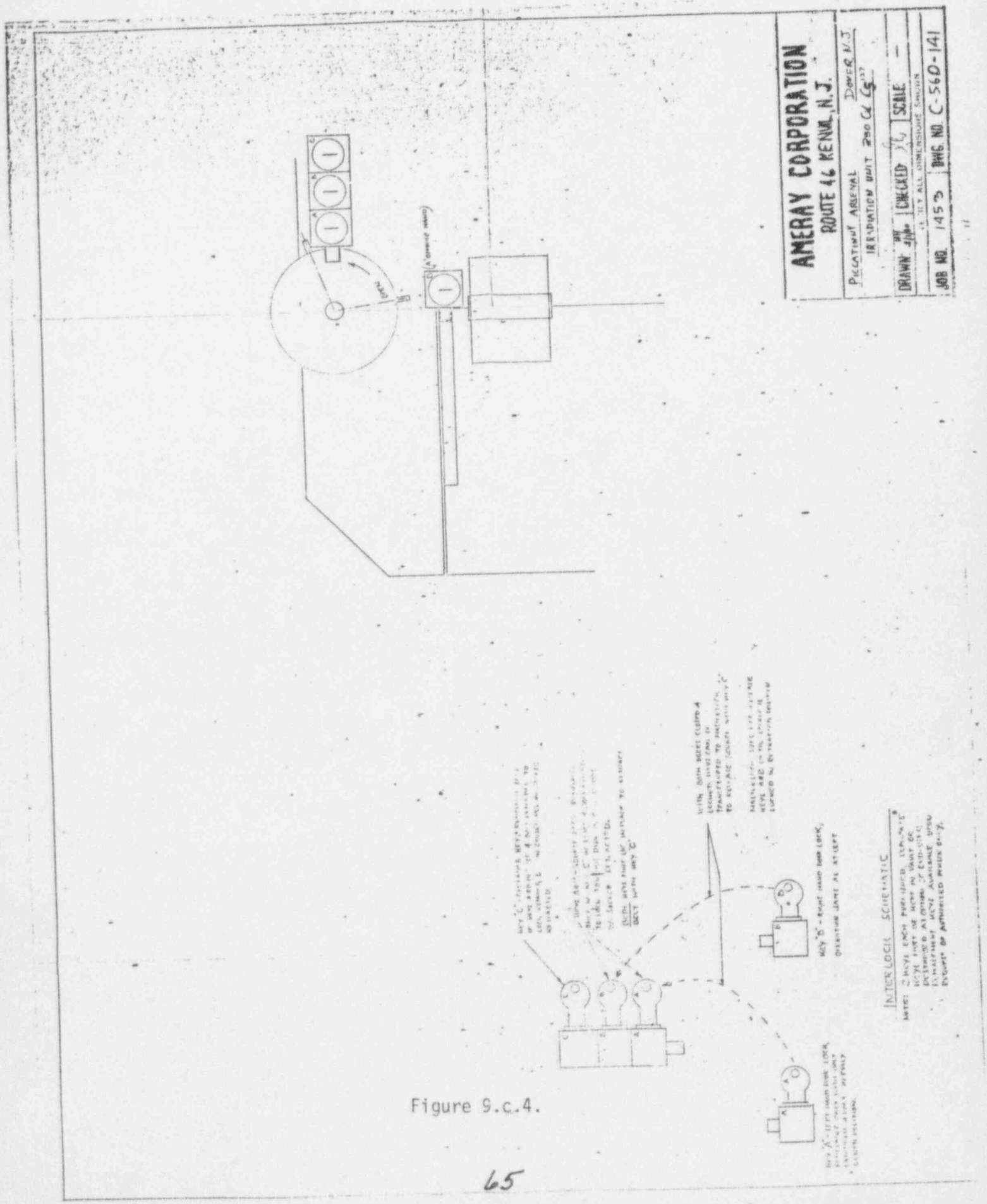

AMERAY CORPORATION
ROUTE 46 KENVIL, N.J.
PICATINNY ARSENAL
IRRADIATION UNIT 200 Ci Cs137
DOVER, N.J.
DRAWN
CHECKED
SCALE
JOB NO. 1453
DWG. NO. C-560-141
INTERLOCK SCHEMATIC

Figure 9.c.4.

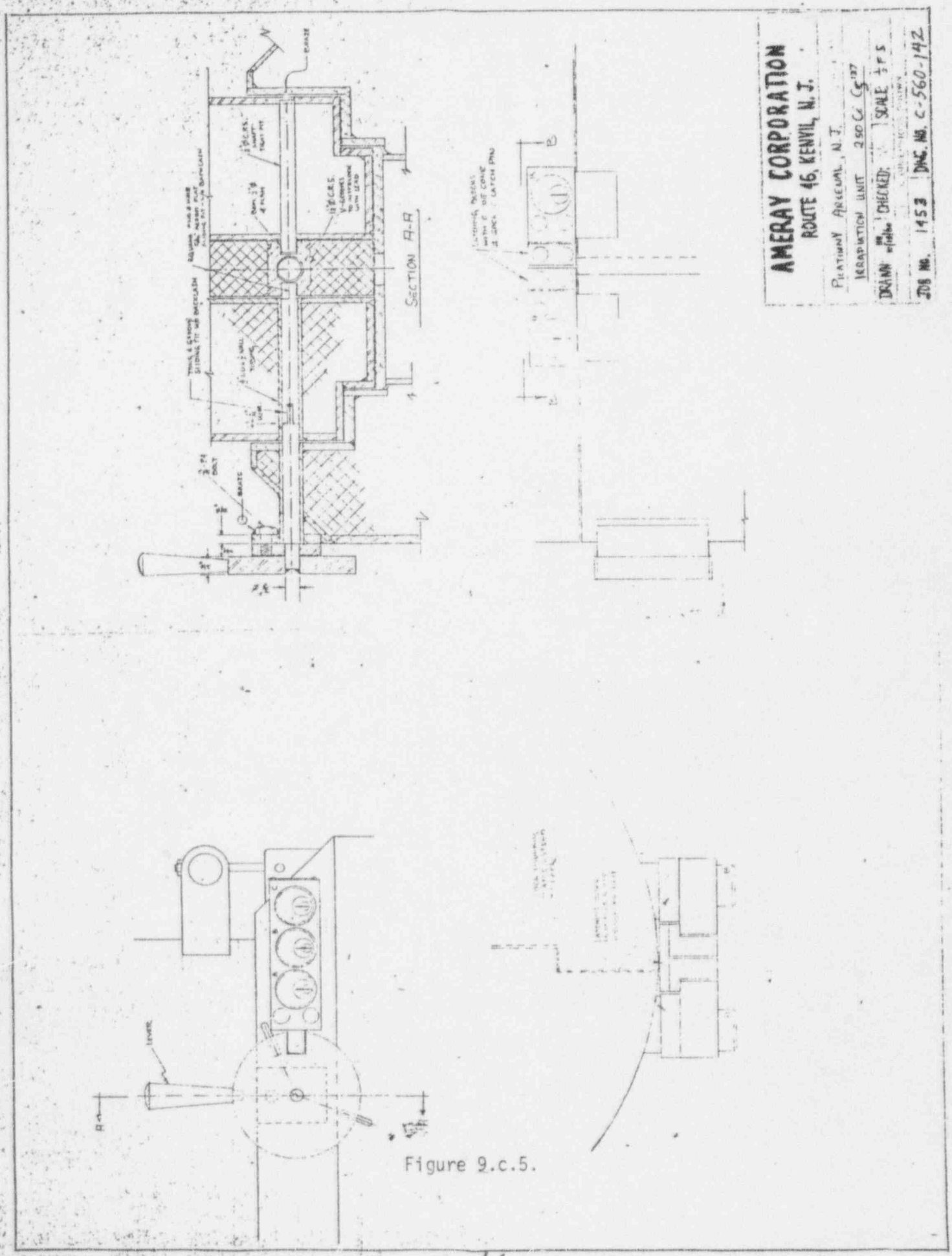

AMERAY CORPORATION
ROUTE 46, KENVIL, N.J.
PLATTSBURG ARSENAL, N.Y.
IRRADIATION UNIT 250 Cu Cs-137
DRAWN CHECKED SCALE 1"=1'-0"
JOB NO. 1453 DWG. NO. C-560-142
SECTION A-A
LEVER

Figure 9.c.5.

ITEM 9

ARDEC, Picatinny Arsenal, NJ 07806-5000

ITEM 9.d. - Facilities and Equipment - Laboratory Facilities

Building 320

The Health Physics staff of the ARDEC Safety Office functions out of a 2200 square foot laboratory facility which is entirely devoted to the field of Radiation Safety.

The building contains an office area, a technical library, supplies storage areas, restroom facilities that include a shower stall, a radiation counting area, a radioisotope laboratory, a non-radioisotope chemical laboratory, and a vented storage vault for the storage of radioactive materials.

Counting Laboratory

A stabilized power supply is used in the counting laboratory to supply power for the Beckman liquid scintillation counter, and theTennelec gas flow proportional counter. The regulated power supply is used to ensure reliable and reproducable operation of the counting equipment.

Radioisotope Laboratory

The Radioisotope Laboratory is set up in such a way that any possible release of airborne radiation or contamination will be contained in the Radioisotope Laboratory.

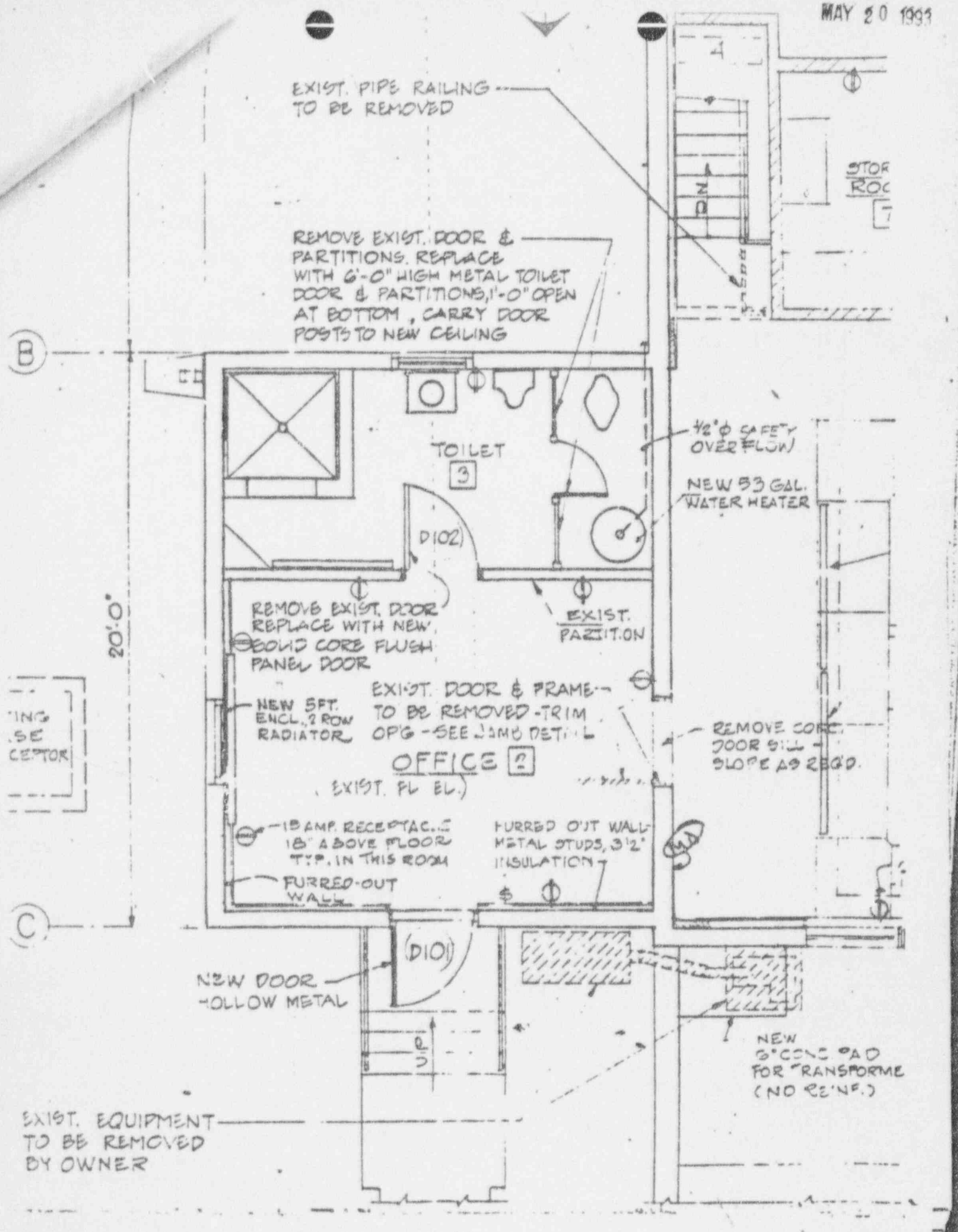
The laboratory contains its own ventilation system that is independent from the rest of the building. The floor and walls of the room were all selected and covered with materials that will facilitate easy removal of any possible contamination.

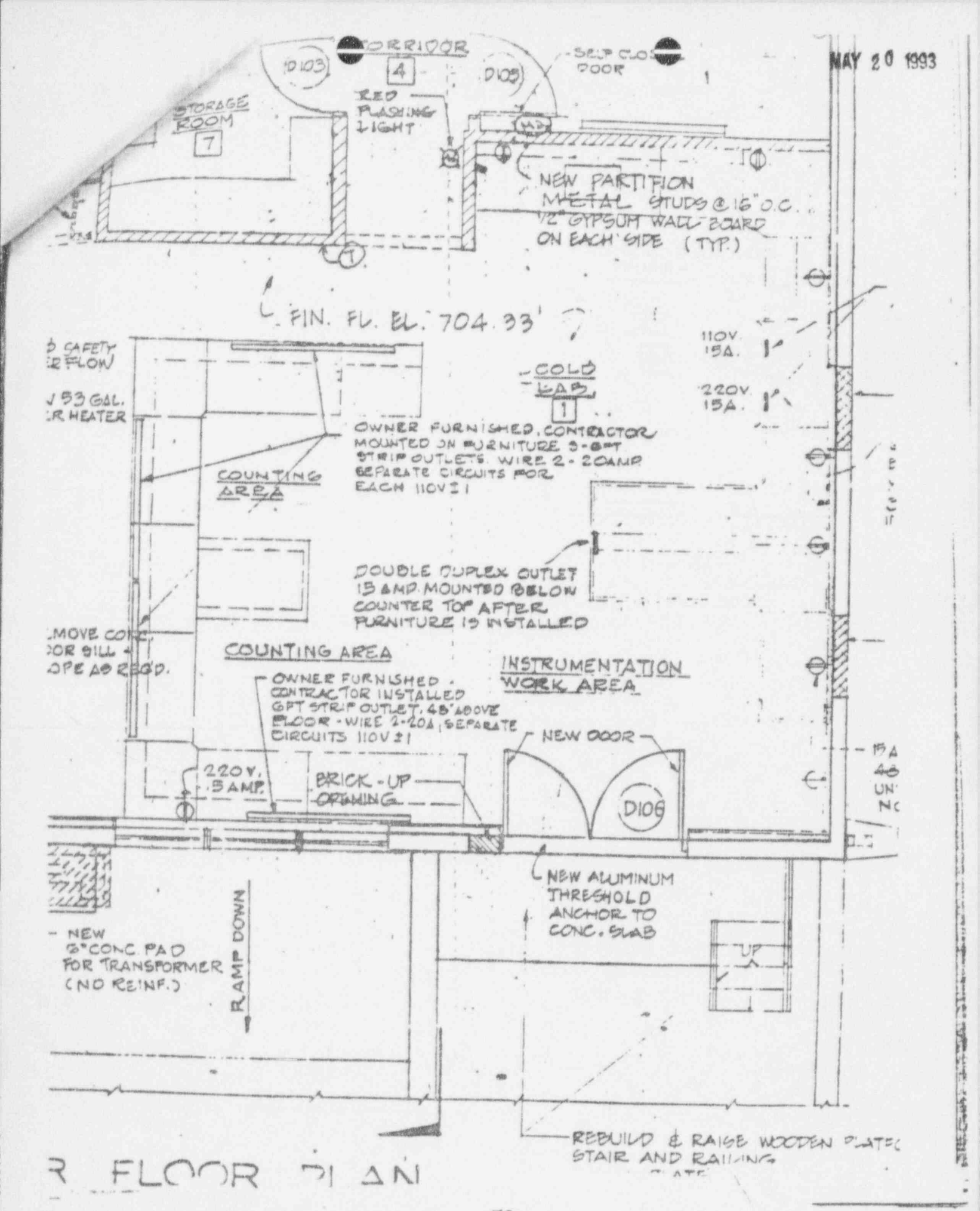
The stainless steel laboratory hood in this room is a Fisher Safety Flow Radioisotope Laboratory Fume Hood, Model 93-480R, with a HEPA filter built into the hood exhaust system.

Vented Radioactive Materials Storage Area

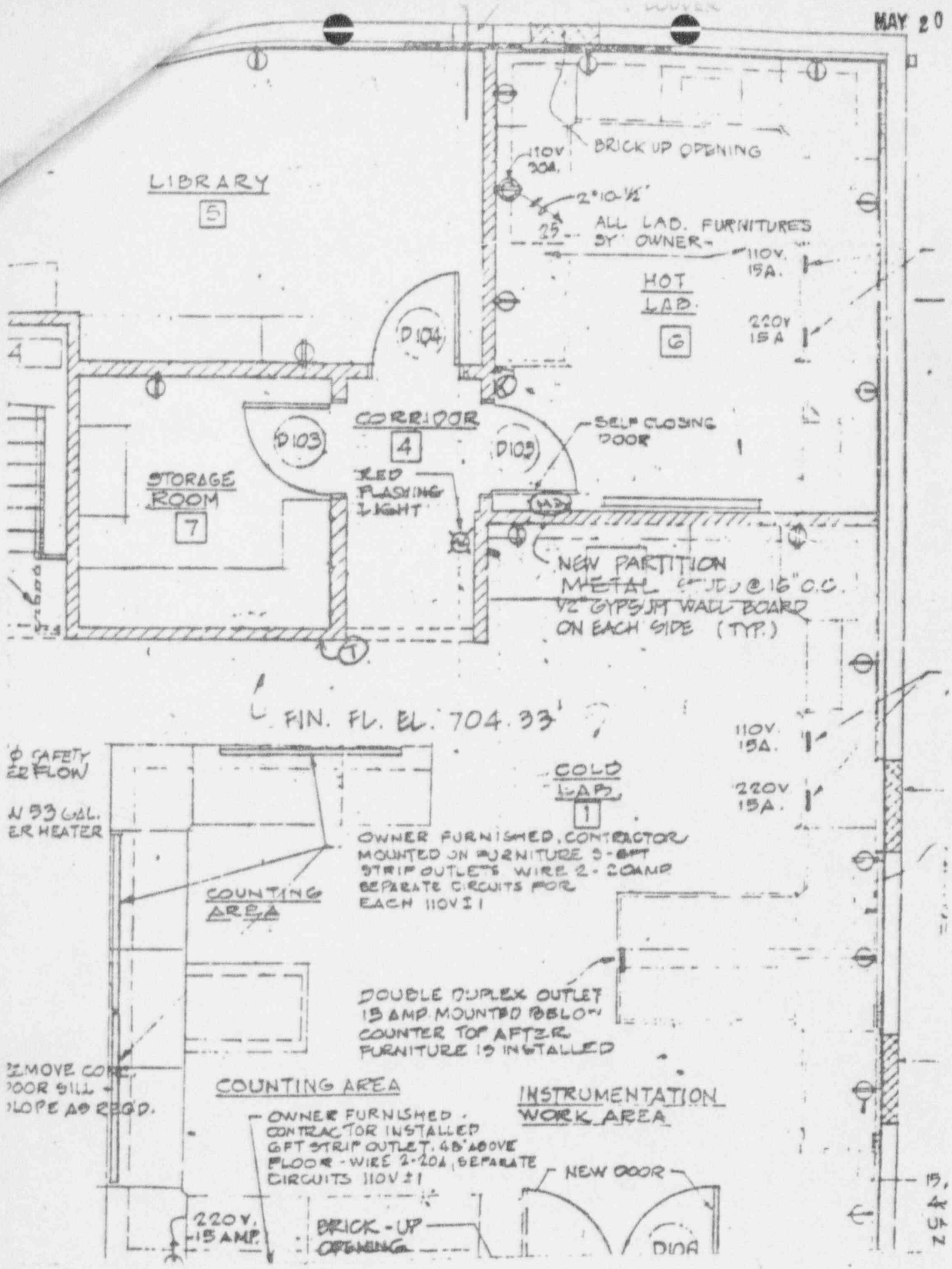
The Health Physics Laboratory also contains a vented radioactive materials storage area. This area is used to store radioactive materials that are either in temporary storage or awaiting shipment or disposal. The room is located on an unoccupied level of the building and is shielded from the occupied level by 25 inches of concrete.

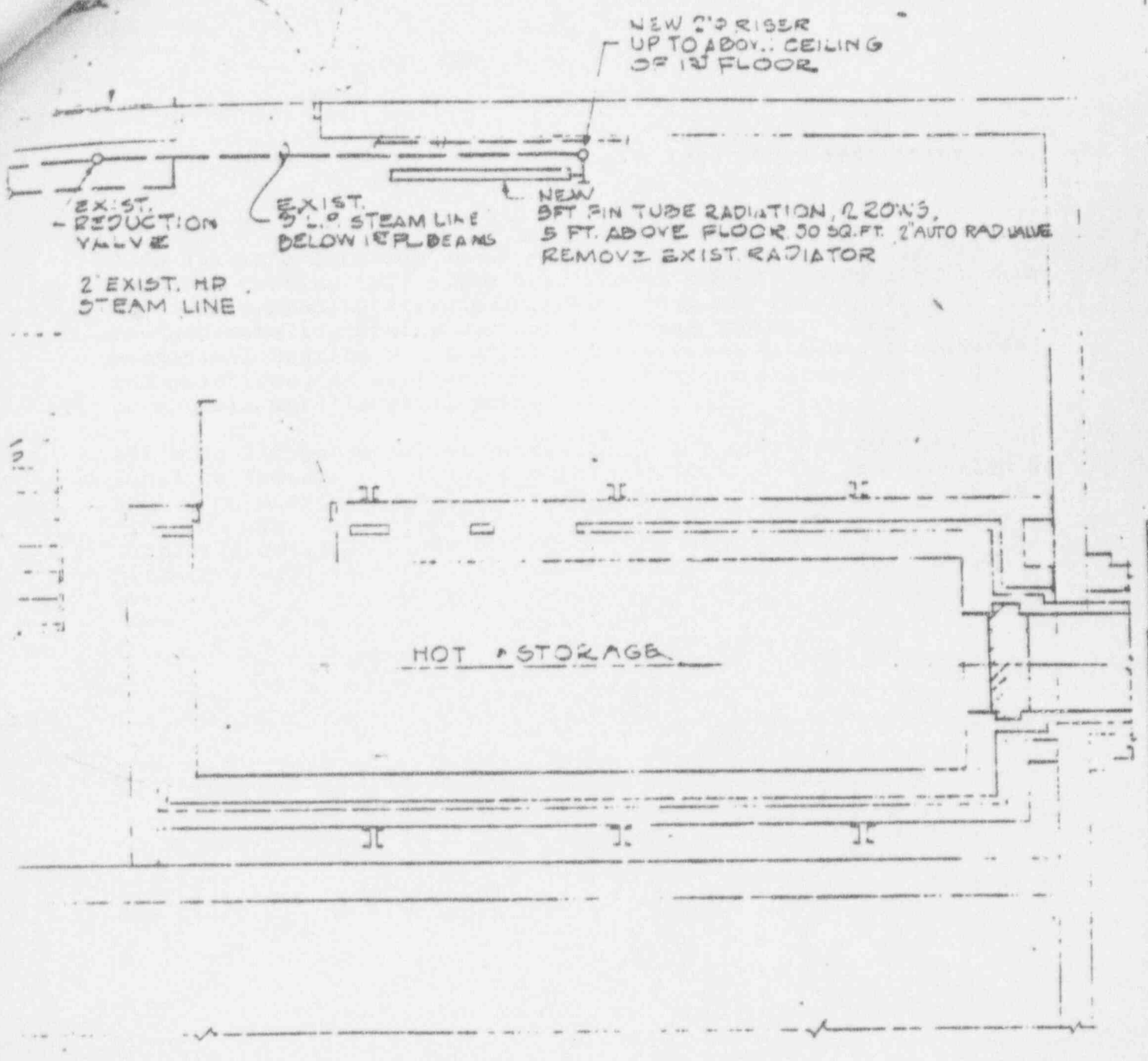
The floor and walls of the storage area are coated with a non-porous paint for ease of decontamination if necessary. The room is secured by a high security lock. This storage area is used to store unsealed radioactive materials that are awaiting radioactive waste disposal.


EXIST. PIPE RAILING TO BE REMOVED
REMOVE EXIST. DOOR & PARTITIONS. REPLACE WITH 6'-0" HIGH METAL TOILET DOOR & PARTITIONS, 1'-0" OPEN AT BOTTOM, CARRY DOOR POSTS TO NEW CEILING
TOILET
3
½"ϕ SAFETY OVERFLOW
NEW 53 GAL. WATER HEATER
D102
REMOVE EXIST. DOOR REPLACE WITH NEW SOLID CORE FLUSH PANEL DOOR
EXIST. PARTITION
20'-0"
NEW 5FT. ENCL. 2 ROW RADIATOR
EXIST. DOOR & FRAME TO BE REMOVED - TRIM OPG - SEE JAMB DETAIL
REMOVE CONC. DOOR SILL - SLOPE AS REQ'D.
OFFICE
2
(EXIST. FL EL.)
15 AMP. RECEPTAC. 18" ABOVE FLOOR TYP. IN THIS ROOM
FURRED-OUT WALL
FURRED OUT WALL METAL STUDS, 3½" INSULATION
D101
NEW DOOR - HOLLOW METAL
NEW 3" CONC. PAD FOR TRANSFORMER (NO REINF.)
EXIST. EQUIPMENT TO BE REMOVED BY OWNER
B
C


MAY 20 1993
CORRIDOR
4
D103
D105
SELF CLOSING DOOR
STORAGE ROOM
7
RED FLASHING LIGHT
NEW PARTITION METAL STUDS @ 16" O.C. 1/2" GYPSUM WALL BOARD ON EACH SIDE (TYP.)
FIN. FL. EL. 704.33'
110V. 15A.
220V. 15A.
COLD LAB
1
OWNER FURNISHED, CONTRACTOR MOUNTED ON FURNITURE 3-6PT STRIP OUTLETS. WIRE 2-20AMP SEPARATE CIRCUITS FOR EACH 110V ±1
COUNTING AREA
DOUBLE DUPLEX OUTLET 15 AMP. MOUNTED BELOW COUNTER TOP AFTER FURNITURE IS INSTALLED
COUNTING AREA
INSTRUMENTATION WORK AREA
OWNER FURNISHED - CONTRACTOR INSTALLED 6PT STRIP OUTLET, 48" ABOVE FLOOR - WIRE 2-20A, SEPARATE CIRCUITS 110V ±1
220V. 15AMP.
BRICK-UP OPENING
NEW DOOR
D106
NEW ALUMINUM THRESHOLD ANCHOR TO CONC. SLAB
NEW 6" CONC. PAD FOR TRANSFORMER (NO REINF.)
RAMP DOWN
UP
REBUILD & RAISE WOODEN PLATE STAIR AND RAILING

R FLOOR PLAN


LIBRARY
5
110V 30A.
BRICK UP OPENING
2'-10½"
25
ALL LAB. FURNITURES BY OWNER
110V. 15A.
HOT LAB.
6
220V 15A
D104
D103
CORRIDOR
4
D105
SELF CLOSING DOOR
RED FLASHING LIGHT
STORAGE ROOM
7
NEW PARTITION METAL STUDS @16" O.C. ½" GYPSUM WALL BOARD ON EACH SIDE (TYP.)
FIN. FL. EL. 704.33'
110V 15A.
220V 15A.
COLD LAB.
1
OWNER FURNISHED, CONTRACTOR MOUNTED ON FURNITURE 5-6FT STRIP OUTLETS WIRE 2-20AMP SEPARATE CIRCUITS FOR EACH 110V ±1
COUNTING AREA
DOUBLE DUPLEX OUTLET 15 AMP. MOUNTED BELOW COUNTER TOP AFTER FURNITURE IS INSTALLED
COUNTING AREA
INSTRUMENTATION WORK AREA
OWNER FURNISHED - CONTRACTOR INSTALLED 6FT STRIP OUTLET. 48" ABOVE FLOOR - WIRE 2-20A, SEPARATE CIRCUITS 110V ±1
NEW DOOR
220V. 15 AMP.
BRICK-UP OPENING
15.4 SQ



LOWER FLOOR - HVAC:

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

ITEM 10

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 10 - Radiation Safety Program

10.1 Personnel Monitoring Equipment: Any radiographer or radiographer's assistant who operates the Gammatron-100, Model A-8-A, either by itself or in conjunction with the Bioimaging Research Corporation Computerized Tomography System, shall wear a whole body thermoluminescent dosimeter (TLD) in addition to a pocket dosimeter having a range from 0 to 200 milliroentgens during operation of the respective system. Since the operation is to be conducted in a permanent radiographic facility in which there is an appropriate alarming/warning device in routine use (Victoreen VAMP, Model 808B, or its equivalent) during operation of the system, the wearing of an alarming ratemeter is not required under these license conditions.

For operation of the Dougherty Box irradiator, the operator(s) shall wear a whole body TLD, as well as a pocket dosimeter which shall have a range from 0 to 200 milliroentgens. The TLDs are exchanged every three months under routine conditions. The pocket dosimeters are calibrated once a year by the U.S. Army Test, Measurement and Diagnostic Equipment (TMDE) Support Group. Calibrated pocket dosimeters shall read within plus or minus 30 percent of the true radiation exposure. The TLD badges are processed and analyzed by the U.S. Army Ionizing Radiation Dosimetry Center (IRDC).

In the event of an incident, or should the pocket dosimeter read off scale, the TLD shall be shipped to the IRDC immediately for processing, and an investigation initiated.

10.2 Radiation Detection Instruments: The Health Physics Branch, Installation Safety Division of the ARDEC Safety, Surety and Environmental Office (SSEO) has available at all times, calibrated portable ionizing chamber instrument(s) that can measure at least up to one roentgen per hour. In addition to the portable survey instruments discussed above, there are several Victoreen VAMP, Model 808B area monitors, or their equivalent, for use during any operation involving the Gammatron-100 system. The calibration due dates for these area monitors are staggered so that there is always a calibrated monitor available for those times when the Gammatron-100 system is to be used. The VAMPs, or their equivalent, are calibrated at intervals not to exceed one year, and after each instrument repair.

These portable radiation detection instruments are calibrated every three months by the U.S. Army TMDE Support Group, presently performed at Tobyhanna Army Depot under NRC license. Calibration

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due dates are staggered so that there are a sufficient number of portable ionizing chamber instruments available for use at all times. The instruments: (1) are calibrated so that the readings are no more than 20 percent of the actual values over the range of the instrument(s); (2) have a calibration chart that shows the results of the calibration; (3) have the date of last calibration, and the due date for the next calibration affixed to the survey meter. Calibration records for the instruments are retained for a minimum of two years after each calibration, and identify who calibrated the instrument(s). Reference attached Table for listing of pertinent radiation detecting equipment presently on hand within the ARDEC Health Physics Branch of SSEO. Equivalent type equipment may be purchased and used in substitution in the future without requiring license amendment.

10.3 Internal Inspection Program: Radiographers and their assistants who operate the Gammatron-100 system will be inspected for compliance with 10 CFR 34 regulations, and license conditions, as well as specific operating and emergency procedures at intervals not to exceed three months, by the health physics staff of the Health Physics Branch within SSEO, or by one of the authorized radiographers for this system. A radiographer may not assess his/her own actions in order to comply with this license condition. Should a radiographer or assistant not have operated the Gammatron-100 system for more than three months since the last inspection, that individual's performance will be observed and assessed prior to the next time that individual participates in the operation. Inspection records on the performance of radiographers or their assistants will be retained a minimum of three years.

Any critical deficiencies discovered during the course of the inspection are to be immediately reported to the Radiation Protection Officer (RPO), and the operation stopped, if that deficiency cannot be corrected at that moment. Operation of the Gammatron-100 alone, or in conjunction with the Bioimaging Research Corporation Computerized Tomography (BIRC-CT) system will not be started up again until the deficiency is corrected, and approval is obtained from the RPO.

Personnel who are to conduct the internal inspections regarding the operation of the Gammatron-100 system will be either health physicists from the Health Physics Branch of SSEO, or one of the radiographers certified in radiation safety through the Certification Program for Industrial Radiography Radiation Safety Personnel of the American Society for Nondestrucutive Testing, Inc. (ASNT-IRRSP).

ITEM 10.2

ARDEC Radiation Detection Instruments or Their Equivalent

Calibrated Each Use with NBS Traceable Standards*

Line No.	Type of Instrument A	Manufacturer B	Model Number C	Number Available D	Radiation Detected E	Sensitivity Range F
1[a]	Gas Flow Proportional counter	Tennelec	LB5100	1	Alpha, Beta, and Gamma	

*Calibration Sets Used for Equipment Calibration and Quality Control Program

a. Isotope Product Laboratories 1
U-238 Standard D-935

Isotope Products Labs 1
Sr-90 Standard #222-86-1

Isotope Products Labs 1
PO-210 Standard #231-9

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ARDEC Radiation Detection Instruments or Their Equivalent

Line No.	Type of Instrument A	Manufacturer B	Model Number C	Number Available D	Radiation Detected E	Sensitivity Range F
	Portable Alpha Survey Meter, Scintillation	Eberline	PAC-ISAGA	6	Alpha	0 - 20,000 CPM 0 - 2 R/hr
	GM Pancake Probe	Ludlum	3	6	Beta & Gamma	0 - 500K CPM 0 - 200 mR/hr
	Ion Chamber	Victoreen	440	1	Gamma	0 - 300 mR/hr
	Ion Chamber	Victoreen	440 RFA	1	Beta, Gamma	0 - 300 mR/hr
	Ion Chamber	Victoreen	470-A	6	Alpha, Beta, Gamma, & X-ray	0 - 1000 mR/hr 0 - 1000 R/hr o - 1000 mR

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ARDEC Radiation Detection Instruments or Their Equivalent

Line No.	Type of Instrument A	Manufacturer B	Model Number C	Number Available D	Radiation Detected E	Sensitivity Range F
	Neutron Probe	Victoreen	488	1	Thermal Neutron	0 - 80,000 CPM
	Neutron Probe with Graded Shielding	Victoreen	488-A	1	Thermal Neutron Thermal & Fast Neutron, Fast Neutron	0 - 80,000 CPM
	GM Tube	Victoreen	489	1	Alpha, Beta, Gamma	0 - 80,000 CPM
	Scintillation	Victoreen	490	2	Gamma	0 -0 800,000 CPM
	Air Sampler (Low Volume)	Gelman	None	1	Alpha, Beta, & Gamma	0 - 30 Liters/M
	Air Sampler (Low Volume)	Nuclear Associates	None	2	Alpha, Beta & Gamma	0 - 30 Liters/M
	High Volume Air Sampler	Staplex	None	2	Alpha, Beta	0 - 70 CFM
	Frisker	Ludlum	177	2	Beta & Gamma	0 - 500K CPM
	R-Chamber w/ Reader	Victoreen	570	1	X-ray & Gamma	0.025 - 250 R
	Dosimeter Charger	Eberline	2000A	2	N/A	N/A

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ARDEC Radiation Detection Instruments or Their Equivalent

Line No.	Type of Instrument A	Manufacturer B	Model Number C	Number Available D	Radiation Detected E	Sensitivity Range F
	Dosimeters	Eberline	862	3	Beta & Gamma	0 - 200 mR
	Dosimeters	Landsverk	IM 9E/PD	5	X-ray & Gamma	0 - 200 mR
	Dosimeters	Landsverk	IM 93/UD	19	Gamma	0 - 600 R
	Dosimters	Nuclear Associates, Inc.	002, 608, 609	10	X-ray, Gamma Neutron	0 - 200 mR (Low Energy), Therma Neutron, Gamma
	Dosimeters	Victoreen	541A	4	Gamma	0 - 200 mR
	Dosimeters	Victoreen	541R	10	Gamma	0 - 200 mR

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The following examples are indicative of the type of issues to be addressed in the internal inspection program for use of the Gammatron-100 system/(BIRC-CT) system:

a. Had the alarm system within Bay 19 been properly activated prior to/following use of the BIRC-CT system, and/or the Gammatron-100 system?

b. Does the operator use a portable radiation instrument to assure the proper location of the Cobalt-60 source each time entry is made into Bay 19 during operation of the Gammatron-100 or BIRC-CT systems?

c. Did the operator wear a TLD finger ring (chip turned in toward palm of hand) when turning the thumb screw on top of the BIRC-CT collimator to either secure or release the Cobalt-60 source restraint within the collimator?

d. Following the initial verification of the presence of the Cobalt-60 source in the Gammatron-100 storage container with a portable radiation meter, had the alarm ratemeter area monitor been set up and turned on within Bay 19 prior to performing any additional procedures, and deactivated as the last procedure of the overall process following the safe return of the Cobalt-60 source to the Gammatron-100 storage container?

The Dougherty Box irradiator is scheduled to be moved to building 312 which is under the direct control of the Health Physics Branch of SSEO. As such, the guidelines provided in this renewal application will be used as part of a radiation work permit which will be issued anytime the irradiator is to be used. Appropriate modifications to these guidelines may be made by the RPO following consultation/aproval from the IRCC, depending on the items to be irradiated during R&D testing, should the need arise, without requiring amendment to the license application.

10.4 Operating Procedures:

The following are procedures/general policy guidelines to be adhered to when operating any of the licensed systems:

a. Gammatron-100 in conjunction with Bioimaging Research Corporation Computerized Tomography (BIRC-CT) System;

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Item 10 - Radiation Safety Program (cont'd)

b. Gammatron-100 by itself;

c. Dougherty Box irradiator;

d. Ameray Corporation self-shielded irradiator.

These procedures may be modified by the RPO following consultation/approval from the IRCC, provided the changes do not compromise safety, without requiring amendment to this license.

10.4.a. Guidelines for Tomographic System with Cobalt-60 Source--Building 908, Bay 19:

(1) Operator(s) are to attach to their clothing a whole body TLD and pocket dosimeter before initiating operations for the day. The pocket dosimeter must be charged prior to the start of each daily operation, and its initial reading recorded in the record book. If at any time during operation, the self-reading pocket dosimeter is found to be off scale, the operator is to immediately curtail operations and, if plausible, crank the source back into the Gammatron-100 storage position--then follow applicable emergency procedures.

(2) Enter Bay 19 using appropriate radiation survey meter to verify that Cobalt-60 source is properly secured in the fully shielded position within the Gammatron-100 exposure device.

(3) Set up and activate the Victoreen Vamp area monitor at the side of the tomography system adjacent to the Gammatron-100. Also, place "Caution (or Danger) High Radiation Area" signs at both entrances to Bay 19.

(4) Perform visual/mechanical inspection of all accessible components of the Gammatron-100 system in accordance with manufacturer's recommendations, including the storage container, control cable and crank assembly, source guide tube, and all interconnection points. The collimator portion of the tomographic system shall be inspected. This inspection must be documented in the appropriate record book.

(5) Position an item to be examined on the turntable of the tomographic system, as needed.

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(6) If not already connected, connect Gammatron-100 to the control cable and crank assembly. Double-check all connections and unlock the Gammatron-100 cable lock on the storage container. Turn crank back to provide tension on the control cable, thereby releasing the locking mechanism.

(7) Connect one end of source guide tube to tomography collimator. Remove flexible safety plug from outlet of the storage container and connect other end of source guide tube to this outlet. The Cobalt-60 system is now ready to be operated.

(8) Secure Bay 19 and interlock system as follows:

(a) Ensure that all personnel have left the exposure bay (Bay 19).

(b) Close and lock the access gate connecting to the rear corridor.

(c) Depress the red interlock button in the corner of the rear passageway, activating the alarm bell. (A continuous ring should be heard).

(d) Double check the Bay for presence of personnel.

(e) Depress the second red button adjacent to the front passageway, which deactivates the alarm bell.

(f) Carrying the survey meter, exit the exposure bay via the front passageway.

(g) Close and lock the front access gate from the outside. The interlock relay will be heard to close, and the warning light in the corridor will illuminate. The exposure room is now ready for radiation operations.

(h) If the alarm bell begins ringing intermittently, and the warning light begins flashing at any time after all interlocks are closed, some part of the interlock system has opened. Exposure operations must be stopped immediately, and the cause of the problem determined. A survey meter must be used when re-entering the exposure bay.

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(9) Transport the Cobalt-60 source from the Gammatron-100 storage container to the tomography collimator by turning the control crank while outside the front access gate. The area radiation monitor (VAMP) adjacent to the storage container will activate an audible alarm while the source is in the guide tube between the storage container and collimator. Continue cranking until the source reaches the stop inside the collimator. The audible alarm will stop when the source is inside the collimator.

(10) Re-enter the exposure room via the front access gate while using a survey meter to verify that the source is contained within the tomography collimator.

(11) Turn the thumb screw on top of the collimator clockwise to secure the source accurately within the collimator. (NOTE: The operator must assure he is wearing a TLD finger ring on hand turning thumb screw with chip facing toward palm of hand).

(12) Secure the exposure room and interlock system, again following paragraph (8) above.

(13) Start radiation exposure of items to be examined by switching on the "Turret" button on the control console. This will cause the collimator to rotate to the open position and activate the "Co-60 Exposed" and "Scan Position" indicator lights. (The "Co-60 Shielded" light will go off).

(14) Perform tomographic scans on the item to be examined by making appropriate keyboard entries in accordance with the tomography manufacturer's instructions.

(15) To terminate a radiation exposure, switch the "Turret" control to off. The "Co-60 Exposed" and "Scan Position" lights will go off, and the "Co-60 Shielded" light will come on when the collimator has rotated to the closed position. This must be done before re-entering the exposure room.

(16) Enter exposure room while using a survey meter to verify that collimator is in the shielded position and that source is contained within collimator. Visually verify position of collimator.

(17) The source may be left in place in the collimator in the shielded position while exchanging items on the turntable.

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(18) Resume exposures and tomographic scans in accordance with paragraphs (8), (13), (14), (15), and (16).

(19) At the completion of tomographic operations, the source must be returned to and secured within the Gammatron-100 storage container as follows:

(a) Enter exposure room in accordance with paragraph (16).

(b) Turn the thumb screw on top of the collimator counterclockwise to release the restraint on the source within the collimator. (NOTE: Operator must wear TLD ring appropriately affixed, and on hand turning thumb screw).

(c) Secure the exposure room and interlock system in accordance with paragraph (8).

(d) Transport the Cobalt-60 source from the tomography collimator into the Gammatron-100 storage container by turning the control crank while outside the front access gate. (Reverse of paragraph (9)). The audible alarm will activate. Continue cranking until the source reaches the stop inside the storage cask, at which point the audible alarm will stop.

(e) Re-enter the exposure room as in paragraph (2).

(f) Remove the source guide tube from the Gammatron-100 storage container. Insert and fasten the flexible safety plug.

(g) Press in and lock the Gammatron cable lock on the storage container. Turn crank back slightly to provide tension on the control cable, allowing the locking mechanism to engage while pressing it in.

(h) Remove and secure key from locking mechanism.

(i) The control cable and crank assembly may be left attached to the Gammatron storage container or removed, as desired. If the storage container is to be relocated, the control cable should be disconnected. The flexible safety plug should be left in place at all times when the source is not in use. The guide tube may be left attached to the tomography collimator when not in use.

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(20) De-activate Victoreen VAMP area monitor by removing power plug from wall socket. Also, remove "Caution (or Danger) High Radiation Area" signs from the entrances to Bay 19.

(21) Read out the pocket dosimeter and document that reading in the record book.

(22) TLDs and pocket dosimeters are to be stored in the storage case located in the lunch room across the hall from Bay 19.

10.4.b. Guidelines for Operation of the Gammatron-100 System -- Building 908, Bay 19:

(1) Operator(s) are to attach to their clothing a whole body TLD and pocket dosimeter before initiating operations for the day. The pocket dosimeter must be charged prior to the start of each daily operation, and its initial reading recorded in the record book. If at any time during operation the self reading pocket dosimeter is found to be off scale, the operator is to immediately curtail operations and, if plausible, crank the source back into the Gammatron-100 storage position--then follow applicable emergency procedures.

(2) Enter Bay 19 using appropriate radiation survey meter to verify that Co-60 source is properly secured in the fully shielded position within the Gammatron-100 exposure device.

(3) Set up and activate the Victoreen VAMP area monitor near to where the Gammatron-100 guide tube will be located. Also place "Caution (or Danger) High Radiation Area" signs at both entrances to Bay 19.

(4) Perform visual/mechanical inspection of all accessible components of the Gammatron-100 system in accordance with manufacturer's recommendations, including the storage container, control cable and crank assembly, source guide tube, and all interconnection points.

(5) Position an item to be examined in the test area that is determined.

(6) If not already connected, connect Gammatron-100 to the control cable and crank assembly. Double check all connections and unlock the Gammatron-100 cable lock on the storage

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(7) Connect the exposure head to the source guide tube. Remove flexible safety plug from outlet of the storage container, and connect the other end of source guide tube to this outlet. The Cobalt-60 system is now ready to be operated.

(8) Secure Bay 19 and interlock system as follows:

(a) Ensure that all personnel have left the exposure bay.

(b) Close and lock the access gate connecting to the rear corridor.

(c) Depress the red interlock button in the corner of the rear passageway, activating the alarm bell. (A continuous ring should be heard).

(d) Double check the bay for presence of personnel.

(e) Depress the second red button adjacent to the front passageway, which deactivates the alarm bell.

(f) Carrying the survey meter, exit the exposure bay via the front passageway.

(g) Close and lock the front access gate from the outside. The interlock relay will be heard to close, and the warning light in the corridor will illuminate. The exposure room is now ready for radiation operations.

(h) If the alarm bell begins ringing intermittently, and the warning light begins flashing at any time after all interlocks are closed, some part of the interlock system has opened. Exposure operations must be stopped immediately, and the cause of the problem determined. A survey meter must be used when re-entering the exposure bay.

(9) Transport the Cobalt-60 source from the Gammatron-100 storage container through the guide tube to the exposure head by turning the control crank while outside the front access gate. The area radiation monitor adjacent to the storage container will activate an audible alarm while the source is in the guide tube. Continue cranking until the source reaches the stop at the exposure head.

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(10) At the completion of the exposure operation, the source must be returned to, and secured within the Gammatron-100 storage container as follows:

(a) Transport the Cobalt-60 source from the exposure head into the Gammatron-100 storage container by turning the control crank while outside the front access gate. (Reverse of paragraph (9)). Continue cranking until the source reaches the stop inside the storage cask, at which point the audible alarm will stop.

(b) Re-enter the exposure room as in paragraph (2).

(c) Either place another item for exposure in place, or if work is completed, even with the intent of start-up later that day, remove the source guide tube from the Gammatron-100 storage container. Insert and fasten flexible safety plug.

(d) Press in and lock the Gammatron cable lock on the storage container. Turn crank back slightly to provide tension on the control cable, allowing the locking mechanism to engage while pressing it in.

(e) Remove and secure key from locking mechanism.

(f) The control cable and crank assembly may be left attached to the Gammatron storage container, or removed, as desired. If the storage container is to be relocated, the control cable should be disconnected. The flexible safety plug should be left in place at all times when the source is not in use.

(11) De-activate Victoreen VAMP area monitor by removing power plug from wall socket. Also, remove "Caution (or Danger) High Radiation Area" signs from the entrances to Bay 19.

(12) Read out the pocket dosimeter, and document that reading in the record book.

(13) TLDs and pocket dosimeters are to be stored in the storage case located in the lunch room across the hall from Bay 19.

10.4.c. Guidelines for Operation of the Dougherty Box Irradiator

(1) Using a survey meter, check the storage container to be sure that the source is positioned near the center of the container on the vertical axis.

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(2) Visually check the scale on the front of the box to see if the source is in a safe position, fully seated in the lower shipping container.

(3) Visually check interlock mechanism on the top of the box to see that the interlock is engaged.

(4) Unlock the door of the radiation chamber box, and open it about one inch.

(5) Check the door opening with the survey meter before fully opening the door.

(6) Place the sample or experimental setup to be irradiated in position in the radiation chamber.

(7) Close and lock the door of the box.

(8) Set up an appropriate radiation caution sign, if warranted, between the Dougherty Box and the entrance to building 312.

(9) Raise the source to the desired position using the mechanical crank handle on the side of the box, and place the pin in the locking disc.

(a) As the source is raised, the position indicator should move down the scale.

(b) When the source is in the fully raised position, the scale indicator is on the mark near the bottom of the scale. The mechanical interlock on the top of the box should also be fully engaged.

(10) If the irradiator is to be left unattended during any portion of the irradiating period, it shall be assured that building 312 is locked.

(11) Enter all appropriate information in the source use log book.

(12) Upon completion of irradiation time, remove the pin from the locking disc, and lower the source with the mechanical crank.

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(13) Repeat numbers (1), (4), and (5) carefully.

(14) Remove the samples or the experimental setup.

(15) Close and lock the door of the radiation chamber box.

(16) Remove the caution signs.

(17) Complete the log book entries.

Safety Requirements for Operation of the Dougherty Box System

1. Personnel operating the source will wear a whole body TLD and a pocket dosimeter before initiating operations for the day. The pocket dosimeter must be charged prior to the start of each daily operation, and its initial reading recorded in the record book. If at any time during operations the self reading pocket dosimeter is found to be off scale, the operator is to immediately curtail operations, and follow applicable emergency procedures.

2. When the door of the box is to be opened, any non-radiation personnel and visitors will clear the area, or be assigned a temporary thermoluminescent dosimeter.

3. The door to the box will be kept locked at all times when it is not open for experimental setup or breakdown. The key will be kept by the Health Physics Branch of SSEO.

4. A "Caution (or Danger) Radioactive Material" sign will be posted on or near the Dougherty Box at all times. Additional signs will be posted when the source is in use, as appropriate.

5. In the event that the outer portion of the source plug jams in the guide tube, the source can still be raised and lowered with the mechanical crank handle; however, the scale position indicator will not function. If this occurs, notify the RPO immediately, and do not operate the mechanism. Keep the door locked.

6. An ionization chamber survey meter shall be used by the operator during source manipulation. The meter will be checked with a check source for proper operation before using it.

7. Maintain a log book of operations containing at least date, time, operator's name, brief description of operation, safety checks, and dosimeter information.

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10.4.d. Ameray Corporation Self Shielded Irradiator:

(1) There are no general policy guidelines at present for the safe use of this irradiator, since it continues to be licensed for storage only, and this application requests a renewal of the storage mode.

(2) Any health physicist from the Health Physics Branch of the ARDEC Safety Office, who should have occasion to enter building 3030, takes portable ionization chamber instrument readings upon approaching and entering the facility to determine whether abnormal high radiation levels exist. (For a quick qualitative assessment, a portable G-M pancake-type probe may be used instead). Should this be the case, the facility would immediately be evacuated of personnel, the facility securely locked, and the RPO immediately notified to address the situation.

(3) Should it become desirable to use this irradiator at a later date, procedures will be formulated that will be approved by both the RPO and the IRCC before a license amendment application is submitted to the NRC. Topics to be included in such procedures would include safe operating procedures; use of personnel dosimetry; procedures for securing the area when the irradiator was unattended, and leak testing requirements.

10.5 Emergency Procedures: Should abnormally high radiation readings be detected during the course of operation (i.e., stuck source in guide tube, etc.), inventory, inspection, etc., for any of the systems covered under this license application, the following procedures would apply:

a. Immediately evacuate the area;

b. Securely lock the test facility;

c. Determine and post the area where an exposure rate of 2 milliroentgens per hour is detected (line of restricted area boundary), if present, either inside or outside of the building. If this exposure rate is determined to be inside the locked test facility, do not re-enter that location at this time;

d. If more than one person is present, maintain continuous surveillance from beyond the restricted area boundary, while another individual immediately contacts the RPO (extension 43126/

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43742); Security (extension 46666); Fire Department (extension 117), if appropriate; and the senior radiographer for the system, if applicable;

e. The RPO or his alternate, in conjunction with the radiographer(s), if applicable, will assess the situation through interviews with the operator(s) on duty at the time of the incident, and take cautious radiation measurements of the area with a portable radiation detection meter to further define the situation. (surveyors are to wear whole body TLD, and pocket dosimeter);

f. Withdraw beyond the restricted area boundary to determine appropriate course of action to remedy the problem (in-house action versus request for outside support);

g. All personnel are to read their respective pocket dosimeter, and have readings recorded immediately upon exiting from the restricted area.

In the event of fire involving a system covered by this license application, the ARDEC Fire Department and Health Physics Branch of SSEO would immediately be notified. The Health Physics Branch would provide radiological safety support and guidance to the Fire Department during the fire, and manage the subsequent decontamination/cleaning procedures in order to assure that all efforts are performed in the most radiologically safe manner.

Theft of any of the systems covered by this license application is highly unlikely based on the size/weight of the system and/or security considerations involved.

10.6 Maintenance of Records:

The following records will be maintained in support of the systems/operations covered by this license application (time-frames in parenthesis are the minimal retention periods):

a. Instrument calibration records - (3 years);

b. Leak test results--dpm or microcuries (3 years);

c. Quarterly physical inventory records (3 years);

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d. Utilization logs (3 years);

e. Device/storage container inspection and maintenance records (3 years);

f. Alarm system test records (3 years);

g. Training records (including copies of written tests, dates of oral tests and field exams) (3 years);

h. Superseded operating and emergency procedures (3 years);

i. Pocket dosimeter readings (3 years);

j. TLD records (retain until license is terminated);

k. End of day/shift source storage survey record (3 years);

10.7 Leak Testing: Not applicable at the present time for the Ameray Corporation self-shielded irradiator which contains the Cesium-137 source, since it remains in a storage-only mode and, therefore, does not need to be tested for leakage. Should it become desirable to once again use this self-shielded irradiator, or to transfer it to another licensee, the irradiator shall be leak tested before use, (following approval of license amendment request), or transfer.

Leak testing is to be performed at least every six months on the Gammatron-100 system/collimator for BIRC-CT system, as well as the Dougherty Box irradiator. Swipes for leak testing will be taken at the nearest accessible point to the sealed source storage position and/or at what would be considered other appropriate measuring points. Leak test locations will be as follows:

a. Dougherty Box--Leak test port located on side of storage container;

b. Gammatron-100 system--The port where the source can be cranked out into the guide tube;

c. Collimator for BIRC-CT system--Channel that accepts Cobalt-60 source from flexible guide tube;

Leak test samples are taken by health physicists from the Health Physics Branch of SSEO. The samples are to be taken as dry swipes. Quantitative measurements of the swipes will be made on a

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Tennelec LB5100 alpha/beta gas flow proportional counting system, or equivalent piece of laboratory equipment. The measuring equipment will be capable of detecting the presence of 0.005 microcurie of radioactivity. The equipment will be checked for reliability using the Chi-Square technique.

The following is a sample calculation for conversion of measurement data to microcuries:

$5.5\ \text{DPM}^{*} \times 4.505 \times 10^{-7}\ \text{uCi/DPM} = 2.48 \times 10^{-6}\ \text{uCi} = .00000248\ \text{microcuries}$

A record of leak test results shall be retained for inspection by the NRC for at least three years from date of leak test swipe.

*Takes into account the measured counts per minute of the sample, background correction, and the efficiency of the measuring instrument against a calibration source.

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Item 10.8 -

Daily Inspection of Gammatron - 100 Exposure Device:

The Gammatron - 100 equipment shall be checked for obvious defects prior to use each day the equipment is used. The following specific points shall be checked:

1. Source Container Shell Assembly: Visually check for external physical damage to shell and legibility of labels.

2. Safety Plug and Lock-Box Cap: Remove these items, making sure they are not damaged and that they can be smoothly and securely attached.

3. Source Outlet Nipple: This should not be out-of-round and the Safety Plug should move through it smoothly.

4. Source Guide Tube: Observe outer surface of entire length of flexible tube for physical damage. Check open end of tube for possible foreign material and check connections on both ends for smooth operation and secure attachment.

5. Lock Plunger: Check that lock is free of foreign material and operates smoothly. Plunger should "pop up" to one-half inch when unlocked.

6. Source Connector (on source pigtail): Check that the flexible cable is straight at the connector and firmly attached. Observe holding pin to be sure that it is not bent or excessively worn.

7. Drive Cable: Check that the source connector is straight and firmly attached to the cable and that the hole is not out-of-round. The cable itself should be free of foreign material, excessive rust, kinks, or other damage.

8. Drive Cable Conduit: Observe outer surface of entire length of flexible tube for physical damage. Check the threaded fitting at the source connector end for damage or foreign material and for free rotation.

9. Control Assembly: Observe the gear box assembly and crank handle for any physical damage or bending. Check that the crank is securely attached and turns freely in both directions.

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 10.9 -

GAMMATRON-100 EXPOSURE DEVICE

QUARTERLY MAINTENANCE AND INSPECTION

Periodic inspection of exposure devices shall be performed at intervals not to exceed three months or prior to first use thereafter, or whenever operation of the device appears to be impaired through abuse or wear. However,it should be emphasized that this applies only to the device. DO NOTHING TO THE SOURCE. If there is evidence that the source might be worn or faulty in any way, contact the RPO and the manufacturer immediately. Perform device inspection and maintenance as follows:

1. Remove safety cap in lock box and inspect source connector. The holding pin should still have a true 90 degree elbow, it should be straight and parallel with axis of source connector and the key on apex of elbow should not be worn excessively. Check flexible cable at connector for straightness.

   Maintenance: If the elbow is not bent out of line, the mating connector should then be connected to the source and tested by pulling straight back on cable applying about 30 to 40 pounds pressure.

2. The lock plunger should be inspected and checked for ease of operation. Foreign matter may at times foul the plunger and make it inoperative. The lock plunger may not retract to its fullest extent which is 1/2 inch. This would prevent free travel of the source in and out of the lock box.

   Maintenance: The lock plunger may be removed by removing the two 8-32 set screws in the lock box. Wash lock in solvent to remove dirt or other foreign matter. Lock may also be cleaned and lubricated by spraying a lubricant (such as WD-40) into the lock.

3. Inspect the source outlet nipple by first removing safety plug. The outlet nipple should be round and smooth so that it will match with the I.D. of the source tube.

   Maintenance: If the outlet nipple should be out-of-round it can sometimes be straightened by using a punch or round bar on the inside of the outlet. If it cannot be straightened or if the nipple has been broken by dropping the unit, it must be replaced. This replacement can be done in the field shop, or returned to the manufacturer.

4. Inspect labeling on exposure device. The warning signs and source identification tags should be distinct and legible.

5. Inspect source tubes for damage such as crimps, foreign matter, ease of connecting, and disconnecting from exposure device.

   Maintenance: Crimps, kinks, and other damaged places may be cut out and connectors placed on ends so that tube is not shortened excessively. The quick disconnect coupling that connects to outlet nipple of exposure device may be removed with heat and replaced. Foreign matter may be washed from tube with solvent and blown

Item 10.9 - Maintenance & Inspection (cont'd)

with compressed air.

6. Inspect source connector on drive cable. The hole should be 7/64" in diameter when new. This hole should show some wear after much use but should not be out-of-round to the extent that it will disconnect from the mating piece other than in the correct position. It should not be loose on the drive cable. The portion of the connector with the connector hole should not be bent, but should be straight and parallel with body of connector.

   Maintenance: This worn connector may be replaced by one of two methods.

   1. Send back to the manufacturer to have new connector replaced by swedging on new replacement.
   2. Order new core with connector attached.

7. Inspect remainder of drive cable for wear, rusty sections, causing cable to become stiff and non-flexing, kinks, or other damaging conditions that would prevent cable from running on gear in the gear box housing.

   Maintenance: The drive cable should be cleaned with a solvent such as varsol, diesel fuel or some other solvent that will not dry out. This is done to remove sand, dust and other foreign matter that will cause abrasions

Item 10.9 - Maintenance & Inspection (cont'd)

in the exposure device and gear box drive mechanism. Drive cable that has become rusty and non-flexible should be replaced. Failure to replace cable may cause controls to become stiff, hard to operate, wear excessively, and possibly break. The cable would usually break when the source is exposed. Lubrication of the drive cable is important. In areas where there is a problem with sand or other abrasive material, dry powered graphite is excellent. Graphite should not be used continually; however, since the graphite will tend to pack in the gear box and cause excessive wear to the gear housing and to the gear. Where the control cables can be kept reasonably clean, a light oil will be adequate.

8. Inspection of control assembly. This assembly consists of the gear box assembly and the crank handle. The bronze bushings in the gear housing and the plate are the most likely places to find wear. When these bushings are worn they tend to permit the gear to wobble and eventually wear out. Usually (due to some build-up either on the drive cable or the gear teeth) there will be some wear around the inner circumference of the housing. This

Item 10.9 - Maintenance & Inspection (cont'd)

will permit the drive cable to slip on the gear and prevent source from moving properly through the exposure device.

Maintenance: It is suggested that if powdered graphite is used as a lubricant the gear box be cleaned with compressed air occasionally so as to remove any packed graphite in the gear mechanism. The application of some type light oil on bronze bushings will help prevent excessive wear.

9. Inspect drive cable housings or conduit. This conduit can be damaged by running a pallet truck over it, severe kinking, or by dropping some object on the conduit. Any of these can prevent the drive cable from moving freely. The conduit at the end connections may become damaged from excessive flexing while being assembled or disassembled.

Maintenance: In any case where the inner liner has been damaged, the conduit must be replaced. When the outer covering has been damaged, waterproof tape should be wrapped around the break to prevent the entrance of water or other corrosive substances. If the extreme ends of the conduit are damaged, these can be replaced with new pieces by returning the conduit to the manufacturer.

ITEM 10

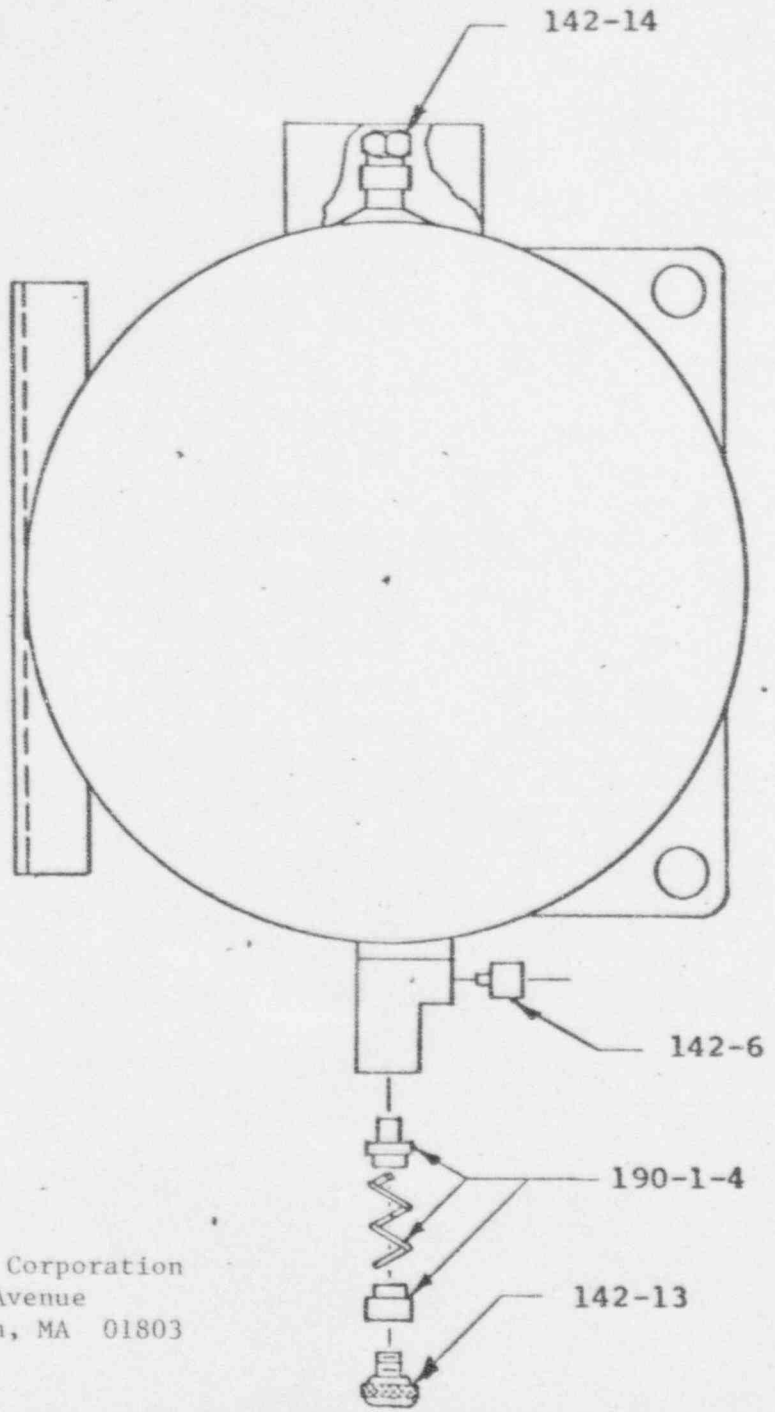
ARDEC, Picatinny Arsenal, NJ 07806-5000

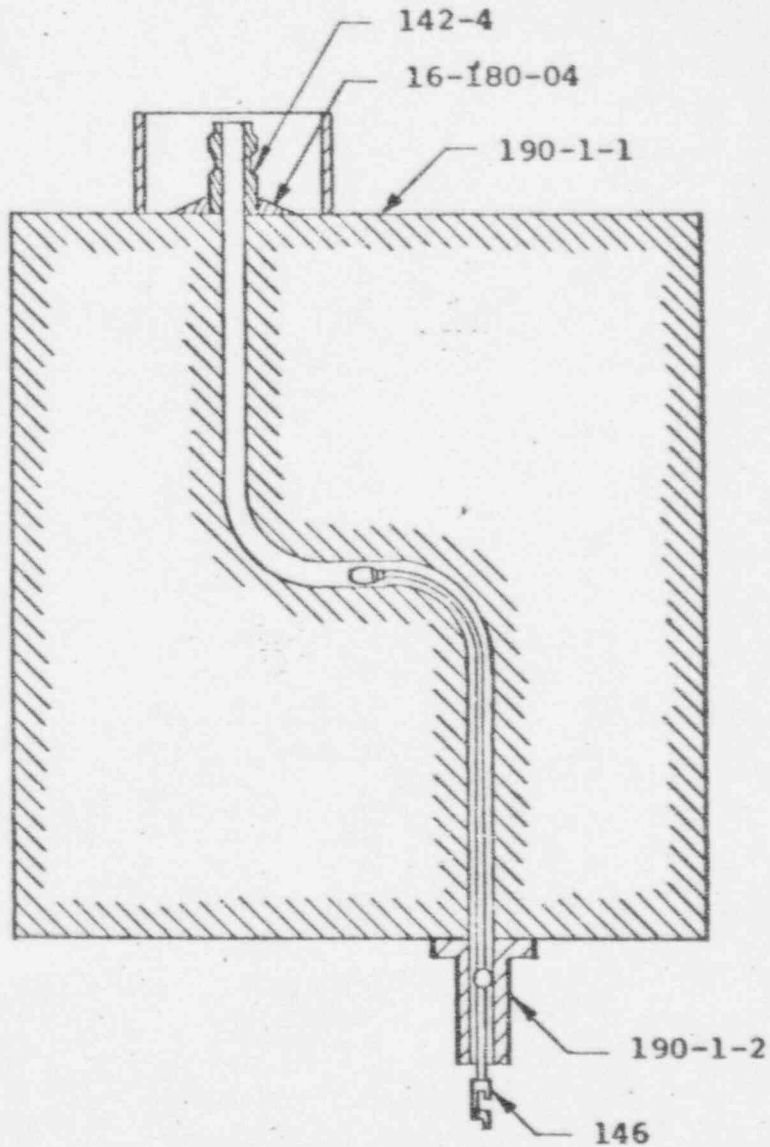
MAY 20 1993

GAMMATRON - 100 EXPOSURE DEVICE

PARTS

142-13	Lock Cap
142-14	Safety Plug
142-4-55	Outlet Nipple
142-6	Lock Plunger
146	Pigtail
190-1-1	Shell Assembly
190-1-2	Disconnect Proof Lock Box
190-1-4	Lock Box Insert Assembly
16-180-04	Outlet Fitting





101

Amersham Corporation
40 North Avenue
Burlington, MA 01803

GAMMA IND. BATON ROUGE, LA.	
GAMMATRON-100-A. (PARTS)	
SCALE: NONE	DATE: 12-4-70
DRAWN BY: J.R.G.	DRAWING NO: 190-1

MAY 20 1993

ITEM 11

ARDEC, Picatinny Arsenal, NJ 07806-5000

Item 11 - Waste Management

If at a later date a determination is made to dispose of the Cs-137 source, or of the Cobalt-60 sources for the Gammatron 100/ Computerized Tomography System, or for the Dougherty Box, disposal will be made only by transfer of the radioactive material to a licensee specifically authorized to accept it. (This is in addition to the transfer of the AIDECS Cobalt-60 sources to NPI in the near future, as previously referenced in this license renewal application.) Waste disposal activities would be coordinated by Headquarters, U.S. Army Armament, Munitions and Chemical Command (HQ, AMCCOM), Rock Island, Illinois. HQ, AMCCOM is the responsible organization within the U.S. Army for administering the procedures necessary for assuring the safe disposal of all radioactive waste.

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MS-16
Q-4

DEPARTMENT OF THE ARMY
U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NJ 07806-5000

January 25, 1993

REPLY TO
ATTENTION OF

Installation Safety Division
Health Physics Branch

U.S. Nuclear Regulatory Commission,
Region I
Attention: Mr. Duncan White
475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

Dear Mr. White:

This letter is in reference to your enclosed letter dated December 23, 1992, in which you requested this office submit a completely revised renewal application for our 29-00047-06 license. (Please refer to License No. 29-00047-06; Docket No. 030-05216; Control No. 116060). The reasons given for this request are that there have been many amendments to this license over the years, and in addition, the license was recently combined with two other ARDEC licenses (29-00047-8 and -09).

Per guidance provided during telephonic discussions between yourself and Mr. Richard Fliszar, ARDEC Radiation Protection Officer, on January 20, 1993 concerning this matter, this correspondence provides a formal request to establish a suspense date of May 28, 1993 for the submission to your office of the revised -06 application. This time increment is requested in order to be able to compose a thoroughly revised renewal application which then will require review and concurrence by the U.S. Army Surgeon General's Office.

It is the understanding of this office that should the May 28, 1993 milestone be acceptable, all present license conditions/amendments which relate to the -06 license, including those from the previous -08 and -09 licenses, will remain in effect until final actions are taken by the NRC on the revised renewal application. In particular, the authorization given this office for the transport of the American Nuclear Corp sealed Cobalt-60 source, Dwg. No. P-101814, contained in Amendment 10

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JAN 28 1993

(Docket or Reference No. 030-12535) of the 29-00047-08 license, which is a one-time occurrence, needs to remain in effect in order that we may be able to carry out that action as soon as Neutron Products Inc. receives license authorization from the State of Maryland to disassemble/ reassemble the Cobalt-60 containing Dougherty Box system. Should this Cobalt-60 source not be moved prior to submission of the revised -06 renewal application to your office, documentation for this one-time action will be included in the renewal request.

Any questions or correspondence concerning this matter should be directed to Mr. Fliszar who may be reached at 201-724-3126.

Sincerely,

Ken Duncan

Kendal M. Duncan
Chief, Installation Safety
Division

Enclosure

Copies Furnished:
AMCSF-P (Mr. John Manfre)
AMSMC-SFS (Mr. David Skogman)
SMCAR-QAH-T (Mr. Emmett Barnes)
SMCAR-SE

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

DEC 23 1992

License No. 29-00047-06
Docket No. 030-05216
Control No. 116060

Department of the Army
Picatinny Arsenal
ATTN: Richard Fliszar, RPO
Army Armament Research and
Development Engineer
Dover, New Jersey 07806-5000

Dear Mr. Fliszar:

This is in reference to your request in a letter dated August 28, 1992 to renew License No. 29-00047-06. In order to continue our review, we need the following additional information:

As stated in the Notice of Expiration which was sent to you, we reserve the right to request a complete, up-to-date application in cases where licenses have been amended frequently or are supported by a large number of fragmented or disjointed documents. We note that License No. 29-00047-06 has been amended 10 times and was recently combined with two other licenses. We are, therefore, requesting that you please submit a single complete application to reflect your current radiation safety program.

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. 116060. If you have any technical questions regarding this deficiency letter please call me at (215) 337-5042.

In order to continue prompt review of your application, we request that you submit your response to this letter within 30 calendar days from the date of this letter.

Sincerely,

Duncan White

Duncan White
Nuclear Materials Safety Branch
Division of Radiation Safety
and Safeguards

Enclosure: NRC Form 3

ENC 1

DEC 23 1992

License No. 29-00047-06
Docket No. 030-05216
Control No. 116060

Department of the Army
Picatinny Arsenal
ATTN: Richard Fliszar, RPO
Army Armament Research and
Development Engineer
Dover, New Jersey 07806-5000

Dear Mr. Fliszar:

This is in reference to your request in a letter dated August28, 1992 to renew License No. 29-00047-06. In order to continue our review, we need the following additional information:

As stated in the Notice of Expiration which was sent to you, we reserve the right to request a complete, up-to-date application in cases where licenses have been amended frequently or are supported by a large number of fragmented or disjointed documents. We note that License No. 29-00047-06 has been amended 10 times and was recently combined with two other licenses. We are, therefore, requesting that you please submit a single complete application to reflect your current radiation safety program.

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. 116060. If you have any technical questions regarding this deficiency letter please call me at (215) 337-5042.

In order to continue prompt review of your application, we request that you submit your response to this letter within 30 calendar days from the date of this letter.

Sincerely,

Original Signed By:
Duncan White

Duncan White
Nuclear Materials Safety Branch
Division of Radiation Safety
and Safeguards

Enclosure: NRC Form 3

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ML 10

DW
RI:DRSS
White/gc

12/22/92

DEPARTMENT OF THE ARMY
U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NEW JERSEY 07806-5000

August 28, 1992

030-05216

REPLY TO
ATTENTION OF

Installation Safety Division
Health Physics Branch

U.S. Nuclear Regulatory Commission,
Region I
Nuclear Materials Safety Branch,
Section B
Attn: Mr. Frank Costello
475 Allendale Road
King of Prussia, PA 19405

Dear Mr. Costello:

Radioactive Material license, 29-00047-06, issued to the U.S. Army Armament Research, Development and Engineering Center (ARDEC), expires on September 30, 1992. Request that this license be renewed in its entirety in accordance with the statements, representations, and conditions previously specified in renewal application for this license, dated September 24, 1986 (Amendment 9 dated March 25, 1987); along with amended license conditions as represented in Amendments 10 thru 14 dated September 8, 1987, January 27, 1988, December 8, 1988, May 23, 1990, and July 22, 1991, respectively.

It is the understanding of the undersigned that the submission of this correspondence will comply with the NRC license requirements for timely filing of renewal applications and, as such, the provision of the present license will remain in effect until action is taken on the renewal application.

Please contact Mr. Richard Fliszar, ARDEC Radiation Protection Officer at (201)724-3126/3742 for any technical questions which might arise from this correspondence.

Sincerely,

Ken Duncan

Kendal M. Duncan
C, Installation Safety
Division

Copies Furnished:
AMCSF-P (Mr. John Manfre)
AMSMC-SFS (Ms. Kathy LaFrenz)
SMCAR-SE

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SEP 0 2 1992

FEB 3 1992

Docket No. 030-05216

License No. 29-00047-06

Control No. 116060

Department of the Army
U.S. Army Armament Research, Development
and Engineering Center
ATTN: Richard Fliszar
Radiation Protection Officer
Picatinny Arsenal, New Jersey 07806-5000

Dear Mr. Fliszar:

SUBJECT: LICENSE RENEWAL APPLICATION

This is to acknowledge receipt of your application for renewal of material(s) license identified above. Your application is deemed timely filed, and accordingly, the license will not expire until final action has been taken by this office.

Any correspondence regarding the renewal application should reference the control number specified above.

Sincerely,

Original Signed By:
Sheryl Villar

Sheryl Villar, Chief
Licensing Assistant Section
Division of Radiation Safety
and Safeguards

2/3/92 2/3/92

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DEPARTMENT OF THE ARMY - 0001.0.0
02/03/92

ML 10

030-05216

DEPARTMENT OF THE ARMY
U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NEW JERSEY 07806-5000

January 17, 1992

X

REPLY TO
ATTENTION OF

Safety Office
Health Physics Branch

U.S. Nuclear Regulatory Commission,
Region I
Nuclear Materials Safety Branch,
Section B
Attn: Mr. John Kinneman
475 Allendale Road
King of Prussia, PA 19405

Dear Mr. Kinneman,

The U.S. Army Armament Research, Development and Engineering Center (ARDEC) has two NRC licenses about to expire -- 29-00047-06 (March 31, 1992), and 29-00047-08 (April 30, 1992). As your office is aware, it has been Army policy to submit renewal applications to your agency through higher headquarters within the Army. This entails an in-house review period of several months, prior to submission of that application to the NRC.

Work has been performed in preparation for the submittal of each of these license renewal applications; however, due to activities underway at present, that relate to each of these licenses, neither application is ready for submittal. On July 22, 1991, an amendment was issued for the "06" license that authorized the use of the Cobalt-60 source in the Gammatron-100, in combination with a newly-purchased customized tomography system, for the purpose of analyzing ammunition components. One major purpose of the amendment was to obtain sufficient documentation for license submittal pertaining to measured radiation readings, designation of radiation zones based on dose rates, and determination of proper operating procedures. Due to work schedules and priorities of the organization that is to operate the tomography system, along with an almost immediate failure of the motor that raises and lowers the collimator assembly which houses the Cobalt-60 source when transferred to the tomography system, the system has only been operated to a limited degree, that being for several hours on the last week of October 1991. Since then, no further testing or measurements have been made, and the system has not been further operated. (NOTE: the Cobalt-60 source has been in storage in its authorized Gammatron-100 container).

NRC EXEMPT

On January 17, 1992, a new motor was installed on the tomography system. However, based on other taskings at this time, both within the Safety Office and the organization that will use

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the tomography system, it does not appear that the renewal application can be completed and processed for submittal in time prior to the expiration date of this license, and certainly not before the mandated 30-day pre-expiration submittal of March 1, 1992 that is required for recognition of timely submittal and continued authorization of present license conditions. This is in addition to the fact that ARDEC has already surpassed the cut-off date for submittal of this renewal application to Army higher headquarters for sufficient review time.

Though the operations as they relate to the "08" license have not changed, preparation is underway to relocate the Dougherty Box from building 3021, for which it is licensed to operate, to building 312. Arrangements are underway to contract out the movement of this system which contains a high activity Cobalt-60 source, by an appropriately licensed contractor. Present plans call for contracting out this effort to Neutron Products, Inc, 22301 Mt. Ephraim Rd., P.O. Box 68, Dickerson, MD 20842, (301) 349-5001. Until final arrangements can be made, and documented, it seems premature to submit a license renewal application.

The other two Cobalt-60 sources listed on these licenses are awaiting either disposal or transfer to another licensee at this time.

Based on the above information, it is requested that each license expiration date be extended six months.

Please contact Mr. Richard Fliszar, ARDEC Radiation Protection Officer at (201)724-3126/3742 for any technical questions which might arise from this correspondence. Your prompt attention to this matter is greatly appreciated.

Sincerely,

Ken Duncan

Kendal M. Duncan
C, Installation Safety Division

Copies Furnished:

AMCSF-P (Mr. John Manfre)
AMSMC-SFS (Ms. Kathy LaFrenz)
SMCAR-SE

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: 03510
STATUS CODE: 2
FEE CATEGORY: EX 3P
EXP. DATE: 19920331
FEE COMMENTS: W 30 PENDING
DECOM FIN ASSUR REQD: N

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED
APPLICANT/LICENSEE: ARMY, DEPARTMENT OF THE
RECEIVED DATE: 920124
DOCKET NO: 3005216
CONTROL NO.: 116060
LICENSE NO.: 29-00047-06
ACTION TYPE: RENEWAL

2. FEE ATTACHED
AMOUNT: ~~0~~
CHECK NO.: ~~0~~

3. COMMENTS

SIGNED M. A. Perkins
DATE 2/4/92

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED /__/)

1. FEE CATEGORY AND AMOUNT: _____

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:
AMENDMENT _____
RENEWAL _____
LICENSE _____

3. OTHER _____
_____

SIGNED _____
DATE _____