UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 13, 2001

Ms. Lilia Lopez, Esq.
Assistant Attorney General
Attorney General of Washington
905 Plum Street, Building 3
P.O. Box 40109
Olympia, Washington 98504-0109

Dear Ms. Lopez:

I am pleased to respond to your March 8, 2001 letter concerning the U.S. Nuclear Regulatory Commission (NRC) or Atomic Energy Commission (AEC) regulatory authority over military reactors in general and the SM-1A Army reactor at Ft. Greely, Alaska in particular. You asked whether or not NRC, or AEC before it, does or has asserted regulatory authority over the Ft. Greely reactor or any other military reactor and if some military reactors are or have been subject to NRC or AEC regulatory authority, while others have not, what distinguishes one type from the other? In addition, you questioned why military reactors and related materials are not subject to regulation and requested relevant written documentation.

A search of NRC files indicates that the AEC did not license the SM-1A reactor at Ft. Greely which operated from 1962 until 1973. The SM-1A reactor was designed, built and operated as part of the Army Nuclear Power Program under authority granted to the Department of Defense (DOD) by Section 91b of the Atomic Energy Act of 1954, as amended. Section 91b authorizes DOD to procure and utilize special nuclear material in the interest of national defense and to acquire utilization facilities, i.e., reactors for military purposes. Section 110(b) of the Atomic Energy Act excludes such utilization facilities acquired by DOD from any of the licensing requirements of the Atomic Energy Act. Enclosed for your information is a publication issued by the Army in the mid 60's which describes the Army Nuclear Power Program. Also enclosed is a 1966 article from *Nuclear Safety* entitled: "Nuclear Reactor Safety Review Procedures in the Department of Defense." This article discusses the distinction between DOD reactors covered under Section 91b and those DOD research reactors licensed by the AEC. It also includes a list of Section 91b reactors and those licensed by AEC that existed in 1966 and describes DOD's relationship with the AEC.

While the SM-A1 reactor operated under Section 91b authority, a review of NRC files reveals that the AEC did issue a byproduct material license (50-07082-010) to the U.S. Army Engineer Reactor Group at Ft. Greely for certain radioisotopes including Polonium 210, Strontium 90, Cobalt 60. This license was terminated on October 2, 1973. Enclosed for your review are copies of our files for this license. NRC has been unable to locate any files associated with the

Ft. Greely reactor operated under the Section 91b authority. Since this reactor operated during a period prior to the establishment of the NRC, you may want to contact the U.S. Department of Energy to determine if they have information relevant to your request. We suggest that you contact the History and Records Group in the Office of the Executive Secretariat, Washington, DC 20585-0101, (202) 586-4389.

I hope that you find this information helpful. Please call me at 301-415-3340 if you have further questions.

Sincerely,

Paul H. Lohaus

Paul H. Lohaus, Director
Office of State and Tribal Programs

Enclosures:
As stated

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Sincerely,

/RA/

Paul H. Lohaus, Director
Office of State and Tribal Programs

Enclosures:
As stated

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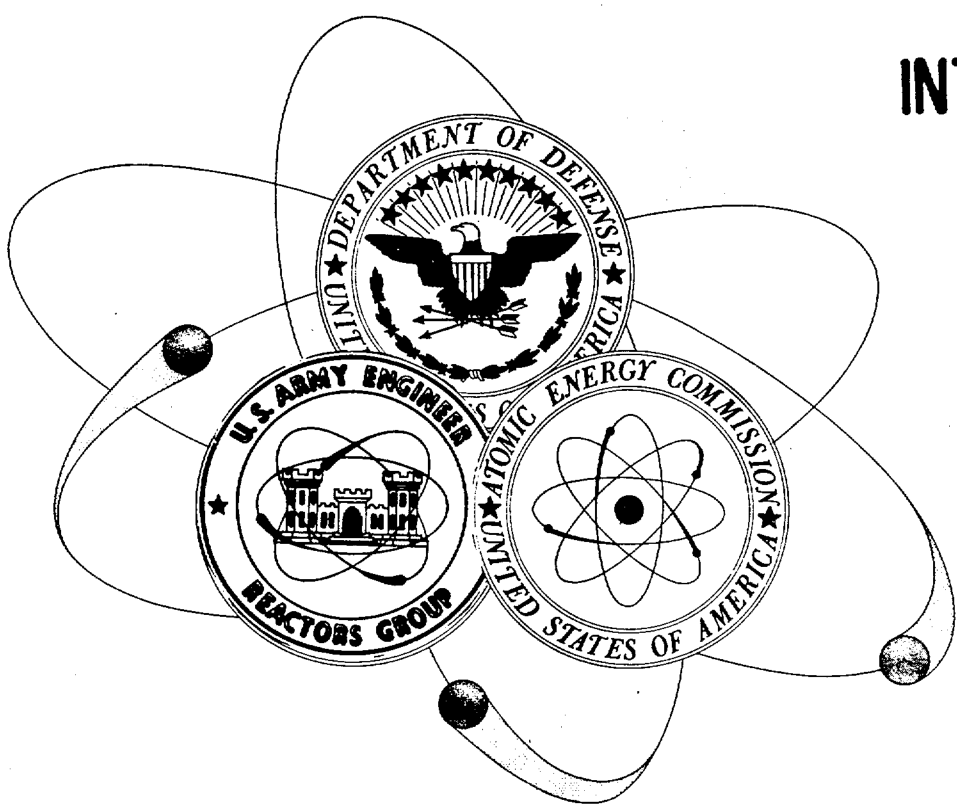

AN INTRODUCTION TO THE ARMY NUCLEAR POWER PROGRAM

U. S. ARMY ENGINEER REACTORS GROUP
FORT BELVOIR, VIRGINIA

AN INTRODUCTION TO THE ARMY NUCLEAR POWER PROGRAM

JANUARY 1966

Approved by: Director
U. S. Army Engineer Reactors Group

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PREFACE

This publication has been prepared as a training text for use within the Army Nuclear Power Program organization in acquainting prospective and newly assigned personnel with the Program mission, its achievements and its objectives. The text covers Program history, current projects and future direction.

AN INTRODUCTION TO THE ARMY NUCLEAR POWER PROGRAM supersedes the earlier Program orientation text Five on the Line.

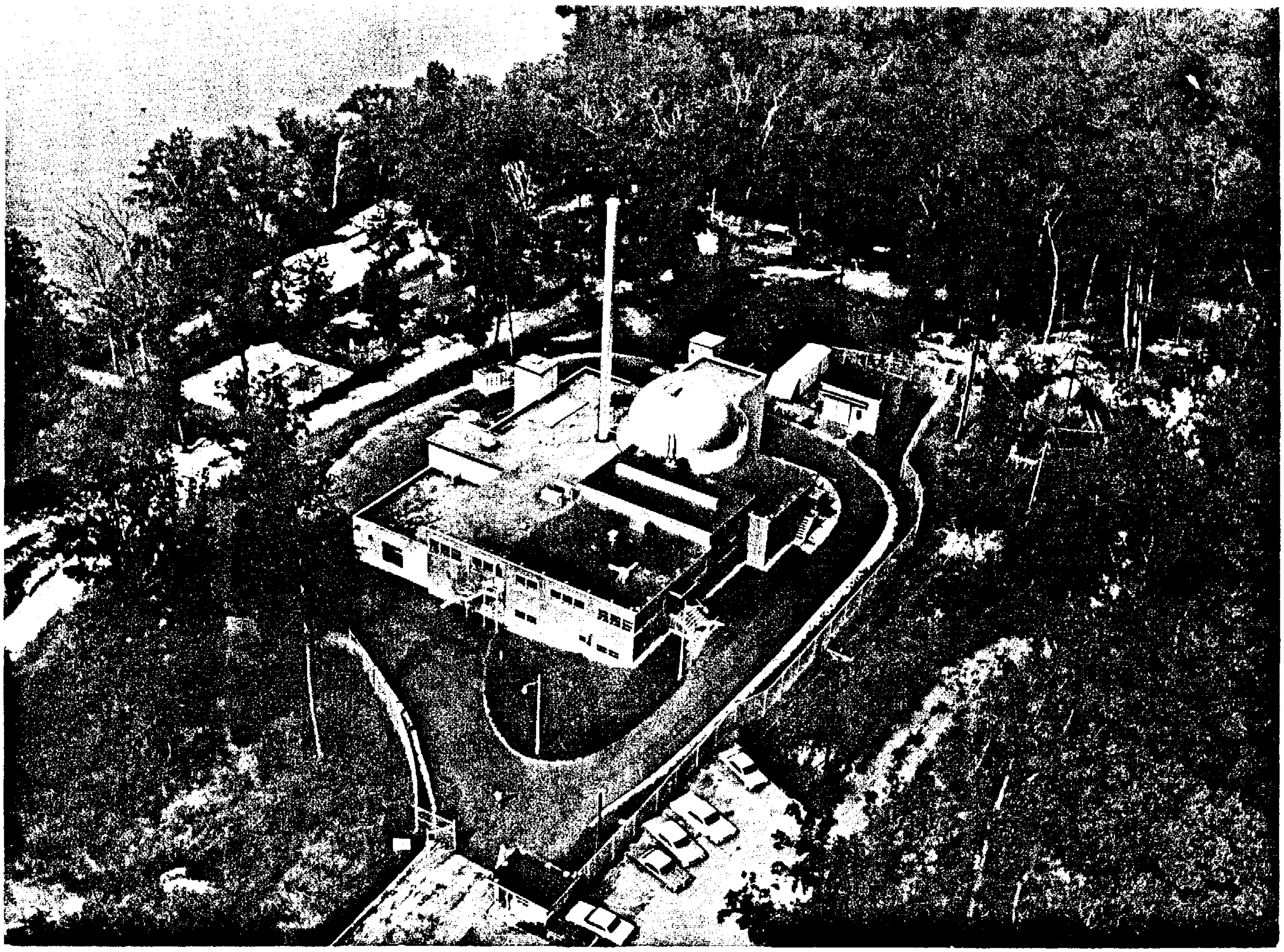

Figure 1-1. Aerial View of SM-1.

1. INTRODUCTION

On 2 December 1942, Dr. Enrico Fermi and his associates, working under the Army Corps of Engineers Manhattan Project, unleashed and controlled nuclear energy for the first time in history. Less than three years later, all of mankind was introduced to nuclear energy by the explosion of an atomic bomb at Hiroshima. We tend to date the beginning of the Nuclear Age from the second event, for the destructive potential of nuclear energy has been a well publicized matter of controversy ever since. Yet even before Hiroshima, scientists had turned their attention to the constructive possibilities of nuclear energy.

The defense considerations of World War II dictated that initial nuclear development would be in the weapons field. World War II, however, also created the military environment which predetermined investigation of the non-weapons nuclear potential.

Under the urgencies of global war, mechanization of armed forces progressed rapidly. The process of mechanization, which had begun with the installation of the first internal combustion engine in a military vehicle, was intensified. Increasingly sophisticated mechanical equipment was introduced during the course of the war, providing greater mobility, improved communications and more precise firepower. Enhanced military effectiveness was the direct result of mechanization. An indirect result was the creation of a tremendous military appetite for fuel — fuel to power engines, to cook food, to provide space heat and to power electrical generators. Half of the overseas logistic tonnage shipped by the United States in World War II was devoted to transporting fuel supplies.

The United States emerged from World War II with expanded defense responsibilities. In order to meet these responsibilities, even more effective utilization of our military resources became essential. Mechanization, therefore, continued to receive greater and greater emphasis; and the military fuel requirement continued its upward spiral. Today's Army fuel requirement accounts for an estimated 70 percent of total supply tonnage. The associated logistic problems of transportation, distribution and storage have increased accordingly. In the same period, civilian consumption of fossil fuels also has grown, forcing us to recognize that the earth's supply of such material is limited. In both the military and civilian environments, there are compelling influences to seek alternate sources of energy.

Nuclear energy is an alternate source of power which has the potential to reduce military fuel logistic problems significantly. Great amounts of energy are contained in relatively small quantities of nuclear material. Consequently, more power can be obtained from less nuclear fuel.

A practical illustration of logistic superiority is a comparison of a fabricated nuclear fuel core with its diesel oil equivalent. The nuclear fuel core, which will sustain power production for as long as two years, weighs between 850 and 900 pounds. Occupying a space no larger than the average utility closet, the nuclear core can be shipped along with other supplies in a single cargo aircraft as well as by more conventional means. 90,000 barrels of diesel oil, weighing in excess of 26 million pounds, would be required to produce an equivalent amount of power. Such a quantity of oil would fill 750 semitrailer tank trucks, 375 railroad tank cars, or 1 medium tanker vessel. Shipment by air would be wholly impractical. The nuclear fuel core cited in this illustration is applicable to a typical "portable" plant. Other cores may provide even greater energy release.

Thus, to a logistician, the potential advantages of nuclear power are (1) a wider choice of shipping expedients, (2) fewer shipments, (3) reduced bulk and tonnage, (4) more rapid transport, and (5) greatly reduced storage needs. Manpower requirements for handling are reduced accordingly. To these advantages can be added decreased overall vulnerability in time of war.

Even though nuclear technology has made great advancements since December 1942, it holds the promise of an even greater potential. In the context of military applications, nuclear power is seen as a promising potential solution to the problem of fuel supply.

Nuclear power today is most advantageous in providing heat and electricity at remote, relatively inaccessible military installations such as those in Antarctica, where conventional fuel supply is difficult and expensive. Although the initial capital investment in a nuclear power facility is presently much greater than that of a conventional fossil-fueled plant, operating costs may be lower because of the reduced supply effort involved. Over the long run, therefore, combined costs of the nuclear power plant can be lower.

For Army purposes, other than remote site utilization, nuclear power presently is at an economic disadvantage. Whereas large (500 MWe) civilian nuclear power plants are economically competitive even today, Army power requirements are widely dispersed in smaller units that cannot be satisfied economically by individual reactors. As the technology advances, however, costs continue to be reduced indicating that in the future nuclear power will become much more competitive from the economic standpoint.

AN INTRODUCTION TO THE ARMY NUCLEAR POWER PROGRAM deals with the Army effort in developing nuclear power for non-weapons military applications to support land operations. The text has been organized to follow the pattern which the development effort has taken. As in any new technical field, progress has been made by building continually on earlier work.

2. THE ARMY NUCLEAR POWER PROGRAM

An association of related activities within the Department of the Army and the U. S. Atomic Energy Commission (AEC), the Army Nuclear Power Program is directed to the development of nuclear power plants for support of military operations on land. The Army is the cognizant Department of Defense agency for this work, and the Program is responsive to requirements generated by Navy and Air Force activities on land as well as to those of the Army. Since its inception, the Program has established power reactor facilities at one Navy, one Air Force and three Army installations.

The Program began in 1952 as a Department of Defense study conducted by the Office of the Chief of Engineers of the feasibility of developing reactor plants to serve military power needs on land. The first U. S. nuclear weapons had been developed under the

Manhattan District of the Corps of Engineers. Colonel (now Lieutenant General) James B. Lampert, an Engineer officer who had been associated with the Manhattan Project, headed the 1952 study group. In 1953, the report of the study group was forwarded to the Joint Chiefs of Staff who established the requirement for development of military nuclear power plants.

Based on recommendations of the Joint Chiefs of Staff, the Secretary of Defense in February 1954 assigned responsibility for the development effort to the Army. This responsibility was delegated to the Chief of Engineers, and Colonel Lampert was assigned to direct the program.

In organizing the Army Nuclear Power Program, it was necessary to recognize the broad national responsibilities vested by law in the AEC. While the Atomic Energy Act provides for the transfer of reactor facilities and special nuclear material (nuclear fuel) to the Department of Defense, research and development in the nuclear field is an AEC responsibility. In 1954, a program was already in existence wherein the Navy and AEC were partners in developing nuclear marine propulsion devices. Using the organizational precedents of this program, the Army Nuclear Power Program structure was based upon two staff elements, one within the AEC and the other in the Office of the Chief of Engineers, both headed by a single individual appointed by the Army with AEC concurrence. In this way, a coordinated effort could be made to fulfill a military objective. Subsequently, similar organizational arrangements have been employed in a now defunct Air Force-AEC program to develop nuclear aircraft and, more recently, in an AEC-National Aeronautics and Space Administration (NASA) development program for nuclear rockets.

In April 1957, the Program completed construction of its first plant. Nuclear power plant utilization then became a matter for consideration which resulted in a broadening of the Program mission. Because men were needed to operate reactor plants, the Program assumed a training mission. Because operation of plants required maintenance, repair and resolution of problems associated with a new technical field, the Program acquired a technical support mission. Because nuclear radiation must be controlled, the Program developed a health and safety capability. With the rapid growth of nuclear technology, applications of nuclear power have increased, expanding the research and development mission of the Program as well. Figure 2-1 details the missions of the Army Nuclear Power Program (ANPP) as they exist today.

In 1958, the Chief of Engineers established the U. S. Army Engineer Reactors Group (USAERG) as the basic Army organizational framework for the expanded Program. The USAERG is a Class II activity and a TD (Table of Distribution) element of the Corps of Engineers.

Command of the USAERG and management of the overall program are centered in the person of the Director, ANPP, a Corps of Engineers officer who functions as Special Assistant for Nuclear Power to the Chief of Engineers and as Assistant Director (Army Reactors), Division of Reactor Development and Technology, U. S. Atomic Energy Commission. His major duties are outlined below:

(1) As Special Assistant for Nuclear Power, he is responsible to the Chief of Engineers for conducting the joint DOD-AEC effort to develop nuclear power systems and

devices to meet the operational needs of the Military Services. In addition, the Chief of Engineers has delegated to the Director, ANPP, command functions as Director, U. S. Army Engineer Reactors Group.

(2) As Assistant Director (Army Reactors), he is responsible for the planning and direction of the joint DOD-AEC program for developing nuclear power systems to meet DOD requirements other than marine propulsion and air and space applications.

To accomplish the basic missions of the ANPP, the following major elements were established: Nuclear Power Division (NPD/OCE); Army Reactors, Division of Reactor

1. Research and Development:

a. Nuclear devices to serve as primary heat sources in generating electrical and mechanical power for Army utilization.

b. Nuclear power plants to supply heat and electricity for operational requirements of the Army, Navy and Air Force.

c. Systems to convert energy from the nuclear reactor to storable form for use in the field.

d. Electrical power generating equipment associated with nuclear reactor systems.

2. Training of operating, maintenance, supervisory and staff personnel for field plants of the Military Services.

3. Technical Support:

a. Technical assistance to military users of nuclear power plants to include special procurement action for nuclear components.

b. Technical liaison with the Military Services and the Atomic Energy Commission to assure exploitation of new developments in nuclear power.

c. Operation of designated plants.

d. Procurement and construction of nuclear power plants for the Army, and upon request for the Navy and Air Force.

e. Technical Assistance to operators of military research reactors upon request.

4. Health and Safety:

Provide support to the Chief of Engineers in the area of his reactor health and safety responsibilities.

Figure 2-1. The missions of the Army Nuclear Power Program as assigned by the Chief of Engineers.

Development and Technology, Atomic Energy Commission (AR); the Nuclear Power Field Office (NPFO); and the Idaho Nuclear Power Field Office (INPFO). Figure 2-2 outlines the ANPP organizational structure which includes these elements.

The Nuclear Power Division, located in the Office of the Chief of Engineers, provides staff support to the Director, ANPP, in the management and surveillance of the overall program, and exercises staff supervision of the DOD portion of the Program. It functions in the personnel and training and health and safety fields and provides programming support and assistance in determining future plans and requirements.

Army Reactors, Division of Reactor Development and Technology, located at AEC headquarters, Germantown, Maryland, plans and directs the nuclear reactor research and development program. AR also provides technical evaluation, guidance and support as directed.

The Nuclear Power Field Office, located at Fort Belvoir, Virginia, is responsible for engineering, operational and administrative support of Army field plants and for implementing USAERG responsibilities to Air Force and Navy plants as well as Army research reactors. NPFO further plans and directs assigned construction programs; trains land-based power plant personnel for the three Services; operates the nuclear power plants under OCE control and the Advanced Power Conversion Experimental Facility; provides administrative support for the Engineer Reactors Group; and supports assigned portions of the Army-wide nuclear reactor systems health and safety effort.

The Idaho Nuclear Power Field Office monitors training conducted by contractors at the National Reactor Testing Station (NRTS), Idaho, provides operations training for operators of nuclear power plants located at NRTS, provides trained crews to operate these plants and provides administrative support to assigned ANPP personnel.

Greater detail on certain of these agencies is provided in later chapters. Let us now consider the Program relationship to the AEC, the Navy, the Air Force and Army agencies other than the Corps of Engineers.

The work of the ANPP already has been identified as a joint DOD-AEC area of interest deriving its relationship from the Atomic Energy Act of 1954 and the precedents established in the nuclear naval propulsion program. Other DOD-AEC agreements have been concluded since 1954 which also have affected the Army Program. The President's Executive Order, dated 23 September 1961, is quoted below as an example of the DOD-AEC relationship in matters pertaining to nuclear health and safety.

"Responsibility will rest with the Department of Defense for identifying and resolving health and safety problems relating to the operation of utilization facilities, or to special nuclear material for use therein, which are held by the DOD pursuant to directives of the President under Section 91b of the Atomic Energy Act. In view of the Atomic Energy Act of 1954, the AEC will participate in the identification and resolution of these problems as a matter of responsibility. In this connection, the DOD or the appropriate Military Department will prepare, issue and enforce safety standards, procedures or instructions applicable to the location and operation of utilization facilities and to special nuclear materials for use therein. Advice and assistance will be obtained from the AEC

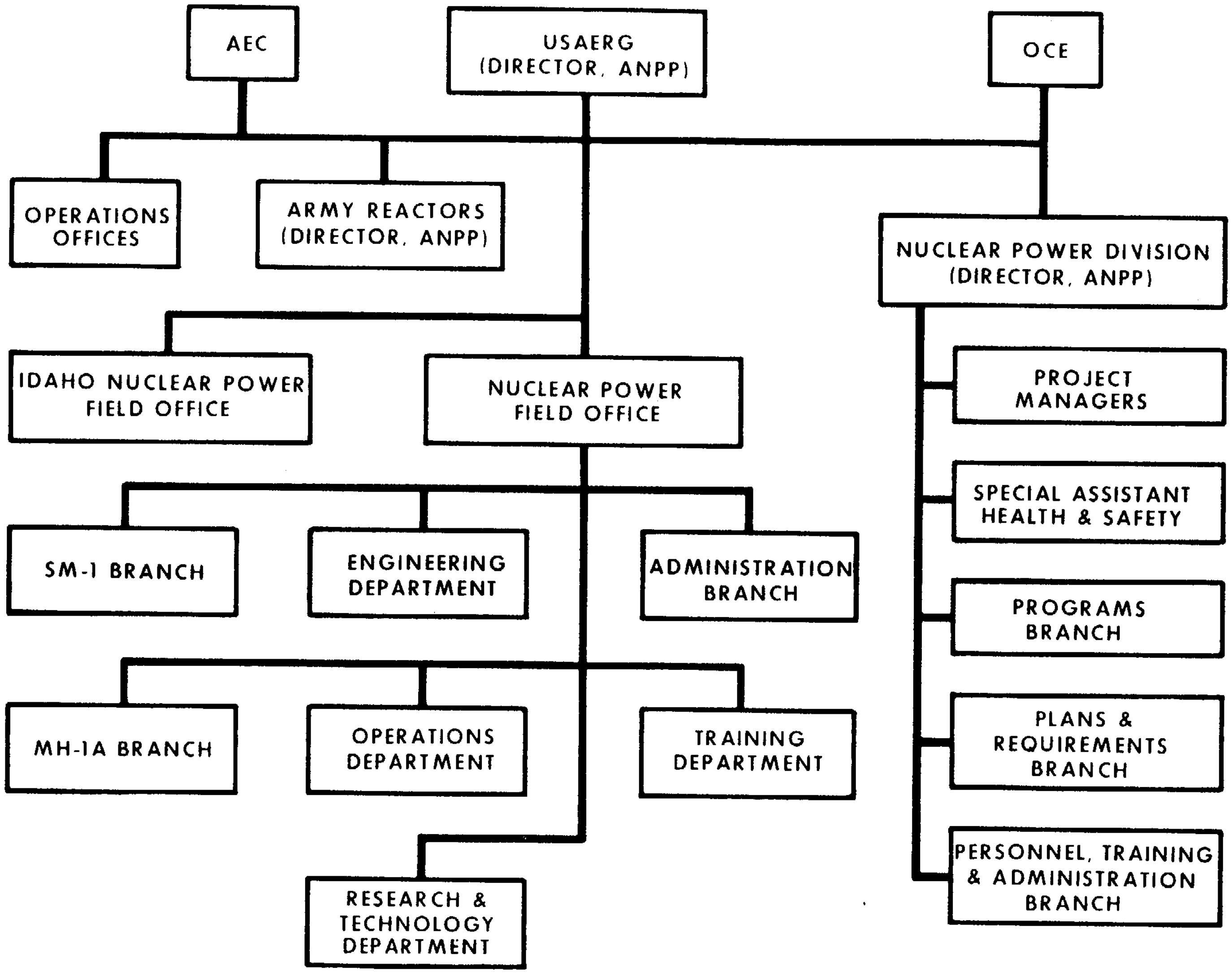

Figure 2-2. Army Nuclear Power Program Organization Chart.

on the safety aspects of the design of utilization facilities and in the preparation or amendment of safety standards, procedures or instructions relating to location and operation of utilization facilities and to special nuclear material for use therein, and comment or concurrence shall be obtained from the AEC as to their adequacy. Any disagreement as to safety aspects, arising as a result of comment by the AEC, which cannot be directly resolved by the two agencies, will be referred to the President for decision."

The ANPP organizational link between the DOD and the AEC is the Office, Assistant Director (Army Reactors)(AR) in the AEC Division of Reactor Development and Technology. In addition to being headed by the Director, ANPP, AR is staffed primarily with Corps of Engineers employees, for the most part, technically trained personnel. The ANPP research and development mission, as a result, is fully responsive to military needs.

Further coordination of military interest in AEC activities is accomplished through the assignment of Corps of Engineers personnel to serve in the AEC Operations Offices through which contracts for military end items are administered.

Since the ANPP must develop and support power plants for the Navy and Air Force and train operators and supervisors for them, there must be close liaison between the services and direct participation by all at the operational levels. Liaison between the Program and the Navy is carried out by direct contact between the Nuclear Power Division, OCE and the Atomic Energy Division, Office, Chief of Naval Operations and the Nuclear Power Division of the Bureau of Yards and Docks. Direct participation of Naval personnel in the Program is accomplished by assignment of individuals to elements of

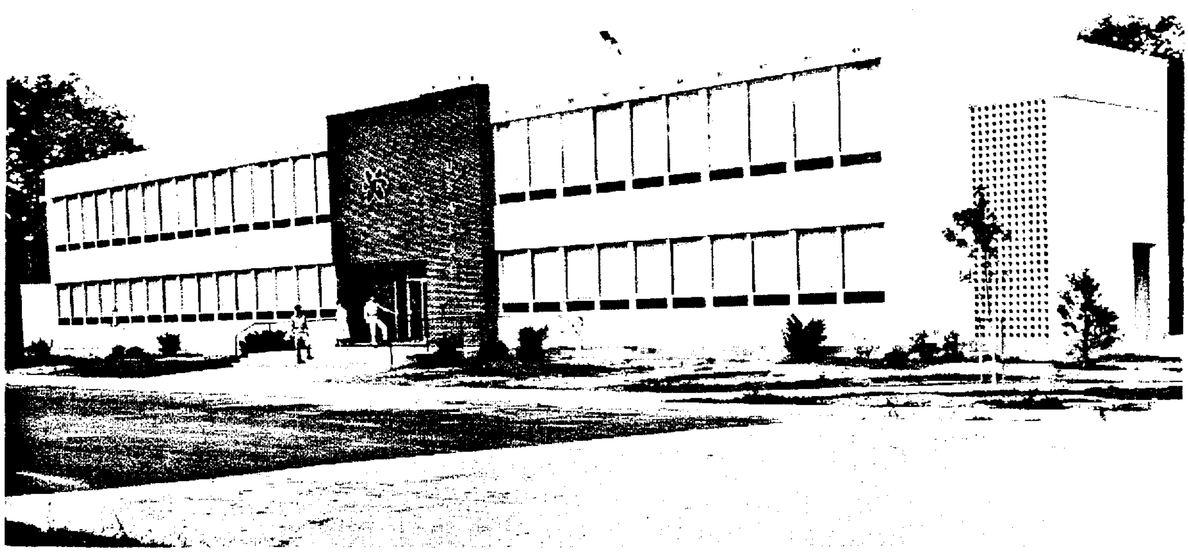

Figure 2-3. USAERG Headquarters & Training Building, Fort Belvoir, Virginia.

the Program and to the Naval Nuclear Power Unit (NNPU) at Fort Belvoir, Virginia. Personnel assigned to NNPU are further assigned by that unit to NPFO for duties in the operation, support or training fields.

Liaison between the Program and the Air Force is effected by direct contact between the Nuclear Power Division, OCE, and the Office of the Assistant for Nuclear Energy, Deputy Chief of Staff for Research and Development, U. S. Air Force. Direct participation of Air Force personnel in the Program is accomplished by assignment of individuals to elements of the Program. These men are assigned to the 3424th Instructor Squadron, Lowry Air Force Base, California. Air Force personnel are attached for administrative purposes to the 3270th Air Force Technical Training Squadron, Air Training Command, at Fort Belvoir, Virginia. Personnel attached to the 3270th are further assigned by that unit to NPFO for duties in the operations, support or training fields. The ANPP also coordinates its research and development work with the Research and Technology Division of the Air Force Weapons Laboratory at Kirtland Air Force Base, New Mexico.

A word about safety inspections, a special kind of support, is worthwhile at this point. The Department of the Army Inspector General (DAIG), through the Technical Inspection Division, is responsible for conducting technical, health physics, and safety inspections of all Army nuclear reactors. This responsibility, requiring close contact with the users of Army research reactors, normally takes the form of an annual inspection. The ANPP assists the DAIG in his responsibilities and provides similar assistance to the Office of the Surgeon General in the areas of health physics and safety.

The Program also provides support to Army research reactors. Among the research reactors are the Diamond Ordnance Research Reactor at Forest Glen, Maryland; the Army Materials Research Reactor, Watertown, Massachusetts; and the Fast Burst Reactor Facility, White Sands Missile Range, White Sands, New Mexico, all of which are operated by the Army Materiel Command (AMC). AMC will operate an additional research reactor presently being built at the Aberdeen Proving Grounds, Aberdeen, Maryland. The Office of the Surgeon General operates the Walter Reed Research Reactor at Walter Reed Army Medical Center, Washington, D. C. The Program also provides support to the Nuclear Engineering Test Facility, a research reactor constructed for the Air Force by the Louisville District, Army Corps of Engineers at Wright-Patterson Air Force Base, Ohio.

Army nuclear power plants currently in operation are the SM-1 at Fort Belvoir, Virginia, and the SM-1A, which is located at Fort Greely, Alaska. A third Army Plant, the PM-2A, operated at Camp Century, Greenland, from February 1961 until July 1963. Removal of the PM-2A was based on a declining need for power at Camp Century. An ANPP-developed plant, the PM-1, is in use by the 731st Radar Squadron of the U. S. Air Force at Sundance, Wyoming. The Navy's McMurdo Station in Antarctica uses the PM-3A nuclear power plant for its electrical requirements.

This chapter has covered briefly the historical development of the ANPP and has given some detail of the objectives, mission and the organization of the Program as well as defining its ties with the AEC and the Military Services. Subsequent chapters deal with the scope and methods of its major activities — research and development, support of field plants, and training.

3. RESEARCH & DEVELOPMENT

From the first investigations, it was recognized that the full military potential of nuclear power could be realized only through an aggressive research and development effort over an extended period of time. While it can draw from and contribute to the continually expanding general body of nuclear technology, the Army program must be cognizant of factors unique to the military environment. Under present technology, military nuclear power cannot be justified economically except in geographic areas where conventional power costs are very high, principally due to the relatively small power requirements associated with military installations. Geographic location, as well as other utilization factors, dictates that military plants must be as reliable and maintenance free as possible. Military utilization also can impose considerations of plant mobility and transportability which rarely would influence the design of a civilian reactor. In covering the ANPP research and development mission, this chapter will emphasize the military characteristics and capabilities which affect ANPP project objectives.

The military environmental characteristics of land operations determined that ANPP research and development effort would take two project directions:

(1) Nuclear power plants intended for post, camp and station applications, a utilization area related closely to civilian projects, and

(2) Mobile nuclear power plants intended to support tactical military operations.

The main objectives of the first developmental area are reduced logistic effort and lower initial and operating costs. The objective for tactical plants is high mobility, which dictates that minimum size and weight are important, in addition to lower system costs. Under present technology, one type of plant cannot serve both station and tactical requirements. To accommodate all apparent military power needs in land operations, reactor plants are being developed in three degrees of mobility: stationary, portable, and mobile. To accommodate the conceivable quantities of power required, plants are being developed in three arbitrary ranges: low-power, medium-power and high-power. Figure 3-1 further defines these characteristics and explains the designation system for ANPP-developed plants.

Generally, development of a nuclear reactor system and its associated equipment is the responsibility of the AEC. The Army is responsible for power conversion and other non-nuclear portions of nuclear reactor systems. Most of the studies and investigations funded by the AEC are handled through contracts with industry or national laboratories with engineering management, programming and evaluation accomplished by the Army Reactors staff. The Nuclear Power Field Office, with assistance from Army Reactors, handles those projects and studies funded by the Army.

ANPP projects are approached administratively on a basis of Project Managerships. Under this concept, each major ANPP project which answers a stated or anticipated military requirement is managed by a single individual. With responsibilities covering research, development, design, construction, testing and operation, the Project Manager plans and coordinates all tasks within his specific activity. At present the ANPP has

The plant designation system used in the Army Nuclear Power Program has four elements:

1. *The first letter indicates the degree of mobility.*

   S — Stationary — Permanent construction; not designed for subsequent relocation.

   P — Portable — Prepackaged at the factory for transportability and rapid assembly at site.

   M — Mobile — Can be moved intact, or virtually intact; may or may not operate in transit.

2. *The second letter indicates the power range.*

   L — Low — 100 to 1000 KWe

   M — Medium — between 1000 to 10,000 KWe

   H — High — 10,000 KWe or higher

3. *The Arabic numeral indicates the order of initiation of plants with the same first two letters.*

4. *The capital letter following the Arabic numeral indicates the order of initiation of field plants of the same type. Absence of the final letter indicates that the plant is an engineering or pilot model.*

Figure 3-1. The Army Nuclear Power Program Plant Designation System.

established Project Managerships for Floating Nuclear Power Plants, the Nuclear Powered Energy Depot concept, and Gas-Cooled Reactors.

The technology of station nuclear power plants, the initial project undertaken by the Program in 1954, has reached a point in development where most requirements for plants of this type can be fulfilled through normal procurement action. The overall objective in this area was to develop a family of nuclear power plants prepackaged in modular form for transport by standard cargo aircraft to remote military sites. Such plants were designated as "portable". Remote, relatively inaccessible military sites are, for the most part, located in areas of climatic extremes; the Arctic and Antarctic are examples. Prefabrication of portable plants by a manufacturer in the United States permits a reduction of on-site construction effort since this work becomes a matter of interconnecting individual modules. Thus the high costs of importing labor to a remote location and the delays created by hostile weather conditions are reduced or eliminated. Work at the site can be completed in less than ninety days. In addition, portable plants can be relocated to a new site after operation.

ANPP experience in portable nuclear power plants has been summarized in a Standard Plant Design applicable to those requirements foreseen in the near future. Investigation of new nuclear power concepts is continuing, however, in an effort to reduce capital and operating costs.

As the technology of station nuclear power has advanced, the range of military applications has broadened. Recently several studies and investigations have been conducted on the utilization of plants in this category in hardened military sites. Such installations are designed to operate during and after a nuclear attack. A nuclear power plant, which requires no combustion air for operation and emits no toxic gases requiring exhaust facilities, offers a unique advantage applicable to hardened, underground utilization. In addition, the capability for extended, logistically independent operation is an advantage of significance in this application.

A second application of nuclear power which promises to offer significant military use is the combination of such a plant with salt water conversion equipment. Such a plant would produce, in addition to heat and electrical power, quantities of potable water.

Thus, while major emphasis in the Army Nuclear Power Program concurrently is being given to tactical, mobile plant development, the older station power technology does offer a limited number of other applications.

For mobile nuclear power plants to provide tactical support to the field Army, the following three major projects have been pursued:

(1) A 300-kilowatt output, trailer-mounted, gas-cooled reactor.

(2) An extremely compact and mobile liquid-metal-cooled reactor power plant.

(3) A Nuclear Powered Energy Depot system.

The gas-cooled power plant, using a gas-cooled reactor and closed-cycle gas turbine, is interesting from several standpoints since it could provide the first reactor system with true land mobility and was the first application of a closed-cycle gas turbine of any type in the United States. To develop these advanced components, the gas-cooled reactor program used two major R&D facilities: the Gas Turbine Test Facility (GTTF), located at Fort Belvoir, Virginia; and the Gas Cooled Reactor Experiment (GCRE), located at the National Reactor Testing Station, Idaho Falls, Idaho. The power conversion equipment technology developed at GTTF and the gas-cooled reactor technology developed at GCRE have been factored into the design of a mobile engineering test model designated the ML-1. This plant served as a test vehicle for the integrated reactor-power conversion system. The GTTF at Fort Belvoir has been redesignated the Advanced Power Conversion Experimental Facility (APCEF) and is operated by the Research and Technology Department, NPFO, while the GCRE has been converted for reactor and reactor core testing by the AEC.

The second major project in the area of mobile nuclear power plants is known as the Military Compact Reactor (MCR). This land mobile, air transportable plant would use a liquid metal coolant to achieve a high power density. It is expected that liquid metal cooled reactor technology will result in maximum power output with a unit of minimum size and weight. The MCR is being investigated as an optimum mobile power source for the Nuclear Powered Energy Depot.

The reactor systems described thus far were and are being developed primarily as sources of electrical power. Both station and mobile nuclear power plants certainly will reduce the logistic problem of fuel supply in those areas and for those systems which can utilize energy in the form of electricity. In the field Army, however, the major portion of petroleum logistic tonnage takes the form of vehicle fuel. Thus, Army energy requirements in the field are small and dispersed. The Program, therefore, has sought to use the tremendous energy concentration of nuclear power indirectly to solve the vehicle fuel problem. This concept of indirect utilization has been designated the Nuclear Powered Energy Depot.

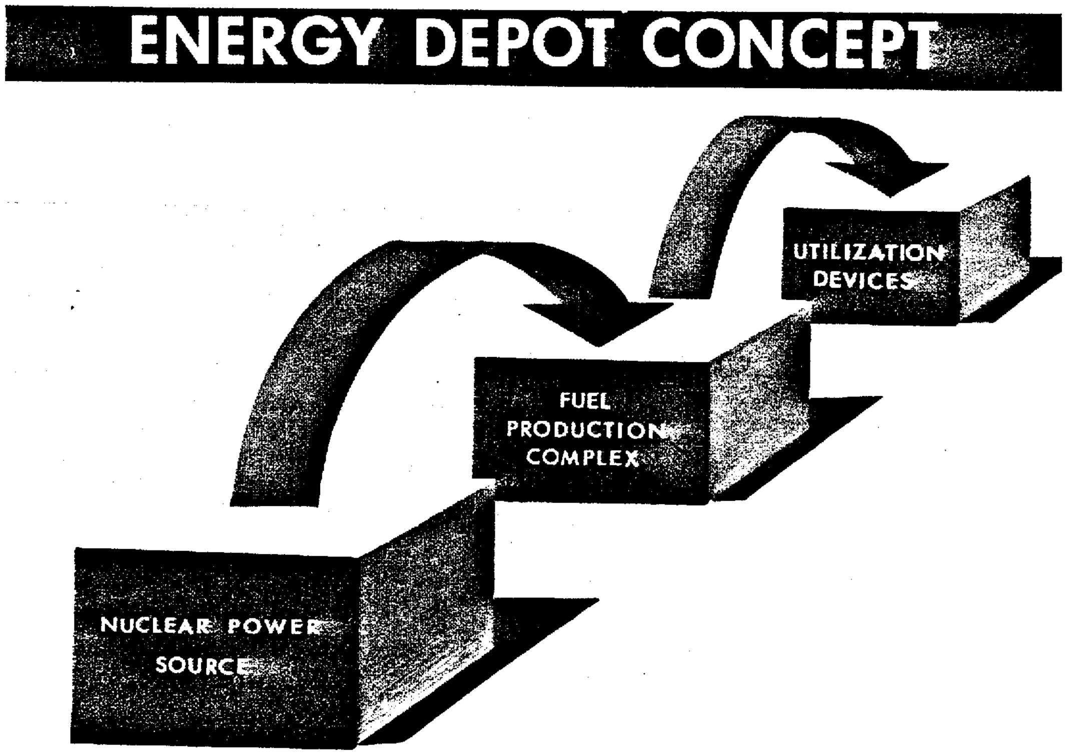

Figure 3-2. Energy Depot Subsystems.

Through the Energy Depot, it is hoped that petroleum logistic tonnages can be greatly reduced and, in some instances, eliminated entirely; that combat units will be able to achieve greater freedom for maneuver; and that such units consequently will be able to achieve eligibility for commitment into areas and situations presently considered to be too difficult. With the Energy Depot, the Program orientation is not only directed to solving present problems; its effort is directed toward creating new military capabilities on land. The Energy Depot is a means to integrate nuclear power into the total Army energy requirement.

There are three concepts for the Energy Depot, based on degrees of difficulty for attainment. In the first approach, nuclear power produces electrical or thermal energy which in turn is used to separate hydrogen from water and nitrogen from air. The hydrogen is then combined with nitrogen to form ammonia which is burned in internal combustion engines.

The second concept again involves the production of hydrogen and possibly ammonia to be used in fuel cells which have a much higher efficiency than internal combustion engines.

The third concept involves the direct regeneration of electrochemical cells mounted in vehicles. While this third method results in the elimination of the fuel production complex, it must be realized that a major development effort is required to achieve a usable electrochemical device.

With the entire Nuclear Powered Energy Depot concept at present in a very early stage of development, current effort is being directed toward total feasibility evaluations of the potential systems. Included in these investigations is a cost effectiveness study applicable to all systems under consideration.

Developmental responsibility for the Nuclear Powered Energy Depot system is divided within the Department of the Army between the Corps of Engineers and the Army Materiel Command (AMC). The ANPP includes investigations of the reactor and the fuel production complex while the AMC is responsible for utilization device development.

In the mid-1950's and early 1960's, the Corps of Engineers performed studies of the facilities required on earth to support lunar operations. In 1962, a study was performed for the National Aeronautics and Space Administration (NASA) by the Engineers which defined the research and development effort necessary to provide the United States with a lunar construction capability. These studies led NASA to request two further investigations: (1) to define an appropriate lunar nuclear power plant and (2) to select an engine fuel concept which could power lunar vehicles and portable power units.

For purposes of these investigations, lunar exploration is scheduled to be undertaken in a four phase plan, Base 1 of which is to be established in the 1970-1980 time frame. Base 1 anticipates a group of three men spending three months in the lunar environment. Base 2 schedules six men to spend six months. The ANPP study has recommended solar cells to supply shelter power during the day for these bases and fuel cells during the night. For portable power supplies, silver-cadmium batteries are recommended for requirements under 1 KW. Hydrogen-oxygen fuel cells have been recommended for vehicle power. Nuclear power is indicated as an absolute necessity for Base 3 when twelve men will begin a stay of one year on the moon. With nuclear power as the primary base power supply, solar cells would become a back-up power source. The reactor plant would be used to regenerate the batteries and the fuel cells, permitting logistically independent operation of the base power systems. Base 4 would operate similarly, but with increased power output from the nuclear plant. An artist's concept of the lunar power plant is shown as Figure 3-3. As a follow-up to these studies, the ANPP has considered the use of isotope power supplies for the smaller lunar power requirements. The general area of space exploration is closely tied to nuclear power because of the exorbitant cost of logistic support for such missions.

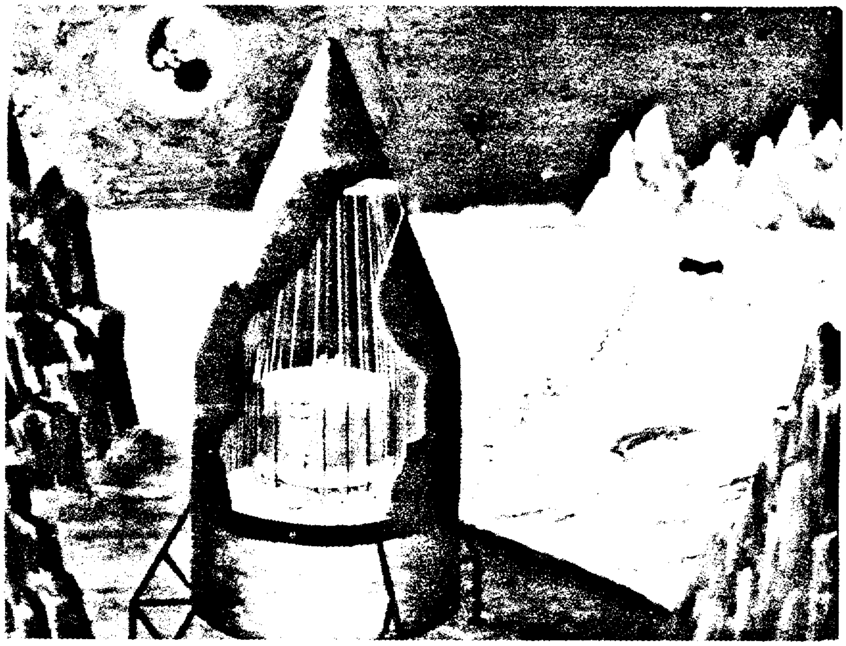

Figure 3-3. Lunar Nuclear Power Plant Concept.

The Army Nuclear Power Program also is investigating radio-isotope generators in connection with direct power conversion devices. The objective here is to eliminate the rotating or reciprocating machinery used in dynamic conversion equipment. Direct conversion is desirable where equipment must operate for extended periods without maintenance or breakdown. Thermoelectric, thermionic and magneto-hydrodynamic methods of direct conversion are being studied.

This discussion of the research and development activities of the Army Nuclear Power Program has covered only the high points of a complex mission. It indicates, however, the scope of this mission and the direction it takes.

4. PROCUREMENT AND SUPPORT

Procurement and construction of a nuclear power plant are initiated when a firm military requirement has been established. Of the various support activities provided plant users by the ANPP, many are integral to procurement and form the basis for later assistance. This chapter describes the methods used for procurement and construction of ANPP plants and details the support activities provided by the Program.

Under normal circumstances, military nuclear power plants are procured by either the Army or the Atomic Energy Commission, the deciding factors being the funding agency and the technology upon which the plant design is based. Field plants, for example, based on proven technology and funded by the Army, are procured through a Corps of Engineers District. Prototypes or plants requiring considerable development, whether funded by the AEC alone or jointly with an agency of the Department of Defense, are procured through an AEC operations office. Plants funded solely by the Navy or Air Force can be procured by either the Army or the AEC, or by the funding agency. In any case, supervision of construction is a responsibility of the procuring agency.

Support actually begins before procurement since the ANPP carries out the initial research and development work. Planning and coordination make certain that all actions such as core procurement, determination of crew requirements and negotiation of support agreements are completed early. This insures smooth integration of the new plant into the ANPP support system.

During design and construction, a review is made of plans, specifications, and drawings in order to ascertain technical adequacy. This review also guarantees that new designs include, insofar as possible, the benefit of experience gained from earlier plants. The procuring agency is given nuclear engineering assistance which assures contractor compliance with specifications. An important factor in future support is the assistance given by the first operating crew in assembling the plant. While this assistance serves as valuable training for the crew, it pays future dividends when close familiarity with components and systems can be useful in solving maintenance problems.

When the plant has become operational, the using agency is provided assistance and technical guidance on specific problems which may arise, and review or design of modifications to plant and equipment. The Program prepares, reviews and updates standards, specifications and procedures. It also performs safety reviews and hazards analyses or provides assistance in such matters. Maintenance assistance is given which includes planning or actual performance of higher echelon maintenance and nuclear fuel handling; procurement of unusual, complex or urgently needed parts; and preparation or review of maintenance procedures and parts allocation lists.

Generally speaking, the support provided to an individual plant is provided by elements within the Engineering and Operations Departments of the Nuclear Power Field Office. Each plant is assigned a Project Officer who coordinates all support activities in its regard. Since his office comes into existence at the same time as the plant, it becomes the repository for accumulated data on the plant. The Project Officer thus maintains familiarity with plant operations and is prepared to take action should problems arise. He can draw from a pool of engineers familiar with problems encountered in research and development of his type of plant. Experienced plant operators are available for consultation; many of them are men who also participated in the assembly of the plant. By maintaining close contact with plant activities from its inception, the Project Qfficer is not only better able to solve problems which may arise, he can circumvent them in many cases.

The safety engineer is a fourth link in the chain of people involved in providing full and responsive support. He participates in the review of all matters pertaining to facility safety. This includes review of Hazards Summary Reports, modifications and malfunctions; and conduct of ANPP Operational Safety Reviews both by visits to the facility and regular study of reports. Working closely with the Project Officer, the engineer and the experienced operator, the safety engineer helps to insure safe and reliable plant operation.

5. OPERATORS AND SUPERVISORS

The role of the nuclear power plant operator and supervisor in the ANPP is another key to the success of the Program's activities. In their everyday work, these operators and supervisors make the energy of the atom available for military uses. This chapter deals with that role as well as with the selection, training, and qualification of the personnel who assume it. Various ANPP agencies contribute to the development of these men. Their contributions are explained in this chapter.

In order to better understand the processes which prepare operators and supervisors, the reader must first understand the role for which they are being prepared. Their role begins in the plant itself, and it is in this area that their performance is most important. As mentioned previously, these crews are instrumental in the construction of ANPP plants, and self-evidently, no plant could stay on the line without such a crew. First in any consideration of a plant crew is the requirement that it be a team composed of highly trained and qualified individuals, each thoroughly competent in his own duties and each trained in and aware of the daily duties of his co-workers. A typical plant crew might be organized as shown in Figure 5-1 to provide operational, maintenance, and plant safety capabilities.

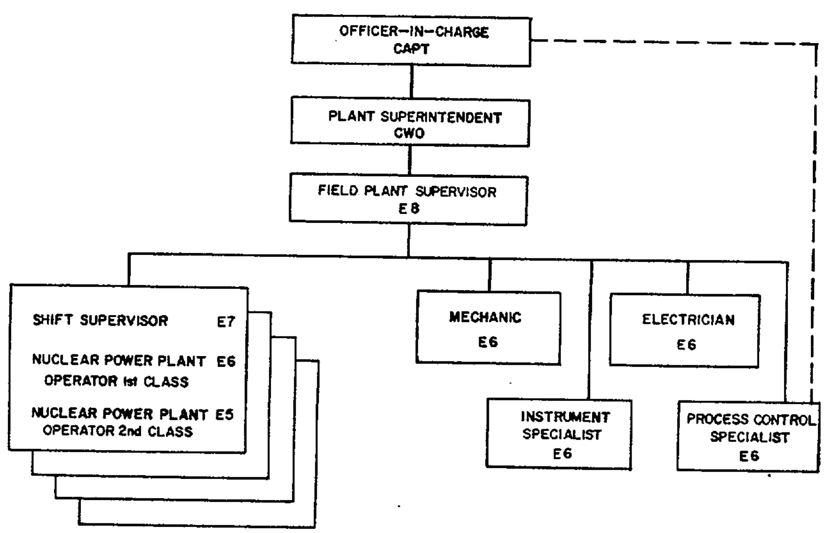

Figure 5-1. A Typical Nuclear Power Plant Crew.

Each operator in the ANPP is a specialist in at least two areas: first, operation of nuclear power plants, and second, maintenance in one of four specialty areas — mechanical, electrical, instrument, and process control. Thus, potentially, the operator is capable of performing plant maintenance in his specialty area and the maintenance specialist is capable of operating the plant. This cross-training and comparable cross-utilization, which is started in a crew member's first training course, is continued throughout his experience, allowing flexibility of assignment and utilization of personnel.

After mastering the details of plant operation and becoming familiar with the three maintenance specialties other than his own, an operator can become a Shift Supervisor and thus be responsible for the entire plant when his shift is on duty. Responsibility for a multimillion dollar power plant indicates the reliability and competence of the Program's Shift Supervisors. The best eventually become Plant Supervisors and are thus responsible for the operation of all four shifts in addition to certain elements of plant administration and maintenance. In addition to becoming Plant Supervisors, a few exceedingly competent enlisted men have become qualified as Plant Superintendents to serve as second in charge of a plant, a position normally occupied by a Warrant Officer.

The Plant Supervisor, who (as an E-8 or E-9) is normally the senior enlisted crew member, is responsible to the Plant Superintendent and the Plant Officer-in-Charge (a commissioned officer). The Plant Superintendent, in addition to serving as second in charge of the plant, and assisting the Officer-in-Charge in day-to-day plant operations, has regular responsibilities as a maintenance and supply specialist. The Officer-in-Charge is the man wholly responsible for the safe, efficient operation of his plant. He must supervise day-by-day plant operations and maintenance and, in so doing, is relied upon for many engineering decisions routinely required in connection with the complex equipment associated with a nuclear power plant.

The requirements placed on a nuclear power plant crew have been illustrated by the self-sufficiency demanded by round-the-clock plant operation of the PM-2A, a reactor facility located at Camp Century, Greenland, until removed during the summer of 1964. Camp Century itself is located less than 900 miles from the North Pole. It is built in trenches under the snow. PM-2A operations were carried out by an officer and a crew of eighteen men. Isolated as Camp Century is, the competence of cross-training of the crew paid off time after time as exemplified by the 2500-hour continuous power run completed at the PM-2A on 12 February 1963.

The PM-2A brings to mind other roles of the Program's operators and supervisors, for the plant was not only operated by them, but also it was installed by its first crew. The training of that first PM-2A crew was presented by other operators and supervisors who were occupying instructor positions. Still another role played by the Program's operators and supervisors is included in the description of the maintenance team's contribution to plant support. The list is long. Let it suffice to say that the operators and supervisors of the ANPP, whether they be Army, Navy or Air Force, play vital roles in Program activities.

How do the three Services develop personnel with the competence required in the various activities described? To answer this question requires a brief analysis of the selection, training and qualification procedures used in the ANPP and its plants.

The selection procedures which provide the input to the ANPP training courses are governed by the course for which an individual is being considered. AR 350-224 covers the application and selection of Army students for the Nuclear Power Plant Operators Course and is typical of Navy and Air Force standards also. The criteria prescribed by the regulation are summarized in Figure 5-2 and are indicative of the quality of the personnel chosen for the course. Those selected are from within approximately the top five percent of Army enlisted men.

1. *Grade E-3 through E-6.*
2. *High school graduate; or must have background experience in general science or standard score of 45 or higher in GED test 3. Credit for high school algebra required.*
3. *Must have 3 years to serve from start of course.*
4. *Volunteer.*
5. *No more than 35 years old.*
6. *Scores of 110 or higher in aptitude area EL. Standard score of 70 or higher in CONARC Basic Mathematics and Science Proficiency Test.*
7. *Medically fit for isolated duty and duty in extreme cold.*
8. *Normal color perception.*
9. *Secret security clearance.*
10. *No record of conviction by Court Martial.*
11. *Experience, training or high aptitude in related fields.*
12. *Completed 18 months of active duty.*
13. *Agree to accept specialist status.*
14. *Possess traits of motivation, ability to learn, adaptability, and reliability.*

Figure 5-2. Selection Criteria for the Nuclear Power Plant Operators Course. (Extracted from AR 350-224)

After selection, the training of operators begins with the Nuclear Power Plant Operators Course (NPPOC), a comprehensive one-year program which teaches the general principles of plant operation and maintenance (Figure 5-3). The course is conducted in three phases which successively teach the theory of nuclear power plants, apply the theory in practice operation of the SM-1, and teach each man the details of one of the four basic maintenance specialties. The objective of the course is to give the training needed to become a competent plant operator and the background information required for eventual advancement to Shift Supervisor.

Shortly after assignment, each enlisted man begins this course. It is complex, extensive and demanding, beginning with four months of algebra, trigonometry, modern physics, health physics and electrical, mechanical and nuclear engineering, presented in the Academic Phase of training. In the Operations Phase of training, each man is trained in the application of the theory which he learned in the Academic Phase. This is accomplished by training the student first on the SM-1 nuclear power plant simulator, and then on the plant itself. During this training, the student receives actual experience in operating the plant's reactor and power generation equipment. Finally, in the Specialty Phase of training, each student develops his demonstrated aptitude in one of the four previously mentioned maintenance specialties. This insures the availability of crew members to perform maintenance on these four categories of equipment.

Conducted by the Training Department, Nuclear Power Field Office, the NPPOC is only the beginning of an operator's training. It provides him with skills to be further

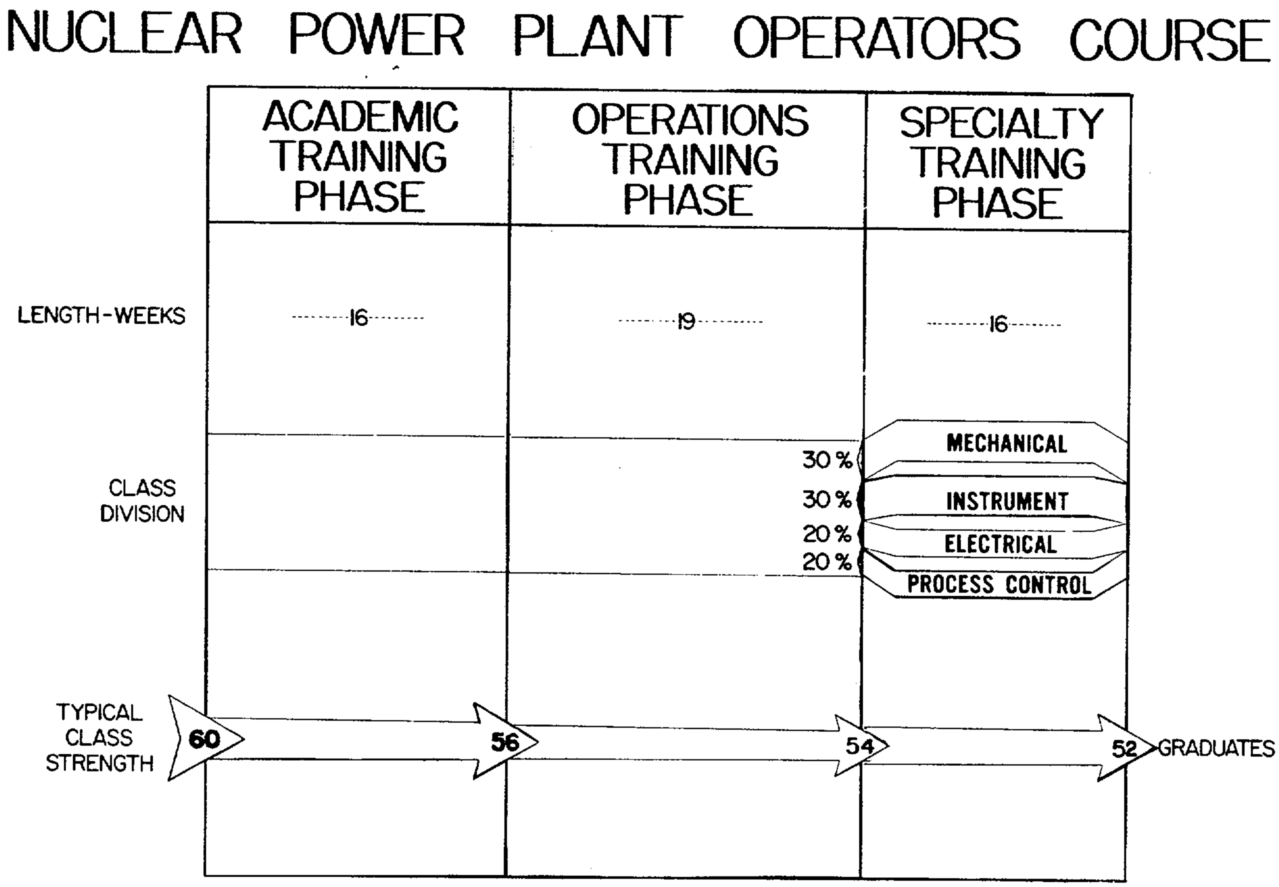

Figure 5-3. The Nuclear Power Plant Operators Course.

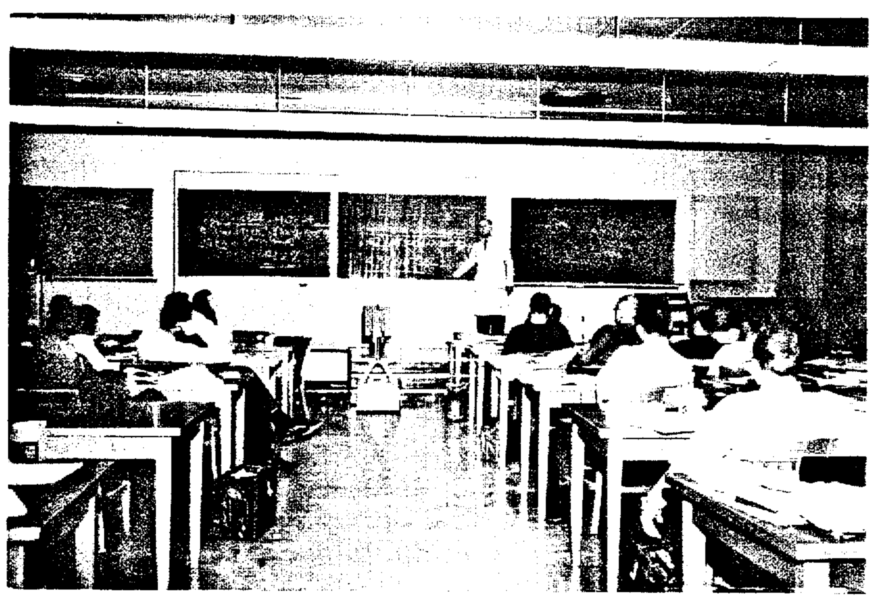

Figure 5-4. An Academic Phase Class of the NPPOC.

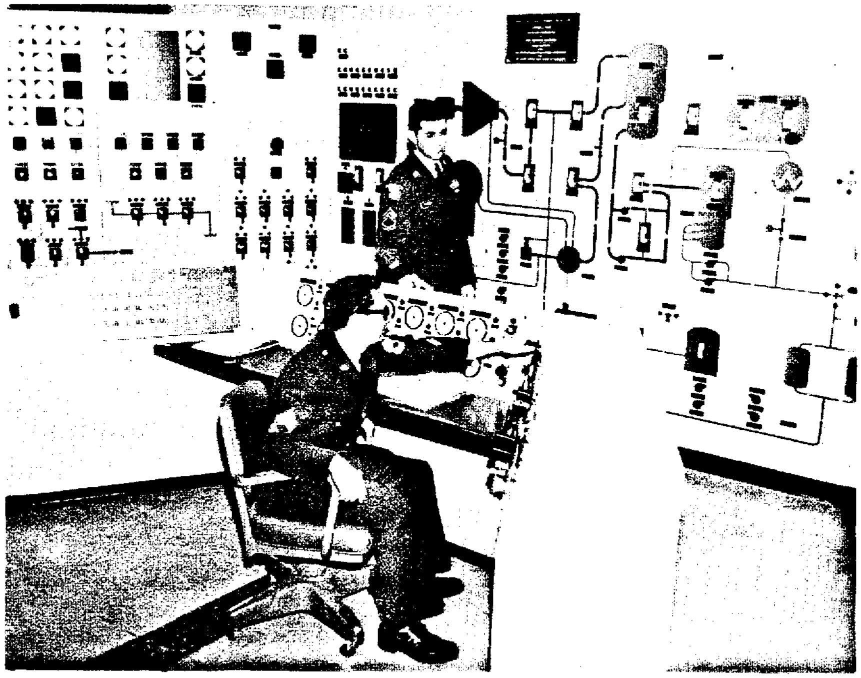

Figure 5-5. An Operations Phase Class using the SM-1 Simulator.

Figure 5-6. A Process Control Specialty Class of the NPPOC.

developed at the various plants to which he is assigned. In each plant, he is trained by the plant Officer-in-Charge to qualify in turn as a second class, then first class operator. The most competent are further trained as Shift Supervisors and Plant Supervisors. Of course, concurrent training in the details of his plant's maintenance is given, and assignments in the training and maintenance fields require still further training. An ANPP operator or supervisor is constantly being trained, either formally or on-the-job, to assume the roles briefly described earlier. By constant attention to the state of each man's training, the maximum utilization of his potential is assured. Naturally, the competition for selection to be trained as a Shift Supervisor and/or Plant Supervisor is quite intense, and those chosen are justly deserving of the increased rank and responsibility.

1.	*Nuclear Power Plant Operators Course*	*52 Weeks*
2.	*Crew Training Courses*	*2 - 6 Weeks*
3.	*Advanced Technical Training Courses*	*Variable*
4.	*Plant Superintendent (General) Course*	*13-1/2 Weeks or 3 Months*
5.	*Nuclear Power Staff Officers Course*	*2 Weeks*
6.	*Course for Nuclear Plant Engineers*	*6 Weeks*
7.	*Course for Officers-in-Charge*	*12 Weeks*
8.	*Nuclear Reactor Health and Safety Course*	*2 Weeks*

Figure 5-7. Summary of Courses Conducted by Training Department, NPFO.

The criteria for selection and training of Officers-in-Charge are also very stringent. Chosen by the Director, ANPP, from among experienced Corps of Engineers Officers, prospective Army OIC's for example, have a BS degree in science or engineering. They are then given a three-month course to augment their nuclear engineering knowledge gained in civil schooling and to qualify them in the details of the type plants used in the ANPP. Finally, each OIC is given a comprehensive course covering the operation and maintenance of the specific plant to which he is assigned. Such criteria and training assures that Program plants are in safe hands.

The final step in an operator's or supervisor's preparation to assume his role is the qualification procedure which is used to evaluate and standardize his competence. Qualification is the act by which the ANPP makes known its confidence in an individual's ability to perform a given job and is awarded only after satisfactory completion of a training program for that job and both written and oral examinations on the details of the job. The procedure is highlighted by appearance before a Qualification Board which thoroughly tests the individual's competence and, only after detailed examination, recommends his qualification. The chain of events connected to each job — selection, training and qualification — leads to every trainee's goal. Satisfactory performance in one job level is normally followed by selection for and training in jobs of greater responsibility.

6. REACTOR PROJECTS

This chapter furnishes brief descriptions of the first five station nuclear power plants developed by the Program. Additionally, information is provided on the Program efforts in the area of mobile reactor applications. The descriptions are limited to plant components and to the more important aspects of each plant's history. Greater detail regarding specific plants can be obtained from technical literature published by the Program in the form of operating manuals, safety analysis studies and other reports.

SM-1

Located at Fort Belvoir, Virginia, the SM-1 was the first plant developed by the Army Nuclear Power Program. This plant also has the distinction of being one of the first reactor systems in the United States to supply power to an electrical grid. It presently is the oldest operational nuclear power plant in the nation. The plant is operated by the SM-1 Branch, Nuclear Power Field Office, as a training vehicle for student operators and as a tool for research and development.

Early in 1954, the Atomic Energy Commission invited proposals from thirty-three industrial firms for the complete design, construction and test operation of a prototype nuclear power plant for the Military Services, to be based on a design conceived by the Oak Ridge National Laboratory. Eighteen proposals were received in response to this invitation, and in December 1954, the contract was awarded to ALCO Products. The contract provided for guaranteed operation, to be established by a 700-hour performance test as well as a six-month operation test during which time the plant would produce electric power. The SM-1 contract was the first fixed-price contract awarded for a reactor plant.

Construction of the plant, originally known as the Army Package Power Reactor (APPR), was begun on 5 October 1955 and the first electric power was produced on 15 April 1957. The 700-hour test was completed before 10 July 1957 and the Corps of Engineers assumed full responsibility for the operation of the plant on 1 July 1960.

Since the SM-1 was the first plant of its kind, many factors influenced its construction. A system was set up to provide constant monitoring of air and water effluents; this system and the characteristically silo-shaped vapor container insure the integrity of the reactor plant and preclude the remotest possibility of a dangerous release of radioactivity. The plant is used for research and development and training activities, thereby creating a need for special features. Fuel element testing at the plant, which contributes to design and construction progress, is a special consideration; core physics work and operational testing, greatly increasing the efficiency and life of present-day reactor fuel cores, has been performed on a continuing basis at the SM-1. The training of new enlisted operators, supervisors and officers represents a special challenge for the SM-1 crew and plant operations. In addition, the SM-1 is the showplace of the ANPP; plant operations must accommodate frequent tours. Visitors from many nations and all walks of life have been introduced to nuclear power by the SM-1 crews.

The initial core of the SM-1 operated from April 1957 until May 1961. With slight modifications, it produced 3.8 megawatt years of electrical energy. Core I achieved a fairly high burnup rate, approximately 30 - 40% which means that about 60 - 70% of the uranium originally in the core will be recovered for future use. After Core I was removed to be shipped to the National Reactor Test Station for reprocessing, Core II was installed. Core II is still operating in the reactor. Core III which represents a major advancement in extended operating life over Core II, has been procured for use when Core II is depleted.

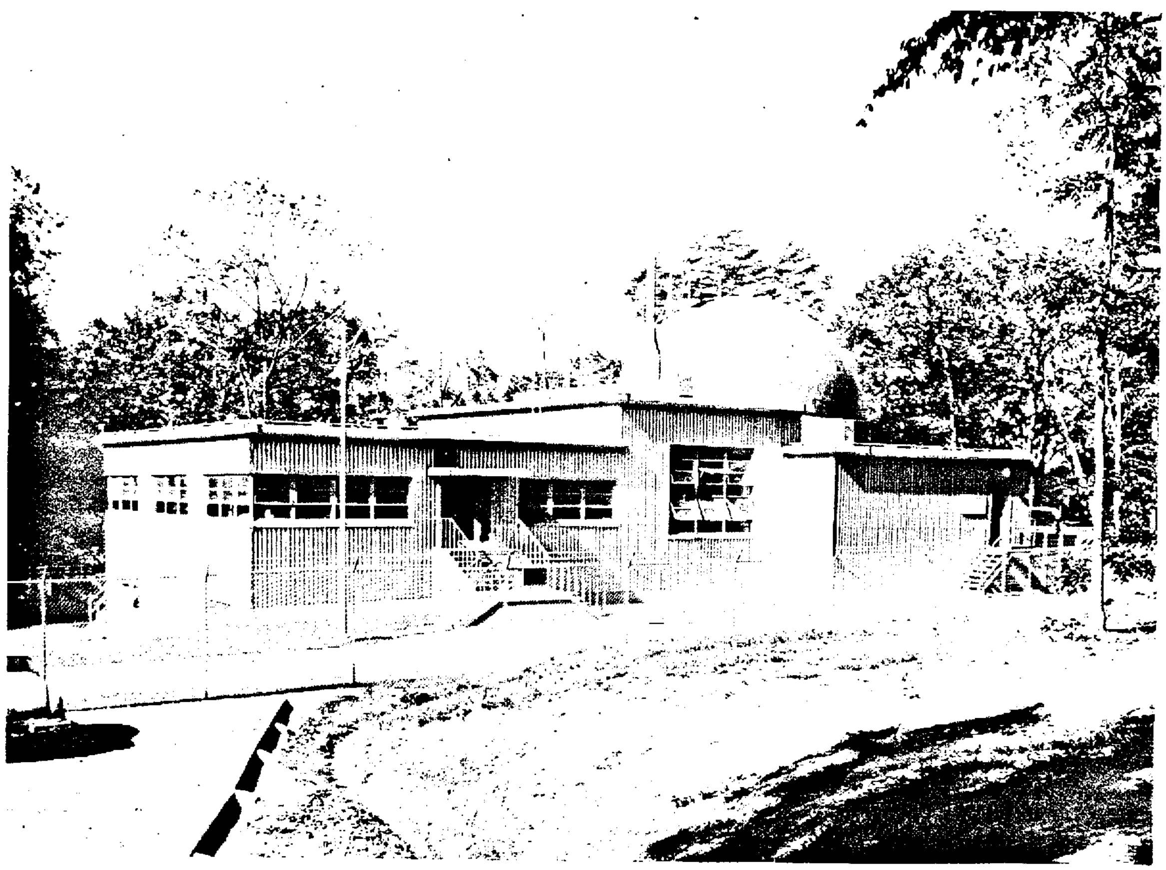

Figure 6-1. A Ground Level View of the SM-1 Nuclear Power Plant.

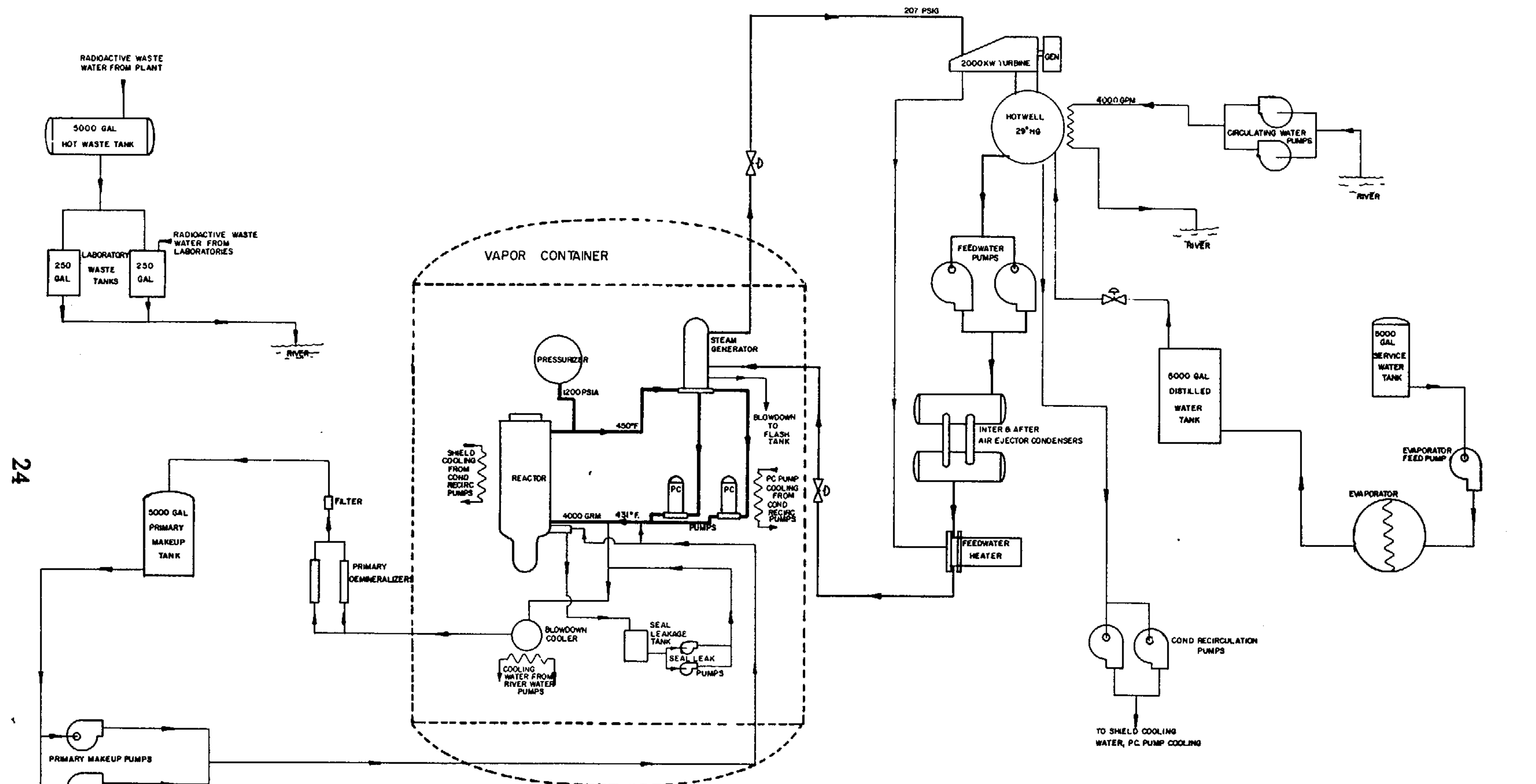

Figure 6-2. Simplified Flow Diagram SM-1.
(Typical of Pressurized Water Reactor Systems)

Location	*Fort Belvoir, Virginia*
Operated by	*U. S. Army*
Operated for	*NPFO*
Reactor type	*Pressurized water*
Reactor thermal power	*10 MW*
Core life	*16.4 MWy*
Primary coolant, moderator, reflector	*Water*
Fuel	*Highly enriched U^{235}*
Control rod absorber	*5-Europium oxide (EU_2O_3)* *1-Gradiated boron enriched in B^{10}* *1-Silver-cadmium-indium*
Burnable poison	*Boron oxide*
Primary loop pressure	*1200 psia*
Core inlet temperature	*431°F*
Core average temperature	*440°F*
Core ΔT	*19°F*
Primary coolant flow rate	*4000 gpm*
Steam flow rate	*34,000 lb/hr*
Throttle inlet pressure	*208 psig @ 425°F*
Condenser pressure	*1.5 inches Hg abs*
Turbine	*Impulse, 8 stages*
Generator rating	*2500 KVA* *1855 KW (net) @ .8 PF*
Condenser	*Water cooled*
Liquid waste	*To Gunston Cove*
Auxiliary power	*300 KW Diesel Generator*
Water supply	*Service water*

Figure 6-3. Summary of the Important Characteristics of the SM-1.

PM-2A

The PM-2A, the second ANPP plant to become operational, was the first portable nuclear power plant in the world. Based on the proven design of the SM-1 at Fort Belvoir, the PM-2A provided electricity and steam for Camp Century, the "City Under the Ice" in Greenland.

Camp Century, built by the Corps of Engineers and operated by the U. S. Army Polar Research and Development Center (now the U. S. Army Arctic Research Support Group), is located 138 miles inland on the Greenland ice cap, less than 900 miles from the North Pole. The camp was constructed entirely below the ice cap surface. Logistic support in such an environment is difficult, especially during the winter months. Hence, it was determined that a nuclear power plant would serve Camp Century requirements advantageously.

Work was begun early in October 1958 by the Nuclear Power Field Office to prepare contract specifications for procurement of a prepackaged nuclear power plant for Camp Century, and in that same month, the U. S. Army Engineer District, Eastern Ocean, was given the overall responsibility for procurement and construction of the plant. On 10 November 1958, invitations to bid on the project were transmitted to ALCO Products and the Martin-Marietta Corporation who had been preselected because of the stringent time schedule imposed by the early power needs of the camp. Proposals were received from the two contractors on 11 December 1958, and a fixed price, guaranteed performance contract for $3,226,560 was awarded to ALCO Products with the requirement that the plant be shipped by 20 May 1960, 16 months from the date of contract award.

This stringent time schedule, coupled with the extreme environment of the plant's locale, placed unusual requirements on the plant characteristics. Designed to be constructed in prepackaged skids, the plant was to be capable of being transported by air and installed in the ice tunnels of Camp Century by an ANPP trained crew in 90 days; and this with no field welding. The contract also prescribed preassembly of the plant at ALCO's Dunkirk, N. Y. facility to be followed by testing of all nonnuclear components. The plant would be disassembled and packaged for shipment after testing.

The plant departed Buffalo, N. Y. on 26 June 1960 aboard the USNS Marine Fiddler. One of the largest skids was air-lifted to Thule AFB to prove the plant's air transportability. On 10 July 1960, the Marine Fiddler arrived at Thule, Greenland, and unloading

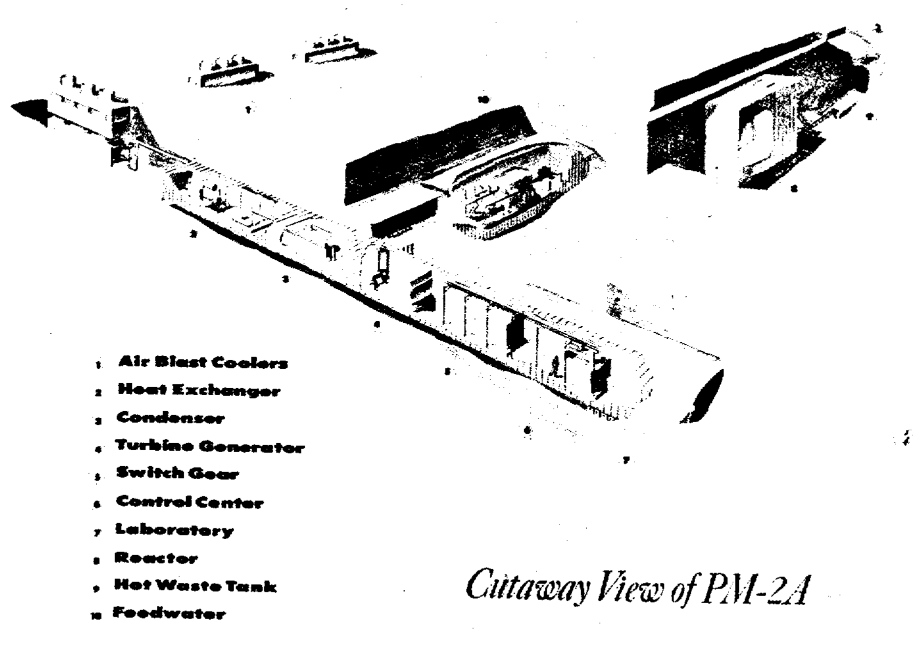

Figure 6-4. Artist's Concept of the PM-2A implaced in Snow Tunnels.

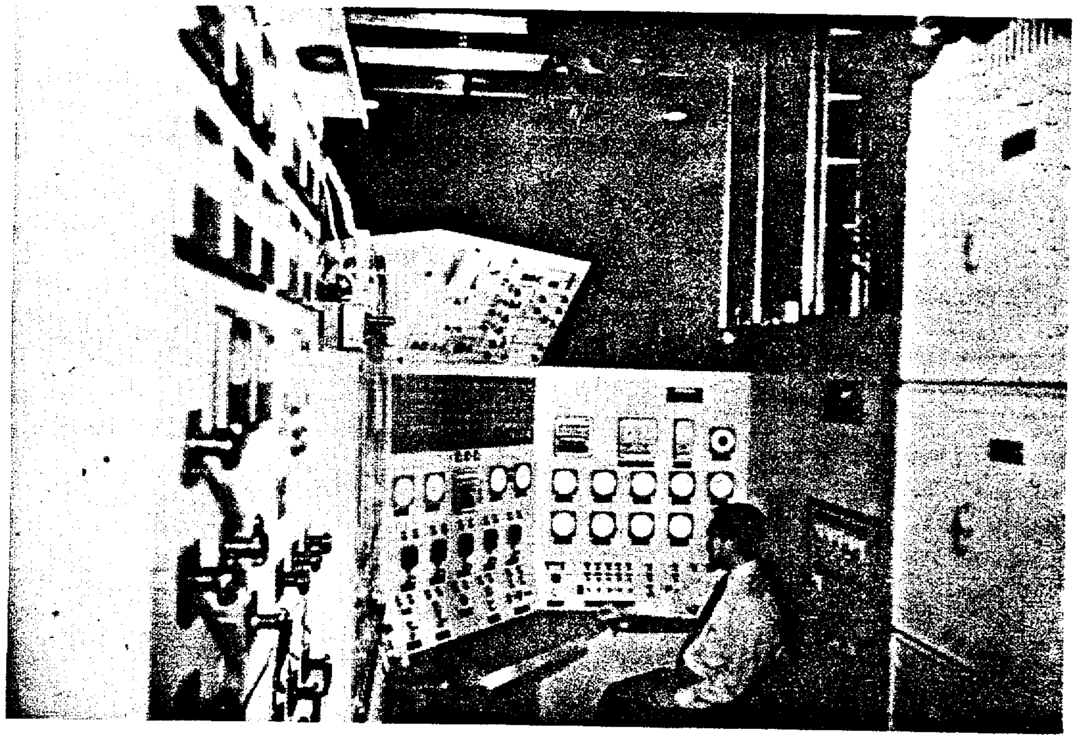

Figure 6-5. The PM-2A controls occupy much less space than the control room of the SM-1.

for the truck trip to the ice cap and the sled trip to Camp Century began. Plant components were shipped in order of installation, the first leaving Camp Tuto on the end of the ice cap at 1200 hours, 13 July and arriving at Camp Century at 0400 hours, 17 July. After much concentrated effort, the plant installation was completed and criticality was reached at 0625 on 2 October, a construction period of 77 days, 7 hours and 25 minutes.

The plant is the first of a kind in many ways, not the least of which is its modular construction, providing separate skids for the primary system air-blast coolers, heat exchangers, electrical switch-gear, the turbine generator and the control package. Additional components and interconnecting piping were packaged separately. Other interesting features of the plant are the air-blast coolers for condensing turbine exhaust steam, and the Rodriguez Well. The well was developed by and named for an engineer of the U. S. Army Engineer Research and Development Laboratories. It provided Camp Century's water supply by using steam from the nuclear power plant to melt ice from the 6,000 feet thick Greenland ice cap.

In the design of the plant, a major consideration was feasibility for relocation should conditions indicate the desirability of such a move. The opportunity to prove this capability came with the declining use of Camp Century and a corresponding reduction in power requirements. The PM-2A was shut down during the summer of 1963. In September, the spent fuel was removed, and Camp Century was closed for the winter. During April 1964, dismantling and packing of plant components got under way. This was

Location	
Primary system	*National Reactor Testing Station, Idaho*
Secondary system	*New Cumberland Depot, Pennsylvania*
Initial criticality	*2 October 1960*
Total power generated	*1.1462×10^7 KWh*
Shutdown for relocation	*9 July 1963*
Operated by	*U. S. Army*
Operated for	*USAPRDC*
Reactor type	*Pressurized water*
Reactor thermal power	*10 MW*
Core life	*10.7 MWy*
Primary coolant, moderator, reflector	*Water*
Fuel	*Highly enriched U^{235}*
Control rod absorber	*Europium*
Burnable poison	*Boron carbide (B_4C)*
Primary loop pressure	*1750 psia*
Primary coolant temperature	
In	*500° F*
Average	*509° F*
Primary coolant flow	*4240 gpm*
Steam generator	
Pressure, operating	*440 psig*
Temperature, operating	*460° F*
Steam flow	*37,700 lb/hr*
Turbine	
Type	*Impulse*
Speed	*7,450 rpm*
Vacuum	*22 in Hg*
Generator	
Rating	*2,500 KVA 2,000 KW @ .8 PF 1,560 KW (net)*
Condensers	*Glycol to air Air blast coolers (3)*
Heating output	*1×10^6 BTU/hr*
Liquid waste	*Liquid to snow hole*
Auxiliary power	*300 KW Diesel Generators*
Water supply	*Melted snow*

Figure 6-6. Summary of the Important Characteristics of the PM-2A.

the first time anywhere in the world that such an operation had been attempted. It was completed by 1 July and by the end of the month the components of the PM-2A were en route to the United States. Dr. C. F. Jacobsen, who completed post removal radiological inspection of the site for the Danish Atomic Energy Commission, reported to his government that, "The dismantling and transportation of the PM-2A had been performed rapidly and without harm to personnel. In the absence of specialized lifting materials, and under adverse climatic and 'soil' conditions, an impressively high efficiency has been attained."

PM-2A components, with the exception of the reactor skid, have been placed in storage. The reactor is being used by the AEC in a pressure vessel test program at the National Reactor Testing Station in Idaho. When a new requirement for the PM-2A is identified, a second reactor skid will be fabricated to meet new site conditions. The new reactor then will be integrated with the stored components and the plant returned to use as a military power facility.

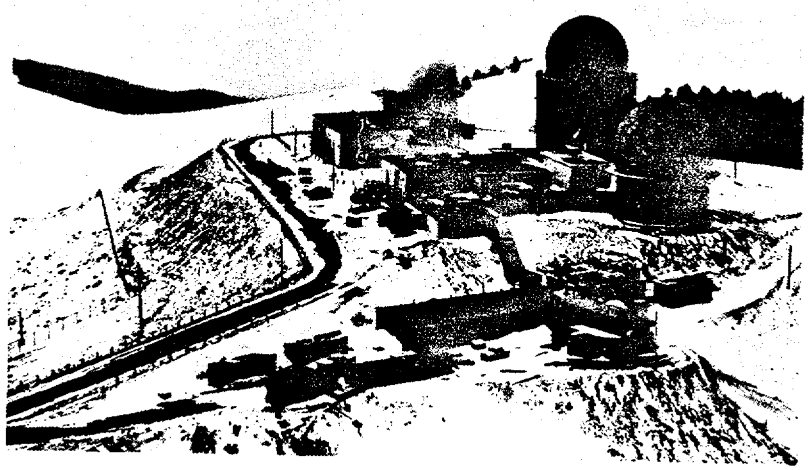

Figure 6-7. The PM-1; perched on the side of Mount Warren near Sundance, Wyoming, and providing power for the Sundance Air Force Station.

PM-1

The PM-1 was the first of the portable medium power plant projects to be initiated in the ANPP (although the PM-2A was the first completed) and is the Program's first plant for the Air Force. The PM-1 furnishes electrical power and space heating for the Sundance Air Force Station radar site six miles from Sundance, Wyoming, in the northeast corner of the state. The plant is under the operational control of the Station Commander and is operated by an Air Force crew, trained by the Army Nuclear Power Program.

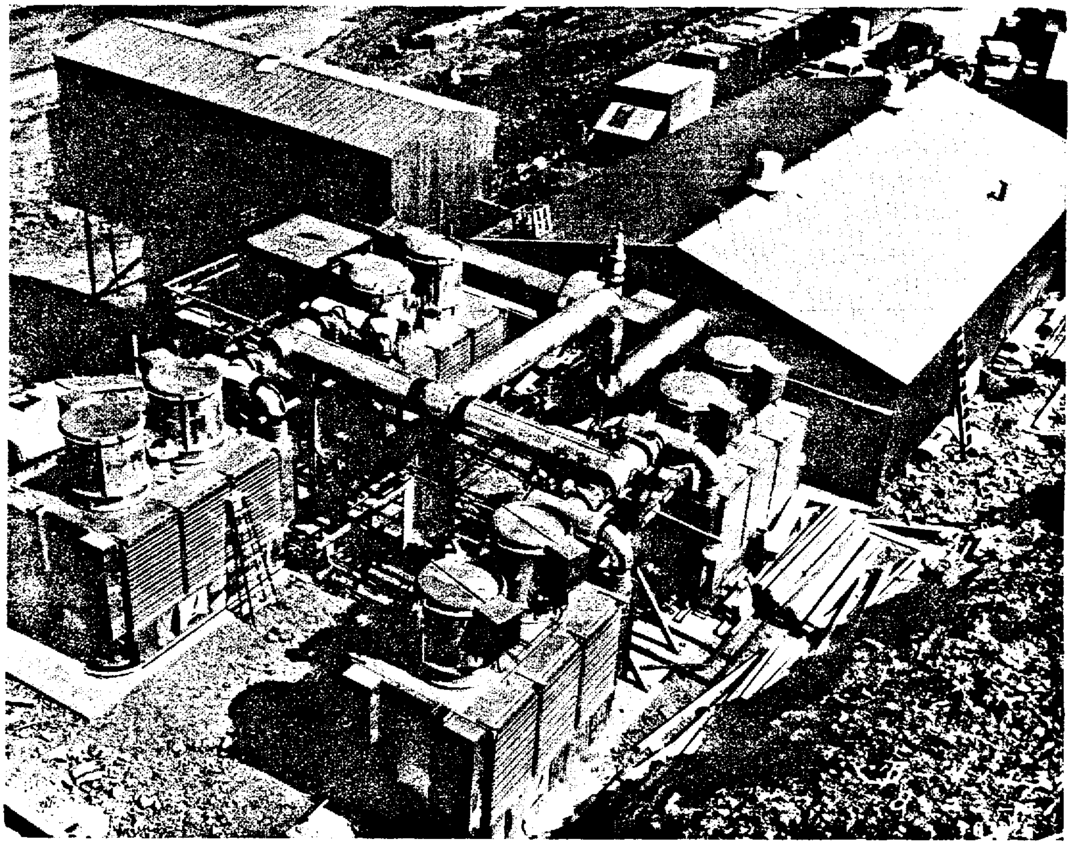

Figure 6-8. The PM-1 under construction; the four air blast coolers are shown in the foreground, while the reactor is under the building to the left rear.

To provide a portable plant incorporating improvements over the SM-1 design and the PM-2A application of that design, a contract was let to the Martin-Marietta Corporation of Baltimore, Maryland, for the design, construction and testing of the PM-1. The contract was jointly funded by the AEC and the Air Force; and construction, under supervision of the AEC was begun in July 1961. As in all portable plants, the modules were assembled and nonnuclear components were tested at the contractor's facility prior to shipment to the site. Also as is normally done with portable plants, the plant's initial crew participated in the test fabrication, as well as the final on-site construction. At 1843 hours, 25 February 1962, construction was essentially complete and the PM-1 went critical, becoming the ANPP's third plant on the line and the first operational Air Force nuclear power plant.

The PM-1 not only provides steam for heating the station area and electricity for normal station use, but also provides precisely controlled power for radar operation. The environment of the station site, high on Warren Peak where winter temperatures of -40^{o} are common, and the radar station's requirement for a precise, highly dependable power source have provided an excellent facility for the Air Force to test the desirability of nuclear power. Lessons learned here will benefit the ANPP in its continuing development of station power plants, and will provide experience for Air Force crews and for future users.

The PM-1 is a pressurized water system, but there are a few unique features which depart radically from the SM-1 type system. The unique features include the packaging of the plant, tubular cermet fuel elements, magnetic-jack control-rod drives, cermet control blades containing europium titanate, and no reactor-plant containment vessel of the usual type.

The reactor core is composed of highly enriched U^{235} formed into stainless steel clad tubes, a total of 741 of which are placed in the cylindrical reactor vessel. The core also contains 90 separate burnable poison rods as well as 18 dummy stainless steel tubes to lengthen core life and establish proper flux distribution. Fuel tubes, poison rods, and dummy tubes are all interconnected into a central bundle and six identical peripheral bundles, each of the latter containing a control rod. The six control rods are composed of europium oxide dispersed in stainless steel and are fabricated in a "Y"

Location	*Sundance, Wyoming*
Operated by	*U. S. Air Force*
Operated for	*Sundance A. F. Station*
Reactor type	*Pressurized water*
Reactor thermal power	*9.37 MW*
Core life, nominal	*18.74 MWy*
Primary coolant, moderator, reflector	*Water*
Fuel	*Highly enriched U^{235}*
Control rod absorbers	*Europium compound dispensed in SS (30 wt % Eu_2O_3)*
Burnable poison	*Boron*
Primary loop pressure	*1300 psia*
Core inlet temperature	*447°F*
Core outlet temperature	*479°F*
Core ΔT	*32°F*
Primary coolant flow rate	*2125 gpm*
Steam flow rate	*34,332 lb/hr*
Throttle inlet pressure	*290 psia*
Condenser pressure	*9" Hg abs*
Heat output	*7 x 10^6 BTU/hr (35 psia)*
Turbine	*Impulse, 5 stages, single extraction*
Throttle pressure (full power)	*290 psia*
Condensers (4)	
Type	*Direct air to steam*
Heat load per unit	*5.2 x 10^6 BTU/hr*
Number of fans per unit	*2*
Generator rating	*1563 KVA 1250 KW @ .8 PF 1,000 KW (net)*
Liquid waste	*Evaporated*
Auxiliary power	*150 KW Diesel*
Water supply	*Pumped from wells*

Figure 6-9. Summary of the Important Characteristics of the PM-1.

shape, while the control rod drive mechanisms are friction-grip, magnetic-jack type actuators. All actuator moving parts (except the position-indicator sensor) are contained entirely inside a "pressure thimble". With the "pressure thimble" of each actuator bolted to a port on the reactor-vessel head, there is no dynamic seal, and the actuator coils and position sensor can be removed without depressurizing the reactor, breaking welds, or removing head bolts. Thus, shaft seals and associated piping do not have to be disconnected for core maintenance or refueling. Sequential energizing of the actuator hold, grip, lift, and pull-down coils, which are located outside the "thimble" causes the control rods to be raised or lowered in an action which has been aptly named "magnetic jacking." With its improved core design, the PM-1 has given an insight into the concept of more modern reactor systems.

One of the more interesting features of the PM-1's construction is its lack of containment. Because of the proven design, remote location, and inherent safety of the pressurized-water system, the PM-1 primary system is uncontained in the generally accepted sense. The primary system components are all installed in three underground cylindrical tanks. Designed to minimize the release of radioactive material and to isolate potential hazard areas, the tanks are buried vertically beneath the primary building. The three container tanks do not provide a volume structurally capable of containing the products of a maximum credible accident. In the unlikely event that an accident does occur, dispersal of radioactive material would be limited by the shield water, ground around the tanks, and the primary building. The PM-1 design formed the starting point on which design of a Standard Plant is based.

PM-3A

A sister plant to the PM-1, the PM-3A has the distinction of being the Navy's first land-based power reactor, the first reactor in Antarctica, and the ANPP's fourth plant on the line. Located on the west side of Ross Island at McMurdo Sound, Antarctica, the PM-3A is operated by an ANPP-trained crew to supply heat and electrical power for McMurdo Station.

In 1960 Congressional hearings, it was determined that the construction of nuclear power plants in the Antarctic would cut the cost of operations, particularly logistics, at our stations there and that, in addition to these savings, the national prestige would be enhanced by developing peaceful uses of atomic energy in Antarctica. At the conclusion of these hearings, Congress authorized and made available to the AEC and the Navy, funds to construct the PM-3A at McMurdo Sound. The contract for the plant was awarded to the Martin-Marietta Corporation, who, since they were already involved in a similar plant (the PM-1) progressed rapidly on the design and testing of the PM-3A.

By November 1961, the testing complete, the PM-3A was disassembled, prepackaged, and transported to Davisville, Rhode Island, for shipment to Antarctica aboard the USS Arneb. The plant arrived at its destination on 12 December 1961 and was sledged over ice-covered McMurdo Sound and up the side of Observation Hill, where assembly began in preconstructed buildings. Assembly of the plant was accomplished by a Navy construction crew with the technical assistance of Martin-Marietta and contract supervision by the AEC's New York Operations Office. With construction essentially complete, the plant went critical on 3 March 1962, 81 days after the Arneb arrived at McMurdo.

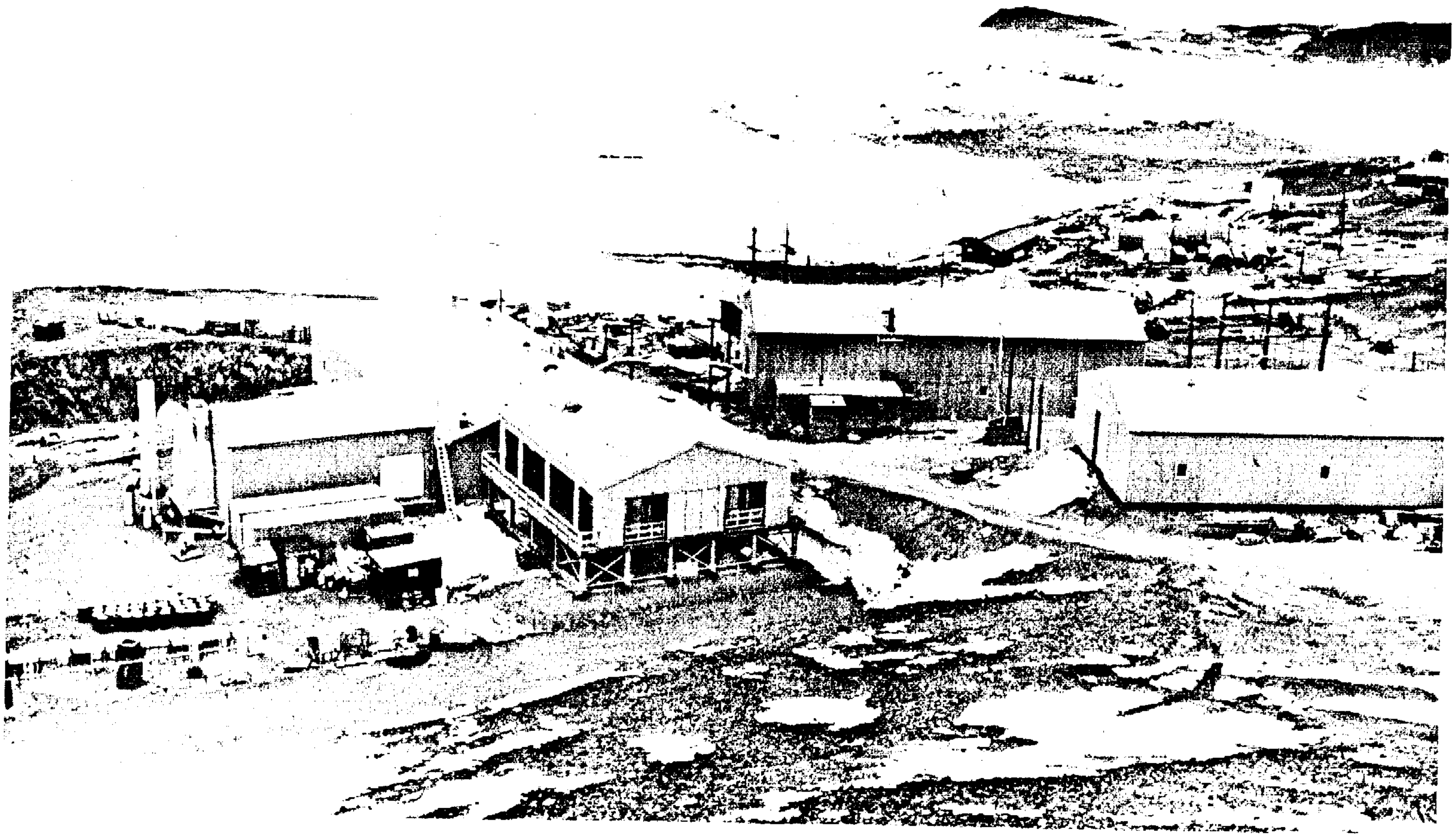

Figure 6-10. PM-3A Nuclear Power Plant, McMurdo Station, Antarctica.

Location	*McMurdo Station, Antarctica*
Operated by	*U. S. Navy*
Operated for	*Antarctic Support Activities*
Reactor type	*Pressurized water*
Reactor thermal power	*9.51 MW*
Core life	*14.73 MWy*
Primary coolant, moderator, reflector	*Water*
Fuel	*Highly enriched U^{235}*
Type	*Cermet (UO_2 dispensed in SS)*
Control rod absorber	*EU_2O_3 .$2TiO_2$ (dispensed in SS)*
Burnable poison	*Natural boron in stainless steel alloy*
Primary loop pressure	*1,300 psia*
Core inlet temperature	*447^oF*
Core average temperature	*463^oF*
Core ΔT	*32^oF*
Primary coolant flow rate	*2,200 gpm*
Steam flow rate (full load)	*36,131 lb/hr*
Steam pressure at turbine throttle at full load	*290 psia, 414^oF*
Electric output	*1,800 KW @ .8 PF*
	1,560 KW (net)
Turbine	*Nine stages (1) Curtis (8) Rateau*
	First stage extraction
Exhaust pressure	*6 " Hg abs*
Generator	*2 pole, direct-drive*
	3600 rpm
	2250 KVA
	Self-cooled
Condensers	*Steam to air*
	Air blast (4)
Waste	*CONUS disposal*
Auxiliary power	*2-Diesel generators*
	(1) 175 KW Allis Chalmers
	(1) 250 KW Caterpillar
Water supply	*Desalinization plant and snow melter*

Figure 6-11. Summary of the Important Characteristics of the PM-3A.

The PM-3A is the third of the modular or skid mounted plants and like the PM-1, is constructed essentially above ground. Only the four tanks containing the primary system components are located below ground. Although located at extreme latitude, the plant is not on permanent ice cap as was the case with the PM-2A at the opposite end of the world. The weather is more extreme, however, for climatological records show an all-time low of -59^o, and winds up to 155 mph have been recorded. The year round mean is 0 degrees, with wind velocities averaging 12 - 14 mph, and a high of 40^o as the maximum recorded. In the summer support season, from October to February, the plant supplies electricity and heat for the station's 1,000 inhabitants. The crew winters over to serve the March - September population of 230 servicemen and civilian scientists.

A conventional pressurized water reactor, the plant's primary system is very similar to the Air Force PM-1 and has the new tubular type core and "magnetic-jack" actuated control rods similar to those described previously. The major difference in the two plants is that the PM-3A is contained (using four containment vessels in place of the three tanks used in the PM-1). The fourth tank is for entrapped gas expansion under accident conditions to insure that absolutely no contamination is released in such a situation through overpressure of the system.

Probably the most unique requirements of the plant are imposed by the Antarctic Treaty, which prescribes that no radioactive waste of any kind will be disposed of on the continent. To comply with this exceedingly stringent requirement, the PM-3A uses a liquid waste concentration system similar to the one described for the PM-1. The highly concentrated sludge is then returned to CONUS for disposal after it is sealed in concrete-lined drums. Gaseous waste is compressed into cylinders and, like solid waste, is packaged for disposal off the continent.

Another interesting feature of McMurdo Sound, which also places a unique requirement on the PM-3A and its crew is its complete isolation from the outside world during the months of March through September. Not only is the crew without the convenience of the corner grocery, but the plant must operate without fuel and parts replacement other than those on hand. A similar situation existed in Greenland, of course, but not to such an extreme; so the PM-3A serves as an even more graphic display of the value of low-maintenance, seldom refueled nuclear power plants.

SM-1A

The SM-1A, which began operation in March 1962, is the largest operational ANPP plant to date. Its 20.2 megawatt (thermal) core produces 1640 kilowatts (net electrical) and 36,000 pounds of steam per hour at 65 psi for space heating, providing the power requirements of the U. S. Army Alaska's Fort Greely, located 100 miles southeast of Fairbanks. An improved version of the SM-1, the plant was operated by the SM-1A Detachment of NPFO until 1 July 1964. Since then, the plant has come under the operational control of the U. S. Army, Alaska. In August 1964, the SM-1A completed 2,750 hours of uninterrupted operation, a record run for military nuclear power plants.

The SM-1A was designed under a contract awarded in July, 1956 to ALCO Products and constructed under a contract awarded in April, 1958 to Peter Kiewitt Sons' Company of Seattle, Washington. Construction began on 4 June 1958, under supervision of the U. S. Army Engineer District, Alaska, and initial criticality was reached at 0038 hours, 13 March 1962. The plant was accepted from the contractor on 15 June 1962.

It is interesting to note that half of the energy produced in the SM-1A is used to generate electricity and the other half to produce low pressure steam to provide all the post's steam space heating.

The home of the U. S. Army Arctic Test Board, Fort Greely experiences weather extremes of -66° in winter to 90° in summer and is an excellent post for application of station nuclear power plants. Not only are its electrical and heating loads compatible

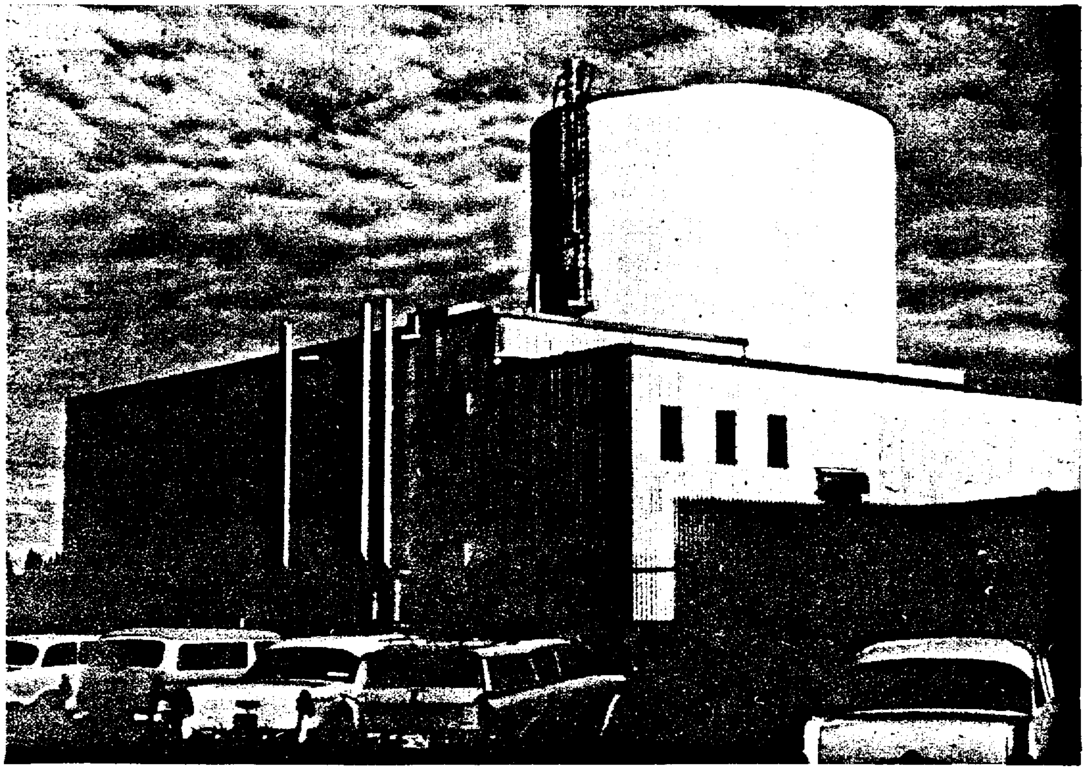

Figure 6-12. The SM-1A at Fort Greely, Alaska; the large cylinder covers the vapor container.

with the capabilities of a medium power plant, but it offers an excellent cold weather environment for "in operation" tests.

From a number of unique construction features of the SM-1A, two of the more interesting will be discussed. The first is the construction of the vapor container and the second is the source of condenser cooling water.

The vapor container, essential in the SM-1A since it is located in a populated area, serves as a final barrier against the release of radioactive substances in the unlikely event of a serious accident in the reactor. The container is constructed of an outside hemispherical topped cylindrical steel shell 40'8" in diameter and 62'4" high, which incloses a cylindrical concrete tank 35'0" in outside diameter and 45'6" high. The space between the outside of the concrete tank and the inside of the steel shell is water filled and serves as radiation shielding. In the event of accidental rupture of the primary system, the vapors which would fill the inner container would spill into this outer, water-filled shell through sixty j-tubes and be cooled as they bubbled up through the water to the dome. In addition to serving as a heat sink, the water would absorb certain gases and particulate matter. The SM-1A vapor container design represents another step in station nuclear power plant development.

Condenser cooling water, which condenses turbine exhaust steam, represents another interesting feature of the SM-1A for it is provided from a recirculating well-water

Design power level

Location	*Fort Greely, Alaska*
Operated by	*U. S. Army, Alaska*
Operated for	*Fort Greely post*
Reactor type	*Pressurized water*
Reactor thermal power	*20.2 MW*
Core life	*32 MWy*
Primary coolant, moderator, reflector	*Water*
Fuel	*Highly enriched U235*
Control rod absorber	*Europium oxide*
Burnable poison	*Boron carbide*
Primary loop pressure	*1200 psia*
Core inlet temperature	*423^{0} F*
Core average temperature	*433^{0} F*
Core ΔT	*20^{0} F*
Primary coolant flow	*7350 gpm*
Steam flow rate (full load)	*70,000 lb/hr*
Throttle inlet pressure	*200 psia*
Condenser pressure	*2.5 in Hg abs*
Turbine	*Impulse (11 stages)* *3 stage extraction for post heating*
Generator rating	*2500 KVA* *1640 KW, net @ .8 PF* – 172.5 *1200 rpm*
Condenser	*Water cooled*
Liquid waste	*Retention area (20,200 gallons)* *Discharged to Jarvis Creek after dilution in summer*
Auxiliary power	*Post diesel generating plant*
Water supply	*Deep well*

Figure 6-13. Summary of the Important Characteristics of the SM-1A.

system. Unlike the SM-1, there is no convenient surface water supply for condenser cooling and so, like the portable plants, the SM-1A required a further search for its heat sink. In contrast to the portable plants using air-blast coolers, the Alaska plant relies on water, constantly drawn from deep wells, for steam condensation. This system is very successful and, like the air-blast coolers of the portable plants, represents another step in the development of nuclear power plants for the Military Services.

STANDARD PLANT

The Standard Plant Design, mentioned earlier in Chapter 3, was prepared in order to summarize the best features of current station nuclear power plant technology in a single procurement package. Thus, the Army Nuclear Power Program has prepared an "off-the-shelf" design applicable to Department of Defense requirements anticipated over the next few years.

Similar to the PM-1 and PM-3A the Standard Plant is a pressurized water reactor using the tubular fuel element core and producing a gross electrical output of 1800 KW. The plant is designed to operate in a variety of environments with temperatures varying from $-65^{o}F$ to $100^{o}F$ and at elevations up to 7000 feet. The universal surface condenser is cooled by a natural water supply, if available. Otherwise, the surface condenser will be coupled to air-blast coolers. This tertiary system may be filled by water-glycol mixtures, when necessary, to prevent freezing.

Reliability has been the theme in designing the Standard Plant and engineering emphasis has been placed on those areas which have caused the most problems in existing plants. Plant instrumentation and the nuclear instrumentation in particular have received much attention. Nuclear detectors are placed in 6-inch diameter dry wells which are outside of the containment; thus, access is provided. Unnecessary piping and valving have been eliminated, and the feedwater heater has been deleted for simplicity.

The plant is to be prefabricated in packages for air shipment to and rapid erection on the selected site. Prior to construction of a Standard Plant, a "site-adapting" contractor will design the building, foundation, and the final heat rejection system. Then an engineer-construction contractor will be selected to build the plant. It should be noted, however, that the Standard Plant has been determined uneconomical.

THE STURGIS (MH-1A)

Construction of a 10,000 KW floating nuclear power plant was initiated in January 1963 by the Martin-Marietta Corporation of Baltimore, Maryland, under contract with the U. S. Army Engineer District, Philadelphia. Under the ANPP designation procedure,

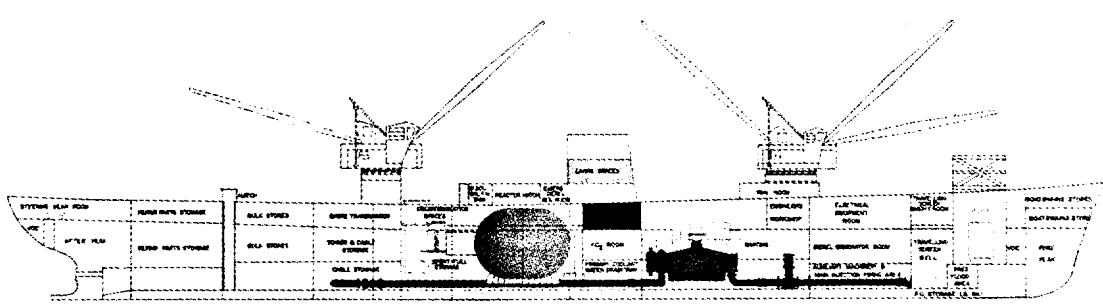

Figure 6-14. Machinery Arrangement, MH-1A.

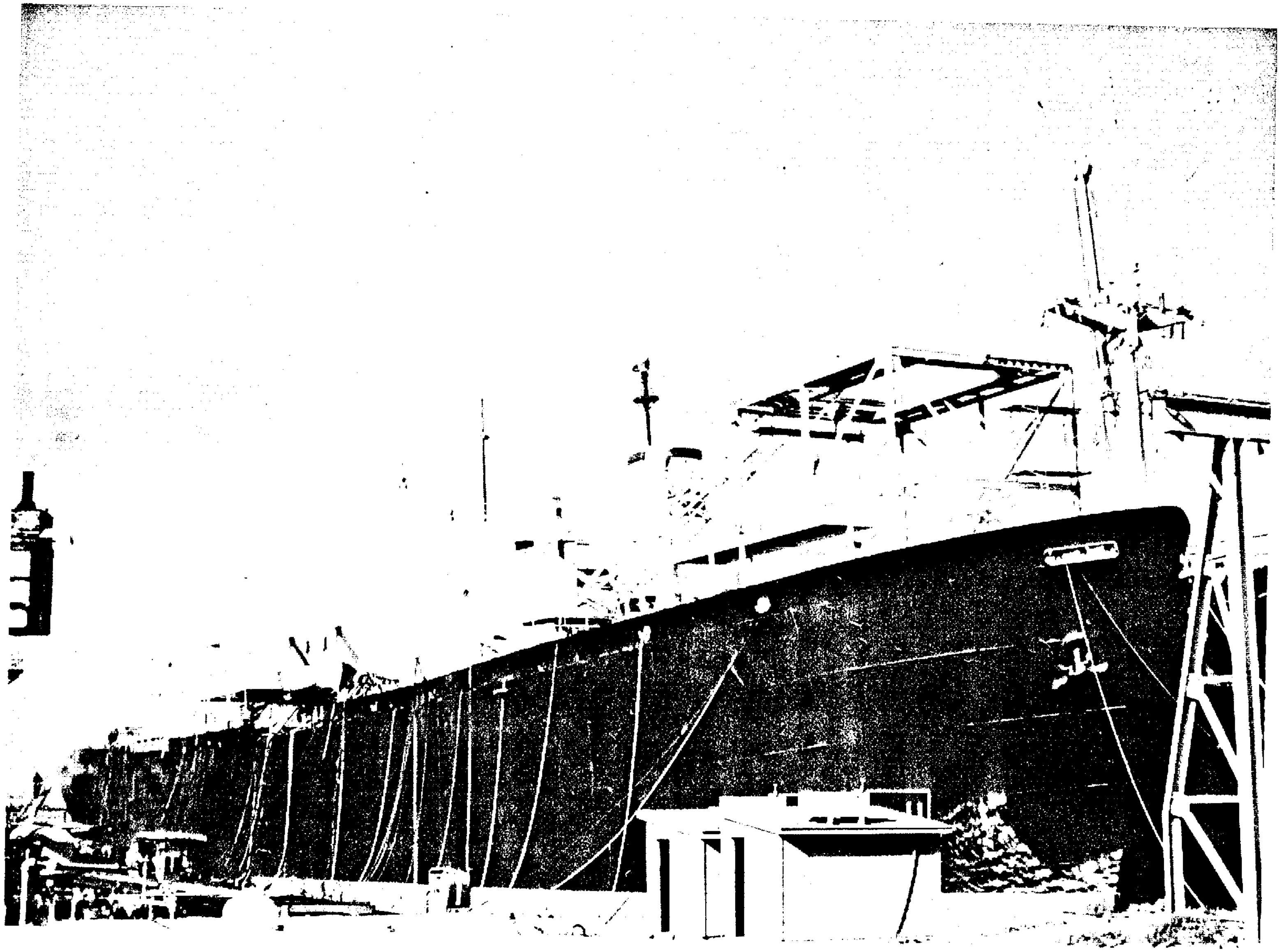

Figure 6-15. STURGIS Floating Nuclear Power Plant.

Location	*Test site — Fort Belvoir, Virginia*
Operated by	*U. S. Army*
Reactor type	*Pressurized water*
Coolant, moderator, reflector	*Water*
Thermal power	*45 MW*
Pressure, operating	*1400 psia*
Pressure, design	*1600 psia*
Flow rate	*8500 gpm*
Temperature (Ave)	
Full load	*490° F*
Core ΔT	
Full load	*40° F*
Core type	*2-Zone*
Fuel elements type	*Bulk UO_2 pellets in 348 SS tubes*
Enrichment (%) (first core)	
Outer zone	*4.65 U235*
Inner zone	*4.07 U235*
Core life	*24 months*
Reshuffling period	*12 months*
Control rods	
Shape	*Cruciform (12)*
Absorber material	*2.1% B^{10} enriched, 304 SS*
Steam generator, pressure	
Full load	*342 psia*
No load	*641 psia*
Output steam, saturated flow	*170,900 lb/hr*
Turbo generator, output, net	
13.8 KV 3 phase 60 cycles	*10,000 KWe*
11.5 KV 3 phase 50 cycles	*8,051 KWe*
Auxiliary diesels	
Number, 680 KW	*3*
Number, 150 KW (emergency)	*1*

Figure 6-16. Summary of the Important Characteristics of the MH-1A.

this plant is identified as the MH-1A (Mobile High Power Field Plant). The barge in which the MH-1A is housed, however, has been named the STURGIS in honor of the late Lieutenant General Samuel D. Sturgis, Jr., Chief of Engineers during the formative years of the Army Nuclear Power Program. The entire facility, therefore, will be known as the STURGIS.

The concept of barge-mounted plants has long been of interest to the military proponents of nuclear power. Barge-mounted, fossil-fueled power plants were employed during World War II by the Military Services at devastated port cities in Belgium, at Manila and at Pearl Harbor. Power barges are in use today at military installations at Thule, Greenland and Okinawa. One of the barges in use today at Okinawa has been in service since 1929 when a commercial power company in New Hampshire first constructed it.

Floating power plants have been proved advantageous in areas where land-based construction is difficult or expensive, or where it is impractical because of short-term needs. A nuclear power plant such as the STURGIS, operating for a year between refuelings, provides the additional advantage of extended logistic independence. As such, the floating nuclear plant would be useful in tactical support operations.

Construction of the STURGIS began with the modification of a surplus Liberty class vessel selected from the mothball fleet. Propulsion equipment was removed and a new mid-section built to accommodate the nuclear power plant and provide adequate protection in the event of collision or grounding. The new mid-body was launched in April 1964, and jointed with the bow and stern sections retained from the original hull. The MH-1A nuclear component containment vessel was installed in the STURGIS in July.

Following completion of the STURGIS, scheduled for the first half of 1966, the floating nuclear power plant will be towed to a site at Fort Belvoir, Virginia. At Fort Belvoir, the plant will undergo approximately six months of intensive testing by the contractor, to be monitored and controlled by the Nuclear Power Field Office.

ML-1

The ML-1, developed for the ANPP by Aerojet General Corporation under contract with the AEC, was an engineering test model plant. The reactor achieved initial criticality in March 1961, and the plant first produced power in September 1962. As its name indicates, the plant is of mobile, low power design. Intended to support Army field operations, the ML-1 program was discontinued in 1966 because of high costs.

ML-type plants are designed to be mounted on low-bed trailers to assure mobility and while they will not operate on the move, they will be capable of producing power within twelve hours after arrival at a new location and can be relocated 24 hours after being shut down.

Representing a new reactor design, the ML-1 combines a high-temperature, gas-cooled, water-moderated reactor with compact power conversion equipment in a mobile nuclear power plant capable of producing 300 KW of electrical power. The plant consists of three major packages: the nuclear reactor package, the power conversion package, and the control cab. Several auxiliary packages required for operation of the plant are also provided; these are the cable reel package, a water treatment package, and a gas generation and storage package. All packages, with the exception of the control cab, are skid-mounted for ease of transport. An emergency cooling system, a moderator deoxygenation system and other non-prototype systems are provided for test operations safety or for diagnostic purposes.

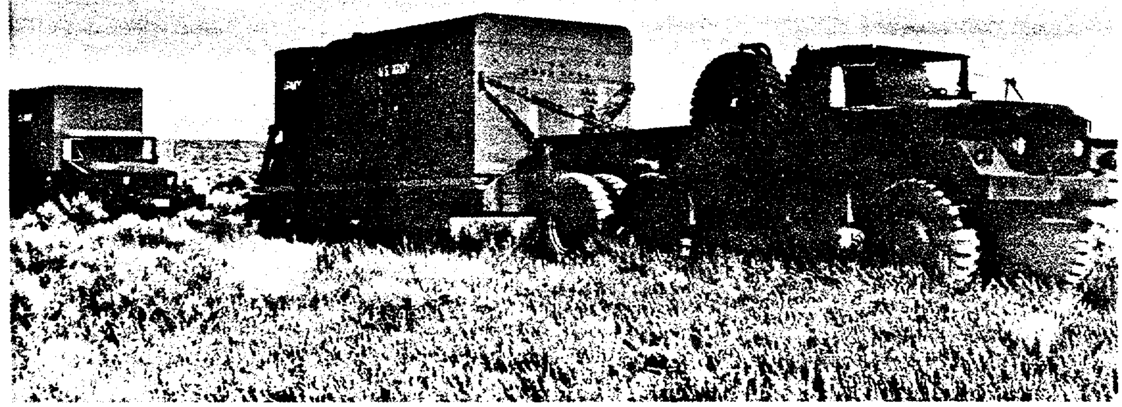

Figure 6-17. The ML-1 Nuclear Power Plant, mounted on a low bed trailer.

Location	*National Reactor Test Station, Idaho*
Operated by	*Aerojet General Nucleonics*
Operated for	*Idaho Operations Office, AEC*
Reactor type	*Gas cooled* (N_2)
Reactor thermal power design	*3.41 MW*
Core life (full power)	*10,000 hrs*
Primary coolant	N_2
Moderator	*Water*
Reflector	*Water and SS*
Fuel	UO_2 *and* UO_2*-BeO*
Control rod absorbers	*Cd In Ag*
Burnable Poison	--------
Primary loop pressure	*315 psia*
Core inlet temperature	800^oF
Core outlet temperature	1200^oF
Core average temperature	1000^oF
Core ΔT	400^oF
Primary coolant flow rate	*2400 scfm*
Electrical output	*400 KW gross*
Heat output	--------
Turbine	*Brayton cycle with regeneration*
Condenser	--------
Alternator	*500 KVA, 3 phase*
Auxiliary power	--------

Figure 6-18. Summary of the Important Characteristics of the ML-1.

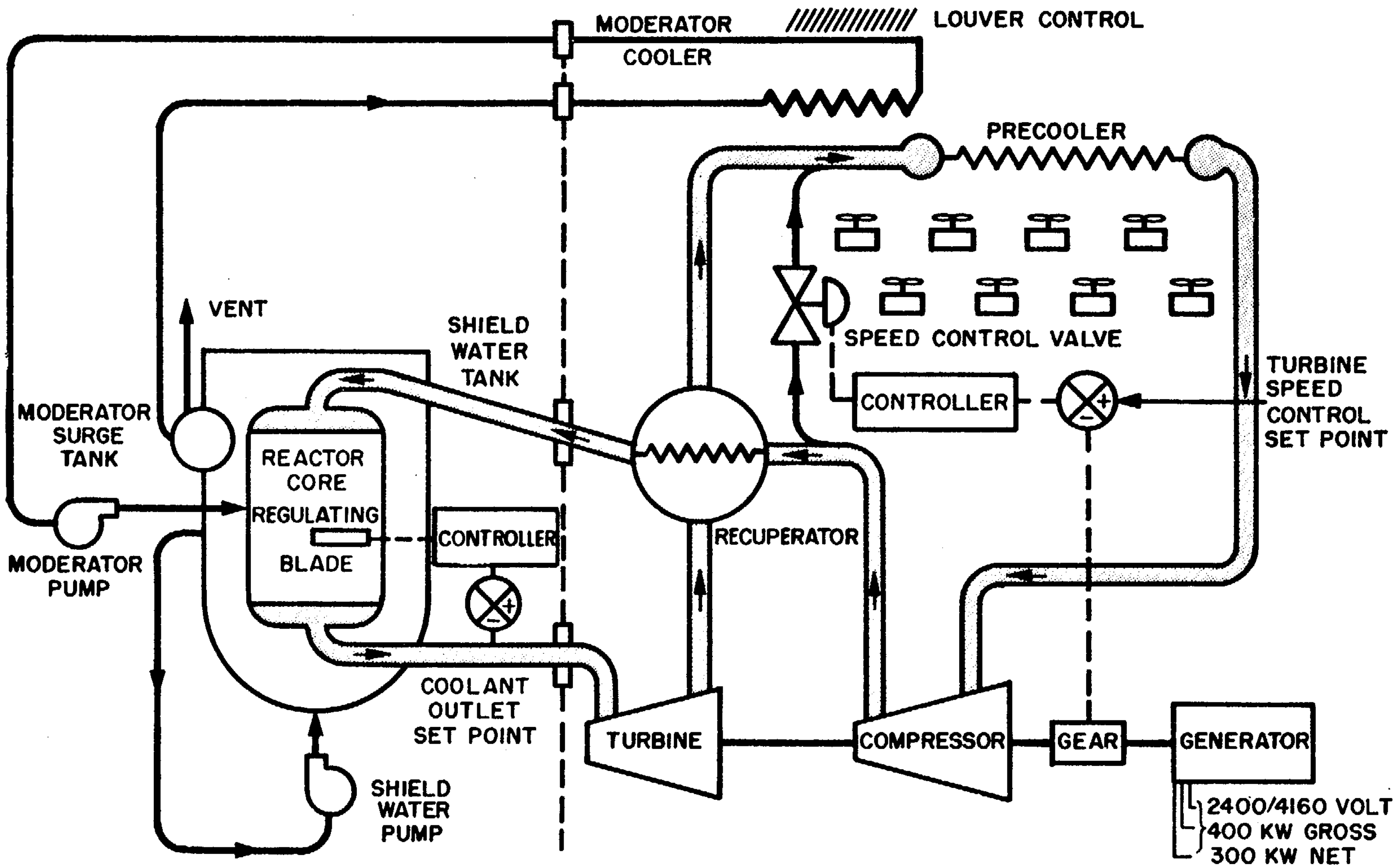

Figure 6-19. Simplified Flow Diagram ML-1.

The reactor package includes the nuclear reactor with the associated control blades and nuclear instrumentation, the moderator system, the solid shutdown shield and the drainable liquid operational shield, and associated support structure. The power conversion package includes the turbine-compressor set, recuperator, precooler, alternator, start motor, and the supporting subsystems such as the lubricating system and the seal gas and cleanup and return system.

The power plant operates as a modified Brayton, closed-cycle gas-turbine plant, utilizing oxygenated nitrogen as the working fluid, and is operated remotely from the compact centralized control cab located about 500 feet from the reactor.

The two major new concepts incorporated in the ML-1 were not only new to the ANPP but to industry as well. The closed-cycle gas-turbine developed for the ML-1 was the first in the United States, the first used in a nuclear application, and the first of its size in the world.

MILITARY COMPACT REACTOR

Like the ML-1, the Military Compact Reactor (MCR) is envisioned as a land-mobile, trailer-mounted plant also capable of being transported by ship, rail and a variety of standard cargo aircraft. Major development objectives for this plant are high power, compactness, minimum weight, rapid response and long life. Power output of the MCR will be an order of magnitude greater than that of the ML-type plants. Present efforts using preliminary design data recently developed, are being devoted to definition of the system which would best suit the Energy Depot.

AMMONIA FUELED ENGINES

Personnel of the Training Department, NPFO, have succeeded in demonstrating the feasibility of ammonia as a fuel for internal combustion engines. Although the development of utilization devices for the Nuclear Powered Energy Depot (NPED) is a responsibility of the Army Materiel Command, such a demonstration was justified before full-scale development of NPED subsystems got under way.

The initial experiment was undertaken by two ANPP enlisted men as a modification of a 1-1/2 HP military standard gasoline engine. A 1/2 HP electric motor was connected to the crankshaft with a belt drive to aid in cranking. Next, a kit used to convert gasoline engines for operation on liquid petroleum gas was installed. Spark plug and breaker point gaps were increased; and an external ignition system, powered by a 12-volt battery, was added. Successful operation of the engine with anhydrous ammonia followed advancement of timing.

Using the same procedures employed in converting the 1-1/2 HP engine, NPFO personnel next attempted to modify a vehicle engine to operate with ammonia. This experiment, in which a half-ton pickup truck was used, also proved to be successful.

7. CONCLUSION

Progress has been made on a step-by-step basis in the Army Nuclear Power Program. Beginning with the reactor technology of 1954, nuclear power plants were first made available as permanent facilities for post, camp and station use. Building on what had been accomplished, the Program next developed modular, air transportable plants that extended the logistic advantages of nuclear power to semipermanent military installations at remote locations and theater support areas. This same station power reactor technology will be available in a water-mobile application on completion of the STURGIS, a floating nuclear power plant.

Because of developmental progress in both the military and commercial reactor areas, additional useful applications have become possible: power for hardened, underground military installations and dual purpose power and desalinization plants. New nuclear reactor concepts are investigated by the Program in a constant effort to reduce the costs of nuclear power.

High costs have thus far prohibited direct application of land-mobile nuclear power plants to Field Army requirements. The Nuclear Powered Energy Depot concept, however, is being investigated as a potential means of indirect application which might permit nuclear power to compete economically with conventional energy sources.

The future efforts of the Army Nuclear Power Program will be influenced by the accumulated experience of its past achievements. The emphasis in the future will be directed to a search for means to reduce nuclear power costs. If a breakthrough in economics can be achieved, a continually broadening range of military uses can be anticipated, for nuclear power already has demonstrated its ability to provide the Military Services with greater freedom from logistic encumbrance. In wider use, it has the potential to permit greater economy of forces and resources and to expand our military capabilities. To accomplish this, nuclear power must be made to compete economically with conventional energy sources.

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TB ENG 184, Guidelines for Technical and Health Physics Inspections of Nuclear Reactors, dated 4 August 1960.

OCRD Directive No. 70-5 dated 1 Dec 60; Research and Development Responsibilities in the Nuclear Power Field.

All USAERG Regulations.

Nuclear Reactor Safety Handbook, Army Nuclear Power Program, April 1962.

SM-1 Orientation Booklet, Nuclear Power Field Office.

PM-3A Orientation Booklet, U. S. Atomic Energy Commission and United States Navy.

Final Construction Report, PM-2A, Nuclear Power Division, Office of the Chief of Engineers.

TAG Letter, 26 March 1963, Subject: Assignment of Responsibilities for the Army Nuclear Power Program.

Army Nuclear Power Program Project Charters.

FIVE ON THE LINE, Third Edition, January 1964, U. S. Army Engineer Reactors Group, Fort Belvoir, Virginia. (Superseded herewith)

1-2 4 —74,798—Ft Belvoir

(Paper SM-89/34) which led to considerable discussion. In Farmer's method, evaluation of probability of failure leads to a systematic choice of accident paths and definition of the reliability requirements for protective systems. Farmer's interesting thesis was more fully developed in a concurrent article in *Nuclear Safety*.[3] Underground containment (Paper SM-89/63), ecological aspects (Paper SM-89/64), and other interesting siting problems were discussed.

The sessions on reactor containment brought out a number of significant points on containment design. This series of papers covered the containment requirements of various reactor types and experience with various testing methods.

The final session, on release and transport of pollutants, covered such subjects as iodine trapping, the vexing question of methyl iodide removal, fuel-melting experiments, and meteorological factors. With the advent of highly populated sites, these problems have all acquired increased importance, which was reflected by the amount and quality of the results presented.

The proceedings of this symposium will soon be published, and so no attempt was made here to give details of the various papers. The symposium came at a crucial moment for reactor safety, in which the accumulated knowledge of experts is being brought to bear on the difficult question of the siting and safety aspects of locating large reactors in highly populated areas. The papers (and, no less, the discussion and debates that followed them) reflected the continuing concern for the development of safe but economical means of nuclear power production.

References

1. G. W. Parker, IAEA Meeting on Reactor Siting, *Nucl. Safety*, 3(4): 12-17 (June 1962).

2. Wm. B. Cottrell, IAEA Symposium on Siting Nuclear Facilities, *Nucl. Safety*, 5(1): 20-31 (Fall 1963).

3. F. R. Farmer, Reactor Safety and Siting: A Proposed Risk Criterion, *Nucl. Safety*, 8(6): 539-548 (November–December 1967).

Nuclear Reactor Safety Review Procedures in the Department of Defense*

By A. De La Paz†

Abstract: The procedures followed by the Department of Defense (DOD) to ensure the health and safety of the public in connection with the operation of nuclear reactors built and operated under Sec. 91b of the Atomic Energy Act of 1954, which do not require an AEC license, are discussed in terms of a regulatory review and a compliance (inspection) function. The differences between the procedures followed by the three services (Army, Navy, Air Force) are noted, and the overall DOD requirements are reviewed in terms of the procedures applicable to nuclear reactors licensed by the AEC. (Naval nuclear propulsion reactors are not considered because they are covered by separate agreements.) The applicable agreements between DOD and the AEC regarding the coordination of the review procedures applicable to Sec. 91b reactors are discussed. The procedures followed by the three services in the training and certification of nuclear reactor operators are also presented. These procedures are discussed in terms of the mission and organization applicable to the specific reactor facilities involved.

Section 91*b* of the Atomic Energy Act of 1954, as amended, authorizes the Department of Defense (DOD) to procure and utilize special nuclear (fissionable) material as necessary for the common defense. Under this provision DOD has designed, built, and is operating nuclear reactors that are not licensed by the AEC. The DOD has a responsibility for the protection of the health and safety of the public in connection with operation of these reactors. Procedures currently being followed in carrying out this responsibility are presented in this article.

Procedures in effect for naval propulsion reactors are excluded from this article because they are covered by separate agreement. Since the National Aeronautics and Space Administration (NASA) is not a function of DOD, NASA reactors are also excluded

*Disclaimer: The views and opinions expressed in this article are solely those of the author and do not reflect a formal Department of Defense presentation.

†Mr. De La Paz received the B.S. and M.S. degrees in chemical engineering from Tulane University in 1955 and 1956, respectively. He worked in the Naval Reactors Program, AEC Division of Reactor Development and Technology, from 1956 to 1961. From 1961 to 1963 he was on the faculty of Catholic University of America, Washington, D.C., as Assistant Professor of Chemical Engineering, during which time he served as a consultant to Nuclear Utility Services, Inc. In 1963 he joined the Army Nuclear Power Program as Chief, Reactor Engineering Branch, Nuclear Power Field Office, Fort Belvoir, Va. In 1965 he was assigned as the first permanent chairman of the Army Reactor Systems Health and Safety Review Committee (ARCHS). In June 1967 he assumed his present position of Chief, Fast Burst Reactor Division, Nuclear Effects Directorate, White Sands Missile Range, N. Mex.

from discussion here. Those nuclear reactors operated by DOD which are licensed by the AEC are, however, identified and discussed in this article.

Development of Reactors by DOD

Development of nuclear reactors by DOD has followed two distinct paths, depending on the use of the reactor for either research or power production. Development and utilization of research reactors by DOD were initiated and conducted by the parent agency through research efforts within the specific service involved. Separate procedures regarding the provisions for procurement of reactor fuel have been involved; therefore some research reactors are licensed by the AEC, whereas others are covered by Sec. 91*b*, as noted herein.

Development of power reactors, however, has been the product of an overall program carried out by the Navy in the development of nuclear propulsion reactors and, originally, by the Army in the development of military reactors for electric-power production. The participation of the AEC was accomplished by the placement of the organizations involved within the organizational structure of the AEC (for example, the Army Reactors Branch of the AEC Division of Reactor Development and Technology).

Nuclear Reactors of DOD

Excluding the naval nuclear propulsion reactors, the nuclear reactors operated by DOD are those listed in Table 1.

DOD Relationship with the AEC

The protection of the health and safety of the public in connection with the operation of nuclear reactors by DOD is a matter of direct concern to the AEC. The Presidential Directive of Sept. 23, 1961, states that the AEC will be informed and participate in the review of nuclear reactors by DOD as a matter of responsibility. The directive also states that any problem areas which cannot be resolved between both agencies will be referred to the President.

The now-established procedures covering the AEC participation in matters dealing with the health and safety aspects of the operation of reactors by DOD evolved during the period following the Presidential Directive. In February 1967 an agreement was executed between the AEC and DOD on health and safety responsibilities associated with nuclear reactors covered by Sec. 91*b*. The agreement provided the basic guidelines to be applied to ensure appropriate processing of matters related to the health and safety

Table 1 NUCLEAR REACTORS OPERATED BY DOD

Operator	Reactor	Type or distinguishing feature	Power rating, Mw: Thermal	Power rating, Mw: Electrical	Year activated	Location	Operating authorization
Army							
Power reactors	SM-1	PWR	10	1.75	1957	Fort Belvoir, Va.	Sec. 91*b**
	SM-1A	PWR	20	1.64	1962	Fort Greely, Alaska	Sec. 91*b*
	MH-1A	PWR	45	10	1967	Fort Belvoir, Va.	Sec. 91*b*
Research reactors	Army Pulsed Reactor Facility	Bare, fast	0.01		1966	Aberdeen Proving Ground, Md.	Sec. 91*b*
	White Sands Fast Burst Reactor	Bare, fast	0.01		1964	White Sands Missile Range, N. Mex.	Sec. 91*b*
	Diamond Ordnance Reactor Facility	U–Zr hydride fuel	0.1		1961	Forest Glen, Md.	Sec. 91*b*
	Walter Reed Research Reactor	Homogeneous	0.05		1962	Washington, D. C.	AEC license
	Army Materials Research Reactor	Pool	2		1960	Watertown, Mass.	AEC license
Air Force							
Power reactor	PM-1	PWR	9.37	1	1962	Sundance, Wyo.	Sec. 91*b*
Research reactors	AF–NETR	Tank	10		1965	Wright–Patterson Air Force Base, Dayton, Ohio	Sec. 91*b*
	Ground Test Reactor	Pool	10		1953	Fort Worth, Tex.	Sec. 91*b*
	Aerospace Systems Test Reactor	Pool	10		1957	Fort Worth, Tex.	Sec. 91*b*
Navy							
Power reactor	PM-3A	PWR	9.51	1.5	1962	McMurdo Station, Antarctica	Sec. 91*b*
Research reactors	Naval Research Laboratory Reactor	Pool	1		1956	Washington, D. C.	AEC license
	Naval Postgraduate School Reactor	Homogeneous, solid	Negligible		1956	Monterey, Calif.	AEC license
Defense Atomic Support Agency (DASA)							
Research reactor	Armed Forces Radiobiological Research Institute (AFRRI) Reactor	U–Zr hydride fuel	0.1		1962	Bethesda, Md.	AEC license

*Atomic Energy Act of 1954, as amended.

of the public. This agreement excluded the consideration of effects of naval propulsion reactors since these are covered by separate agreements.

Under the terms of the agreement, the following specific documents were to be provided the AEC for review and comment:

1. Preliminary and final safety-analysis reports on first-of-a-kind reactor facilities
2. Reports giving proposed modifications to reactor facilities and operating procedures not described or implicit in the safety-analysis report
3. Proposed criteria and procedures on qualification of reactor operators
4. Proposed directives or regulations establishing safety policies, standards, and principles
5. Reports of significant events and operational problems involving health considerations or reactor safety; and inspection reports, operating reports, and safety-study or safety-evaluation reports

The agreement provided needed definition of the relationship between the two agencies. Specifically it formalized procedures for implementing the AEC responsibilities for DOD reactors acquired pursuant to Sec. 91*b* of the Atomic Energy Act of 1954 as amended. The implementation of the agreement will provide the DOD with AEC comment, advice, and guidance concerning the health and safety aspects of the design, location, and operation of its reactors.

Safety Review Procedures

The nuclear reactor safety review procedures discussed in this article encompass the review of reactor designs or modifications, as well as the periodic inspections conducted to verify compliance with health and safety requirements. Two principal functions are involved that can be compared with the regulatory function applicable to nuclear reactors licensed by the AEC. These are (1) the regulatory review function, such as that of the Division of Reactor Licensing, and (2) the compliance function, which is equivalent to that of the Division of Compliance. The procedures followed by DOD are presented on the basis of these two considerations.

The review procedures differ somewhat among the three services and are therefore presented separately. In particular, the procedures which apply to those nuclear reactors licensed by the AEC differ between the Army and Navy (the Air Force has no AEC-licensed reactor). The Navy does not have a separate safety review function at a service level for its two AEC-licensed reactors, and emphasis is placed primarily on the requirements of the AEC licenses for these reactor facilities. The same basic procedure applies to the Triga reactor operated by the Defense Atomic Support Agency at the Armed Forces Radiobiology Research Institute, Bethesda, Md. However, those Army reactors licensed by the AEC also come under Army review procedures. The detailed procedures applicable to the three services are described below.

ARMY

The responsibility for the Army-wide review of the health and safety aspects of nuclear reactor operation is placed with the Chief of Engineers. This responsibility covers both power reactors and research reactors in the Army and includes those research reactors, previously identified, which are licensed by the AEC. Within the Office of the Chief of Engineers, the health and safety responsibility is delegated to the Safety Office.

The Safety Office of the Chief of Engineers has direct responsibility for the performance of technical reviews and safety evaluations associated with nuclear reactor systems. The principal group involved in these reviews is the Army Reactor Systems Health and Safety Review Committee. This committee is made up of representatives of the various major Army agencies that have direct responsibility in nuclear reactor operations. The specific agencies represented, in addition to the Corps of Engineers, include the Surgeon General, Army Materiel Command, Military Traffic Management, and Terminal Service. The latter organization is responsible for the health and safety aspects of transporting radioactive material. The Surgeon General, in addition to the health aspects associated with reactor operation, is responsible for operation of the Walter Reed Research Reactor. All other research reactors are operated under the Army Materiel Command, which also has responsibilities associated with the environmental considerations related to the health and safety aspects of nuclear reactor operation.

The reviews conducted by the committee result from (1) development of a new reactor design and (2) modifications made to existing nuclear reactors. The Army regulation that establishes the health and safety program places the review requirements on a basis comparable with that for the AEC-licensed reactors. For example, the basic requirement for review of reactor modifications is that modifications which result in a change in the technical specifications of the reactor must be reviewed and approved by the Chief of Engineers. The reports of the committee are issued by the Chief of Engineers through the Safety Office. The findings of these reviews, when issued as above, are binding on the agency or command involved.

The Chief of Engineers also has the responsibility for coordination with the AEC on matters related to health and safety aspects of the operation of nuclear reactors. Reports of Army reviews conducted by the Chief of Engineers, as described above, are transmitted to the AEC regulatory staff for comment or concurrence. Army approval action on matters under review is taken following receipt of such AEC comıent or concurrence. This procedure is emphasized) a significant extent in those cases where the matter nder review involves a power reactor.

The review procedures carried out by the Chief of ngineers for the Army are also applied to those re-earch reactors licensed by the AEC. The reviews re conducted when an application for a license mendment is made, since it is required that reactor ıodifications of this nature have Army approval. The esults of these reviews are transmitted to the AEC nd placed in the documentation associated with the cense. These review procedures are separate and part from the reviews conducted by the AEC regu-atory staff. Direct contact between the reactor facil-ty operator and the AEC is carried out on these natters.

The regulatory function applicable to Army nuclear eactors is carried out by the Chief of Engineers, as lescribed above. The compliance function is carried ut by the Department of the Army Inspector General. n annual inspection of all Army nuclear reactors is arried out by the Inspector General. These "IG" in-pections have as their objective the verification of he protection of the health and safety of the public in onnection with operation of the reactors, as well as ompliance with all applicable directives. These in-pections are technical rather than purely military in ature. The actual inspection is conducted by a team nade up of personnel knowledgeable in the specific reas covered, such as reactor operations, health hysics, mechanical systems, electrical and instru-nentation systems, and environmental monitoring. The inspections last for a period of approximately $2\frac{1}{2}$ lays. The last $\frac{1}{2}$ day is spent in briefing the manage-nent of the reactor staff regarding the findings of in-pections. Items of disagreement are brought up and esolved to the maximum possible extent at this time. very effort is made to give reactor staff manage-nent a clear picture of the specific findings that will e noted in the inspection report.

Reports of the inspections are issued directly by the nspector General. Deficiencies noted in the findings ust be corrected and resolved with the Inspector eneral. Army regulations require expeditious re-ponse and compliance with the inspection reports ssued by the Inspector General.

AVY

The procedures followed in the Navy review of its uclear reactors, excluding those employed in nuclear ropulsion plants, can be considered primarily in erms of the PM-3A reactor at McMurdo Station, ntarctica. The two Navy research reactors, located t the Naval Research Laboratory and the Naval Post-raduate School, are AEC-licensed reactors. There is o overall Department of the Navy safety review func-ion exercised over these two reactors in view of heir coverage and required conformance with the requirements of their AEC license, including the exercise of appropriate safety responsibility by local command.

The Naval Facilities Engineering Command is responsible for the support required to operate the PM-3A, including the performance of appropriate safety reviews and inspections. Under special agreement the custody of the reactor fuel is maintained by the AEC's New York Operations Office, which in turn delegated this authority, through the chain of command, to the commanding officer (Officer-in-Charge) of the PM-3A at McMurdo Station. The authorization for the execution and implementation of this agreement is derived from Sec. 91*b* of the Atomic Energy Act as amended. The Antarctic treaty places further emphasis on the health and safety aspects of operation of the PM-3A. Accordingly, the safety review procedures that are applied to this reactor are based on practices followed in power reactors licensed by the AEC. Appropriate contact with the AEC regulatory staff, as described below, is maintained by the Naval Facilities Engineering Command.

The PM-3A is operated within a prescribed set of operating limits, and the Officer-in-Charge of the PM-3A is authorized to operate the reactor within these prescribed limitations. However, any change or deviation from the operating limits must be approved by the Naval Facilities Engineering Command. This approval action is exercised through the Nuclear Power Division of the Naval Facilities Engineering Command and its principal element, the Naval Nuclear Power Unit, located at Fort Belvoir, Va.

Approval action taken by the Naval Facilities Engineering Command on changes in the operating limits, as described above, is the subject of direct contact with the AEC regulatory staff. The regulatory staff is informed regarding the action taken on these changes in the operation of the PM-3A. In addition, monthly operating reports that detail the results of PM-3A operating experience are developed by the Naval Nuclear Power Unit and transmitted to the regulatory staff, as well as to other agencies.

The Navy inspection of the PM-3A for compliance with applicable Navy and AEC requirements is performed annually by the Naval Facilities Engineering Command. The actual inspection is conducted by an inspection team representing the major disciplines involved. The team makes the trip to McMurdo Station, Antarctica, and remains there for approximately 2 weeks, or as long as necessary to complete the inspection. The Officer-in-Charge and the local command at McMurdo Station are briefed on the results of the inspection prior to the return of the team. The inspection report is submitted to the Nuclear Power Division, Naval Facilities Engineering Command, which in turn develops the overall inspection report that includes the inspection findings and their resolution. This report is then distributed to the AEC regulatory staff and other agencies as necessary.

Thus the review (regulatory) function and the inspection (compliance) function for the PM-3A are conducted by the Naval Facilities Engineering Command.

AIR FORCE

The safety review procedures applied to Air Force nuclear reactors are essentially similar to those followed by the other services. A review (regulatory) and inspection (compliance) function is exercised by the Directorate of Nuclear Safety, an element of the Air Force Inspector General located at Kirtland Air Force Base, N. Mex. None of the Air Force reactors are licensed by the AEC, and the safety review procedures can be considered in terms of the Sec. 91*b* reactors. As noted previously, this includes the research reactors at Fort Worth, Tex., and Wright–Patterson Air Force Base, Ohio, and the PM-1 reactor at Sundance, Wyo.

Changes made in the Air Force reactors which constitute changes in the technical specifications or the equivalent document or which otherwise present a potential safety problem must be reviewed and approved by the Directorate of Nuclear Safety prior to implementation. The review procedures apply in the case of the initial startup and operation of a reactor under Air Force control. In accordance with recent agreements, reports of the reviews performed by the Directorate of Nuclear Safety are transmitted to the AEC regulatory staff for information or comment. In addition, operation reports periodically developed for the Air Force reactors are reviewed by the Directorate of Nuclear Safety and transmitted to the AEC.

The Air Force inspection of its nuclear reactors is conducted annually by the Directorate of Nuclear Safety. The exercise of the inspection function is carried out by an inspection team organized by and under the control of the Directorate of Nuclear Safety. The inspection is conducted over a period of approximately 4 days. The team leader conducts a briefing of the reactor staff at the conclusion of the inspection. The report of the inspection is subsequently issued through formal command channels. Particular emphasis is placed on the technical aspects of the inspection rather than solely on the military factors involved. For this reason the term "annual nuclear survey" is applied to this function.

Certification of Reactor Operating Personnel

The importance of the subject of review and certification of reactor operating personnel requires that specific consideration be given to this area. The procedures used can be considered in terms of those for nuclear reactors licensed by the AEC, where the Commission's operator licensing requirements apply, and those for the non-AEC-licensed reactors, where the certification requirements are those established by DOD. As a general rule, in the case of the AEC-licensed reactors, conformance with the certification requirements of the AEC license is considered to provide the required certification of the operating personnel. Further, DOD does not take any action to interpose itself between its licensed-reactor staffs and the AEC in either the overall area of reactor safety review or the certification of reactor operating personnel.

Certification procedures for reactor operating personnel which apply for the non-AEC-licensed reactors can best be considered in terms of the type of reactor (i.e., research or power) and the specific armed service involved.

ARMY

The certification of operating personnel for Army research reactors is a function exercised by the Reactor Safeguards Committee, or an appropriately designated subcommittee, which makes its recommendations on certification, following its evaluation, to the commanding officer of the laboratory that has the reactor. The commanding officer actually issues the certification documents based on the recommendation of the Reactor Safeguards Committee. The criteria employed by the Reactor Safeguards Committee are based on extensive direct experience wit the specific reactor being considered, as well as o support of consultants as may be required.

Certification procedures applied to operating personnel for the Army power reactors differ from thos employed for operators of research reactor facilities In the case of power reactors, the operating personnel are certified for specific duties on an interi basis prior to their arrival at the reactor plant. Th interim certification is accomplished at the Nuclea Power Field Office, Fort Belvoir, Va., as part of th terminal stage of training. The training instructor are all experienced reactor operating personnel wh have had 1 or more years of duty at the Army nuclea power plants. The training facilities of the Army' Nuclear Power Field Office are also used by the Na and Air Force for their reactor operating personne as described below.

Following their arrival at the reactor plant, t personnel are placed in the final stages of the certif cation process. They are assigned to the performan of the duties of their position under direct supervisi and evaluation of certified reactor plant personnel. evaluation of the individual's performance is th made at the conclusion of his final training phase, a appropriate certification is then issued.

In general, operating personnel at the power rea tors are military personnel, whereas the resear reactors have both military and civilian reactor o erators. In both cases the tours of duty of the pe sonnel may be extended over a period of seve years. Primarily because of this, it is required tha periodic reevaluation be made of the qualifications and suitability of the individuals assigned to the reactor operating staffs. This provision ensures that the reactor operating personnel be certified on a basis subject to continuing review, both at specific intervals and as may be required by the individual's performance. Insofar as possible, the certification procedures and examination are similar to those which apply in the case of AEC-licensed reactors of the same type.

NAVY

Procedures for the certification of reactor operators administered exclusively by the Navy apply only in the case of the PM-3A reactor. (Again, this excludes those involved in naval propulsion reactors.) The certification of reactor operators in the two Navy research reactors is handled as part of their AEC license requirements, and no overall Navy procedures are involved. Therefore only the procedures that apply to the PM-3A reactor are considered here.

The crew of the PM-3A is assigned to the reactor during a wintering-over period, in which the site is rendered inaccessible by the austral winter. Because of this the crew of the PM-3A is trained and replaced as a unit. The training is conducted under the direction and control of the Naval Nuclear Power Unit, Fort Belvoir, Va. The training program and facilities used are those of the Army's Nuclear Power Field Office, which is also located at Fort Belvoir. The training facilities of this office are used, in part, on an interservice basis, and Air Force reactor operators also receive their training at this location, as subsequently described.

Training provided the members of the PM-3A replacement crew includes actual experience at the PM-3A during the summer support period, which is in addition to the training received at Fort Belvoir. At the conclusion of their training, the personnel are evaluated for assignment to the PM-3A. The replacement crew then is transferred to the PM-3A site at McMurdo Station, where the final phase of the certification process takes place. The replacement crew members are assigned to work under the supervision of the certified reactor operators in specifically designated duties. After a period of conducting operations under this final phase, an examination of the personnel is conducted, and the operators are certified. The examination and evaluation is conducted by a certification board that reports to the Officer-in-Charge of the PM-3A. Members of the PM-3A crew which conducted operations over the prior year do not leave the site until their replacements have been certified.

AIR FORCE

The procedures employed by the Air Force in the certification of its reactor operators provide for:

1. Examination and evaluation at the end of the formal training phase
2. Assignment to a reactor as a trainee
3. Examination and certification of the individual by the reactor facility command.

The formal training of Air Force reactor operators is similar to that of operators in the other services, since the facilities of the Army's Nuclear Power Field Office are employed. The general training program is the same as that followed by the other services, and because of this it is possible for service personnel to be assigned to reactor facilities of the other services. For example, there are Navy personnel at the PM-1 and Army personnel at the PM-3A.

Upon completion of the formal training, personnel are assigned to a specific reactor facility in a trainee status. They then enter an on-the-job training program under the direct supervision of certified reactor staff personnel. After completion of this program, which is developed and implemented by the reactor facility staff, the individuals appear before a certification board for examination. The reactor facility command actually certifies the personnel.

Conclusion

Administration and organization of health and safety review procedures vary among the three services, but all are equivalent in that they provide for review (regulatory) and inspection (compliance) functions. Communication with the AEC regulatory staff is maintained separately by the three services and is carried out in accordance with the established agreement for the proper exercise of government responsibility to ensure the protection of the health and safety of the public in connection with operation of nuclear reactors by DOD.

ROUTING SLIP TO DIRECTORATE OF LICENSING 11-6-72

J. C. Malaro
Materials Branch

R. B. Chitwood
Fuel Fabrication & Reprocessing Branch

Attached for your information is a copy of the licensee's reply to the Regional RO Office enforcement letter dated 9-27-72, a copy of which was sent you previously.

Licensee: Army

License No: Ft Greeley, Alaska
50-07082-01

Industrial

Gen W. Roy
Gen W. Roy, Chief
Materials & Fuel Facilities Branch
Regulatory Operations

7286

UNITED STATES
ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION V
2111 BANCROFT WAY
BERKELEY, CALIFORNIA 94704

TELEPHONE: 841-5121
EXT. 681

October 30, 1972

Department of the Army
U. S. Army Engineers Reactor Group
SM-1A Nuclear Power Plant
Fort Greely, Alaska 98733

License No. 50-07082-01

Attention: Major Gail P. Burchell
Commanding Officer

Gentlemen:

Thank you for your letters dated October 4 and 24, 1972, informing us of the steps you are taking to correct the item brought to your attention in our letter dated September 27, 1972.

The request for license amendment mentioned in the letter dated October 24, 1972, should be expedited since noncompliance will exist until the amendment is issued.

Your cooperation with us is appreciated.

Sincerely,

R. W. Smith
Director

cc: Walter H. Abbott, LTC, CE
Deputy Director, Ft. Belvoir

bcc w/cy ltrs dtd 10-4-72 & 10-24-72:
RO Chief, Materials & Fuel Facilities Br. (2)
RO Office of Operations Evaluation
RO AD for Procedures
RO AD for Inspection & Enforcement
PDR
NSIC
RO Files

ENPG-HQ-TD (27 Sep 72) 2d Ind
SUBJECT: Inspection by Mr. R. F. Fish of AEC License No. 50-07082-01

Headquarters, United States Army Engineer Power Group, Fort Belvoir, Virginia 22060 24 October 1972

~~THRU: HQDA (DAEN-MCN) WASH DC 20314~~ A 24 Oct 72

TO: United States Atomic Energy Commission, Directorate of Regulatory Operations, Region V, 2111 Bancroft Way, Berkeley, California 94704

1. The Americium-241 source was procured from New England Nuclear on 15 July 1971. The source model number is NES 039. The Certificate of Radioactivity Calibration is attached as Incl 1.

2. This source was obtained under the authority of 10CFR31, paragraph 31.8. On 10 February 1972 this source was diluted to be used as an alpha reference source.

3. The dilutions of the NES 039 New England Nuclear Americium 241 source have been removed from service and stored in a safe until an amendment to the USAENPG AEC Byproduct Material License allowing use of this material as a calibration alpha source is obtained.

Walter H. Abbott
WALTER H. ABBOTT
LTC, CE
Deputy Director

1 Incl
Added 1 Incl
as

RECEIVED
OCT 27 1972
REGION V
Dir. of Compliance

CERTIFICATE OF RADIOACTIVITY CALIBRATION

CERTIFICATE OF RADIOACTIVITY

Americium-241 Standard

Lot Number: 970
Half-Life: 458 years

The activity of Americium-241 was found to be,

0.63 microcuries/ml. on Sept. 30, 1970

DESCRIPTION OF THE STANDARD

Chemical Composition	$AmCl_3$ in
Physical Form	Flame-sealed ampoule
Volume	5 milliliters

METHOD OF CALIBRATION

Aliquots of the solution were compared to a standard certified by the National Bureau of Standards by alpha counting on a 2 π gamma proportional flow counter.

PRODUCTION METHOD

Transuranic neutron capture process

ERRORS

Random Errors (3 times the standard deviation)

a. Accuracy of the NBS Standard ±2.0%
b. Precision of the NENC measurements ±3.0%

Overall Error

$$\sqrt{(2.0)^2 + (3.0)^2} = \pm 3.6\%$$

New England Nuclear
575 Albany Street, Boston, Mass. 02118
CUSTOMER SERVICE: (617) 482-9595

ENPG-NPP (27 Sep 1972) 1st Ind   MAJ Burchell/af/317-872-3106
SUBJECT: Inspection by Mr. R. F. Fish of AEC License No. 50-07082-01

Headquarters, U.A. Army Nuclear Power Plant (SM-1A), Fort Greely, Alaska APO Seattle 98733 4 October 1972

THRU: Deputy Director, U.S. Army Engineer Power Group, Fort Belvoir, Virginia 22060

TO: United States Atomic Energy Commission, Directorate of Regulatory Operations, Region V, 2111 Bancroft Way, Berkeley, California 94704

Source was transferred to U.S. Army Engineer Power Group on 26 September 1972. Source was received on 15 February 1972 from U.S. Army Engineer Power Group for calibration purposes. Since this unit is deactivating there will be no future requirements for sources of this nature, thus this problem will not happen again.

GAIL P. BURCHELL
MAJOR, CE
Commanding

Materials File
[handwritten initials]
11-8-72

UNITED STATES
ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION V
2111 BANCROFT WAY
BERKELEY, CALIFORNIA 94704

TELEPHONE: 841-5121
EXT. 881

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Sincerely,

[signature]

R. W. Smith
Director

cc: Walter H. Abbott, LTC, CE
Deputy Director, Ft. Belvoir

bcc w/cy ltrs dtd 10-4-72 & 10-24-72:
RO Chief, Materials & Fuel Facilities Br. (2)
RO Office of Operations Evaluation
RO AD for Procedures
RO AD for Inspection & Enforcement
PDR
NSIC
RO Files

Materials File
[illegible]
11-8-72

UNITED STATES
ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION V
2111 BANCROFT WAY
BERKELEY, CALIFORNIA 94704

TELEPHONE: 841-5121
EXT. 691

October 30, 1972

Department of the Army
U. S. Army Engineers Reactor Group
SM-1A Nuclear Power Plant
Fort Greely, Alaska 98733

License No. 50-07082-01

Attention: Major Gail P. Burchell
Commanding Officer

Gentlemen:

Thank you for your letters dated October 4 and 24, 1972, informing us of the steps you are taking to correct the item brought to your attention in our letter dated September 27, 1972.

The request for license amendment mentioned in the letter dated October 24, 1972, should be expedited since noncompliance will exist until the amendment is issued.

Your cooperation with us is appreciated.

Sincerely,

R. W. Smith
Director

cc: Walter H. Abbott, LTC, CE
Deputy Director, Ft. Belvoir

bcc w/cy ltrs dtd 10-4-72 & 10-24-72:
RO Chief, Materials & Fuel Facilities Br. (2)
RO Office of Operations Evaluation
RO AD for Procedures
RO AD for Inspection & Enforcement
PDR
NSIC
RO Files

ENPG-HQ-TD (27 Sep 72) 2d Ind
SUBJECT: Inspection by Mr. R. F. Fish of AEC License No. 50-07082-01

Headquarters, United States Army Engineer Power Group, Fort Belvoir, Virginia 22060 24 October 1972

~~THRU: HQDA (DAEN-MCN) WASH DC 20314~~ A 240ct72

TO: United States Atomic Energy Commission, Directorate of Regulatory Operations, Region V, 2111 Bancroft Way, Berkeley, California 94704

1. The Americium-241 source was procured from New England Nuclear on 15 July 1971. The source model number is NES 039. The Certificate of Radioactivity Calibration is attached as Incl 1.

2. This source was obtained under the authority of 10CFR31, paragraph 31.8. On 10 February 1972 this source was diluted to be used as an alpha reference source.

3. The dilutions of the NES 039 New England Nuclear Americium 241 source have been removed from service and stored in a safe until an amendment to the USAENPG AEC Byproduct Material License allowing use of this material as a calibration alpha source is obtained.

Walter H. Abbott
WALTER H. ABBOTT
LTC, CE
Deputy Director

1 Incl
Added 1 Incl
as

RECEIVED
OCT 27 1972
REGION V
Div. of Compliance

CERTIFICATE OF RADIOACTIVITY CALIBRATION

CERTIFICATE OF RADIOACTIVITY

Americium-241 Standard

Lot Number: 970
Half-Life: 458 years

The activity of Americium-241 was found to be,

0.63 microcuries/ml. on Sept. 30, 1970

DESCRIPTION OF THE STANDARD

Chemical Composition	$AmCl_3$ in
Physical Form	Flame-sealed ampoule
Volume	5 milliliters

METHOD OF CALIBRATION

Aliquots of the solution were compared to a standard certified by the National Bureau of Standards by alpha counting on a 2 π gamma proportional flow counter.

PRODUCTION METHOD

Transuranic neutron capture process

ERRORS

Random Errors (3 times the standard deviation)

a.	Accuracy of the NBS Standard	±2.0%
b.	Precision of the NENC measurements	±3.0%

Overall Error

$$\sqrt{(2.0)^2 + (3.0)^2} = \pm 3.6\%$$

NEN New England Nuclear
575 Albany Street, Boston, Mass. 02118
CUSTOMER SERVICE: (617) 482-9595

ENPG-NPP (27 Sep 1972) 1st Ind   MAJ Burchell/af/317-872-3106
SUBJECT: Inspection by Mr. R. F. Fish of AEC License No. 50-07082-01

Headquarters, U.A. Army Nuclear Power Plant (SM-1A), Fort Greely, Alaska APO Seattle 98733 4 October 1972

THRU: Deputy Director, U.S. Army Engineer Power Group, Fort Belvoir, Virginia 22060

TO: United States Atomic Energy Commission, Directorate of Regulatory Operations, Region V, 2111 Bancroft Way, Berkeley, California 94704

Source was transferred to U.S. Army Engineer Power Group on 26 September 1972. Source was received on 15 February 1972 from U.S. Army Engineer Power Group for calibration purposes. Since this unit is deactivating there will be no future requirements for sources of this nature, thus this problem will not happen again.

GAIL P. BURCHELL
MAJOR, CE
Commanding

UNITED STATES
ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION V
2111 BANCROFT WAY
BERKELEY, CALIFORNIA 94704

TELEPHONE: 841-5121
EXT. 651

Kay

September 27, 1972

Department of the Army
U. S. Army Engineers Reactors Group
SM-1A Nuclear Power Plant
Fort Greely, Alaska 98733

Attention: Officer-in-Charge

Gentlemen:

This refers to the inspection conducted by Mr. R. F. Fish of this office on September 11, 1972 of operations authorized by AEC License No. 50-07082-01 and to the discussion of our findings held by Mr. Fish with Major G. P. Burchell and others of your staff at the conclusion of the inspection.

The inspection was an examination of the activities conducted under your license as they relate to radiation safety and to compliance with the Commission's rules and regulations and the conditions of your license. The inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspector.

During this inspection, it was found that certain of your activities appeared to be in noncompliance with AEC requirements. The item and references to the pertinent requirement are listed in the enclosure to this letter. Please provide us within 20 days, in writing, with your comments concerning this item, any steps which have been or will be taken to correct it, any steps that have been or will be taken to prevent recurrence, and the date all corrective actions or preventive measures were or will be completed.

Should you have any questions concerning this letter, we will be glad to discuss them with you.

Sincerely,

G. S. Spencer
for R. W. Smith
Director

Enclosure:
a/s

cc: Department of the Army
Deputy Chief of Staff for Logistics
Washington, D. C. 20310
Attn: Chief, PEMA Execution Division

bcc: RO Chief, Materials & Fuel Facil. (2)
RO Office of Operations Evaluation
RO AD for Procedures
RO AD for Inspection & Enforcement
PDR
NSIC
RO Files

Department of the Army
U. S. Army Engineers Reactor Group
SM-1A Nuclear Power Plant
License No. 50-07082-01

Certain activities under your license appear to be in noncompliance with AEC regulations as indicated below.

1. 10CFR30.3, "Activities requiring license", specifies that "no person shall...receive, acquire, own, possess...byproduct material except as authorized in a specific or general license...."

   Contrary to this requirement, a shipment of americium-241, containing 13,081 disintegrations per minute, was received on February 15, 1972 without being authorized by license No. 50-07082-01 or an appropriate general license.

ENCLOSURE

File

ROUTING SLIP TO DIRECTORATE OF LICENSING 10-3-72

J. C. Malaro
Materials Branch

R. B. Chitwood
Fuel Fabrication & Reprocessing Branch

Attached for your information is a copy of a recent enforcement letter from a Regional RO Office to the following licensee:

Licensee: Army
Fort Greely, Alaska 98733

License No: 50-07082-01

Date: 9-11-72

Gen W. Roy
Gen W. Roy, Chief
Materials & Fuel Facilities Branch
Regulatory Operations

UNITED STATES
ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION V
2111 BANCROFT WAY
BERKELEY, CALIFORNIA 94704

TELEPHONE: 841-5121
EXT. 651

September 27, 1972

Department of the Army
U. S. Army Engineers Reactors Group
SM-1A Nuclear Power Plant
Fort Greely, Alaska 98733

Attention: Officer-in-Charge

Gentlemen:

This refers to the inspection conducted by Mr. R. F. Fish of this office on September 11, 1972 of operations authorized by AEC License No. 50-07032-01 and to the discussion of our findings held by Mr. Fish with Major G. P. Burchell and others of your staff at the conclusion of the inspection.

The inspection was an examination of the activities conducted under your license as they relate to radiation safety and to compliance with the Commission's rules and regulations and the conditions of your license. The inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspector.

During this inspection, it was found that certain of your activities appeared to be in noncompliance with AEC requirements. The item and references to the pertinent requirement are listed in the enclosure to this letter. Please provide us within 20 days, in writing, with your comments concerning this item, any steps which have been or will be taken to correct it, any steps that have been or will be taken to prevent recurrence, and the date all corrective actions or preventive measures were or will be completed.

Should you have any questions concerning this letter, we will be glad to discuss them with you.

Sincerely,

D. L. Spencer
for R. W. Smith
Director

Enclosure:
a/s

cc: Department of the Army
Deputy Chief of Staff for Logistics
Washington, D. C. 20310
Attn: Chief, PEMA Execution Division

bcc: RO Chief, Materials & Fuel Facil. (2)
~~RO Office of Operations Evaluation~~
RO AD for Procedures
RO AD for Inspection & Enforcement
PDR
NSIC
RO Files

Department of the Army
U. S. Army Engineers Reactor Group
SM-1A Nuclear Power Plant
License No. 50-07082-01

Certain activities under your license appear to be in noncompliance with AEC regulations as indicated below.

1. 10CFR30.3, "Activities requiring license", specifies that "no person shall...receive, acquire, own, possess...byproduct material except as authorized in a specific or general license...."

   Contrary to this requirement, a shipment of americium-241, containing 13,081 disintegrations per minute, was received on February 15, 1972 without being authorized by license No. 50-07082-01 or an appropriate general license.

ENCLOSURE

LR:IB:NB

JUN 26 1963

Commanding Officer
SM-1A Operations
U.S. Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

Dear Sir:

Returned herewith is your application dated June 20, 1963, for amendment to License No. 50-7032-1. The application was not submitted through appropriate Army channels. The Army has requested us and we have agreed not to take action on any application which has not been submitted through appropriate channels. All applications must be submitted through the Office of the Surgeon General.

Sincerely yours,

Nathan Bassin
Isotopes Branch
Division of Licensing
and Regulation

Enclosure:
As stated above

cc: Office of the Surgeon General

OFFICE ▶	LR:IB					
SURNAME ▶	NBassin:cs					
DATE ▶	6/26/63					

Form AEC-318 (Rev. 9-53) U. S. GOVERNMENT PRINTING OFFICE 16—62761-3

LR:IB:NB

JUN 26 1963

Commanding Officer
SM-1A Operations
U.S. Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

Dear Sir:

Returned herewith is your application dated June 20, 1963, for amendment to License No. 50-7082-1. The application was not submitted through appropriate Army channels. The Army has requested us and we have agreed not to take action on any application which has not been submitted through appropriate channels. All applications must be submitted through the Office of the Surgeon General.

Sincerely yours,

Nathan Bassin
Isotopes Branch
Division of Licensing
and Regulation

Enclosure:
As stated above

cc: Office of the Surgeon General

LR:IB

NBassin:cs

6/26/63

LR:IB:NB (51032)

MAY [illegible]

Commanding Officer
U. S. Army Engineer Reactors Group
Fort Greely, Alaska

Dear Sir:

This is in reference to your application dated March 16, 1963, for amendment to License No. 50-7032-1.

In order to continue review of your application, it is necessary that you specify the make and model number of the antimony beryllium source you desire to possess. Also, we request that you clarify the statement of purpose "used in conjunction with the reactor start-up source".

Upon receipt of this information, we shall continue review of this application.

Sincerely yours,

Nathan Bassin
Isotopes Branch
Division of Licensing
and Regulation

cc: Office of the Surgeon General

bcc: Region V, Compliance

OFFICE ▶	LR:IB					
SURNAME ▶	NBassin:cs					
DATE ▶	5/9/63					

Form AEC-318 (Rev. 9-53) U. S. GOVERNMENT PRINTING OFFICE 16—62761-3

E. III

Form AEC-591
(11/3/66)

UNITED STATES ATOMIC ENERGY COMMISSION

DIVISION OF COMPLIANCE

INSPECTION FINDINGS AND LICENSEE ACKNOWLEDGMENT

1. LICENSEE	2. REGIONAL OFFICE
Dept of the Army CM-1A Nuclear Power Plant Fort Greeley, Alaska 98733	**Region V, Division of Compliance** **U. S. Atomic Energy Commission** **2111 Bancroft Way** **Berkeley, California 94704**
3. LICENSE NUMBER(S)	**4. DATE OF INSPECTION**
SP-7082-1	Aug. 16, 1968

5. INSPECTION FINDINGS

- ☒ A. No item of noncompliance was found.
- ☐ B. Rooms or areas were not properly posted to indicate the presence of a RADIATION AREA. 10 CFR 20.203(b) or 34.42
- ☐ C. Rooms or areas were not properly posted to indicate the presence of a HIGH RADIATION AREA. 10 CFR 20.203(c) (1) or 34.42
- ☐ D. Rooms or areas were not properly posted to indicate the presence of an AIRBORNE RADIOACTIVITY AREA. 10 CFR 20.203(d)
- ☐ E. Rooms or areas were not properly posted to indicate the presence of RADIOACTIVE MATERIAL. 10 CFR 20.203(e)
- ☐ F. Containers were not properly labeled to indicate the presence of RADIOACTIVE MATERIAL. 10 CFR 20.203(f) (1) or (f) (2)
- ☐ G. A current copy of 10 CFR 20, a copy of the license, or a copy of the operating procedures was not properly posted or made available. 10 CFR 20.206(b)
- ☐ H. Form AEC-3 was not properly posted. 10 CFR 20.206(c)
- ☐ I. Records of the radiation exposure of individuals were not properly maintained. 10 CFR 20.401(a) or 34.33(b)
- ☐ J. Records of surveys or disposals were not properly maintained. 10 CFR 20.401(b) or 34.43(d)
- ☐ K. Records of receipt, transfer, disposal, export or inventory of licensed material were not properly maintained. 10 CFR 30.51, 40.61 or 70.51
- ☐ L. Records of leak tests were not maintained as prescribed in your license, or 10 CFR 34.25(c)
- ☐ M. Records of inventories were not maintained. 10 CFR 34.26
- ☐ N. Utilization logs were not maintained. 10 CFR 34.27

RECEIVED
1968 AUG 22 AM 9 38
U.S. ATOMIC ENERGY COMM.
REGION V
MAIL & RECORDS SECTION

(signature)
(AEC Compliance Inspector)

6. LICENSEE'S ACKNOWLEDGMENT

The AEC Compliance Inspector has explained and I understand the items of noncompliance listed above. The items of noncompliance will be corrected within the next 30 days.

(Date) (Licensee Representative — Title or Position)

COPIES: ☐ LICENSEE; ☐ COMPLIANCE REGION; ☐ DIV. OF ST. & LIC. REL.; ☒ DIV. OF COMPLIANCE

File

NOTE TO: Nate Bassin, Isotopes Branch

FROM: T. W. Brockett *TWB*, Enforcement Branch
Division of State and Licensee Relations

SUBJECT: COMPLIANCE INSPECTION HANDLED UNDER 592 PROCEDURE FOR BYPRODUCT MATERIAL LICENSE NO. 50-7082-1 ISSUED TO Dept. of Army, Fort Greely, Alaska

As a result of the inspection conducted on Sept. 20 1966, the subject licensee submitted an application for license amendment to achieve correction of one or more items of noncompliance. Since this application is presently being considered by you, we have attached for your information the inspection report and letters exchanged between the Regional Compliance Office and the licensee subsequent to the inspection. If, after evaluating the application, you determine that it must be denied, please inform the Enforcement Branch so that appropriate enforcement action can be taken concurrently with the denial.

The attachments should be returned to the file room when you have finished with them.

Attachments

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

5010-108

TWB

UNITED STATES GOVERNMENT

Memorandum

TO : R. G. Page, Chief, Enforcement Branch
Division of State and Licensee Relations

DATE: October 25, 1966

FROM : H. E. Book, Senior Radiation Specialist HE Book
Region V, Division of Compliance

SUBJECT: DEPARTMENT OF THE ARMY, SM-1A NUCLEAR POWER PLANT, FORT GREELY, ALASKA
LICENSE NO. 50-7082-1

CO:V:HEB

Attached is a copy of the licensee's reply to our letter and Form AEC-592 concerning an inspection conducted on September 20, 1966.

We consider this reply satisfactory.

You will note that the licensee has applied for amendment to correct Item 5.a. on the Form AEC-592.

Enclosure:
Ltr dtd 10/19/66
fm E. W. Blanchard

cc: L. Dubinski, CO:HQ, w/encl.

App. Recd 10/17/66
Control 80695
NB

DEPARTMENT OF THE ARMY
HEADQUARTERS, FORT GREELY, ALASKA
APO SEATTLE 98733

ARGEN

19 OCT 1966

SUBJECT: Inspection of AEC License No. 50-7082-1

TO: U. S. Atomic Energy Commission
Division of Compliance
Region V, 2111 Bancroft Way
Berkeley 4, California

1. Reference Letter your headquarters, dated 30 September with enclosed Form AEC-592.

2. The following action has been taken, or will be accomplished, as indicated, regarding the discrepancies noted on Form AEC-592 referenced above:

a. Reference para 5 a. The addition of the nominal 1.1 millicurie cobalt-60 source fabricated by Tracer Lab to subject license was requested by a request for amendment (AEC Form 313) dated 27 September.

b. Reference para 5 b. The 20.5 curie polonium-210 beryllium neutron source will be packaged for shipment and subsequent disposal on 20 October.

c. Reference para 5 c. The internal procedures of the SM-1A Health Physics section have been modified to include a suspense system for leak testing all sources.

FOR THE COMMANDER:

EDWARD W. BLANCHARD
1st Lt, AGC
Adjutant

2 Incl
as

Copy furnished:
CG, USARAL
ATTN: ARAEN

RECEIVED
OCT 2- 1966
REGION V
Div. of Compliance

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

5010-106

H65

UNITED STATES GOVERNMENT

Memorandum

TO : R. G. Page, Chief, Enforcement Branch
Division of State and Licensee Relations

DATE: September 30, 1966

FROM : H. E. Book, Senior Radiation Specialist
Region V, Division of Compliance

SUBJECT: DEPARTMENT OF THE ARMY, SM-1A NUCLEAR POWER PLANT, FORT GREELY, ALASKA
LICENSE NO. 50-7082-1

CO:V:HEB

Attached are copies of a letter of transmittal and Form AEC-592 which were mailed to the subject licensee on this date. Also attached is a copy of the inspection notes which contain information gathered during the inspection.

The licensee stated that he plans to apply for a license amendment to correct Item a. on the attached Form AEC-592.

Enclosures:
1. Transmittal Letter, w/Form AEC-592
2. Inspection Notes

cc: L. Dubinski, CO:HQ, w/Transmittal
letter and Form AEC-592

RECEIVED
OCT 7 1966

UNITED STATES
ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE
REGION V
2111 BANCROFT WAY
BERKELEY 4, CALIFORNIA

TELEPHONE: THORNWALL 1-5620

IN REPLY REFER TO:

September 30, 1966

Commanding Officer
Headquarters, Fort Greely
APO Seattle, Washington 98733

Dear Sir:

This letter relates to the discussion Mr. Fish of this office held with Major Jonathan D. Nottinghem and others of your staff at the conclusion of the recent inspection of AEC License No. 50-7082-1. In particular, as a result of this inspection, certain of your licensed activities appear to be in noncompliance with AEC requirements. The items and references to the pertinent requirements are listed in paragraph 5 on Form AEC-592, enclosed. As noted on the form, Item "c" has been corrected.

The purpose of this letter is to give you an opportunity to advise us in writing of (a) your position concerning items a. and b. on the form, (b) any corrective steps you may have taken or plan to take with respect to these two items, and (c) the date all corrective action was or will be completed.

Your reply should be sent to us within 20 days of the date of this letter to assure that it will receive proper attention in our further evaluation of the matter.

Should you have any questions concerning this matter, you may communicate directly with this office.

Sincerely yours,

ORIGINAL SIGNED BY
R. W. SMITH

R. W. Smith
Director

Enclosure:
Form AEC-592

cc: Major Jonathan D. Nottinghem, OIC, w/Form AEC-592

Form AEC-592
(5-63)

UNITED STATES ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE

1. LICENSEE	2. REGIONAL OFFICE
Department of the Army SM-1A Nuclear Power Plant Fort Greely, Alaska	Region V, Division of Compliance U. S. Atomic Energy Commission 2111 Berkeley Way Berkeley, California 94704
3. LICENSE NUMBER 50-7082-1	4. DATE(S) OF INSPECTION September 20, 1966

5. The following activities under your license (identified in Item No. 3 above) appear to be in noncompliance with AEC regulations or license requirements, as indicated.

a. A nominal 1.1 millicurie cobalt-60 source fabricated by Tracerlab was possessed without a valid AEC license as required by Section 30.3, Title 10, Code of Federal Regulation.

b. A nominal 20.5 curie polonium-210 beryllium neutron source was not leak tested upon removal from the pressure vessel, after having been in the reactor more than six months, as required by Condition 15 of the license.

c. Five strontium-90 internal check sources, used in Jordan Electronics survey meters, were not leak tested during the 15-month period between June 1965 and September 1966, which violates Condition 14A of the license. We are aware that these sources were leak tested on September 18, 1966, and the results showed removable contamination was less than 0.005 microcurie.

Supplementary page None attached. R. F. Fish ORIGINAL SIGNED BY R. F. FISH, JR. 9/30/66

AEC Compliance Inspector — Date

ORIGINAL: LICENSEE. COPIES: ☐ CO REGION ☐ CO HEADQUARTERS ☑ L&R HEADQUARTERS.

U.S. GOVERNMENT PRINTING OFFICE: 1963—O-665311

882-995

592 Notes
Fish/msa
9/30/66

ORIGINAL SIGNED BY
R. F. Fish, Jr. Inspector 9-30-66
ORIGINAL SIGNED BY
H. E. [illegible] Reviewer 10-3-66

Department of the Army
SM-1A Nuclear Power Plant
Fort Greely, Alaska
License No. 50-7082-1

1. An announced reinspection of the subject licensed program was conducted on September 20, 1966, by R. F. Fish, Region V, Division of Compliance. Mr. Richard L. Mikkelsen, USPHS, was present during this inspection as a representative of the Alaska Department of Health and Welfare. The following licensee personnel were interviewed during the inspection:

   Major Jonathan D. Nottingham, OIC Plants Branch
   CW2 George O. Wilkinson, Plant Superintendent
   SFC Robert J. Springer, Health Physicist

2. At the conclusion of the inspection, a verbal summary of the findings was given to Major Nottingham and CW2 Wilkinson. The results were also discussed with SFC Springer. Three items of noncompliance were noted during the inspection. A nominal 1.1 millicurie cobalt-60 sealed source, fabricated by Tracerlab, was possessed. This source was added to the license by Amendment 2; however, Amendment 7, which amended the license in its entirety, omitted it. The January 7, 1965 application which resulted in Amendment 7 did not list this source as one to be possessed. A review of the records showed the five strontium-90 calibration sources were not leak tested during the period July 1965 through August 1966. In October 1965 a polonium-210 neutron startup source was removed from the reactor. The source was not leak tested upon removal and has not

been leak tested since.

3. The licensee stated that the omission of the Tracerlab source from the application was an oversight on their part. It should be noted that other personnel occupied the responsible positions at the time of the application. The licensee intends to submit an application to DML requesting authorization to possess the source. Concerning the failure to leak test the strontium-90 sealed sources, a wipe test was made on September 18, 1966, with no removable contamination detected. Several corrective actions were discussed regarding the leak testing of the polonium-210 neutron source. One possibility is to ship the source as waste immediately upon removal from the pressure vessel. Condition 15 could be amended to require leak testing upon removal from the vapor container rather than the pressure vessel. A third possibility was to alter the leak test procedure, i.e., sample the water in contact with the source or wipe the outside of the shielded container used to store the source. No final decision was made in regard to the action to be taken to correct the noncompliance.

4. The SM-1A nuclear power plant is operated by the staff at Fort Greely. Major Nottingham, OIC, Plants Branch, is responsible for all the power plant operations (conventional and nuclear) at Fort Greely. He reports to the Post Engineer. An organization has been established under Major Nottingham to operate the SM-1A reactor. The Plant Superintendent is CW2 Wilkinson, who reports to Major Nottingham. The Plant Supervisor, MSG Buteau, reports to Wilkinson. Administratively, SFL Robert Springer, the Senior Health Physicist, reports to the Plant Supervisor; however, functionally significant safety problems are handled by direct

discussion with Wilkinson and Nottingham. Also reporting to the Plant Supervisor are the following functions:

Maintenance Supervisor (SFC Schaffer)
Mechanical Section (SP6 Drew, senior repairman)
Instrument Section (Mr. Isenhoff)
Electrical Section
Operations Supervisor (SFC Garrison)

The Operations Supervisor is responsible for the operation of the reactor. There is a Shift Supervisor for each of the four shifts - all Shift Supervisors report to the Operations Supervisor.

5. The radiation safety program is the responsibility of SFC Springer. SP6 Mallory is a Health Physicist from Fort Belvoir, on temporary loan, who is under Springer's direction. Mr. D. Clark operates the chemical laboratory. Major Nottingham explained that, because the staff is small, persons are rotated through the various jobs. Therefore, there are several persons (i.e., Shaw and Dilworth) on the staff who have served in the capacity of Health Physicist. It should be noted that the radiation safety program has been established for the nuclear reactor which is exempt from licensing. The subject license authorizes sealed sources used for calibration of survey meters and instruments associated with reactor operation. It also covers the possession of a polonium-210 neutron, reactor startup source. Licensed material is used by the following personnel: Springer, Garrison, Dilworth and Mallory. Mallory uses the material under the direction of Springer.

6. The licensee has established an Isotope Committee. The Committee's composition is shown in Attachment A to this set of notes. Major Nottingham stated that the Committee meets on an informal basis and there are no minutes kept. Radiation safety problems are resolved

by discussion of the three members acting both as a committee and in the normal course of their positions. Essentially all of the radiation safety problems are associated with the reactor and its operations.

7. All written procedures pertaining to the operations conducted under the subject license have been approved by DML. Copies of the procedures have been distributed to all responsible personnel.

8. Since the last inspection on August 7, 1964, the licensee has received a 100 millicurie cobalt-60 source and a 45 curie polonium-210 neutron source. No radioactive material has been disposed under the subject license either by transfer or as waste. There have been no exports or imports under the subject license. All receipts of material are documented. One of the two neutron sources is held under the license (the other is in the reactor). The licensee's inventory was as follows:

Polonium-210	-	one nominal 20.5 curie neutron source (U. S. Nuclear Type 386)
Strontium-90	-	two sources of four microcuries each three sources of three microcuries each used in Jordan survey meters
Cobalt-60	-	one AECL source - nominal 57 millicuries one Tracerlab source - nominal 1.1 millicuries (not authorized on license) one U. S. Nuclear source - nominal 100 millicuries

9. The facility description contained in the notes of the August 1964 inspection are still current. The Tracerlab source is stored in the block of concrete in the demineralizer room. The 100 millicurie source is in its original shielded shipping container, which is stored in the corner of the laboratory adjacent to the reactor vapor container - a diagram of the laboratory was submitted with the January 7, 1965 license application. The nominal 57 millicurie cobalt-60 source is in the in-

strument room. The source is mounted in a shielded box of lead bricks which are on a table. The box is designed to provide a beam of radiation and the table serves as a calibration range. The nominal 20.5 curie neutron source was in a two-inch, lead-shielded container stored in the reactor vapor container. This container was to be removed from the reactor vapor container in the immediate future and transferred to U. S. Army Edgewood Arsenal for disposal.

10. A review of the posting and labeling showed no violation of 10 CFR 20.203(b), (e)(1) and (f). A Form AEC-3 was posted on the wall near the main entrance to the building.

11. The licensee's radiation instrumentation was found to be as described in the January 7, 1965 license application.

12. The licensee's personnel monitoring program includes both film badges and pocket dosimeters. The film badges are supplied by the Army Signal Depot and exchanged on a frequency of four weeks, four weeks and five weeks per quarter. The dosimeters are radiacmeter model 1M-9E/PD with a range of 0 to 200 mr. No records are kept of the exposures shown by the dosimeters. Film badge results are kept on Form DD1141 (one for each person). These forms are maintained by the medical personnel. The film badge readings are also kept on a form maintained by the Health Physicist. These latter forms, newly initiated, record the following information: name, service and/or social security number, date of birth, value for 5(n-18), accumulated dose, and exposure shown on each badge. The exposure received during 1966 was found to be typical. The following exposures were received during

1966 by persons associated with the subject licensed program:

R. F. Dilworth	2.759 r	through August 21, 1966
W. C. Garrison	0.365 r	through August 21, 1966
J. D. Nottingham	0.430 r	through August 21, 1966
R. Springer	1.105 r	through August 21, 1966
W. C. Mallory	0.441 r	August 21 to September 19, 1966*

*Dosimeter reading because film badge result not yet received.

The Form DD1141 also provides information on each employee's exposure history.

13. The licensee's survey program includes measurement of radiation levels and removable contamination at various locations in the reactor facility. The frequency of these surveys depends upon the locations and activities at a given time (from more than one per day to one per month). Results of the surveys are recorded on a standard form. The radiation level at the surface of the container holding the 100 millicurie cobalt-60 source was 20 mr/hr. According to the records, the radiation level at the surface of the shielded container, into which the 20 curie polonium-210 source was placed, was 100 R/hr at the time of insertion. According to Springer, this level is now about 5 R/hr. The radiation level at the surface of the container housing the nominal 57 millicurie cobalt-60 source was less than 1 mr/hr.

14. Leak tests of the sealed sources are performed by the health physics staff using the procedures contained in SOP #3101 which was submitted with the application dated January 7, 1965. Results of all leak tests are recorded on a form generated specifically for that purpose. One of the columns is for showing the results in microcuries. A review of the records shows the cobalt-60 sources have been leak tested on a six-month frequency. The five strontium-90 sealed sources (item B on license) were leak tested

on September 18, 1966 and before that in June 1965 - a period of 15 months between tests. All leak test results showed less than 0.005 μc removable contamination.

15. The nominal 20 curie polonium-210 source was removed from the reactor pressure vessel in October 1965. The source was placed in a two-inch thick lead-shielded container and stored in the reactor vapor container. The source was in the reactor for more than six months. The source was not leak tested upon removal from the pressure vessel and has not been tested since - reference Conditions 14 and 15 of license. The licensee explained that it was not practical to leak test the source upon its removal from the pressure vessel due to the high levels of radiation resulting from activation of the capsule material - see paragraph 13 above. It should be noted that the reactor vapor container is a contaminated area and entrances into it are during reactor shutdown periods with appropriate controls.

ARGEN — Radiological Control Assignments

SM-1A Personnel — OIC, Plants Branch PE — 8 Sep 66

1. The following personnel are assigned the administrative duties as indicated:

Radiological Protection Officer	CW2 George O. Wilkinson, W2214461
Deputy	SFC Robert J. Springer RA19353389
Deputy	Mr. George F. Shaw, DAC, S9

2. Under the provisions of par 5 d (3), AR40-580, the following personnel are appointed to, and shall comprise, the SM-1A Isotope Committee:

Chairman	MAJ Jonathan D. Nottingham, O 75733
Member	CW2 George O. Wilkinson, W2214461
Secretary	SFC Robert J. Springer, RA19353389

JONATHAN D. NOTTINGHAM
MAJ, CE
OIC, Plants Branch, PE

Dist:
1-Bul Board
1-Ea Indiv Concerned
1-File

Attachment A

Form AEC-591
(11-62)

UNITED STATES ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE

I E-3
Rein (1)

INSPECTION FINDINGS AND LICENSEE ACKNOWLEDGMENT

1. LICENSEE	2. REGIONAL OFFICE
Department of the Army SM-1A Operations U.S. Army Engineer Reactors Group Process Control Section Fort Greely, Alaska	DIVISION OF COMPLIANCE U. S. ATOMIC ENERGY COMMISSION 2111 BANCROFT WAY BERKELEY, CALIFORNIA 94704
3. LICENSE NUMBER(S)	4. DATE OF INSPECTION
License No. 50-7082-1	August 7, 1964

5. INSPECTION FINDINGS

- [x] A. No Item of noncompliance was found.
- [ ] B. Rooms or areas were not properly posted to indicate the presence of a RADIATION AREA. 10 CFR 20.203(b) or 31.302
- [ ] C. Rooms or areas were not properly posted to indicate the presence of a HIGH RADIATION AREA. 10 CFR 20.203(c) (1) or 31.302
- [ ] D. Rooms or areas were not properly posted to indicate the presence of an AIRBORNE RADIOACTIVITY AREA. 10 CFR 20.203(d)
- [ ] E. Rooms or areas were not properly posted to indicate the presence of RADIOACTIVE MATERIAL. 10 CFR 20.203(e)
- [ ] F. Containers were not properly labeled to indicate the presence of RADIOACTIVE MATERIAL. 10 CFR 20.203(f) (1) or (f) (2)
- [ ] G. Storage containers were not properly labeled to show the quantity, date of measurement, or kind of radioactive material in the containers. 10 CFR 20.203(f) (4)
- [ ] H. A current copy of 10 CFR 20, a copy of the license, or a copy of the operating procedures was not properly posted or made available. 10 CFR 20.206(b)
- [ ] I. Form AEC-3 was not properly posted. 10 CFR 20.206(c)
- [ ] J. Records of the radiation exposure of individuals were not properly maintained. 10 CFR 20.401(a) or 31.203(b)
- [ ] K. Records of surveys or disposals were not properly maintained. 10 CFR 20.401(b) or 31.303(d)
- [ ] L. Records of receipt, transfer, disposal, export or inventory of licensed material were not properly maintained. 10 CFR 30.41, 40.61 or 70.51
- [ ] M. Records of leak tests were not maintained as prescribed in your license, or 10 CFR 31.105(c).
- [ ] N. Records of inventories were not maintained. 10 CFR 31.106
- [ ] O. Utilization logs were not maintained. 10 CFR 31.107

(AEC Compliance Inspector)

6. LICENSEE'S ACKNOWLEDGMENT

The AEC Compliance Inspector has explained and I understand the items of noncompliance listed above. The items of noncompliance will be corrected within the next 30 days.

(Date) (Licensee Representative – Title or Position)

COPIES: ☐ LICENSEE; ☐ COMPLIANCE REGION; ☑ DIV. OF LIC. & REG.; ☐ DIV. OF COMPLIANCE

Form AEC-591 (Tentative)
(9-61)

UNITED STATES ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE

INSPECTION FINDINGS AND LICENSEE ACKNOWLEDGMENT

IE III

1. LICENSEE	2. REGIONAL OFFICE
Department of the Army SM-1A Operations U.S. Army Engineer Reactors Group Process Control Section Ft Greely Alaska	REGION V DIVISION OF COMPLIANCE U. S. ATOMIC ENERGY COMMISSION 2111 BANCROFT WAY BERKELEY 4, CALIFORNIA
3. LICENSE NUMBER(S) 50-7082-1	

4. INSPECTION FINDINGS

Date of Inspection 4 October 1962

- [ ] A. No item of noncompliance was found.
- [ ] B. Rooms or areas were not properly posted to indicate the presence of a RADIATION AREA. 10 CFR 20.203(b)
- [ ] C. Rooms or areas were not properly posted to indicate the presence of a HIGH RADIATION AREA. 10 CFR 20.203(c)(1)
- [ ] D. Rooms or areas were not properly posted to indicate the presence of an AIRBORNE RADIOACTIVITY AREA. 10 CFR 20.203(d)
- [ ] E. Rooms or areas were not properly posted to indicate the presence of RADIOACTIVE MATERIAL. 10 CFR 20.203(e)
- [ ] F. Containers were not properly labeled to indicate the presence of RADIOACTIVE MATERIAL. 10 CFR 20.203(f)(1) or (f)(2)
- [ ] G. Storage containers were not properly labeled to show the quantity, date of measurement, or kind of radioactive material in the containers. 10 CFR 20.203(f)(4)
- [ ] H. A current copy of 10 CFR 20, a copy of the license, or a copy of the operating procedures was not properly posted or made available. 10 CFR 20.206(b)
- [x] I. Form AEC-3 was not properly posted. 10 CFR 20.206(c)
- [ ] J. Records of the radiation exposure of individuals were not properly maintained. 10 CFR 20.401(a)
- [ ] K. Records of surveys or disposals were not properly maintained. 10 CFR 20.401(b)
- [ ] L. Records of receipt, transfer, disposal, export or inventory of licensed material were not properly maintained. 10 CFR 30.41, 40.61 or 70.51
- [ ] M. Records of leak tests were not maintained as prescribed in your license.

Herbert E. Book
AEC Representative

5. LICENSEE'S ACKNOWLEDGMENT

The AEC representative has explained and I understand the items of noncompliance listed above, if any. The items of noncompliance will be corrected within the next 30 days.

4 October 1962 — Date

[signature] — Licensee Representative

COPIES: ☐ LICENSEE; ☐ COMPLIANCE AREA; ☑ DIV. OF LIC. & REG.; ☐ DIV. OF COMPLIANCE (2)

GPO 918462

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314

REPLY TO ATTENTION OF:
DAEN-SO

5 September 1973

SUBJECT: Cancellation of AEC Byproduct Material License No. 50-07082-01

U. S. Atomic Energy Commission
Division of Material Licensing
ATTN: Mr. Robert Brinkman, Isotopes Branch
Washington, D. C. 20545

Dear Mr. Brinkman:

Please cancel AEC Byproduct Material License No. 50-07082-01, expiration date: 31 January 1974, issued to Department of the Army Engineer Reactors Group, SM-1A Nuclear Power Plant, Fort Greely, Alaska. The SM-1A Nuclear Power Plant, located in Fort Greely, Alaska, is in the final stages of decommissioning. All licensed byproduct material has been removed from the SM-1A Nuclear Power Plant in accordance with Army Regulation 755-15, Disposal of unwanted Radioactive Material.

Sincerely,

Roy David Ashley

ROY DAVID ASHLEY
Assistant for Industrial Hygiene
Safety Office

1 Incl
Ltr HQ US Army Engineer
Power Group 3 Aug 73

COPIES
SENT TO COMPLIANCE

40824

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
USA Engineer Reactors Group
SM-1A Operations
APO 733, Seattle, Washington

ARGSM 13 June 1963

United States Atomic Energy Commission
Washington 25, D.C.

ATTN: Nathan Bassin
Isotope Branch
Division of Licensing and Regulation

Dear Sir:

Reference my application dated March 16 1963, for amendment to license No. 50-7082-1, and telephone conversation between you and Captain Newsom of Operations Support Department of the Army Nuclear Power Program.

The following information is forwarded for incorporating with my application:

1. Inclosure 1, Drawing AES 432 (ALCO).

2. Inclosure 2, Drawing B-0039 (U.S. Nuclear).

3. The Po-Be source will have a strength of 45 curies and will be a U.S. Nuclear Type 386 neutron source.

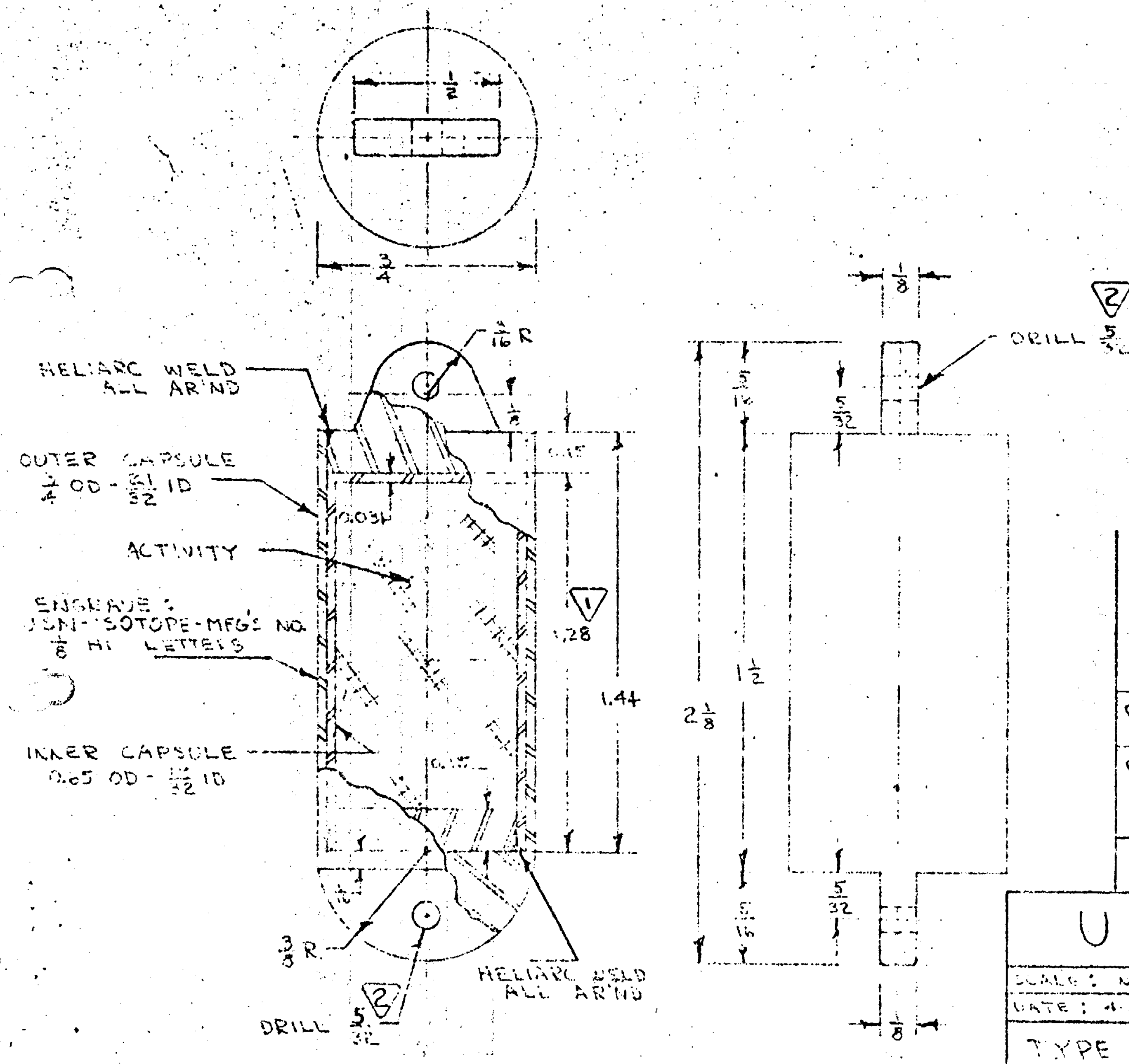
4. The Sb-Be capsule will be inactive when inserted in the reactor and will be handled as radioactive waste material after removal from the cone in the future.

Walter H. Abbott
WALTER H. ABBOTT
Captain CE
OIC, SM-1A Oper.

2 Incl
as

NOTES

1. CAPSULE MAT'L:
   321 ST. STL.



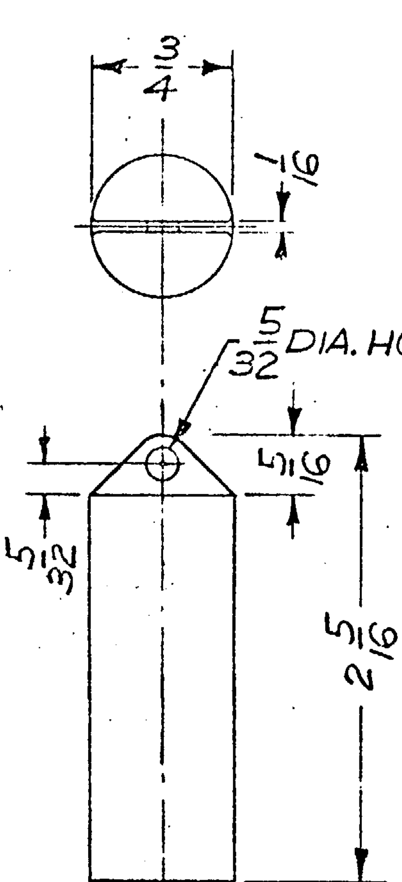
2	CHG'D $\frac{3}{32}$ TO $\frac{5}{32}$ 4-22-60
1	CHG'D 1.29 TO 1.28 TO ALLOW 0.01 CLEAR. 4-21-60

REVISIONS

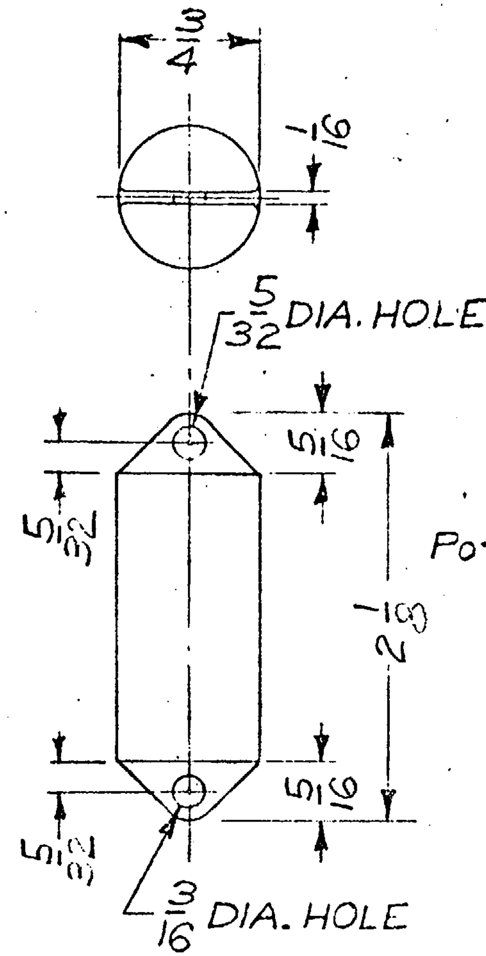
US NUCLEAR

SCALE: NONE	APP. BY:	CORR. BY:
DATE: 4-6-60		4-15

TYPE 396 NEUTRON SOURCE



Sb-Be NEUTRON SOURCE
(MUST BE ENCAPSULATED IN TWO STAINLESS STEEL CAPSULES)



Po-Be NEUTRON SOURCE (MUST BE ENCAPSULATED IN TWO STAINLESS STEEL CAPSULES)

THE DIMENSIONS INCLUDE [illegible] STAINLESS STEEL CAPSULES [illegible] BOTH SOURCES.

incl 1

BREAK SHARP EDGES
REMOVE ALL BURRS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES ON FINISHED FRACTIONAL DIMENSIONS TO BE ± 1/64

√	FINISH AS INDICATED IN MICROINCHES.
ƒ1	MACHINE FINISH - ROUGH
ƒ10	FLAME CUT OR SAW

ALCO PRODUCTS, INC.
NUCLEAR POWER ENGINEERING DEPT.
SCHENECTADY, N. Y., U. S. A.

SCALE FULL	REF.	DR.	[illegible]	[illegible]
MATERIAL SPEC.		TR.		
		CHK.	[signature]	1-18-60
		APPR.		
		APPR.		
		MET.	[signature]	[illegible]

NAME
STARTUP SOURCES

PART NO.
AES - 432

incl 1

1 Copy - Dep

HEADQUARTERS
DEPARTMENT OF THE ARMY
OFFICE OF THE SURGEON GENERAL
WASHINGTON 25, D. C.

IN REPLY REFER TO
MEDPS-PO

6 March 1961

Isotopes Branch
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

Gentlemen:

The inclosed copy of a letter from Office of the Chief of Engineers, APO 733, Seattle, Washington to The Surgeon General requesting that Item 6 (b)(2) of Byproduct Material License No. 50-7082-1 (A63) be changed to read ". . .two sources of 4 microcuries each" is forwarded for your approval and action.

Sincerely,

CHARLES W. KRAUL
Lt Colonel, MC
Preventive Medicine Division

1 Incl
as

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
USA Engineer Reactors Group
SM-1A Operations
APO 733, Seattle, Washington

ARGSM 14 February 1961

SUBJECT: Amendment to Byproduct Material License

TO: The Surgeon General
Department of the Army
Washington 25, D. C.
ATTN: MEDCE

THRU: Commanding Officer
Fort Greely, Alaska
ATTN: ARGMD

1. References:

a. Letter, File: ARGSM, subject: "Transmittal of Application for Byproduct Material License, AEC Form 313", dated 23 November 1960.

b. Letter, File: MEDPS-PO, subject: "Byproduct Material License", dated 27 January 1961.

2. Application for a specific byproduct material license was transmitted by reference 1.a. U. S. Atomic Energy Commission Byproduct Material License Number 50-7082-1 (A63) was forwarded to this Activity by reference 1.b.

3. So much of Item 6. (b) (2) of Form AEC 313 as reads, "* *, one source of 8 microcuries/." was in error and should be changed to read: "* *, two sources of 4 microcuries each/."

4. It is therefore requested that Item 8.B. of USAEC Byproduct Material License Number 50-7082-1 (A63) be amended to read: "Two sources of 4 microcuries each."

RICHARD L. HARRIS
Captain, Corps of Engineers
Officer-In-Charge, SM-1A Operations

33108

0477

HEADQUARTERS
DEPARTMENT OF THE ARMY
OFFICE OF THE SURGEON GENERAL
WASHINGTON 25, D. C.

IN REPLY REFER TO
MEDPS-PO

24 January 1961

Isotopes Branch
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

50 - 7082 - 1
issued 1/24/61

Gentlemen:

Reference is made to our letter to Isotopes Branch, Division of Licensing and Regulation dated 17 January 1961 which recommended approval of an application for a Byproduct Material License for Fort Greely, Alaska.

The inclosed correspondence from the Chief of Engineers includes additional information and certain changes requested in Items 1(a), 1(b), and 3.

Sincerely,

Charles W. Kraul

CHARLES W. KRAUL
Lt Colonel, MC
Preventive Medicine Division

1 Incl
AS

RECEIVED
JAN 26 1961
U.S.A.E.C.
Isotopes Branch
Div. of L & R

MEDPS-PO 24 January 1961

Isotopes Branch
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

Gentlemen:

Reference is made to our letter to Isotopes Branch, Division of Licensing and Regulation dated 17 January 1961 which recommended approval of an application for a Byproduct Material License for Fort Greely, Alaska.

The inclosed correspondence from the Chief of Engineers includes additional information and certain changes requested in Items 1(a), 1(b), and 3.

Sincerely,

1 Incl
AS

CHARLES W. KRAUL
Lt Colonel, MC
Preventive Medicine Division

SECURITY CLASSIFICATION (If any)

DISPOSITION FORM

FILE NO.	SUBJECT
ENGSD	Application for Byproduct Material License

TO	FROM	DATE	COMMENT NO. 1
TSG Attn: MEDCE-OH	CofEngrs	16 Jan 61	HARDIN/72706

1. References:

a. Inclosed letter, with inclosures, from SM-1A Operations, U. S. Army Engineer Reactors Group, Fort Greely, Alaska dated 23 November 1960.

b. Telecon of 3 January 1961 between representative of your Preventive Maintenance Division and Mr. S. E. Martin of this office.

2. Request following changes on Form AEC-313 be made:

a. Item 1 (a) - Change to read "Officer-In-Charge
U. S. Army Engineer Reactors Group
Fort Greely, Alaska
APO 733, Seattle, Washington"

b. Item 1 (b) - Delete "Not Applicable"

c. Item 3 - Delete "45-6380-1 (MSGT W. R. Gwinn only)"

3. It is further requested that license be forwarded to this office for transmittal to the applicant at which time he will be informed that Fort Greely, Alaska must have their own AEC license for the sources when plant is turned over to them and that license issued to SM-1A Operations must be returned thru channels for cancellation.

4. This office has no objection to direct notification to applicant as to action taken on application.

FOR THE CHIEF OF ENGINEERS:

1 Incl
a/s

ROBERT L. JENKINS
Chief, Safety Division

DD FORM 1 FEB 50 96 REPLACES NME FORM 96, 1 OCT 48, WHICH MAY BE USED

648—16—54801-3 U.S. GOVERNMENT PRINTING OFFICE

FORM AEC-374A
(10-61)

U. S. ATOMIC ENERGY COMMISSION
MATERIAL LICENSE
Supplementary Sheet

License Number 50-7082-1
(ADS)

Amendment No. 6

Department of the Army
SM-1A Operations
U.S. Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

In accordance with letter dated June 13, 1963, License No. 50-7082-1 is amended as follows:

Items 6A, 7A, and 8A are amended to read:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
A. Polonium 210	A. U.S. Nuclear Type 366 Sealed Neutron Source	A. One source of 45 curies

9. Authorized use

Date

For the U. S. Atomic Energy Commission
Original Signed by
Nathan Bassin

by
Division of Licensing and Regulation
Washington 25, D. C.

U. S. ATOMIC ENERGY COMMISSION
MATERIAL LICENSE
Supplementary Sheet

License Number 50-7082-1
(A65)
Amendment No. 4

Department of the Army
SM-1A Operations
U.S. Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

In accordance with letter dated June 13, 1963, License No. 50-7082-1 is amended as follows:

Items 6A, 7A, and 8A are amended to read:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
A. Polonium 210	A. U.S. Nuclear Type 386 Sealed Neutron Source	A. One source of 45 curies

~~9. Authorized use~~

DUPLICATED FOR DIV. OF COMPLIANCE

Date JUN 25 1963

For the U. S. Atomic Energy Commission

Original Signed by
Nathan Bassin

by ~~Isotopes Branch~~ Division of Licensing and Regulation
Washington 25, D. C.

MB 6-26-63

Returned - through OSG

Form AEC-313 (5-58)

ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved Budget Bureau No. 38-R027.4

INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only Items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail three copies to: U. S. Atomic Energy Commission, Washington 25, D. C. Attention: Isotopes Branch, Division of Licensing and Regulation. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30 and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital, person, etc.)*

Department of the Army
SM-1A Operations
US Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1 (a).)*

Same as 1.a.

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Process Control Section

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

Amendment of License #50-7082-1 (A65)

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

1. WO-1 William G. Hubacek
2. SSG Robert J. Springer Sr Proc Cont Tech
3. SGT Elvin H. Burger Proc Cont Tech
4. SP5 William C. Mallory Proc Cont Tech
5. SP5 Michael D. Senshine Proc Cont Tech

5. RADIATION PROTECTION OFFICER *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)*

WO-1 William G Hubacek

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*

See original application

(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*

See original application

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)*

See original application

(Continued on reverse side)

Form AEC-313 (5-58)

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 (Use supplemental sheets if necessary)

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	Nuclear Power Plant Operators Course, Fort Belvoir, Va	1 year	Yes No	Yes ~~No~~
b. Radioactivity measurement standardization and monitoring techniques and instruments	Removal for Burger & Sonshine	1 year	Yes No	Yes ~~No~~
c. Mathematics and calculations basic to the use and measurement of radioactivity	Bubaeck, Springer & Mallery	1 year	Yes No	Yes ~~No~~
d. Biological effects of radiation	Transferred from SM-1 Ft Belvoir, Va	1 year	Yes No	Yes ~~No~~

9. EXPERIENCE WITH RADIATION. (Actual use of radioisotopes or equivalent experience.)

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Po^{210}	35 Curies	Bubaeck, SM-1 and PM-2A	5 years	Reactor start-up
Co^{60}	100 mc			Calibration
Sr^{90}	17 mc			Calibration
Sb^{124}, Pu^{239}Be	45 Curies	Springer and Mallery		Calibration W/Start-up
Ra	100 mc	SM-1 Ft Belvoir, Va.	2 years	Calibration

10. RADIATION DETECTION INSTRUMENTS. (Use supplemental sheets if necessary.)

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm²)	USE (Monitoring, surveying, measuring)
Refer to inventory of survey instruments in inclosure "3" of original application					

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE. Survey instruments are calibrated monthly using standard sources which include Pu, Be, Ra^{226}, Co^{60} and [illegible]

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. (For film badges, specify method of calibrating and processing, or name of supplier.)
Refer to SM-1A memo #5 submitted with original application.

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached (Circle answer) Yes No
See original application

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.
See original application

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. See original application

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

SM-1A Operations
US Army Engineer Reactors Group
Applicant named in item 1

Date 20 June 1963

RECEIVED
JUN 24 1963
U.S.A.E.C.
Isotopes Branch
Div. of L & R

By: ____________________

WALTER H. ABBOTT, CAPT, CE
Officer-In-Charge, SM-1A Operations
Title of certifying official

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.

GPO-87487-3

HEADQUARTERS
DEPARTMENT OF THE ARMY
OFFICE OF THE SURGEON GENERAL
WASHINGTON 25, D.C.

IN REPLY REFER TO
MEDPS-PO

25 April 1963

Isotopes Branch
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

Gentlemen:

Recommend that the application for amendment to Byproduct Material License No. 50-7082-1 (A65), U. S. Army Engineer Reactors Group, Fort Greely, Alaska, be approved.

The radiation protection program is adequate for the proposed use of the material requested.

Sincerely,

ROSWELL G. DANIELS
Lt. Colonel, MC
Preventive Medicine Division

1 Incl
AEC 313 (in trip)

Form AEC-313 (5-58)

ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved Budget Bureau No. 38-R027.4

INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only Items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail three copies to: U. S. Atomic Energy Commission, Washington 25, D. C. Attention: Isotopes Branch, Division of Licensing and Regulation. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30 and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital, person, etc.)*

Department of the Army
SM-1A Operations
US Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1 (a).)*

Same as 1.a.

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Process Control Section

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

Amendment of License #50-7082-1 (A65)

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

1. MSgt Harold L. Allen RPO
2. Sgt Elvin H. Burger Sr Process Cont Tech
3. SP5 Michael D. Sonshine Process Cont Tech

5. RADIATION PROTECTION OFFICER *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)*

MSgt Harold L. Allen

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*	(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*
A. Polonium 210	A. Mound laboratory sealed polonium - Beryllium Source A. Two (2) Sources not to exceed a total of 50 curies
B. Strontium 90	B. Jordan Electronics Inc., Model BB-1010 Sealed Source B. 17 microcuries contained in two (2) sources of four (4) microcuries each, and three (3) sources of three (3) microcuries each.
C. Cobalt 60	C. Tracerlab Sealed Source C. One Source of 1.1 millicuries
D. Sb 124-Be	D. One source of 45 curies

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)*

A. Reactor Start Up Source

B. Internal Calibration Source in Jordan Electronics Model AGB-10KG-SR Radector

C. Calibration Source for Area and Process Monitoring System

D. Used in conjunction with the reactor start-up source

DUPLICATED FOR DIV OF COMPLIANCE

51032

(Continued on reverse side)

Form AEC-313 (5-58)

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 *(Use supplemental sheets if necessary)*

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	Nuclear Power Plant Operators Course, Fort Belvoir, Virginia	1 Year	(Yes) No	(Yes) No
b. Radioactivity measurement standardization and monitoring techniques and instruments	Burger and Sonshine Training and Experience	"	(Yes) No	(Yes) No
c. Mathematics and calculations basic to the use and measurement of radioactivity		"	(Yes) No	(Yes) No
d. Biological effects of radiation	Renewal for Allen.	"	(Yes) No	(Yes) No

9. EXPERIENCE WITH RADIATION. *(Actual use of radioisotopes or equivalent experience.)*

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Po^{210}	35 Curies	SM-1 Fort Belvoir, Va. and SM-1A Fort Greely, Alaska	Burger SM-1 1 Year SM-1A 6 Mos	Reactor Start Up
Co^{60}	57 uc			Calibration
Sr^{90}	17 uc		Sonshine SM-1 2 Yrs SM-1A 2 Mos	Calibration
Sb^{124}-Be	45 Curies			Conjunction with Reactor Start-Up

10. RADIATION DETECTION INSTRUMENTS. *(Use supplemental sheets if necessary.)*

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm²)	USE (Monitoring, surveying, measuring)
Refer to complete inventory of survey instruments used at SM-1A, in Inclosure #3 of SM-1A Memorandum #5 "SM-1A Radiological Security and Control" submitted with original license application.					

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE. Survey instruments are calibrated monthly, using standard sources appropriate to the radiation detected and the instrument sensitivity ranges. Sources include U^{238} RA^{226} Co^{60} for survey instruments.

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. *(For film badges, specify method of calibrating and processing, or name of supplier.)*

Refer to SM-1A Memorandum #5 submitted with original license application.

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. (Circle answer) Yes No Amendment - See original application.

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.

Amendment - See original application.

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. See original Application

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

SM-1A Operations
US Army Engineer Reactors Group
Applicant named in item 1

RECEIVED APR 26 1963 Isotopes Branch Div. of L & R

Date 16 March 1963

By: Walter H. Abbott
WALTER H. ABBOTT, CAPT., CE
Officer-In-Charge, SM-1A Operations
Title of certifying official

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.

GPO-87407 3

FORM AEC-374 (12-57)

U. S. ATOMIC ENERGY COMMISSION

BYPRODUCT MATERIAL LICENSE NO. 50-7082-1 AMENDMENT NO. 2

(A65)

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 30, Licensing of Byproduct Material, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, own, possess, transfer and import byproduct material listed below; and to use such byproduct material for the purpose(s) and at the place(s) designated below. This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee

1. Name Department of the Army
SM-1A Operations

2. Address U.S. Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

In Accordance with application dated November 16, 1962

3. License number 50-7082-1 is amended in its entirety to read as follows:

4. Expiration date January 31, 1965

5. Reference No.

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
A. Polonium 210	A. Mound Laboratory Sealed Polonium-Beryllium Neutron Sources	A. 50 curies total

9. Authorized use

A. Reactor start-up sources.
B. Internal check sources in Jordan Electronics Model AGB-10KG-SR Radectors.
C. Calibration source for area and process monitoring system.

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

11. The licensee shall comply with the provisions of Title 10, Part 20, Code of Federal Regulations, Chapter 1, "Standards For Protection Against Radiation".

12. Byproduct material shall be used by, or under the supervision of MSgt Harold L. Allen, MSgt William R. Gwinn, SP6 Oscar A. Vogtsberger, Sgt Elvin H. Burger or SP5 Michael D. Sonshine.

13. Byproduct material as sealed sources shall not be opened.

14. A. Each sealed source containing byproduct material, other than Hydrogen 3, with a half-life greater than thirty days and in any form other than gas shall be tested for leakage and/or contamination at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made six months prior to the transfer, the sealed source shall not be put into use until tested.

(See page 2)

U. S. Atomic Energy Commission

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE
Supplementary Sheet

License Number 50-7082-1
(A65)

AMENDMENT NO. 2

CONTINUED

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
B. Strontium 90	B. Jordan Electronics Model BB-1010 Sealed Source	B. 17 microcuries contained in two sources of 4 microcuries each and three sources of 3 microcuries each.
C. Cobalt 60	C. Tracerlab Sealed Source	C. One source of 1.1 millicuries

Condition 14 continued

14. B. The test shall be capable of detecting the presence of 0.005 microcurie of removable contamination on the source. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is permanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.

C. If the test reveals the presence of 0.005 microcurie or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within five days of the test with the Director, Division of Licensing and Regulation, U. S. Atomic Energy Commission, Washington 25, D. C., describing the equipment involved, the test results and the corrective action taken. A copy of such report shall also be sent to the Director, Region V, Division of Compliance, USAEC, 2111 Bancroft Way, Berkeley 4, California.

D. Tests for leakage and/or contamination shall be performed by an individual named in Condition No. 12 of this license in accordance with procedures entitled "Polonium - Beryllium Neutron Source Leak Test" and "Strontium 90 Source Leak Test," submitted with application dated November 23, 1960, and "Cobalt 60 Source Leak Test," submitted with application dated March 22, 1962.

(See page 3)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE
Supplementary Sheet

License Number 50-7082-1
(AGS)

AMENDMENT NO. 3

Conditions continued

15. Except as specifically provided otherwise by this license, the licensee shall possess and use byproduct material described in Items 6, 7 and 8 of this license in accordance with statements, representations and procedures contained in application dated November 23, 1960; March 22, 1962; and November 16, 1962.

For the U. S. Atomic Energy Commission
Original Signed by
Nathan Bassin
by Isotopes Branch
Division of Licensing and Regulation

Date January 4, 1963

U. S. ATOMIC ENERGY COMMISSION

BYPRODUCT MATERIAL LICENSE NO. 50-7082-1 AMENDMENT NO. 2 (A65)

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 30, Licensing of Byproduct Material, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, own, possess, transfer and import byproduct material listed below; and to use such byproduct material for the purpose(s) and at the place(s) designated below. This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Name Department of the Army SM-1A Operations **2. Address** U.S. Army Engineer Reactors Group Process Control Section Fort Greely, Alaska	In Accordance with application dated November 16, 1962 **3. License number** 50-7082-1 is amended in its entirety to read as follows: **4. Expiration date** January 31, 1965 **5. Reference No.**

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
A. Polonium 210	A. Mound Laboratory Sealed Polonium-Beryllium Neutron Sources	A. 50 curies total

9. Authorized use

A. Reactor start-up sources.
B. Internal check sources in Jordan Electronics Model AGB-10KG-SR Radectors.
C. Calibration source for area and process monitoring system.

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

11. The licensee shall comply with the provisions of Title 10, Part 20, Code of Federal Regulations, Chapter 1, "Standards For Protection Against Radiation".

12. Byproduct material shall be used by, or under the supervision of MSgt Harold L. Allen, MSgt William R. Gwinn, SP6 Oscar A. Vogtsberger, Sgt Elvin H. Burger or SP5 Michael D. Sonshine.

13. Byproduct material as sealed sources shall not be opened.

14. A. Each sealed source containing byproduct material, other than Hydrogen 3, with a half-life greater than thirty days and in any form other than gas shall be tested for leakage and/or contamination at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made six months prior to the transfer, the sealed source shall not be put into use until tested.

(See page 2)

AMENDMENT NO. 2

CONTINUED

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
B. Strontium 90	B. Jordan Electronics Model BB-1010 Sealed Source	B. 17 microcuries contained in two sources of 4 microcuries each and three sources of 3 microcuries each.
C. Cobalt 60	C. Tracerlab Sealed Source	C. One source of 1.1 millicuries

Condition 14 continued

14. B. The test shall be capable of detecting the presence of 0.005 microcurie of removable contamination on the source. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is permanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.

C. If the test reveals the presence of 0.005 microcurie or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within five days of the test with the Director, Division of Licensing and Regulation, U. S. Atomic Energy Commission, Washington 25, D. C., describing the equipment involved, the test results and the corrective action taken. A copy of such report shall also be sent to the Director, Region V, Division of Compliance, USAEC, 2111 Bancroft Way, Berkeley 4, California.

D. Tests for leakage and/or contamination shall be performed by an individual named in Condition No. 12 of this license in accordance with procedures entitled "Polonium - Beryllium Neutron Source Leak Test" and "Strontium 90 Source Leak Test," submitted with application dated November 23, 1960, and "Cobalt 60 Source Leak Test," submitted with application dated March 22, 1962.

(See page 3)

FORM AEC-374A
(12-57)

U S. ATOMIC ENERGY COMMISSIO^NT
YPRODUCT MATERIAL LICENSF
Supplementary Sheet

License Number 50-7082-1
(A65)

AMENDMENT NO. 3

Conditions continued

15. Except as specifically provided otherwise by this license, the licensee shall possess and use byproduct material described in Items 6, 7 and 8 of this license in accordance with statements, representations and procedures contained in application dated November 23, 1960; March 22, 1962; and November 16, 1962.

For the U. S. Atomic Energy Commission

Original Signed by
Nathan Bassin

Date January 4, 1963

by Isotopes Branch
Division of Licensing and Regulation
Washington 25, D. C.

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HEADQUARTERS
DEPARTMENT OF THE ARMY
OFFICE OF THE SURGEON GENERAL
WASHINGTON 25, D.C.

IN REPLY REFER TO
MEDPS-PO

19 December 1962

Isotopes Branch
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

Gentlemen:

Recommend approval of the inclosed application for renewal of Byproduct Material License No. 50-7082-1 (A63) for 50 curies of Polonium 210; 17 microcuries of Strontium 90; and 1.1 millicuries of Cobalt 60 for U. S. Army Engineer Group, Fort Greely, Alaska.

The Radiation Protection Program is adequate for the proposed use of the material requested.

Sincerely yours,

Roswell G. Daniels
ROSWELL G. DANIELS
Lt Colonel, MC
Preventive Medicine Division

1 Incl
AEC-313 (in trip)

48357

Form AEC-313 (5-58)

ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved. Budget Bureau No. 38-R027.3.

INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only Items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail three copies to: U. S. Atomic Energy Commission, Washington 25, D. C. Attention: Isotopes Branch, Division of Licensing and Regulation. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30 and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital, person, etc.)*

Department of the Army
SM-1A Operations
US Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1 (a).)*

Same as 1a.

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Process Control Section

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

Renewal of License # 50-7082-1 (A 63)

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

1. MSgt Harold L. Allen RPO
2. MSgt William R. Gwinn Deputy RPO
3. SP6 Oscar A. Vogtsberger Jr Deputy RPO
4. Sgt Elvin H. Burger Sr Process Cont Tech
5. SP5 Michael D. Sonshine " " "

5. RADIATION PROTECTION OFFICER *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)*

MSgt Harold L. Allen

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*

(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*

(a)	(b)
A. Polonium 210	A. Mound laboratory sealed polonium - Beryllium Source A. Two (2) Sources not to exceed a total of 50 curies
B. Strontium 90	B. Jordan Electronics Inc., Model BB-1010 Sealed Source B. 17 microcuries contained in two (2) sources of four (4) microcuries each, and three (3) sources of three (3) microcuries each.
C. Cobalt 60	C. Tracerlab Sealed Source C. One Source of 1.1 millicuries

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)*

A. Reactor Start Up Source

B. Internal Calibration Source in Jordan Electronics Model AGB-10KG-SR Radector

C. Calibration Source for Area and Process Monitoring System

DUPLICATED FOR DIV. OF COMPLIANCE

(Continued on reverse side)

48357

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 (Use supplemental sheets if necessary)

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	Nuclear Power Plant Operators	1 Year	(Yes) No	(Yes) No
b. Radioactivity measurement standardization and monitoring techniques and instruments	Course, Fort Belvoir, Virginia Burger and Sonshine Training	"	(Yes) No	(Yes) No
c. Mathematics and calculations basic to the use and measurement of radioactivity	and Experience	"	(Yes) No	(Yes) No
d. Biological effects of radiation	Renewal for Allen, Gwinn, & Vogtsberger	"	(Yes) No	(Yes) No

9. EXPERIENCE WITH RADIATION. (Actual use of radioisotopes or equivalent experience.)

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Po^{210}	35 Curies	SM-1 Fort Belvoir, Va. and SM-1A Fort Greely, Alaska	Burger SM-1 - 1 Year SM-1A 6 Mos	Reactor Start Up
Co^{60}	57 uc		Sonshine SM-1 2 Years	Calibration
Sr^{90}	17 uc		SM-1A 2 Mos	Calibration

10. RADIATION DETECTION INSTRUMENTS. (Use supplemental sheets if necessary.)

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm²)	USE (Monitoring, surveying, measuring)
Refer to complete inventory of survey instruments used at SM-1A, in Inclosure #3 of SM-1A Memorandum #5 "SM-1A Radiological Security and Control" submitted with original license application.					

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE. Survey instruments are calibrated monthly, using standard sources appropriate to the radiation detected and the instrument sensitivity ranges. Sources include U^{238} RA^{226} Co^{60} for survey instruments.

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. (For film badges, specify method of calibrating and processing, or name of supplier.)
Refer to SM-1A Memorandum #5 submitted with original license application.

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. (Circle answer) Yes (No) Renewal - See original application

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.
Renewal - See original application

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. See original Application

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

SM-1A Operations
US Army Engineer Reactors Group
Applicant named in item 1

RECEIVED DEC 20 1962 U.S.A.E.C. Isotopes Branch Div. of L & R

Date 16 November 1962

By Walter H. Abbott
WALTER H. ABBOTT, CAPT., CE
Officer-In-Charge, SM-1A Operations
Title of certifying official

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.

FORM AEC-374A
(12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE
Supplementary Sheet

License Number 50-7082-1
(A63)

Amendment No. 2

Department of the Army
SM-1A Operations
U. S. Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

In accordance with application dated March 22, 1962, License No. 50-7082-1 is amended as follows:

Items 6A, 7A and 8A are amended to read:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
A. Polonium 210	A. Mound Laboratory Sealed Polonium-Beryllium Neutron Source	A. One source of 35 curies

Items 6B, 7B, 8B and 9B are amended to read:

B. Strontium 90	B. Jordan Electronics Model BB-1010 Sealed Sources	B. 17 microcuries contained in two sources of 3 microcuries each and three sources of 3 microcuries each

9. Authorized use

B. Internal check sources in Jordan Electronics Model AGB-10KG-SR Radectors.

Items 6, 7, 8 and 9 are amended to add:

C. Cobalt 60	C. Tracerlab Sealed Source	C. One source of 1.1 millicurie

9. Authorized use

C. Calibration source for area and process monitoring system.

Continued:

FORM AEC-374A (12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE
Supplementary Sheet

License Number 50-7082-1 (A63)

AMENDMENT NO. 2

CONTINUED:

Condition No. 12 is amended to read:

12. Byproduct material shall be used by, or under the supervision of, MSGT William R. Gwinn, SP-6 Oscar A. Vogtsberger, Jr., or MSGT Harold L. Allen.

Condition No. 14 is amended to read:

14. Except as specifically provided otherwise by this license, the licensee shall possess and use byproduct material described in Items 6, 7 and 8 of this license in accordance with statements, representations and procedures contained in applications dated November 23, 1960, and March 22, 1962.

Condition No. 15 is amended to read:

15. A. Each sealed source containing byproduct material, other than Hydrogen 3, with a half-life greater than thirty days and in any form other than gas shall be tested for leakage and/or contamination at intervals not to exceed six months, except that each source designed for the purpose of emitting alpha particles shall be tested at intervals not to exceed three months. In the absence of a certificate from a transferor indicating that a test has been made six months prior to the transfer, the sealed source shall not be put into use until tested.

B. The test shall be capable of detecting the presence of 0.005 microcurie of removable contamination on the source. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is permanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.

C. If the test reveals the presence of 0.005 microcurie or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within five days of the test with the Director, Division of Licensing

(See page 3)

AMENDMENT NO. 2

15. Continued:

and Regulation, U. S. Atomic Energy Commission, Washington 25, D. C., describing the equipment involved, the test results and the corrective action taken. A copy of such report shall also be sent to the Director of the appropriate Regional Office, Division of Compliance, U. S. Atomic Energy Commission:

Region I, Division of Compliance, USAEC, 376 Hudson Street, New York 14, New York

Region II, Division of Compliance, USAEC, 50 Seventh Street, Northeast, Atlanta 23, Georgia

Region III, Division of Compliance, USAEC, 9800 South Cass Avenue, Argonne, Illinois

Region IV, Division of Compliance, USAEC, P. O. Box 15266, Denver 15, Colorado

Region V, Division of Compliance, USAEC, 2111 Bancroft Way, Berkeley 4, California

D. Tests for leakage and/or contamination shall be performed by an individual named in Condition No. 12 of this license in accordance with procedures entitled "Polonium - Beryllium Neutron Source Leak Test" and "Strontium 90 Source Leak Test," submitted with application dated November 23, 1960, and "Cobalt 60 Source Leak Test," submitted with application dated March 22, 1962.

DUPLICATED
FOR DIV. OF COMPLIANCE
1. [illegible] 5-28-62

Date MAY 25 1962

For the U. S. Atomic Energy Commission

Original Signed by
Nathan Bassin

by Isotopes Branch
Division of Licensing and Regulation
Washington 25, D. C.

FORM AEC-374A
(12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE
Supplementary Sheet

License Number 50-7082-1 (A63)

Amendment No. 2

Department of the Army
SM-1A Operations
U. S. Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

In accordance with application dated March 22, 1962, License No. 50-7082-1 is amended as follows:

Items 6A, 7A and 8A are amended to read:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
A. Polonium 210	A. Mound Laboratory Sealed Polonium-Beryllium Neutron Source	A. One source of 35 curies

Items 6B, 7B, 8B and 9B are amended to read:

B. Strontium 90	B. Jordan Electronics Model BB-1010 Sealed Sources	B. 17 microcuries contained in two sources of 3 microcuries each and three sources of 3 microcuries each

9. Authorized use

B. Internal check sources in Jordan Electronics Model AGB-10KG-SR Radectors.

Items 6, 7, 8 and 9 are amended to add:

C. Cobalt 60	C. Tracerlab Sealed Source	C. One source of 1.1 millicurie

9. Authorized use

C. Calibration source for area and process monitoring system.

Continued:

License Number 50-7082-1 (A63)

AMENDMENT NO. 2

CONTINUED:

Condition No. 12 is amended to read:

12. Byproduct material shall be used by, or under the supervision of, MSGT William R. Gwinn, SP-6 Oscar A. Vogtsberger, Jr., or MSGT Harold L. Allen.

Condition No. 14 is amended to read:

14. Except as specifically provided otherwise by this license, the licensee shall possess and use byproduct material described in Items 6, 7 and 8 of this license in accordance with statements, representations and procedures contained in applications dated November 23, 1960, and March 22, 1962.

Condition No. 15 is amended to read:

15. A. Each sealed source containing byproduct material, other than Hydrogen 3, with a half-life greater than thirty days and in any form other than gas shall be tested for leakage and/or contamination at intervals not to exceed six months, except that each source designed for the purpose of emitting alpha particles shall be tested at intervals not to exceed three months. In the absence of a certificate from a transferor indicating that a test has been made six months prior to the transfer, the sealed source shall not be put into use until tested.

B. The test shall be capable of detecting the presence of 0.005 microcurie of removable contamination on the source. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is permanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.

C. If the test reveals the presence of 0.005 microcurie or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within five days of the test with the Director, Division of Licensing

(See page 3)

FORM AEC-374A
(12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE
Supplementary Sheet

License Number 50-7082-1
(A63)

AMENDMENT NO. 2

15. Continued:

and Regulation, U. S. Atomic Energy Commission, Washington 25, D. C., describing the equipment involved, the test results and the corrective action taken. A copy of such report shall also be sent to the Director of the appropriate Regional Office, Division of Compliance, U. S. Atomic Energy Commission:

Region I, Division of Compliance, USAEC, 376 Hudson Street, New York 14, New York

Region II, Division of Compliance, USAEC, 50 Seventh Street, Northeast, Atlanta 23, Georgia

Region III, Division of Compliance, USAEC, 9800 South Cass Avenue, Argonne, Illinois

Region IV, Division of Compliance, USAEC, P. O. Box 15266, Denver 15, Colorado

Region V, Division of Compliance, USAEC, 2111 Bancroft Way, Berkeley 4, California

D. Tests for leakage and/or contamination shall be performed by an individual named in Condition No. 12 of this license in accordance with procedures entitled "Polonium - Beryllium Neutron Source Leak Test" and "Strontium 90 Source Leak Test," submitted with application dated November 23, 1960, and "Cobalt 60 Source Leak Test," submitted with application dated March 22, 1962.

For the U. S. Atomic Energy Commission

Date MAY 25 1962

Original Signed by
Nathan Bassin

by Isotopes Branch
...ing and Regul...
D. C.

HEADQUARTERS
DEPARTMENT OF THE ARMY
OFFICE OF THE SURGEON GENERAL
WASHINGTON 25, D. C.

IN REPLY REFER TO MEDPS-PO

1 May 1962

Isotopes Branch
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

Gentlemen:

Recommend approval of the inclosed application for amendment to Byproduct Material License No. 50-7082-1 (A63) for the U. S. Army Engineer Reactor Group, Fort Greely, Alaska for 35 curies of Polonium 210; 17 microcuries of Strontium 90; and 1.1 millicuries of Cobalt 60. The inclosed letter from the U. S. Army Engineer Reactors Group provides additional information to support this request for amendment.

Arrangements have been made for the facilities at Fort Greely to be surveyed by personnel from the U. S. Army Environmental Hygiene Agency.

Sincerely,

ROSWELL G. DANIELS
Lt Colonel, MC
Preventive Medicine Division

2 Incl
as

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Form AEC-313 (5-58)	ATOMIC ENERGY COMMISSION **APPLICATION FOR BYPRODUCT MATERIAL LICENSE**	Form approved Budget Bureau No. 38-R027.4

INSTRUCTIONS.–Complete Items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only Items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail three copies to: U. S. Atomic Energy Commission, Washington 25, D. C. Attention: Isotopes Branch, Division of Licensing and Regulation. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30 and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital, person, etc.)*

SM-1A Operations
US Army Engineer Reactors Group
Fort Greel, Alaska (APO 733, Seattle, Washington)

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1 (a).)*

Not applicable

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Process Control Section

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

45-6380-1 (MSGT W. R. GWINN only)

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

MSGT WILLIAM R. GWINN, Senior Plant Process Control Technician (Principle).
SP-6 OSCAR A. VOGTSBERGER JR., Process Control Technician (Alternate).
MSGT HAROLD L. ALLEN, Plant Superintendant (Alternate).

5. RADIATION PROTECTION OFFICER *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)*

MSGT HAROLD L. ALLEN

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*	(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*
A. Polonium 210	A. Mound Laboratory Sealed Polonium-Beryllium Neutron Source. One source of 35 curies.
B. Strontium 90	B. Jordan Electronics, Inc. Model BB-1010 Sealed Sources. 17 microcuries contained in two sources of 4 microcuries each & 3 sources of 3 uc each.
C. Cobalt 60	C. Tracerlab Sealed Source SN #437. One source of 1.1 millicuries.

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A.(Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)*

A. Po-Be source is to be used as reactor start-up source; the source will be located within the SM-1A reactor pressure vessel.

B. Sr sources are to be used as internal calibration sources for Jordan Electronics, Inc., Model AGB-10KG-SR Radectors.

C. Co source is to be used as an external calibration source for Riggs Nucleonics Corporation installed area and process monitoring system. Source will be stored in an installed steel-lined, concrete source well facility, which is locked and located in a permanently marked Radiation Area.

DUPLICATED
FOR DIV. OF COMPLIANCE

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(Continued on reverse side)

Form AEC-313 (5-58) Page Two

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 *(Use supplemental sheets if necessary)*

8. TYPE OF TRAINING * MSGT HAROLD L. ALLEN	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	Univ. of Virginia; ALCO Products Schenectady, NY; Nuclear Power ~~Plant Operators Crs., and SM-1~~ (APPR-1), Ft Belvoir, Va.; PM-2A, Camp Century, Greenland.	5 yrs	Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments	Same as above	"	Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity	Same as above	"	Yes No	Yes No
d. Biological effects of radiation	Same as above	"	Yes No	Yes No

9. EXPERIENCE WITH RADIATION. *(Actual use of radioisotopes or equivalent experience.)*

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Co-60	57mc	SM-1, Fort Belvoir, Va.	4 yrs	Calibration
Pu-239	100mc	same	"	"
Po-210	100mc	same	"	"
Po-210	15c	PM-2A, Camp Century, Greenland	1 yr	"
Po-210	50c	same	"	Reactor Start-up Source

10. RADIATION DETECTION INSTRUMENTS. *(Use supplemental sheets if necessary.)*

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm²)	USE (Monitoring, surveying, measuring)

Refer to complete inventory of survey instruments used at SM-1A in Inclosure 3, of SM-1A Memorandum Number 5, 1962, "SM-1A Radiological Security and Control", attached to this application as Inclosure 1.

* Training and experience of Gwinn and Vogtsberger included on initial application of 23 Nov. 1960.

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.
Instruments are routinely calibrated once a month using standard sources appropriate to the radiation detected and instrument sensitivity ranges. Sources include standard U-238, Ra-226, P-239 and Co-60 calibrators for survey instruments.

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. *(For film badges, specify method of calibrating and processing, or name of supplier.)*
Refer to Inclosures 1 and 3 of SM-1A Memorandum Number 5, 1962, "SM-1A Radiological Security and Control", attached to this application. Self reading dosimeters, gamma and neutron sensitive, will be worn by operating personnel and recharged daily.

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. (Circle answer) Yes No Sketch submitted in initial application of 23 Nov 1960. For descriptions see 14. below.

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source. See Inclosures 1 and 2 for radiation protection program. Leak test procedures for Po and Sr sources submitted in application, 23 Nov 1960. Co source leak test is included as Incl 3.

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved.
See Inclosure 2.

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

SM-1A Operations
US Army Engineer Reactors Group
Applicant named in Item 4

Date 22 March 1962 MAY 3 1962

By RICHARD L. HARRIS, Major, CE

Officer-In-Charge, SM-1A Operations
Title of certifying official

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.

GPO-87407

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
USA Engineer Reactors Group
SM-1A Operations
APO 733, Seattle, Washington

ARGSM 22 March 1962

SUBJECT: Amendment to Byproduct Material License 50-7082-1 (A63)

TO: The Surgeon General
Department of the Army
Washington 25, D. C.
ATTN: MEDPS-PO

THRU: Commanding Officer
U. S. Army Environmental Hygiene Agency
Army Chemical Center
Maryland

THRU: Commanding Officer
Fort Greely, Alaska
ATTN: ARGMD

1. References:

a. AR 40-580.

b. DA Circular 40-17.

c. Letter, ARGSM, SM-1A, subject: "Transmittal of Application for Byproduct Material License, AEC Form 313", dated 23 November 1960.

d. Letter, MEDPS-PO, OTSG, subject: "Byproduct Material License", dated 27 January 1961.

e. Letter, ARGSM, SM-1A, subject: "Amendment to Byproduct Material License", dated 14 February 1961.

f. Letter, MEDPS-PO, OTSG, subject: "Byproduct Material License", dated 27 March 1961.

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ARGSM 22 March 1962
SUBJECT: Amendment to Byproduct Material License 50-7082-1 (A63)

2. It is requested that the subject Byproduct Material License be amended as follows:

a. Item 8.A.; change to read: "One source of 35 curies".

b. Item 8.B.; change to read: "17 microcuries contained in two sources of 4 microcuries each and three sources of 3 microcuries each."

c. Add to No's 6, 7, 8 and 9, Item 6.C., 7.C., 8.C. and 9.C. as indicated on Form AEC 313 inclosed.

d. Identify as "Individual User" (Alternate) and as "Radiation Protection Officer" MSGT Harold L. Allen in lieu of CWO Severt L. Sundine, as indicated on Form AEC 313 inclosed.

3. In support of the requested amendment, completed Form AEC 313 is inclosed.

Incl:
AEC Form 313 w/inclosures

RICHARD L. HARRIS
Major, Corps of Engineers
Officer-In-Charge, SM-1A Operations

Cobalt - 60 Source Leak Test

Purpose

Leak testing shall be performed periodically to insure that no leakage exists from the handling, storage and use of the sealed radioactive source.

Procedure

Leak testing shall be performed under the provisions of a radiation work permit and precautions shall be taken to minimize personnel exposure during such testing. A smear using a 2" diameter laboratory grade filter paper will be made on the surface of the source container and counted using a scintellation assembly with gamma crystal. Positive results will be regarded as indicative of a leak and the source will be returned to the manufacturer for repair or replacement.

Instruments

1 each Radiation Instrument Development Laboratory (RIDL) Decade Sealer, Model No. 49-51

1 each Radiation Instrument Development Laboratory (RIDL) Model 10-2 Scintellation Counter

1 each Scintellation Counting Shield including crystal mount, RIDL Model 60-2.

Frequency of Test

A leak test shall be performed on receipt of the source at the site and at 3 month intervals thereafter.

Sensitivity

Assuming that a level of radiation equivalent to background where background is conservatively selected as 400 cpm, the lower level of detection with a counter of 20% efficiency, would be equal to $9X10^{-4}$ uc which is significantly more sensitive than is required.

Records

A permanent record shall be maintained which contains the date of performance and results of all source leak tests.

Incl. 3

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
USA Engineer Reactors Group
SM-1A Operations
APO 733, Seattle, Washington

MEMORANDUM
NUMBER 5

5 March 1962

SM-1A RADIOLOGICAL SECURITY AND CONTROL

1. PURPOSE: The purpose of this memorandum is to establish procedures and policies governing the prosecution of health physics activities and the maintenance of effective radiological safeguards at SM-1A.

2. GENERAL:

a. Direction and general guidance in the establishment of a radiological security and control program is set forth in Section VIII, "Radiological Safety" of reference 20.s. and in paragraph 9. of reference 20.w.

b. This Activity will, to the maximum extent possible, conform to the policies set forth in reference 20.ee. Continuing liaison will be maintained with the Chemical Officer, USARAL, and Radiological Safety Officer, USARAL, in all matters pertaining to SM-1A radiological safety and control; copies of this memorandum and other applicable policies or information identified in reference 20.ee. shall be provided the Commanding General, USARAL, ATTN: ARACM.

c. The provisions below shall become effective upon the date of SM-1A facilities transfer to the Government, except in those instances where prior implementation is a prerequisite to Contractor sponsored operations, (Contract No. DA-95-507-ENG-1116).

3. RESPONSIBILITIES:

a. General: Ultimate radiological security and control responsibility is a function of command; command at SM-1A is exercised by the Officer-In-Charge. The Senior Plant Process Control Specialist (a health physics and radiochemistry technician), SPPCT, reports to the Plant Superintendent by advising him in matters regarding radiation health hazards as well as by performing specific functions designed to protect personnel. The Shift Supervisor, who also reports to the Plant Superintendent, must be capable of handling routine health physics matters and must act in the absence of the SPPCT or other plant health physics technicians. Cross training of the chemistry-radiochemistry and health physics technicians

Incl 1

provides an additional source of assistance. Tasks involving a radiation hazard should be accomplished under the surveillance of the SPPCT or other health physics technicians. It is, therefore, the responsibility of operating supervision to maintain human exposure to ionizing radiation to the lowest practical level and to understand and apply nationally accepted radiological safety standards to SM-1A operation. It is the responsibility of the technician to perform monitoring services required for the maintenance of these standards and provide operating supervision with technical staff assistance.

b. Plant Superintendent:

(1) Responsible to the OIC, SM-1A for the implementation and maintenance of these and subsequent policies and procedures relating to radiological security and control.

(2) Act as SM-1A Radiological Protection Officer, (see below).

c. Plant Supervisor (NCOIC):

(1) Exercise immediate operational control of radiological security and control activities as directed.

(2) Consult with the SPPCT on all matters within the scope of these instructions which may affect the prosecution of plant operations, maintenance and repair.

(3) Advise the SPPCT of any revisions, additions, or modifications to plant operating procedures, shift or maintenance and repair schedules, or conditions of operations.

d. Shift Supervisor:

(1) Support and enforce all instructions and orders relating to radiological security and control during the shift.

(2) Be prepared to assume the responsibilities of a Plant Process Control Technician (health physics) in the absence of such a technician.

(3) Consult, as required, with the SPPCT in effecting (1) above.

MEMORANDUM
NUMBER 5

5 March 1962

e. Senior Plant Process Control Technician, (below identified responsibilities are only those within the scope of this memorandum):

(1) Provide staff supervision for the effective implementation and maintenance of all activities relating to radiological security and control. Alert command and operating supervision to all potential, incipient or actual radiological hazards, incidents, or accidents.

(2) Administer SM-1A photodosimetry.

(3) Read, record, and recharge pocket dosimeters daily or at shorter intervals as may be required.

(4) Provide first echelon (user) maintenance on all health physics and radiochemistry equipment; initiate work orders on items requiring more extensive maintenance.

(5) Maintain the SM-1A Health Physics and the SM-1A Chemistry and Radiochemistry Logs.

(6) Calibrate radiation detection, monitoring, and counting equipment to insure accurate performance; maintain calibration records.

(7) Assess, delineate, and supervise the maintenance of controls relative to contamination and radiation within the SM-1A control area by:

(a) Radiation surveys.

(b) Plant process and area monitoring.

(c) Personnel monitoring.

(8) Supervise, control, and administer the use, storage, and maintenance of all radioactive materials exclusive of fuel-in-use.

(9) Supervise, control, and administer the disposition of radioactive waste within the scope of SM-1A responsibilities.

(10) Supervise, control, and administer the packaging, shipment, and/or transfer of radioactive materials within the scope of SM-1A responsibilities.

(11) Where required, supervise prescribed methods of personnel, equipment, and facilities decontamination.

(12) Evaluate potential radiological hazards and make staff recommendations in this regard to the Plant Superintendent.

(13) Schedule and coordinate routine physical examinations and clinical analyses.

(14) Prepare and maintain such records as may be required by this or other pertinent verbal or written instructions; similarly initiate and submit reports as directed.

(15) Serve as principal licensee for those byproduct materials at SM-1A which are specifically licensed by the Atomic Energy Commission.

(16) Undertake other actions and duties required to protect personnel from radiation hazards, not specifically identified above.

f. Operating Personnel:

(1) Observe all policies, procedures, and specific instructions pertinent to radiological security and control.

(2) Report all potential, incipient or actual radiological hazards, incidents or accidents suspected or observed to operating supervision and process control personnel.

g. Radiological Protection Officer:

(1) Responsible to command for operational supervision, control, and administration of all radiological security and control matters pertaining to the SM-1A.

(2) Execute all policies and directives of command within the scope of radiological security and control.

(3) Perform or supervise the fulfillment of all specific duties or requirements of the terms of any specific license of the Atomic Energy Commission in effect at SM-1A.

(4) Assume all responsibilities specifically set forth in Department of the Army or Technical Service publications pertinent to individual byproduct material military supply items used at SM-1A.

5 March 1962

(5) Serve as an alternate licensee for those byproduct materials at SM-1A which are specifically licensed by the Atomic Energy Commission.

h. Isotope Committee: Review and approve in advance of purchase of radioisotopes, proposals for use, in compliance with reference 20.e.

4. MAXIMUM PERMISSIBLE EXPOSURES AND CONCENTRATIONS:

a. Permissible Dose from External Sources of Ionizing Radiation:

(1) External Sources in Control Area:

(a) Personnel Exposure Limits:

Condition of Exposure	Rems/Week	Dose Rems/Qtr	Rems/Yr
Whole body (including critical organs)	0.3	3.0	5.0
Hands and forearms; feet and ankles	---	18.75	75.0
Skin of whole body	---	7.5	30.0

(b) A daily whole body dose in excess of 50 mrem will not normally be permitted. Exceptions will be made only in cases of operational necessity as determined by the CIC or Plant Superintendent, SM-1A.

(c) The total maximum cumulative exposure at any time for personnel is 5 (N-18) rem, where N = age in years of exposed individual and must be greater than 18 (an average MPD of 100 mrem/week). Credit per day to compensate an overexposure (technical) is 50 mrem. Example: an exposure of 700 mrem in one week is 400 mrem more than permissible; 400/50 = 8, the number of days during which no occupational exposure may be permitted.

(d) Technical Overexposure: A technical overexposure is established by a film badge reading of 300 mrem or more for a one week period. If the pocket dosimeter total for a week is 300 mrem or more, the film badge must be dispatched immediately, or as soon as possible, for official determination of exposure;

no further exposure is normally permissible until the report is obtained and disposition made. Determination as to the use of such an individual will be made by the OIC, SM-1A. Reports and medical evaluation concerning technical overexposures are discussed below.

(2) External Sources Outside Control Area:

(a) Personnel Exposure Limits:

1 2 mrem in any one hour.

2 100 mrem in any seven consecutive days.

3 0.5 rem in one calendar year.

(b) Possession or use of radioactive materials or other sources of radiation outside the control area are not presently contemplated.

b. Permissible Concentration for Potential Internal Sources of Ionizing Radiation:

(1) Potential Internal Sources Inside Control Area: Applicable Maximum Permissible Concentrations are identified in Appendix B, Table I (including explanatory notes and table) of reference 20.y.

(2) Potential Internal Sources Outside Control Area (governing concentrations in plant effluents to uncontrolled areas): Applicable Maximum Permissible Concentrations are identified in Appendix B, Table II (including explanatory notes and table) of reference 20.y.

(3) If an individual is suspected of having internal deposition of one or more radioisotopes, the most expedient means of evaluation generally is to compare radioactivity found in urine with urine known to have no internal contamination. Decay of activity can also be followed. Maximum Permissible Urinary Activity Levels and Body Burdens are found in reference 20.dd.

c. Contamination Limits: Paragraph B., below.

5. PERSONNEL MONITORING:

a. General: Monitoring of exposure to ionizing radiation of all personnel when within the control area is required. Direct

MEMORANDUM
NUMBER 5

5 March 1962

measurement of the cumulative dose of ionizing radiation received by an individual is accomplished by means of (1) film badges (clip-on and wrist) and (2) pocket dosimeters of the self-reading type. If a person will not be permitted to enter a Radiation Area (as is usual in the case of a visitor, for example), a film badge may be used alone. No one will enter a Radiation Area without both a film badge and a pocket dosimeter.

b. Pocket Dosimeters: Pocket dosimeters must be worn on the chest region and not lower than the belt line. They are sensitive to X and gamma radiations. A scale reading 0-200 mr (the cumulative range) is visible through the viewing portal if the instrument is held as if it were a telescope. No one should leave the plant without knowing the reading of his pocket dosimeter. Each individual should begin his shift with an "0" reading (dosimeter fully charged). It is not permissible to take one's dosimeter or film badge outside the Control Area. The use of the pocket dosimeter is important because it is the only immediate means of estimating the dose received by an individual from an external source during a job involving a radiation hazard. To help assure proper performance, each pocket dosimeter will be calibrated at uniform monthly intervals and must be accurate within ± 10%.

c. Film Badges (photodosimetry):

(1) The film used is sensitive to beta, X, and gamma; the clip-on badges are to be worn on the chest region no lower than the belt line. The reported reading of the film badge is the official dose which must be recorded on the DD Form 1141, "Record of Exposure to Ionizing Radiation", dated 1 June 1956, which is a permanent part of the individual Health Record kept at the Post Dispensary, Fort Greely. (Reference 20.b.) A cumulative record of exposure of each individual must also be kept on file for local use. A copy of each film badge report is forwarded when received (as soon as practical) to the Surgeon, Fort Greely. Initially, close coordination between the plant and the medical unit may be required to assure accuracy. At initial startup of the nuclear power plant, film badges will be processed weekly; however, when sufficient experience is gained, the interval may be extended, if justified, by weekly increments to a maximum of four (4) weeks. (Reference 20.a.) If an overexposure is suspected, based usually upon a high reading or complete discharge of a pocket dosimeter, the film badge must be dispatched as soon as possible for processing. Until it is established than an overexposure did not occur, no further exposure of the individual shall normally be allowed.

(2) Film badges may be used as cumulative monitors for area beta and gamma activity.

(3) Arrangements have been made by the OIC, SM-1A, to also use neutron badges during the initial testing and startup period of SM-1A for personnel monitoring; additional authorization provides for the use of up to five (5) such badges for area monitoring.

(4) Information of Film Badge Service (photodosimetry) as Furnished by the Sacramento Signal Depot: Inclosure 1.

d. Control of Monitoring Devices:

(1) SM-1A Memorandum Number 1, 1960.

(2) Control Instructions:

(a) All visitors requiring entrance into Radiation Areas will be issued two charged pocket dosimeters.

(b) Personnel monitors shall be worn on the front of the outer garment at all times the individual is within the Control Area.

(c) No monitoring unit once used by one individual shall be assigned to or used by another individual during the monitoring period in which it was once assigned and used.

(d) Each time a person leaves the control area, he shall leave his film badge and pocket dosimeter, if issued, at the guard desk.

(e) Pocket dosimeters will be properly identified with the individual user, or his film badge, and stored for daily processing.

(f) Any lost or missing badges or pocket dosimeters shall be immediately reported to the SPPCT.

e. Records of Accumulated and Cumulative Dose:

(1) AEC Form 4 (modified) will be maintained as a record of previously accumulated occupational dose, i.e. an occupational exposure history for all employment prior to entry into (operational assignment with) or attachment to an element of

the Army Nuclear Power Program, from the time the individual was 18 years old. This form shall be additionally executed to indicate the individual permissible dose as of 1 January 1961; the dose will be recalculated and the form replaced annually, with current entries, on the individual's birthday.

(2) Cumulative occupational exposure history shall be maintained on DD Form 1141 in accord with reference 2.b., as indicated above.

f. Notification of Exposure Dose, Transient Personnel: All personnel entering the SM-1A Control Area, for which records are not maintained as indicated in subparagraph 5.e., above (non-SM-1A crew personnel), will be separately advised, subsequent to receipt of the completed "Photodosimetry Report", of the dose received during their visit.

6. MONITORING OF CONTROL AREA AND EFFLUENTS:

a. Survey: A survey is the evaluation of a radiation hazard, if present, in a work area, generally with portable or mobile instrumentation.

(1) Routine surveys shall be made in areas of the plant (within the Control Area) on a regular schedule. Surveys include an evaluation of the following:

(a) The dose rates present at all work stations under representative operating conditions.

(b) The presence of an unsuspected dose rate in all accessible areas to personnel within the control area.

(c) The levels of radiation at the perimeter of each Radiation or High Radiation Area, (this includes readings on accessible roofs, floors above, ceilings below and at walls in rooms adjoining such areas).

(d) The unsuspected presence of surface contamination in work or general areas.

(e) The determination of airborne contamination at all work stations.

(2) Special surveys will be made to assess dose rates and contamination problems so as to prescribe controls for Radiation

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Work Permits, shipment of radioactive materials, movement of contaminated materials, decontaminating operations, etc.

(3) Surveys will include surveillance and evaluation of fixed area monitoring instrumentation and area film monitors, (see Area Monitoring below).

b. Area Monitoring:

(1) Fixed area radiation monitors are provided, at select points, to continuously detect, measure, and record the presence of gamma radiation and to warn the operator of any abnormal situation which may be or become hazardous to personnel. This instrumentation monitors the following areas:

(a) Spent Fuel Pit.

(b) Demineralizer Room.

(c) Laboratory.

(d) Vapor Container Entrance.

(e) Inner Vapor Container.

(2) Area film monitors, to detect and provide an integrated record of beta, gamma, and neutron radiation, may be used to supplement the fixed instrumentation above, in the same or other areas, as deemed appropriate by the Plant Superintendent or OIC, SM-1A.

c. Process Water Monitoring:

(1) Fixed process radiation monitors are provided at select points to continuously detect, measure, and record the presence of gamma radiation in the process water (includes condensed steam) and to warn the operator of abnormal activity levels for which investigative or corrective actions, not automatically prompted, must be taken. This instrumentation is located at the following locations, (asterisk indicates applicable process valving is tripped closed automatically as a result of an abnormal activity level signal):

*(a) Primary Blowdown - upstream of demineralizer.

(b) Primary Blowdown - downstream of demineralizer.

*(c) Main Steam (includes post heating and laundry steam).

*(d) Steam Generator Blowdown.

*(e) Primary Blowdown Cooler (inner vapor container cooling water) - downstream of blowdown cooler.

(f) Service Water Return - upstream of condenser overboard line.

(2) Water samples are taken on a regular basis at select points. All water samples are assayed for beta-gamma activity to detect increases in activity and ascertain whether gross fission products are present. Samples are taken at the following locations, (samples normally taken for water chemistry analyses alone are not included):

(a) Primary Blowdown.

(b) Demineralizer Effluent.

(c) Primary Make-up Tank.

(d) Circulating Water Discharge.

(e) Steam Generator Blowdown.

(f) Main Steam.

(g) Vapor Container Cooling Water - downstream of blowdown cooler.

(h) Hot Waste Tanks.

(i) Laboratory Waste Tanks.

(j) Well Water.

(k) Steam Condensate.

(3) Source Summary of Activity, Secondary Process Fluids, (activity monitored by process monitors and samples):

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LOCATION	POSSIBLE SOURCE(S)
Service Water to Recharge Well	Primary Coolant leakage at: Steam Generator (SG Blowdown) Primary Blowdown Cooler Inner Shield Tank Cooling Coils PCP #2 PCP #1 (Condenser Hotwell to SG Blowdown)
Steam Generator Blowdown	Primary Coolant leakage at: Steam Generator PCP #1 (Condenser Hotwell)
Main Steam	Primary Coolant leakage, resulting in volatile or gaseous activity, at: Steam Generator PCP #1 (Condenser Hotwell)
Condenser Hotwell	Primary Coolant leakage at: PCP #1 Volatile or gaseous activity added to condensate from: Main Steam
Feedwater	Primary Coolant leakage at: PCP #1 (Condenser Hotwell)

d. Area and Operational Process Monitoring System (schematic): Inclosure 2.

e. Effluent Monitoring:

(1) Liquid:

(a) SM-1A Memorandum Number 6, 1962.

(b) All effluent solutions shall be considered contaminated and shall be continuously monitored or periodically sampled at the final point of effective control. Samples of stored liquid waste will be radiochemically analyzed in the SM-1A Process Control Laboratory, prior to movement of waste through the effluent discharge lines to Jarvis Creek.

(c) No solution shall be discharged from the plant control area in excess of the limits specified in paragraph 4.b.(2), above, except through the effluent lines to the Jarvis Creek dilution facility. No solution shall be discharged to the environs in excess of the limits specified above.

(2) Gas:

(a) SM-1A Memorandum Number 6, 1962.

(b) All effluent gas from SM-1A shall be considered potentially contaminated aerosol and shall be monitored at the final point of effective control with portable or mobile air monitors where not specifically monitored by the stack air monitor.

(c) Sources potentially giving rise to airborne activity are monitored by a stack air monitor; particulate activity will be removed by air filtration.

(d) Effluent discharge shall be controlled such that average concentrations and the average annual concentrations do not exceed the limits of paragraph 4.b.(2), above.

(e) In the event abnormal activity levels or increases in activity levels are detected, sources shall be identified and isolated; further discharge, involving effluent from the identified source, shall be prohibited until a source evaluation has been made and appropriate corrective action has been taken or decay permitted.

(f) The Vapor Container, the greatest potential source of airborne activity subsequent to a period of operation, is sealed during operation and served by a separate decontamination system. No vapor container air shall be discharged to the environs until the concentration of radioactivity is reduced to within release limits.

f. Survey and Sampling Schedules:

(1) Surveys (smear samples and area radiation levels):

AREA	TYPE	FREQUENCY
Demineralizer Room	Area	Daily
Demineralizer Room	Smear	Weekly

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AREA	TYPE	FREQUENCY
Laboratory	Area	Daily
Laboratory	Smear	Daily
Primary Makeup Pump Area	Area	Daily
Primary Makeup Pump Area	Smear	Weekly
Lunch Area	Area	Daily
Lunch Area	Smear	Daily
Other General Plant Areas	Area	Daily
Other General Plant Areas	Smear	Weekly

(2) Surveys (air samples):

AREA	FREQUENCY
*Stack Effluent	Continuously
*Demineralizer Room	Continuously
Laboratory (during primary sample processing)	Daily
Pump Room	Weekly
Maintenance Shops	Weekly
Control Room	Weekly
Turbine Area (in area of steam leakage)	Weekly

(3) Process Water Samples:

POINT	FREQUENCY
Primary Blowdown	Daily
Demineralizer Effluent	Daily

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POINT	FREQUENCY
Primary Make-up Tank	Weekly
Circulating Water Discharge	Daily
Steam Generator Blowdown	Daily
Main Steam	Daily
Vapor Container Cooling Water	Weekly
Hot Waste Tanks	1' Level
Laboratory Waste Tanks	40" Level
Steam Condensate	Daily
Well Water	Daily

g. Post Steam and Condensate System Monitoring:

(1) A monitoring program will be undertaken to detect any possible carry over of steam-borne activity to the Fort Greely post steam system, undetected by monitoring activities within the SM-1A control area. This program will include:

(a) Water sample analyses for gross beta-gamma activity.

(b) Area radiation surveys for gamma activity.

(2) Water samples will be taken from steam system condensate at the strainers, upstream of building surge tanks in the buildings identified below.

(3) An area survey will be made external to the radiators of a selected room in each of the buildings wherein condensate samples are taken.

(4) The following buildings and rooms are selected as being representative of utilization, habitation, and location:

Bldg. 801, BOQ, Company Grade Officer's Quarters.

Bldg. 605, Post Ordnance Shop, Shop Area.

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Bldg. 603, Post Engineer's Office, General Office Room.

Bldg. 655, USA Cold Weather and Mountain School, Classroom - Auditorium.

(5) Initial samples and surveys will be taken prior to plant startup, to establish background, and each thirty days thereafter. At least four such observations of each building shall be made prior to startup.

7. ENVIRONMENTAL MONITORING:

a. Environmental monitoring consists of the maintenance of select collection points, for samples of air, airborne particulate, surface water and subsurface water in the proximate area of SM-1A, and the assay of these samples to establish long range records of background radiation levels. The present program is conducted by the Chemical Corps Arctic Test Activity, with monthly sample assays provided SM-1A. Location and type of samples collected are indicated below:

(1) Gummed Paper Stations:

(a) Approx. 2700' east of plant site.

(b) Approx. 2800' north of plant site.

(c) Approx. 2400' northwest of plant site.

(d) Approx. 2600' west, southwest of plant site.

(e) Approx. 5500' north, northwest of plant site.

(f) Approx. 2800' north, northwest of plant site.

(g) Approx. 1300' south, southwest of plant site.

(2) Air Sample Station: At plant site.

(3) Precipitation Station: On roof of Bldg. 606.

(4) Surface water stations:

a. Tanana River Bridge:

1 Sediment.

2 Filtrate.

3 Residue.

(b) Jarvis Creek at Richardson Highway:

1 Sediment.

2 Filtrate.

3 Residue.

(c) Delta River (just below Tanana River Bridge):

1 Sediment.

2 Filtrate.

3 Residue.

(5) Subsurface Water Stations (wells):

(a) Near Bldg. 606.

(b) Buffalo Lodge on Richardson Highway.

b. Continuing liaison shall be maintained with the Arctic Test Activity in order that discrepancies between apparent data due to technique are subject to valid interpretation, maximum reproducibility of data is assured, data trends are preliminarily analyzed and assistance can be rendered if required. Such liaison will regularly be maintained by joint monthly meetings between members of the two activities and may be augmented by jointly planned and conducted experiments.

8. SM-1A RADIATION MONITORING INSTRUMENTS: Inclosure 3.

9. CONTROL OF RADIOACTIVE MATERIALS: SM-1A Memorandum Number 17, 1960.

10. RADIOLOGICAL MEDICINE: SM-1A Memorandum Number 15, 1960.

11. RADIATION WORK PERMITS:

a. The Radiation Work Permit (Inclosure 4) is used to insure that all work performed in a Radiation or High Radiation Area or on potentially contaminated equipment will not start until each task has been properly evaluated from the standpoint of radiological safety and has been approved by operating supervision. All such work shall be performed under and in conformance with an approved Radiation Work Permit.

b. Types of Permits:

(1) Routine permits shall be issued to cover all routine operations performed by crew personnel within Radiation or High Radiation Areas and will be approved, as required, for extended periods of time.

(2) Special permits shall be issued to cover all special or non-routine operations or maintenance and repair work performed by any individual in an actual or potential Radiation or High Radiation Area. These permits will be issued for each job to be performed even though it may involve several different specialties.

c. Radiation Work Permits shall be executed in duplicate and will be serialized by calendar year. Both copies of the permit will be kept at the permit area until the work is completed.

d. It is not intended that the Radiation Work Permit be a license to perform a job; rather it is an instrument of notification of the radiological hazards involved, if any.

e. Survey measurements are to be entered as a dose rate, i.e. mr/hr. Should the dose rate vary within the Radiation Work Area, the low and high measurements will be recorded.

f. Execution:

(1) The initial portions of the permit dealing with survey data, special instructions, and task evaluation shall be completed and signed by a Plant Process Control Technician. In the absence of a Plant Process Control Technician, the above may be executed by the applicable Shift Supervisor.

(2) The following personnel may authorize the starting of work: OIC, Plant Superintendent, Plant Supervisor (NCOIC), or Shift Supervisor. Evidence of authorization is the signature of any of the above on the permit.

(3) A permit may be terminated by any of those identified in the preceeding subparagraph, a Process Control Technician, the Maintenance Supervisor, or foreman of the work party. Entries shall include the signature of the individual terminating the work and the reason for terminating.

(4) Every individual performing work, observing, supervising or participating in any way with the work being performed under a Radiation Work Permit shall sign his last name and initials and enter his film badge number and the serial number or numbers of the self-reading dosimeters used, where applicable. The reading of the self-reader will be noted upon entry into and return from the Radiation Work Area or permit area (if not designated a Radiation Work Area), as well as the time in and time out. Total time and estimated dosages received will be noted. The signature here indicates understanding and compliance with the terms of the permit.

12. CAUTION SIGNS, LABELS, AND SIGNALS:

a. Posting: Section 20.203 of reference 20.y.

b. Exceptions: Section 20.204 of reference 20.y.

13. CONTAMINATION CONTROL (including waste disposal): SM-1A Memorandum Number 6, 1962.

14. PACKAGING, HANDLING, AND TRANSPORTATION OF RADIOACTIVE MATERIALS:

a. Radioactive materials shipped from the SM-1A, where this Activity is responsible for making such shipment, shall be packaged and labeled in accordance with Sections 20.203 and 20.205 of reference 20.y.

b. Applicable regulations of the Interstate Commerce Commission, regarding this topic, are compiled and presented in reference 2.tt. The OIC, SM-1A shall coordinate radioactive materials' shipments with the Transportation Officer, Fort Greely, and provide the Transportation Officer with such technical assistance as may be required, including personnel for assistance in handling, radiation monitoring, and inspection.

c. SM-1A Memorandum Number 15, 1961.

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15. RADIOLOGICAL EMERGENCIES OR ABNORMAL CONDITIONS:

a. General:

(1) "Emergencies or abnormal conditions", within the context of this memorandum, relate to events arising from, causing modifying or in any way affecting or being affected by actual or potential radiation hazards, and may include conditions not defined as Nuclear Reactor Accidents/Incidents.

(2) Emergency or abnormal conditions arising from conventional or fire accidents which do not fall within the definition of Nuclear Reactor Accidents/Incidents are treated in other memoranda; the preventive nature and response provisions of these instructions are applicable however to any security program and are referenced in the NRAICP below.

b. Classification of Emergencies and Abnormal Conditions:

(1) Technical overexposure (photodosimetry), defined as established exposures in excess of the limits set forth in paragraph 20.101 and in excess of the weekly MPD set forth in TB Med 254.

(2) Internal exposures.

(3) Loss, damage, theft, or fire involving radioactive materials.

(4) Levels of radiation or concentrations of radioactive materials in excess of the limits established for an unrestricted area (outside SM-1A Control Area), in paragraphs 20.105 and 20.106, 10CFR20, the source of which is SM-1A, including the spread of contamination by personnel or equipment from the Control Area.

(5) Excessive exposures of personnel to concentrations of radioactive materials in the restricted area (within SM-1A Control Area), in violation of paragraph 20.103, 10CFR20.

c. General Emergency Instructions:

(1) Notification: In the event of any of the occurrences classified in subparagraph 15.b. above, the senior SM-1A supervisor on duty will notify the following in the order indicated until all have been notified:

(a) OIC, SM-1A.

(b) Plant Superintendent, SM-1A.

(c) Plant Supervisor, SM-1A (NCOIC).

(2) Responsibilities:

(a) Radiological Protection Officer will supervise and direct the conduct of all activities pertinent to the evaluation, control, alleviation, and elimination of the emergency condition.

(b) SM-1A Process Control Personnel will:

1 On the basis of information indicating the location, type, and nature of the emergency, select appropriate emergency control equipment and supplies from emergency provisions, in addition to standard operational materiel. An inventory of emergency materiel, other than that routinely used, shall be maintained by Process Control Personnel; these emergency provisions shall be inspected monthly by the Radiological Protection Officer for completeness and serviceability.

2 Evaluate the emergency condition and establish boundaries of Radiation Areas based on radiation levels and/or extent of contamination; a Personnel Contamination Control Point shall be established on the area perimeter.

3 Assist in the decontamination and removal of injured personnel.

4 Post, isolate, and continuously monitor the area or areas subject to the emergency condition.

5 When spreadable activity is present, conduct surveys of uncontrolled items required such as an ambulance, stretchers, blankets, fire equipment, etc.

6 Continue to assist the Radiological Protection Officer and other emergency personnel as directed.

7 Completely document the emergency as to the individuals involved and the nature of the radiological conditions.

(c) Other Emergency Personnel (including crew members, Post RAMDET personnel, fireman, medical personnel, guards, etc.,) will:

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1 Obtain and wear an emergency film badge and two pocket dosimeters from the SM-1A Security Guard. It is not necessary that these items be logged individually upon entry, but individual identification must be established prior to departure.

2 Observe all instructions of the Radiological Protection Officer.

3 Unless otherwise advised, obtain respiratory protection before entering and working in a Radiation or High Radiation Area.

4 Minimize any time spent in a Radiation or High Radiation Area.

5 Remain in the vicinity of the established Contamination Control Point until their person, clothing, and equipment are surveyed and released by a SM-1A Process Control Technician or other health physics technician. Medical attention will take priority over this contamination control procedure, however personnel involved must be monitored as soon as conditions permit; where possible treatment should be performed within the SM-1A control area; under no circumstances will extraneous equipment or material, be permitted to leave the area in connection with this exception.

6 Use only fog nozzles when fighting fires in Radiation Areas with water; use, where possible, carbon-dioxide equipment or small hand extinguishers.

7 Never use water for fighting fire in the fuel vault.

(3) Emergency Exposure Levels: If an emergency exists and it is not possible to control the problem by observing MPC limitations (any exposure of personnel to ionizing radiation above the MPC is an overexposure), the degree of this overexposure must, of course, be kept to the absolute minimum and, if such exposure is permitted, it must be justifiable. No routine or periodic task can be considered justification for recurrent planned overexposure. Permission of an overexposure is a command decision. As directed in reference 20.w., the OIC will be guided by paragraph 10 of reference 20.u. in permitting any overexposure as a result of an emergency. Keeping exposures to the practical minimum is even more important under these conditions of stress. Overexposed individuals shall be evaluated medically if possible, and if the 50 mrem/day used for estimating the individual's recovery period would require many months

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of non-exposure time, no less than three weeks of exclusion from radiation areas will be utilized. If there is any reason to suspect that the crew member in question does not appear well, the three week period shall be extended. Medical evaluation must be accomplished at the earliest opportunity. Anyone known to have received high doses, 100 rem or more, who gets sick (nausea and vomiting, for example) from no other known cause, shall be evacuated (and then replaced) as soon as possible. If the external dose is 25 rem, or if there is enough of a possibility of serious internal contamination to require hospitalization for evaluation, DD Form 285 must be submitted.

d. Nuclear Reactor Accident/Incident Control Plan: Inclosure 5.

e. Notification and Reports: Paragraph 18, below.

16. SANITARY REPORT: The OIC, SM-1A will routinely provide the Post Engineer, Fort Greely, with a copy of the SM-1A Monthly Operating Report; summary information included in Section 5, "Health Physics and Safety", will include all information necessary for the preparation of the Post Engineer Sanitary Report.

17. TECHNICAL AND HEALTH PHYSICS INSPECTION, SM-1A: Policies, procedures, and guidelines pertinent to the conduct of technical and health physics inspection of the SM-1A within Department of the Army and the Army Nuclear Power Program are set forth in references 20.k., 20.n., and 20.ff.

18. RECORDS AND REPORTS:

a. SM-1A Memorandum 7, 1961.

b. SM-1A Memorandum 13, 1960.

c. Inclosure 6., "Reporting Requirements for Emergencies and Abnormal Conditions".

d. Pertinent information relating to SM-1A radiological security and control is routinely reported in Section 5, of the SM-1A Monthly Operating Report, reference 20.x.

19. SUMMARY OF RULES OF RADIATION PROTECTION: Inclosure 7.

20. REFERENCES:

a. AR 40-414.

b. AR 40-431.

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c. AR 40-571.

d. AR 40-573.

e. AR 40-580.

f. AR 40-582.

g. AR 385-10.

h. AR 385-30.

i. AR 385-40.

j. AR 500-60.

k. AR 742-12.

l. AR 755-380.

m. SB 11-206.

n. TB ENG 184.

o. TB MED 247.

p. TB MED 254.

q. ER 385-1-1.

r. ER 385-1-3.

s. EM 385-1-1.

t. EM 385-1-24.

u. EM 385-1-27.

v. EM 385-1-28.

w. EM 385-1-32.

x. EM 700-3-3.

y. Title 10, Chapter 1, Part 20, Code of Federal Regulations.

z. NBS Handbook 42.

aa. NBS Handbook 48.

bb. NBS Handbook 52.

cc. NBS Handbook 59.

dd. NBS Handbook 69.

ee. USARAL Circular 40-8.

ff. ANPP Directive No. 13.

gg. ANPP Directive No. 15.

hh. Fort Greely Domestic Emergency Plan, Headquarters, Fort Greely, Dated 18 April 1961.

ii. Nuclear Accident and Incident Control Plan, Headquarters, Fort Greely, dated 9 February 1962.

jj. 1st Letter Indorsement, ENGRD-N (10 October 60), OCOFENGRS, subject: "Definition of a Radiation Area", dated 18 October 1960.

kk. Letter, ENGRD-NI, OCOFENGRS, subject: "Wrist and Ring Badges", dated 20 December 1960.

ll. 1st Letter Indorsement, ENGRD-NT (5 Jan 61), OCOFENGRS, subject: "Request for Information, Radiological Control", dated 27 January 1961.

mm. 1st Letter Indorsement, ENGRD-NI (12 Jun 61), OCOFENGRS, subject: "Total Skin Exposure Limit", dated 23 June 1961.

nn. Letter, ENGSD, OCOFENGRS, subject: "Nuclear Accident and Incident Control Plan (NAICP)", dated 2 February 1961.

oo. Letter, SIGFT-DM-5a, Sacramento Signal Depot, subject: "Photodosimetry Service", dated 23 February 1961.

pp. Letter, NPAGL, USAED, Alaska, subject: "Environmental Background Monitoring, Fort Greely, Alaska", dated 7 July 1961.

qq. Letter, ARGSM, SM-1A, subject: "Nuclear Accident and Incident Control Plan (NAICP)", dated 9 March 1961.

rr. Letter, ARGSM, SM-1A, subject: "Advice of Nuclear Reactor Accident/Incident Control Plan, [illegible]ICP for Army Nuclear Power Program", dated 25 January 1962.

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ss. Manual, IDO-19014, Vols I and II, Health Physics and Radiochemistry Manual for Army Nuclear Power Plants, Combustion Engineering, Inc., 1960.

tt. Handbook, Transportation of Radioactive Materials, US Atomic Energy Commission, May 1958.

21. SUPERSESSION: This memorandum supersedes SM-1A Memorandum Number 2, 1961, subject: "SM-1A Radiological Security and Control", with Changes Numbered 1 and 2.

7 Incls:
as

RICHARD L. HARRIS
Major, Corps of Engineers
Officer-in-Charge, SM-1A Operations

10 February 1961

INFO[illegible]ATION ON FILM BADGE SERVICE (PH[illegible]DOSIMETRY)
AS FURNISHED BY SACRAMENTO SIGNAL DEPOT

(Supersedes "Information on Film Badge Service (Photodosimetry)" dated 5 Jan 59)

1. PURPOSE: The purpose of this publication is to provide supplementary information concerning photodosimetry service provided by Sacramento Signal Depot in accordance with SB 11-206 and AR 40-414.

2. DEFINITIONS: For the purpose of this bulletin, the following definitions apply:

a. Photodosimetry - Measurement, by means of exposure to photographic film, of radiation dose received from beta, gamma, X-Ray and neutron emitting sources including radioactive materials, X-Ray machines, and nuclear reaction equipment, and nuclear bombardment devices.

b. Film Badge Holder - A convenient holder for film packets, usually fastened to the clothing by an alligator, or similar clip.

c. Film Packet - One or more pieces of d[illegible]ntal type film in a light proof envelope. Fits into film badge holder.

d. Film Badge - A film packet in a holder.

e. Evaluation - Interpretation of images on developed film into dose readings.

f. Wearing Period - The length of time during which a film packet is worn by an individual.

g. Control Film - Film packets used to compute correlation factors for incidental exposure or emulsion deterioration which may occur in transit or storage.

h. Code Designator - A coding system which identifies each separate film packet with a specific period of time, the using installation, and the wearing individual. The exchange [illegible] film packets, and correspondence thereto,

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between the using installation and supplying Signal Depot will employ the organizational code symbol appearing on the film packet.

i. Quantity of radiation, as applied to an individual, expressed in rem or millirem. Maximum permissible exposure are prescribed by TB MED 254.

3. <u>GENERAL INFORMATION</u>:

a. The photodosimetry service provided a means for determination of the exposure of persons to ionizing radiation (beta, gamma, X-Ray, or neutron), while engaged in noncombat activities.

b. The film badge consists of a plastic film holder and a film packet. This film packet provides a range of 10 millirems to 1000 rems.

4. <u>SUPPLY, STORAGE, HANDLING, PROCESSING AND EVALUATION OF FILM</u>:

a. Films are normally used on a four (4) week basis; however, they may be used on a one (1), two (2), or three (3) week basis. Every four (4) weeks sufficient film will be shipped to each using installation to provide for four (4) weeks' supply, regardless of wearing period.

b. One or more control film packets are furnished together with the monitoring film packets for each wearing period and will be identified by the word "Control". <u>These films are not to be used</u>, but should be inserted in a spare film holder and kept in the same location (see c below), where the remainder of the film badges are kept when not being worn. <u>The control films must always be returned with the monitoring films after the completion of each wearing period</u>.

c. Film badges, when not being worn, should be kept on a rack or board mounted to a wall in a radiation free area. For each location of film badges, a control film must also be kept. It is important that the number of the control film be closely identified with each group of monitoring films

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stored in the separate locations. This information must be indicated on the Photodosimetry Report Form (SC Form 787) when the film packets are returned for processing so that proper evaluation may be attained.

d. Film packets received by the using installation before the intended period of use should be stored in a refrigerator or cool dry container in an area free from radiation.

e. Using installations must return all used and unused film packets at the end of the using period to this depot for processing. Instructions to be used in returning these film packets for processing are as follows:

(1) The film packets should be changed on a Friday afternoon or Monday morning and returned immediately by air parcel post to this depot for processing and evaluation.

(2) Film packets are to be returned in the same or similar type container in which they were received.

(3) When returning film packets, caution labels must be placed on the outside of the shipping container. The supply of these labels is automatically replenished by this depot, or upon demand by the using organization.

(4) Return all film packets to the original depot from which the films were received.

(5) Lost or destroyed films must be accounted for by appropriate notation on transmittal form.

f. Exposed film packets will be processed within one work day after arrival at the depot. In the event any film indicates a dose greater than three hundred (300) millirems per week, a telegram will be forwarded immediately to the using installation indicating the film number, name of the user, period the film was worn, source of ionizing radiation, and the exposure received. A copy of each telegram forwarded to a using installation will be transmitted to the Surgeon General, Department of the Army Washington, D. C. by the servicing depot.

g. Photodosimetry Report forms (SC Form 787) are also initially furnished by this depot to each new customer, and will be automatically replenished or upon demand thereafter. The Photodosimetry Report is to be filled out in triplicate by the user, who must type in the installation's complete mailing address, date of report, period letter, date for the using period, organizational code symbol assigned, the name of the person wearing each film packet and the applicable control film number, the individual film number and the energy of radiation or type of radioactive material used. (For X-Ray machines, the peak kilovoltage should be recorded; for radioisotopes, the name of the radioisotopes should be recorded). Visitors badges and spare badges, when used, are to be identified with the name of the user, the type and energy level of radiation to which he was subjected, and the approximate period of exposure. The report forms and the used and unused film packets should be returned in the same container to the depot. When the film is evaluated, the dose is entered on the report by the processing depot in rems. Two (2) copies are returned to the using installation and one (1) copy is retained by the depot as a permanent record.

h. All film returned to the depot for processing are evaluated and doses are reported exactly as indicated by the film densities. Film which show 0.00 density units will be reported as zero (0) dosage. However, the film may receive small amounts of radiation which are not indicated due to the limitations of the film. These limitations are listed below and may be used for proper evaluation of results furnished by the depot.

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GAMMA OR X-RAY ENERGY	LOWEST READABLE DOSE
Below 100 Kev	2 Millirems
100 Kev - 200 Kev	10 Millirems
Above 200 Kev	20 Millirems
Beta Radiation	40 Millirems

i. The time element is of utmost importance in the treatment of an overdose of radiation. If there is an indication that an individual has received an overdose (for example, a high pocket dosimeter reading), his film packet should be immediately sent to the depot for processing even though the using period is not yet completed. In addition, the usual information required on the Photodosimetry Report form should accompany the film packet. Exposure reading will be transmitted back to the using installation as prescribed in paragraph 4f above.

5. CODING OF FILMS:

a. Film packets are prenumbered. The personnel at Sacramento Signal Depot apply a code designator on the film packets in ink and this same code is superimposed on the film components by means of X-Rays. Using installations should not attempt to renumber film packets as no other number will appear on the film when it is processed.

b. The code designator consists of three (3) groups and is placed at the top of the film packet. The single letter indicates the wearing period during the year, the three letter group denotes the using installation; and the three (3) digit group identifies the individual wearing the film packet.

(1) the placement of the three (3) groups will determine whether the film is on weekly, 2-weeks, 3-weeks or 4-week basis.

(a) Example: Taking organizational code "AAA", period of use "a" and individual's number "001":

1 Weekly use will be coded: a AAA 001

2 Two (2) week use will be coded: AAA 001 a

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3 Three (3) week use will be co[illegible] a 001 AAA

4 Four (4) week use will be coded: 001 a AAA

(2) Each week of the year has been assigned a letter, first twenty-six (26) weeks capital letters "A" thru "Z" and the second twenty-six (26) weeks small letters "a" thru "z". A date sheet indicating the wearing periods for which the films are to be used is furnished each installation using this service. Under no circumstances (without prior concurrence) are the films to be used other than for the period indicated.

c. Each installation utilizing the film badge service will initially be assigned a three (3) letter symbol. This symbol will be part of the film code designator for the installation as long as Sacramento Signal Depot's film badge service is used. This code is to be used on all correspondence pertaining to the photodosimetry service.

d. Each shipment of film packets to a using installation are numbered consecutively, beginning with 001. At the start of each wearing period, the employee will be assigned the code number on the film he is wearing and he will be identified with this number throughout the wearing period. (NOTE: This number is not an employee's permanent number and may be interchanged if necessary, after the wearing period.)

e. The control films are numbered beginning with C01, C02, C03, and etc., according to the quantity of control films being furnished to the using installation.

7. FILM BADGE HOLDER:

a. The film badge holder is made of tenite II plastic. An ejection tee is located inside the film cavity at the bottom of the holder and a "positioning" cap at the top. (NOTE: The cap is hinged and should not be completely

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removed when loading and unloading the film packets.) A plastic tool is furnished as an aid in removing the film packet from the holder. The "FRONT" and "BACK" of the holder are identified accordingly. The opening for the insertion of the film packet is located at the top of the holder.

b. Caution should be taken when inserting the film packet into the holder. This precaution is necessary in order to perform a proper evaluation of the films by this depot. The cap must be in place when the holder has been loaded to insure proper placement of the film packet.

c. To load the film holder, the front side of the holder should be held toward the individual, the cap raised and pulled forward and the film packet inserted into the holder. When inserting the film packet into the holder, the identification number or code designator at the top of the film packet should face the front of the holder and the green flap toward the back of the holder. The cap should be replaced and pushed down firmly as soon as the film packet is inserted.

d. To remove the film packet, raise the cap as indicated above, insert the plastic tool into the slot at the bottom of the holder and push upward gently (the film packet will now be exposed), grasp the film packet and remove from the holder.

e. The film badge holders are expendable property; however, when a holder has been damaged, it should be returned to Commanding Officer, Sacramento Signal Depot, ATTENTION: Nucleonics Branch, Maintenance Division, Sacramento 1, California.

8. REQUISITIONING FOR SERVICE:

a. The procedure for initial requisition is outlined in SB 11-206.

(Inclosure 1)

9. WRIST BADGE: Service for wrist badge may be arranged by a direct request to Sacramento Signal Depot.

a. The wrist badge may be worn in the palm of the hand, back of the hand and inside or outside the wrist. Film packet used with the wrist badge is identical to that used with the regular clip-on type badge. When the wrist badge is used, the word "Wrist" should be marked on the film packet by the using installation and likewise indicated beside the user's name on the report.

b. Personnel utilizing the wrist badge should also wear the regular clip-on film badge, so that the entire body exposure may be determined.

10. NEUTRON BADGE: Service for neutron badges may be arranged by a direct request to this depot.

a. Coding system on neutron film packets is identical with the regular film packet, and to further identify it, the word "neutron" is placed on the packet.

b. Neutron films are placed in the regular holder and are worn in the usual manner.

c. Separate Photodosimetry Report should be prepared for neutron films.

11. SPECIAL INFORMATION:

a. Periodic liaison visits will be conducted by a representative from Sacramento Signal Depot to each installation utilizing the Film Badge Service. The purpose of these visits will be to assist in resolving any problems which may arise relative to photodosimetry service which cannot be resolved through correspondence or otherwise.

b. All used and unused film packets, and queries or correspondence with regard to photodosimetry service, will be addressed to the Commanding Officer, Sacramento Signal Depot, ATTENTION: Nucleonics Branch, Maintenance Division, Sacramento 1, California.

(Inclosure 1)

12. LOCAL IMPLEMENTATION, SM-1A:

a. The SM-1A will use the weekly film badge service outlined above, as a separate installation, Station AFD.

b. Film badges will be obtained in sufficient quantities for use by the operating crew, administrative staff, post personnel routinely having business at SM-1A and visitors.

c. Internal control of film badge stocks including issues, collections, and preparation for shipment will be the responsibility of the Senior Plant Process Control Technician; he will also be responsible for the preparation of SC Form 787 as indicated in subparagraph 4.c., above.

d. Telegraphic notice of technical overexposure will be provided the OIC, SM-1A as indicated in subparagraph 4.f., above. The Surgeon, Fort Greely, will be provided a copy of this report by the OIC, SM-1A.

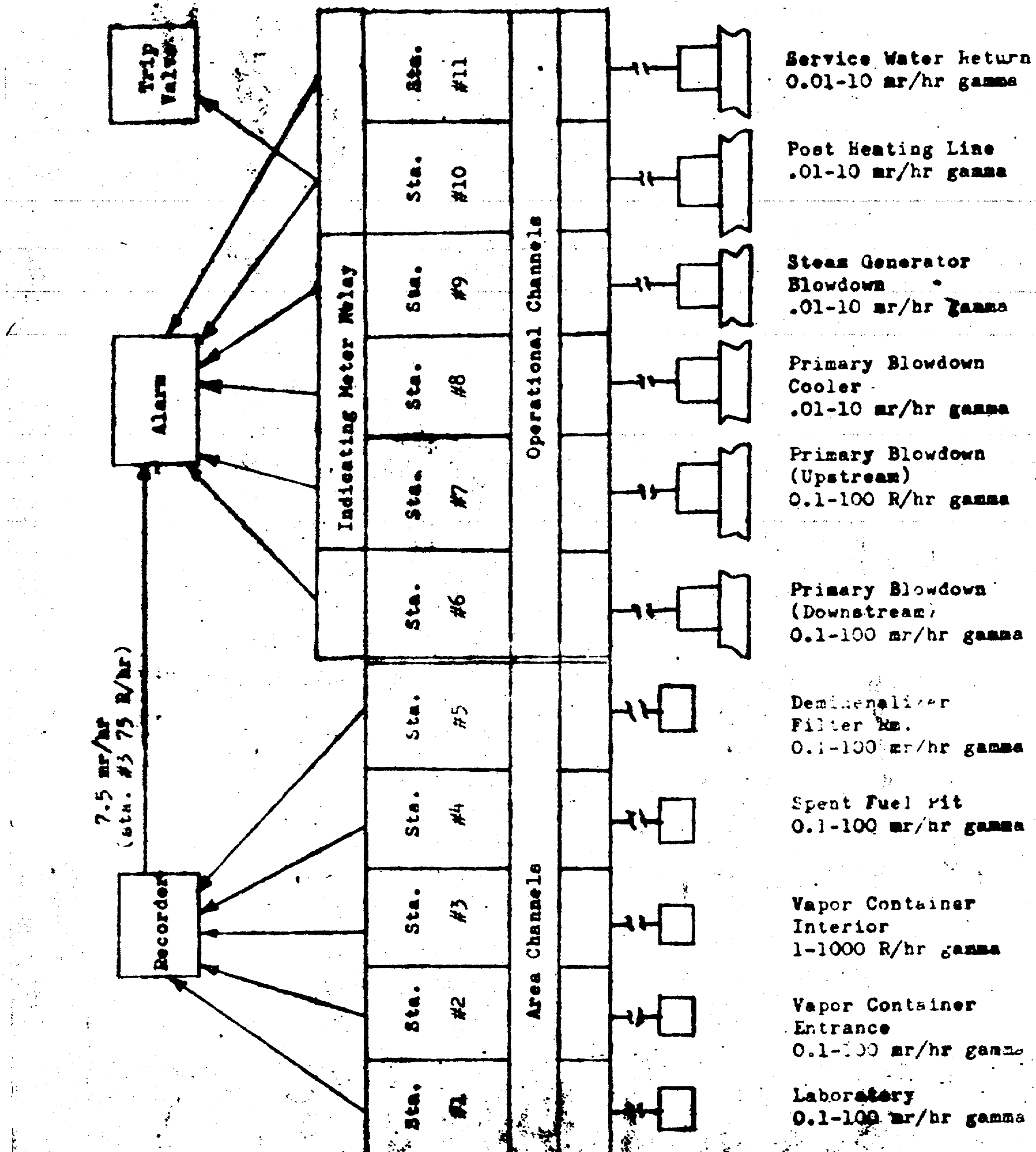
e. Wrist badges will be routinely worn by SM-1A crew personnel.

f. Neutron badges will be used by SM-1A personnel during the initial start-up and testing period. If the need for continuation of this service is indicated, it shall be continued.

g. Specific authority has been provided for the use of up to five (5) neutron badges for area monitoring.

(Inclosure 1)

Area and Operational Process
Monitoring System



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Area and Operational Process Monitoring System

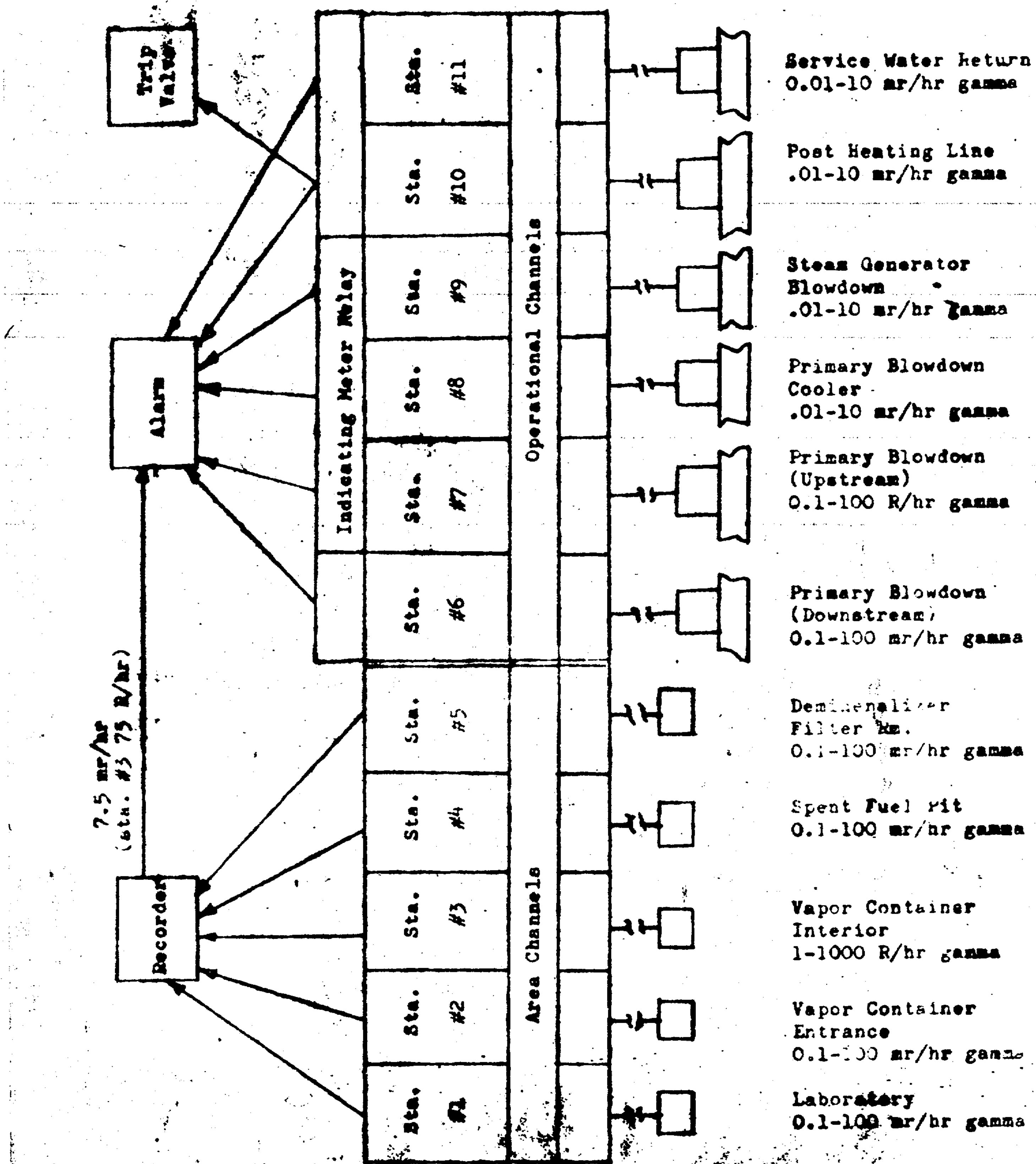

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TABLE I

SM-1A RADIATION MONITORING INSTRUMENTS

SURVEY INSTRUMENTS

NAME	#	TYPE	SCALES	DETECTION	APPLICATION
Juno (Technical Assc. Model #SRJ-6)	2	Ionization Chamber	0-50 mr/hr 0-500 mr/hr 0-5 R/hr	Alpha, Beta-Gamma	Area and surface surveys, window shield permits detection of Alpha, Beta, and Gamma, or Beta-Gamma, or Gamma. Medium range.
Radiacmeter IM-156/PD (Juno)	1	Ionization Chamber	0-50 mr/hr 0-500 mr/hr 0-5 R/hr	Alpha, Beta-Gamma	Area and surface surveys, window shield permits detection of Alpha, Beta, and Gamma, or Beta-Gamma, or Gamma. Medium range.
Jordan (Model #AGB-10KG-SR)	5	Ionization Chamber	0.01-10 mr/hr 0.01-10 R/hr 0.01-10,000 R/hr	Beta-Gamma	Area survey for Beta or Gamma, or combination of Beta-Gamma. High range.
Radiac Set AN/PDR-27G	2	Geiger-Mueller	0-0.5 mr/hr 0-5 mr/hr 0-50 mr/hr 0-500 mr/hr	Beta-Gamma	Area and surface surveys. Window shield permits detection of Beta. Probe and small geiger tube permit detection of Gamma. Low and medium ranges.
Radiac Set AN/PDR-39A	2	Ionization Chamber	0-5 mr/hr 0-50 mr/hr 0-500 mr/hr 0-5 R/hr 0-50 R/hr	Gamma	Area and surface surveys for Gamma. High range.
Geiger Counter (Eberline Model #E112B)	2	Geiger-Mueller	0-0.2 mr/hr 0-2 mr/hr 0-20 mr/hr	Beta-Gamma	Area and surface surveys, window shield permits detection of Gamma or Beta-Gamma. Low range.

(Inclosure 3)

TABLE I (Cont'd)

SM-1A RADIATION MONITORING INSTRUMENTS

SURVEY INSTRUMENTS

NAME	#	TYPE	SCALES	DETECTION	APPLICATION
2112-Neutron	2	BF_3 Tube	0-150 CPM 0-1,500 CPM 0-15,000 CPM	Fast and thermal neutron.	Area survey for Neutron. Lucite Shield for BF_3 tube. Sensitive to Gamma above 2^3 R/hr.
2112-Alpha	1	Proportional	0-150 CPM 0-1,500 CPM 0-15,000 CPM	Alpha	Surface survey for Alpha. No Beta-Gamma sensitivity.
Condenser-R-Meter	1	Ionization Chambers, 13 Chambers	0-10 R 0-25 R 0-100 R 0-250 R	Gamma	Area survey for Gamma, chambers must be exposed for known periods of time. High range.

(Inclosure 3)

TABLE II

SM-1A RADIATION MONITORING INSTRUMENTS

COUNTING INSTRUMENTS

NAME	#	MODEL #	TYPE	DETECTION	APPLICATION
Scaler, RIDL	2	49-51	Mica End Window, Geiger Tube	Beta-Gamma	Count activity samples of water and air. Can be used to count with Alpha and Gamma crystals.
Scaler, Nuclear Chicago	1	C-181	Mica End Window, Geiger Tube	Beta-Gamma	Count activity samples of water and air.
Scintillation Counter (RIDL)	1	10-2	Photo tube with a NaI (TL) Gamma crystal and Alpha phosphor crystal.	Alpha, Gamma	The Model 10-2 Scintillation Counter may be fitted with an Alpha or Gamma crystal. Main purpose is counting of air and radioactive water samples prior to and during discharge.
Low Beta, Low Level System (Sharp)	1	LB-100	Proportional	Alpha, Beta	Count activity samples of water and air for Beta and Alpha, either separately or simultaneously. All radioactive water and air to be counted prior to and during discharge.

(Enclosure 5)

TABLE [illegible]

SM-1A RADIATION MONITORING INSTRUMENTS

EFFLUENT COUNTING INSTRUMENTS

NAME	#	MODEL #	TYPE	DETECTION	APPLICATION
Air Monitor, Stack	1	AM-2A	End-on Coplanor end-window G-M detector.	Beta-Gamma	To monitor all air being released through the stack vent. To close valve on waste tank vents when activity limit is above MPC.
Air Monitor, Mobile	1	AM-2A	End-on Coplanor end-window G-M detector. Can be used with Model FCM-1 for gas flow.	Beta-Gamma	To monitor air in three locations, either separately or any combination of the three. Air monitored from the Laboratory, Demineralizer Room, and Vapor Container. Air Monitor will be run in conjunction with the stack monitor.
Gas Monitor, Stack	1	FMS-1	Geiger-Mueller	Beta-Gamma	Monitors the air being discharged up the stack for gaseous activity. The gas monitored is the effluent filtered by the stack monitor.
Water Moniter, Discharge	1	FMS-1	Scintillation (NaI Crystal)	Gamma	Monitors all liquid effluent being discharged to Jarvis Creek. Monitor tied in with count meter located at SM-1A site.

TABLE IV

SM-1A RADIATION MONITORING INSTRUMENTS

PERSONNEL MONITORING INSTRUMENTS

NAME	#	MODEL #	TYPE	DETECTION	SCALE	APPLICATION
Pocket Dosimeter (Landswerk)	15	L-49	Ion Chamber	Gamma, Neutron	0-200 mr	Self-reading dosimeter worn by individuals within the control area to detect exposure for the period of time worn.
Pocket Dosimeter (Landswerk)	82	IM-93/PD	Ion Chamber	Gamma	0-200 mr	Self-reading dosimeter worn by individuals within the control area to detect exposure for the period of time worn.
Pocket Dosimeter (Bendix)	6	IM-147/PD	Ion Chamber	Gamma	0-50 R	Self-reading dosimeter worn in high exposure areas. 4 of the 6 dosimeters in SM-1A Emergency Entry Kit.
Hand and Shoe Counter (Technical Assc.)	1	HSM-10A	Geiger-Mueller	Beta-Gamma	CPM	To monitor the hands and feet of personnel leaving the plant or upon leaving contaminated areas.

(Inclosure 5)

USAERC Form 5
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PLANT DESIGNATION ________
PLANT LOCATION ________

RADIATION WORK PERMIT

DESCRIPTION OF JOB: ________
SURVEY MEASUREMENTS: ________
WORKING CONDITIONS: ________
MONITORING REQUIRED: ________

RWP SERIAL NO. ________
DATE: ________
PAGE: ________ of ________ PAGES
LOCATION: ________
TIME APPROVED: ________
TIME STARTED WORK: ________

MAXIMUM WORKING TIME LIMIT PER MAN: ________

SPECIAL INSTRUCTION

CONTAMINATION CONTROL POINT:
____YES ____NO
OTHER: ________

PROTECTIVE EQUIPMENT REQUIRED

LAB COAT ________ FRESH AIR MASK ________
OVERALLS ________ DRIP PAN ________
RUBBERS ________ PAPER ________
PLASTIC BOOTIES ________ EYE PROTECTION ________
RUBBER GLOVES ________ SURGEONS CAP ________
HOODS ________ RUBBER SUITS ________
RESPIRATOR ________ RUBBER BOOTS ________
ASSAULT MASK ________ OTHER ________

APPROVAL TO START WORK:
PLANT SUPERVISOR: ________
HEALTH PHYSICS: ________

PERMIT TERMINATED BY:
____
(SIGNATURE) (DATE) (TIME)
REASON: COMPLETION( ) CONCELLATION( )
CHANGED CONDITION( )

TIME RECORD

• NAME	FILM BADGE NO.	DOSI-METER NO.	READINGS IN	READINGS OUT	TIME IN	TIME OUT	TOTAL TIME	DOSAGE REC'D M/R

• INDICATES UNDERSTANDING AND COMPLIANCE
(Inclosure 4)

PLANT DESIGNATION ________

PLANT LOCATION ________

RADIATION WORK PERMIT

CONTINUATION SHEET

RWP SERIAL NO. ________

DATE ________

PAGE ____ of ____ PAGES

NAME	FILM BADGE NO.	DOSI-METER NO.	READINGS		TIME		TOTAL TIME	DOSAGE REC'D M/R
			IN	OUT	IN	OUT		
							[illegible]61	

(Inclosure 4)

28569—ARMY—FORT BELVOIR, VA.—13 JUN 60—1800

SM-1A NUCLEAR REACTOR ACCIDENT/INCIDENT CONTROL PLAN

1. PURPOSE AND SCOPE: The purpose of this plan is to define nuclear reactor accident/incident; to establish responsibilities in connection with controlling and minimizing the effects of the accident/incident; to identify channels of communication and support elements available to assist in control of the accident/incident; and to provide specific information pertinent to the execution of the plan.

2. DEFINITIONS:

a. Accident: An accident is an unexpected event involving a reactor, any component, radioactive material, or nuclear material in any of the following:

(1) Loss or serious damage to a reactor and its radioactive components. Serious damage is that sufficient to render a component unsafe or non-operational to an extent which requires major reqork or complete replacement.

(2) Nuclear excursion or chemical explosion within a reactor or involving nuclear or radioactive material.

(3) Radioactive contamination above permissible limits in areas outside the confines of previously designated radiation areas.

(4) Public hazard -- a conditionswherein there exists a certainty that the civilian community or areas not related to the detail activity generating the hazard will be adversely affected.

b. Incident: An incident is an unexpected event involving a reactor, any component, radioactive material, or nuclear material which results in, or could lead to, an accident as defined above. Incidents may include:

(1) Errors committed in the assembly, testing, loading, transporting, storage, or operation of reactors, components, or material.

(2) Malfunction of equipment or materials.

(3) Any Act of God (natural phenomena, over which man has ...l).

Individual errors, malfunction of equipment and ...cted events involving a reactor or radio-

(Inc...

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active materials which possibly could, under other specific conditions, result in an accident as defined above.

3. RESPONSIBILITIES: In the event of a nuclear reactor accident/incident at SM-1A, the following actions will be taken by the individuals indicated:

a. Officer-in-Charge, SM-1A:

(1) Remind the Commanding Officer, Fort Greely, of the availability of technical assistance from the ANPP Technical Operations Center, Nuclear Power Field Office, Fort Belvoir, Virginia.

(2) Establish an Emergency Operations Center (EOC), which will be capable of facilitating the exchange of information with the ANPP Technical Operations Center. The EOC will be established jointly with KICO, Fort Greely, as indicated below.

(3) Provide an alert warning to ANPP elements as follows:

POSITION	INCUMBENT	OFFICE PHONE	HOME PHONE
Director, USAERG	Col. W.C. Gribble, Jr.	OXford 7-2228 Washington, D.C.	ROckwell 8-1752 Alexandria, Virginia
Chief, NPFO	Lt. Col. R.B. Burlin	SOuth 5-7700 ext. 5243 Fort Belvoir, Virginia	SOuth 5-7700 ext. 5135 Fort Belvoir, Virginia

(4) Establish and maintain communications with the ANPP Technical Operations Center as outlined in Annex 1.

(5) Undertake responsibilities set forth in paragraph 4.k. of reference 20.ii., of the basic memorandum.

(6) Direct and control all technical operations within the SM-1A Control Area in keeping with the purpose of this plan.

b. Plant Superintendent, SM-1A:

(1) Organize operating personnel of the SM-1A into work forces (evacuation teams, decontamination teams, etc.) as

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directed, to control and minimize the effects of the nuclear accident/incident within the SM-1A Control Area, as directed.

(2) Directly supervise and control all technical operations within the SM-1A Control Area as directed.

c. Chief, ANPP: Implement the provisions of reference 20.gg. of the basic memorandum.

d. Commanding Officer, Fort Greely: Implement the provisions of reference 20.ii. of the basic memorandum.

4. ORGANIZATION AND CONTROL: An Emergency Operations Center will be established subsequent to a nuclear accident/incident as indicated in subparagraph 4.k.(7) of reference 20.ii. of the basic memorandum.

5. NOTIFICATION:

a. ANPP: Notification will be provided as indicated in bparagraph 3.a.(3) above.

b. Fort Greely: Notification will be provided as indicated aragraphs 4.k.(5) and (6) of reference 20.ii. of the basic ..dum.

c. USARAL and Yukon Command: Notification will be provided as indicated in paragraph 7. of reference 20.ii. of the basic memorandum.

6. COORDINATING INSTRUCTIONS AND SUPPORT:

a. ANPP: Applicable instructions relative to coordination and support are set forth in reference 20.gg. of the basic memorandum; point of coordination shall be the OIC, SM-1A.

b. Fort Greely and Major Commands: Applicable instructions relative to coordination and support are set forth in reference 20.ii. of the basic memorandum; point of coordination shall be the NICO, Fort Greely.

7. ADMINISTRATIVE INSTRUCTIONS:

a. SM-1A:

(1) Emergency Entry Provisions: An Emergency Entry Kit, containing an approved inventory of radiological security and control

supplies and equipment, to include AN/PRC-6 radios, for emergency use by plant or evacuation and rescue personnel, shall be maintained in the Consolidated Maintenance Building immediately to the west of the SM-1A. These provisions shall be kept in a readily accessible, but physically secure, storage area in that building. Keys to this storage area shall be kept by duty personnel of that facility and shall be made available to SM-1A personnel designated by the OIC, SM-1A, on request. The Senior Plant Process Control Technician shall inventory all provisions in the kit monthly, performing such supply item maintenance, including calibration, as may be necessary to keep the provisions in the best possible working or use condition.

(2) Conventional and Fire Safety:

(a) SM-1A Memorandum Number 6, 1961.

(b) SM-1A Memorandum Number 4, 1962.

(3) Duplicate SM-1A Operations Log: Subparagraph 3.c.(5), SM-1A Memorandum Number 13, 1960.

(4) Emergency Medical Assistance: Subparagraph 3.b., SM-1A Memorandum Number 15, 1960.

(5) Succession of Command: Should the nuclear accident/incident or subsequent control actions result in the evacuation or absence of the OIC, SM-1A, or other SM-1A supervisory personnel, command of this Activity shall be assumed by the following personnel in the order indicated:

(a) Plant Superintendent, SM-1A.

(b) NCOIC, SM-1A.

(c) Maintenance Supervisor, SM-1A.

(d) Shift Supervisors, SM-1A, in order of military seniority.

b. Non-SM-1A Elements and Organizations: Specific administrative instructions pertinent to the nuclear reactor accident/incident shall be established by the Commanding Officers of elements involved as further directed or guided by senior responsible commander or his designee.

8. REPORTS:

a. SM-1A: Reports will be rendered by the OIC, SM-1A in

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accord with paragraph 18 of the basic memorandum.

b. Fort Greely and Major Commands: Reports will be rendered by the NICO, Fort Greely, in accordance with reference 20.ii. of the basic memorandum.

ANNEX 1

EMERGENCY COMMUNICATIONS

A. AUTHORITY:

In accordance with the provisions of TAG message DA 578416, 25 October 1961, the Chief of Engineers has authorized the use of "Priority 3" when making emergency telephone calls to Army Nuclear Power Plants.

B. ORIGINATING AT SM-1A:

The individual placing a Priority 3 call, from a reactor site to Fort Belvoir, Virginia, will proceed as follows:

Contact the local military switchboard.

When the switchboard operator answers, state: "This is (state your name and organization). I want to place a Priority 3 call to number (See Annex 2) at Fort Belvoir, Virginia.

C. AVAILABILITY OF CIRCUITS:

1. If the circuit is busy with a Priority 3 or higher call, and alternative routing is not available, the operator will "book" the call and advise the caller of the delay. Upon availability of the circuit, the operator will voluntarily place the call to the re-quested number. When the connection is established, the operator will ring the calling party back. It is most important that the calling party not leave his telephone unattended.

NOTE: Priority 3 calls which are routed over Air Force [illegible] b[illegible]ped and may require justification to the Air Force operator. In such instances, the caller should state, "This call is authorized and directed by the Army Chief of Engineers."

2. When it is apparent that military telephone circuits will be unduly delayed due to an excessive number of Priority 3 or higher calls, technical difficulties, or lack of circuit to the called area, these calls will be placed with the local telephone company. Should a delay be encountered within the commercial telephone system, the operator will be contacted and informed that the call is of an emergency nature.

REPORTING REQUIREMENTS FOR EMERGENCY AND ABNORMAL CONDITIONS

The attached subject summary refers, by Item Number, to the classification of subparagraph 15.b. of the basic memorandum.

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ITEM	REPORT	BY	ADDRESSEE	PERTINENT DISTRIBUTION	INFORMATION & TIME LIMITS
*(1)	Telegraph	Sacramento Signal Depot	OIC, SM-1A (Station AFD)	Surgeon General/ MEDCE	Film No., name of individual, period badge was worn, source of radiation, exposure received; within 24 hours of receipt
	Telegraph Copy	OIC, SM-1A	Surgeon, Ft Greely	---	Same
	Telephone a/o Telegraph	OIC, SM-1A	ChofEngrs/ENGRD-N	CO, Ft Greely/ ARGMD	
	a) Criteria of subpar 20.403(a), 10CFR20				Subparagraph 20.403(a), 10CFR20; immediately after technical overexposure established
	b) Criteria of subpar 20.403(b), 10CFR20				Subparagraph 20.403(b), 10CFR20; within 24 hours after technical overexposure established
	Letter	OIC, SM-1A	ChofEngrs/ENGRD-N	CO, Ft Greely/ ARGMD	Subparagraph 20.405(a), 10CFR20, and exposures in excess of weekly MPD established by TB Med 254; within 30 days after technical overexposur established
*(2)	Telephone a/o Telegraph	Surgeon, Ft Greely	Surgeon General/ MEDCE-OH	OIC, SM-1A ChofEngrs/ENGRD-N	paragraph 5, AR 40-582; immediately
	Letter	OIC, SM-1A	ChofEngrs/ENGRD-N	CO, Ft Greely/ ARGMD	Narrative description of all pertinent circumstances relating to the internal exposure; within 30 days unless sooner requested by the ChofEngr

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(Inclosure 6)

ITEM	REPORT	BY	ADDRESSEE	PERTINENT DISTRIBUTION	INFORMATION & TIME LIMITS
•(3)	Telephone a/o Telegraph	OIC, SM-1A	ChofEngrs/ENGRD-N	CO, Ft Greely/ NICO Safety Off, ARGEN (Fire), ARGMP (Loss or Theft)	All facts and circumstances available following occurrence; immediately
	As required by applicable Post Regulations or Directives (Fire or Theft)	OIC, SM-1A	CO, Ft Greely/ approp. Staff Officers	---	As required by applicable Post Regulations; as required
	Letter	OIC, SM-1A	ChofEngrs/ENGRD-N	CO, Ft Greely/ approp. Staff Officers	
	a) Fire or Theft				Transmission of copy of report rendered CO, Ft Greely and any additional information of particular interest to ChofEngrs; within 30 days of occurrence, unless sooner requested by the ChofEngrs
	• b) Loss or Damage				All facts and circumstances available concerning loss or damage, including any potential hazard anticipated within and without the control area; within 30 days of occurrence, unless sooner requested by the ChofEngrs
	Letter	OIC, SM-1A	ChofEngrs/ENGRD-N	As required	After-action report, as required

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ITEM	REPORT	BY	ADDRESSEE	RTINENT DISTRIBUTION	INFORMATION & TIME LIMITS
*(4)	Telephone a/o Telegraph	OIC, SM-1A	ChofEngrs/ENGRD-N	CO, Ft Greely/ NICO, Safety Officer	
	a) Criteria of subpar 20.403(a), 10CFR20				Subparagraph 20.403(a), 10CFR20; immediately
	b) Criteria of subpar 20.403(b), 10CFR20				Subparagraph 20.403(b), 10CFR20; within 24 hours
	Telephone	OIC, SM-1A	CO, Ft Greely/ NICO, Safety Officer	---	Same as above plus recommended action where indicated; immediately
	Letter	OIC, SM-1A	ChofEngrs/ENGRD-N	CO, Ft Greely/ NICO, Safety Officer, ARGMD	Subparagraph 20.405(a), 10CFR20; within 30 days of occurrence
	Reports as may be further required by CO, Ft Greely	OIC, SM-1A	As required	ChofEngrs/ENGRD-N	As required
*(5)	Telephone a/o Telegraph	OIC, SM-1A	ChofEngrs/ENGRD-N	CO, Ft Greely/ NICO, Safety Officer	
	a) Criteria of subpar 20.403(a), 10CFR20				Subparagraph 20.403(a), 10CFR20; immediately
	b) Criteria of subpar 20.403(b), 10CFR20				Subparagraph 20.403(b), 10CFR20; within 24 hours
	Letter	OIC, SM-1A	ChofEngrs/ENGRD-N	CO, Ft Greely/ NICO, Safety Officer	Subparagraph 20.405(a), 10CFR20; within 30 days

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ITEM	REPORT	BY	ADDRESSEE	PERTINENT DISTRIBUTION	INFORMATION & TIME LIMITS
*(6)	Telephone	OIC, SM-1A	Director, USAERG Chief, NPFO	CO, Ft Greely/ NICO, Safety Officer	Alert warning, subparagraph 3.b., ANPP Directive No. 15; immediately
	Telephone and Telegraph	OIC, SM-1A	Chief, ANPP TOC	CO, Ft Greely/ NICO	Subparagraph 3.c.(1)(c), ANPP Directive No. 15; throughout Operations Phase of Incident/ Accident
	Reports as may be further required by ChofEngrs	OIC, SM-1A	As required	CO, Ft Greely	As required
*	Reports as may be further required by CO, Ft Greely	NICO, Ft Greely	As required	ChofEngrs/ENGRD-N	As required

*Occurrences involving solely or primarily licensed material, (materials for which members of this Activity are specifically licensed by the Atomic Energy Commission), shall be reported in strict accord with the provisions of paragraphs 20.402, 20.403, and 20.405, 10CFR20. Reports will be addressed to the Manager, Hanford Operations Office, USAEC, PO Box 550, Richland, Washington, or Director, Division of Licensing and Regulation, USAEC, Washington 25, D.C., as appropriate; copies of such reports will be furnished ChofEngrs/ ENGRD-N and the CO, Ft Greely, when applicable.

NOTES:

1. Above reports do not preclude reporting actions required by reference 20.i. as implemented by reference 20.t. Where emergencies or abnormal conditions fall within the reporting criteria of these references, immediate notification and DA Form 285 will be provided as required, (see SM-1A Memorandum Number 4, 1962).

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2. Dependent upon nature and extent of occurrence, classifications (3), (4), and (5) above may be properly classified as accidents/incidents and will be treated as such.

3. Report actions to Yukon Command and USARAL will be handled in accordance with the Fort Greely Nuclear Accident and Incident Control Plan by the CO, Ft Greely, or his designee.

(Inclosure 6)

SUMMARY OF RULES OF RADIATION PROTECTION

1. When entering radiation zones wear film badges along with additional dosimeters as prescribed by Health Physics.

2. Obtain a radiation work permit before beginning work in radiation areas. Read, understand, and comply with all instructions on the permit.

3. Wear protective clothing when working in radiation zones, handling radioactive sources, or contaminated equipment.

4. Dispose of all radioactive gaseous, liquid, and solid materials not covered by a radiation waste permit according to instructions of the Health Physics technicians.

5. Wash hands at all times upon completion of work in radiation areas and before smoking, eating, or drinking.

6. Perform a thorough personal radiation survey upon completion of work in radiation areas. This should include a complete survey of clothing and shoes with particular emphasis on the hands and shoes.

7. Do not remove any known or potentially contaminated equipment from a radiation control area before determining the degree of contamination.

8. Do not remove any contaminated equipment, clothing, or radioactive sources to uncontrolled areas of the plant.

9. Do not work with radioactive materials while having scratches, cuts, or any breaks in the skin without first obtaining the approval of a medical officer or Health Physics technician.

10. Do not handle or come in contact with clean equipment while wearing contaminated gloves or clothing.

11. Do not perform welding, soldering, or brazing of contaminated materials unless special ventilated facilities are available or protective respiratory equipment is in use.

12. Do not leave radioactive sources unlabeled. Label should include dose rate at specified distance, isotope, if known, and special handling instructions.

13. Do not enter areas beyond radiation tape before determining the type of hazard that exists within the area.

(Inclosure 7)

C1, SM-1A Memo Nr 5
(5 March 1962)

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
USA Engineer Reactors Group
SM-1A Operations
APO 733, Seattle, Washington

Change 1 to
MEMORANDUM
NUMBER 5 (1962)

15 March 1962

SM-1A RADIOLOGICAL SECURITY AND CONTROL

SM-1A Memorandum Number 5, 1962, is changed as follows:

Add to paragraph 15., subparagraph 15.b.(6):

"(6) Nuclear Reactor Accidents/Incidents, (may include emergencies or abnormal conditions of (3), (4), or (5), above, where such occurrences may be properly defined as nuclear reactor accidents or incidents)."

RICHARD L. HARRIS
Major, Corps of Engineers
Officer-in-Charge, SM-1A Operations

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
USA Engineer Reactors Group
SM-1A Operations
APO 733, Seattle, Washington

MEMORANDUM
NUMBER 6

7 March 1962

SM-1A CONTAMINATION CONTROL PLAN

1. PURPOSE: The purpose of this memorandum is to define and provide procedures for radiation work areas and personnel contamination control points and to provide instructions for the handling and disposition of contaminated equipment, materials, and waste during operations.

2. GENERAL:

a. Direction and general guidance in the establishment of a contamination control plan is provided in paragraph 9. of reference 10.h. These implementing instructions are necessarily a part of, and are included in, the radiological security and control program at SM-1A, which provisions are set forth in SM-1A Memorandum Number 5, 1962.

b. The provisions below shall be come effective upon the date of SM-1A facilities transfer to the Government, except in those instances where prior implementation is a prerequisite to Contractor sponsored operations, (Contract No. DA-95-507-ENG-1116).

3. DEFINITIONS:

a. Radiation Hazard: Any possible condition that might result in exposure of person in excess of the limits established for a "Radiation Area".

b. Radiation Area: Any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 5 mrem, or in any five consecutive days a dose in excess of 100 mrem. An area may be designated a Permanent Radiation Area if radiation levels are such that the area would routinely be defined as a Radiation Area.

c. High Radiation Area: Any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 100 mrem.

Incl 2

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d. Control Area: The area under the supervisory control of the Plant Superintendent, that is the area within the SM-1A security fence, access to which is controlled by a security guard.

e. Radiological Survey: An analysis and evaluation of the radiation hazards under a specific set of conditions. The evaluation includes a physical survey of the disposition of materials, equipment, and personnel within the radiation hazard area; measurement or analytical estimates of the levels of radiation and contamination that are or may be involved; and a prediction of hazards resulting from expected or possible changes in materials, equipment, arrangements, or practices, including incidents/accidents.

4. ACCESS PROVISIONS: Prior to entry preparations for access to the Vapor Container or any other Radiation Area, a Personnel Contamination Control Point and a Radiation Work Area shall be established. The Contamination Control Point will be established at the point of entry to the Radiation Work Area; the Radiation Work Area will be established coincident with or adjacent to the Radiation Area, as may be operationally appropriate. In any event, the Radiation Area served will be included within a Radiation Work Area.

5. RADIATION WORK AREAS:

a. A Radiation Work Area will be defined and isolated by an impenetrable structural barrier (as the VC itself), coincident with or at the edge of the area, or by magenta and yellow radiation warning tape, wherever the integrity of restraint against personnel access is not positive or complete. The area will be marked by appropriate caution signs; each area will have associated with it at least one Personnel Contamination Control Point.

b. Entry to the Radiation Work Area will be made through a Personnel Contamination Control Point or Points.

c. All work on or with any equipment or materials in or removed from a Radiation Area will be done in the Radiation Work Area, unless:

(1) Contamination activity levels are less than those set forth in paragraph 7 below, and;

(2) No abrasive or welding operation is to be performed on or with the materials or equipment, or;

(3) An Equipment Release Form is attached to the material or equipment and the Radiation Work Permit is completed.

d. Radiation Work Permits will be used for each type of task to be performed on or with the equipment or materials in a Radiation Work Area.

6. <u>PERSONNEL CONTAMINATION CONTROL POINTS</u>:

a. A Contamination Control Point shall be established at each Radiation Area and Radiation Work Area by a plant process control technician (MOS 358.4).

b. Wherever survey operations have revealed the presence of surface contamination within a Radiation Work Area or wherever activities within the Radiation Work Area may result in contamination, strong, moisture-absorbent paper will be used to cover the floor at the Contamination Control Point.

c. Protective clothing and equipment, as indicated on the Radiation Work Permit for work and/or inspection, shall be obtained from plant supply and placed at the Contamination Control Point by a plant process control technician.

d. Contaminated waste can or cans will be placed within the Radiation Work Area near the Contamination Control Point for disposal of contaminated or potentially contaminated disposable materiel.

e. Folders of active Radiation Work Permits, and pencils, will be placed at the Contamination Control Point.

f. If required by the work to be performed, work benches and tools shall be provided within the Radiation Work Area; this materiel will, until properly released, be considered potentially contaminated.

g. During operations within the Vapor Container, or fuel handling operations in the Spent Fuel Pit and at such other times as specifically directed by the OIC, Plant, Superintendent or NCCIC, the designated Contamination Control Point(s) will be continuously manned by a plant process control technician.

h. All personnel shall enter and leave a Radiation Work Area through the Contamination Control Point, wearing/carrying such items of protective clothing and equipment into the Radiation Work Area as may be prescribed by the Radiation Work Permit. Personnel will sign in and out of the Radiation Work Area on the appropriate Radiation Work Permit provided.

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NUMBER 6

7 March 1962

i. No protective clothing worn inside a Radiation Work Area shall be worn outside the Contamination Control Point. Protective clothing shall be removed without touching the outerside of the garment with the bare hands; clothing shall be placed in appropriately marked clothing containers. No protective clothing shall be reused until washed (or otherwise cleaned/decontaminated), dryed, surveyed, and released by a plant process control technician.

j. No other materiel shall be taken outside the Contamination Control Point, until properly released by a plant process control technician, (see subparagraph 5.c.(1) above, and paragraph 8. below).

k. Personnel shall check themselves for beta-gamma contamination, after removing clothing, with an AN/PDR-27 survey instrument; where there is survey evidence of, or the possibility of, by nature of the operation involved, alpha contamination, personnel shall additionally check themselves for alpha contamination using a Nuclear Chicago 2112-P survey instrument equipped with an AP-4 alpha probe. Contamination in excess of the limits set forth in paragraph 7. below shall be removed prior to leaving the Contamination Control Point.

7. CONTAMINATION (Surface Activity) LIMITS AND DECONTAMINATION:

a. Contamination Limits (Release Limits): Direct survey of contamination activity levels for personnel or materiel shall be established using AN/PDR-27 (beta-gamma) and Nuclear Chicago 2112-P (alpha) survey instruments; smear surveys shall be made using the same instruments with the smear samples. All routine smear samples will also be counted using mica-end window countings and a G-M tube detector or an alpha scintillation detector, as appropriate.

(1) Within Control Area (release from Radiation Work Area):

Class	Contamination	Type	Limits (above background)
Personnel	Alpha	Smear	Undetectable
		Direct Survey	$<$50 dpm/100 cm^2
	Beta-Gamma	Smear	Undetectable
		Direct Survey	$<$0.1 mrad/hr at 1"
Clothing (Protective)			
(1) Release	Alpha	Direct Survey	$<$500 dpm/100 cm^2

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Class	Contamination	Type	Limits (above background)
	Beta-Gamma	Direct Survey	<1 mrad/hr at 1"
(2) Issue	Alpha	Direct Survey	Undetectable
	Beta-Gamma	Direct Survey	<0.1 mrad/hr at 1"
Other Materiel	Alpha	Smear	Undetectable
		Direct Survey	<500 dpm/100 cm^2
	Beta-Gamma	Smear	<.05 mrad/hr at 1"
		Direct Survey	<1 mrad/hr at 1"

(2) Outside Control Area (release from Control Area):

(a) Spreadable Activity: Alpha and beta-gamma smear indications undetectable above background.

(b) Fixed Alpha Activity: Less than 500 dpm/100 cm^2 above background by direct survey.

(c) Fixed Beta-Gamma Activity: Less than 0.05 mrad/hr at 1".

NOTE: The above limits do not relate to radiation emitting materiel subject to transport. Separate regulatory limits are established for the transport of such materiel.

b. Decontamination: Surfaces above the levels indicated above must be decontaminted; materiel which is not decontaminated or is not capable of decontamination must be disposed of as solid waste or removed to a retention area identified as a Permanent Radiation Area. Recommended decontaminating procedures are identified as Procedures 306 and 307, Volume II, reference 10.r. Gross decontaminating procedures, applicable to large areas or widespread environmental contamination, are set forth in Part IV, reference 10.e.; such procedures would normally be employed by RAMDET or other support personnel designated for use in general decontamination in the event of a nuclear accident.

3. DISPOSAL OF EQUIPMENT AND MATERIALS:

a. All disposable equipment or materials will be placed in the radioactive waste cans located within the Radiation Work Area, if the dose rate measured is less than 20 mrem/hr at 1.5 inches using an AN/PDR-27 survey instrument. Material or equipment having dose rates exceeding this limit shall be tagged and placed in an interim waste retention area designated by the Plant Superintendent or Plant Supervisor (NCOIC). No disposable equipment or materials shall be removed to the plant exterior except in, or during planned transfer operations to high and low level waste containers provided by the Chemical Corps. No change will be made in a radioactive waste interim retention area (e.g. the demineralizer room) without the approval of the Non-Commissioned Officer-in-Charge or Plant Superintendent.

b. All non-disposable materials and equipment used in a Radiation Work Area shall be checked for contamination prior to removal from the area; the individual using such materials and equipment is responsible for checking and cleaning, as indicated. Material shall not be released from the Radiation Work Area unless the contamination activity levels are less than those set forth in paragraph 7. above, as appropriate. These levels are designated as release limits for the materiel involved. Materiel exceeding the release limits will be decontaminated of spreadable activity and removed to an interim retention area designated by the Plant Superintendent or NCOIC. Such materiel will not be reused until released by a plant process control technician.

9. DISPOSAL OF RADIOACTIVE WASTE:

a. Solid Waste:

(1) Under the provisions of AR 755-380, staff supervision of the disposition of this waste is the responsibility of the Chief Chemical Officer, US Army. This supervision is exercised within USARAL by the Chemical Officer, USARAL; removal, transport and disposition of solid waste will be effected by the Chemical Supply Officer, USARAL Support Command. The provisions of reference 10.j. shall apply to the disposition of solid waste or materiel to be disposed of at the USARAL level. Notification of materiel to be shipped will be provided the Commanding Officer, USARAL Support Command, ATTN: Chemical Supply Officer; acknowledgement of notification will include any special shipping instructions. All dispositions of radioactive materials for which separate mandatory provisions exist (see SM-1A Memorandum Number 17, 1960) will be coordinated with the Chemical Officer, USARAL. SM-1A waste being processed through the USA Radioactive Waste Disposal Facility, USARAL, will be handled in accordance with the provisions of reference 10.k.

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NUMBER 6

7 March 1962

(2) Interim Waste Retention at SM-1A:

(a) A Radiation Area, external to the SM-1A and within the Control Area, will be established for interim retention of solid waste, pending disposition by the Chemical Supply Officer, USARAL Support Command. This area will be used only for filled waste containers, (see subparagraph 8.a. above).

(b) Solid waste, high and low level, will be accumulated in disposable containers provided the SM-1A by the Chemical Supply Officer, USARAL Support Command; the OIC, SM-1A, is responsible for waste accumulation, transfer of waste materials to the disposable containers, radiological survey, and security of the waste during interim retention, and capping or closing the filled disposable containers. Demineralizer waste may, dependent on disposal destination, be temporarily stored and shipped in lead shield-casks.

(c) The OIC, SM-1A will make immediate arrangements for the shipment of filled, disposable containers in order to prevent undue accumulation of solid waste at SM-1A; the period of interim retention is not to be considered a "cooling off period", but rather a convenience to permit planned materials transfer and accumulation prior to movement and disposition by the Chemical Supply Officer, USARAL Support Command.

(d) The Chemical Supply Officer, USARAL Support Command, will assume responsibility for the waste and containers at the SM-1A and at the time of pick-up for disposition.

(e) The OIC, SM-1A will make available to representatives of the Chemical Supply Officer, USARAL Support Command, at the time of waste transfer referred to above, assistance to include: radiological survey of materials and personnel, radiological and administrative data pertinent to the shipment, and labor.

(f) A record of each shipment of waste will be maintained to show: shipment date and destination, description of materials (waste) shipped, description of container, estimate of total activity, external dose measurements, mode of shipment, and individual authorizing the release of the waste for shipment. A cumulative record of waste disposal shipments will be maintained.

b. Liquid Waste:

(1) Liquid waste will be accumulated at SM-1A in three (3) hot waste tanks of a total capacity of 20,000 gallons and two (2)

laboratory waste tanks of a total capacity of 500 gallons. The radioactive liquid waste generated within the plant will be stored in the available tankage during the months of the year when Jarvis Creek is not flowing. A summary of waste storage associated with waste sources is included as Inclosure 1.

(2) The undiluted waste will be pumped through a closed, pressurized pipe to a dilution facility located near the stream bed of Jarvis Creek. The dilution facility will include a dilution pump system, a well, and a means of metering and monitoring the discharge.

(3) Water from the dilution well will be used to dilute the liquid waste. At maximum waste flow from SM-1A a dilution ratio of approximately 1 to 2000 will be permitted; reduced flow rates will permit correspondingly greater dilution ratios. The pumping and dilution of the radioactive liquid waste will be accomplished only when the flow of water in Jarvis Creek is continuous (generally May through August of each year). Waste will not be discharged to Jarvis Creek in excess of the Maximum Permissible Concentration of 10^{-7} microcuries per cc.

(4) Throughout the period of discharge, the stored waste, the discharge effluent, and Jarvis Creek (up and downstream of the discharge) will be monitored and sampled in accordance with detailed instructions provided as Supplementary Operating Instructions, "Planned Discharge of Liquid Waste to Jarvis Creek". System line-up and preparation for the waste discharge operation will be set forth in Plant Operations Check List #42, "Hot Waste Dilution and Discharge System".

(5) No discharge will be effected without prior notification to and approval of the Commanding Officer, Fort Greely, or his designee. No waste will be discharged by plant personnel without the written order of the Plant Superintendent or OIC, SM-1A.

(6) A record of each discharge event will be maintained to show: discharge date and time (interval, if appropriate), volume of waste discharged, specific and total activity of waste, and rate of disposition. A cumulative record of discharge events will be maintained.

c. Airborne Activity:

(1) Control of airborne activity wasted (effluent) to

the environs is maintained at SM-1A by isolation of potential sources, including a duct and fan system directed to stack for each such source with isolating valves, positive particulate filtration prior to stack removal, and continuous monitoring of the stack air:

Potential Source	Filtration	Discharge
Vapor Container	Vapor Container Vent Filter	Stack
Hot Lab Hood Exhaust	Hood Vent Filter	Stack
Cold Lab Hood Exhaust	Roof Line Filter	Stack
Hot Lab Sink Hood Exhaust	Roof Line Filter	Stack
Laboratory Waste Tank	Roof Line Filter	Stack
Hot Waste Tank	Roof Line Filter	Stack
Demineralizer Room, Hot Waste Tank Storage Room and Sampling Point Hood	Roof Line Filter	Stack
Blowoff Tank (Secondary)	----------------	Stack

A source summary of possible sources contributing to evidence of activity, in excess of background, observed on the stack, mobile air, or gas monitor is included as Inclosure 2.

(2) Stack air is continuously monitored and recorded by a rack-mounted Nuclear Measurements Corporation AM-2A monitor, sampling stack air at a point just below point of discharge and viewing built-up particulate activity on a fixed filter. In series with the AM-2A is a Nuclear Measurements Corporation Fluid Shield Monitor FMS-1 which continuously monitors and records air passing the AM-2A filter for gaseous (residual) activity. Since the AM-2A detector tube views the built-up activity on the filter paper, the readings indicate a combination of activity accumulation and decay; an increasing trend, therefore, indicates a build-up greater than the decay rate of the isotope(s) collected, a constant reading indicates an equilibrium between build-up and decay or collection of a long-lived isotope, and a decreasing trend indicates a build-up less than the decay rate of the isotope(s) collected. The FMS-1 will monitor instantaneous activity associated with its volume.

MEMORANDUM
NUMBER 6

7 March 1962

(3) For area surveys of airborne activity within various plant areas and to support special operations where contaminated aerosol might be expected, a mobile air monitor (AM-2A) and several portable air samplers are provided.

(4) Stack air will not be continuously discharged to the environs, but will be released when specifically directed by the Senior Plant Process Control Technician in connection with sampling operations, vapor container entry operations, laboratory chemical or radiochemical analyses, or other operations where discharge is indicated. MPC of activity discharged is based on the annual average.

(5) Detailed instructions pertinent to stack air discharges are contained in Supplementary Operating Instructions, "Planned Discharge (stack air) of Potentially Contaminated Aerosol".

(6) A record of each discharge event will be maintained to show: discharge date and time (interval, if appropriate), volume discharged, specific and total activity of effluent, and rate of disposition. A cumulative record of discharge events will be maintained.

d. Reporting Requirements: A record of radioactive waste disposed of, transported or discharged from the control area, during the month shall be provided in the SM-1A Monthly Report as required by reference 10.h

10. <u>REFERENCES</u>:

a. AR 40-414.

b. AR 385-30.

c. AR 755-380.

d. TB Med 254.

e. TM 3-[illegible].

f. EM 385-1-1.

g. EM 385-1-[illegible].

h. EM 385-1-32.

i. EM 700-[illegible]-3.

j. USARAL Circular 755-2.

k. Standard Operating Procedure, U.S. Army Radioactive Waste Disposal Facility, Office of the Chemical Supply and Maintenance Officer, USARAL, dated 15 December 1959.

l. Title 10, Chapter 1, Part 20, Code of Federal Regulations.

m. NBS Handbook 42.

n. NBS Handbook 48.

o. NBS Handbook 51.

p. NBS Handbook 59.

q. NBS Handbook 69.

r. Manual, IDO-19014, Volumes I and II, Health Physics and Radiochemistry Manual for Army Nuclear Power Plants, Combustion Engineering, Inc., 1960.

s. 1st Letter Indorsement, ENGRD-N (10 Oct 60), OCOFENGRS, subject: "Definition of a Radiation Area", dated 18 October 1960.

t. Letter, ARCSP-SC, USARAL, subject: "Test Program, SM-1A, Contract DA-1116, Fort Greely, Alaska", dated 1 February 1961.

11. SUPERSESSION: This memorandum supercedes SM-1A Memorandum Number 1, 1961, subject: "SM-1A Contamination Control Plan", with Change Number 1.

2 Incls.
as

RICHARD L. HARRIS
Major, Corps of Engineers
Officer-In-Charge, SM-1A Operations

SOURCE SUMMARY OF SM-1A LIQUID WASTE

Destination (Storage)	Source
Laboratory Waste Tanks	Emergency Shower
Laboratory Waste Tanks	Washing Machine Drain
Laboratory Waste Tanks	Laboratory "Hot" Sinks
Laboratory Waste Tanks	Pri. Make-Up Pump Leakage
Laboratory Waste Tanks	Stack Condensate Drain
Hot Waste Tanks	Primary Sampling Sink
Hot Waste Tanks	Primary Blowdown
Hot Waste Tanks	Cuno Filter Backwash Discharge
Hot Waste Tanks	Secondary Blowdown
Hot Waste Tanks	Steam Blowoff Tank
Hot Waste Tanks	V.C. Cooling Water (B/D Cooler)
Hot Waste Tanks	Laboratory Waste Tanks

(Inclosure 1)

SOURCE SUMMARY - STACK, MOBILE AIR OR GAS MONITOR ACTIVITY

LOCATION	POSSIBLE SOURCE(S)
1. Vapor Container	Volatile or gaseous activity from: Contaminated water and oil tanks, PCP # 2 Fuel loading and unloading operations Maintenance operations, e.g. SG tube plugging, involving any primary system components in contact with primary coolant Vapor condensate accumulation in Rod Drive Pit Any primary system leaks resulting in spra aerosol or steam Spills or accidental discharges involving primary coolant samples or samples of fluids which could have been contaminat by primary coolant
2. Spent Fuel Pit	Volatile or gaseous activity from: Fuel transfer operations Spent Fuel Pit recirculation or clean-up Spills involving samples of pit water
3. Laboratory	Volatile or gaseous activity from: Water sample evaporation (hot plate) Sample discharge to laboratory waste Spills involving water samples
4. Operating Floor	Volatile or gaseous activity, involving primary coolant leakage, in steam from: Turbine Throttle Air Ejector Volatile or gaseous activity from: Radiation Monitor leakage Spills involving water samples
5. Ground Floor	Volatile or gaseous activity from: Primary MW Pump seal leakage Washing machine, washing and discharge Leakage from discharge at Mobile Air Monit
6. Ground Floor, Pipe Pit	Volatile or gaseous activity from: Steam Generator Blowdown leakage
7. Waste Tank Room	Volatile or gaseous activity from: Liquid waste tank transfer Liquid waste tank discharge Diversion of primary blowdown to waste Addition of waste to any tanks (See also external activity below)

(Inclosure 2)

SOURCE SUMMARY - STACK, MOBILE AIR OR GAS MONITOR ACTIVITY (Continued)

LOCATION	POSSIBLE SOURCE(S)
8. Demineralizer Room	Volatile or gaseous activity from: Waste Tank Room: Waste tank leakage Operation relief valves on waste tanks Any leakage from primary system piping and spills during sampling operations Sampling operations involving primary water or waste Handling and removing demineralizers Handling and removing micrometallic filter Leakage during Spent Fuel Pit cleanup operations

(Enclosure 2)

FORM AEC-374A
(12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE

Supplementary Sheet

License Number 50-7082-1
(A63)

AMENDMENT NO. 1

Department of the Army
SM-1A Operations
U.S. Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

Attention: MSGT William R. Gwinn
CWO Severt L. Sundine

In accordance with letter dated March 6, 1961, License No. 50-7082-1 is amended as follows:

Items 6B, 7B, 8B, and 9B are amended to read:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
B. Strontium 90	B. Jordan Electronics, Inc. Model BB-1010 Sealed Sources.	B. 8 microcuries contained in two sources of 4 microcuries each.

9. Authorized use

B. Internal calibration sources in Jordan Electronics Model AGB-10KB-SR Radectors.

DUPLICATED
FOR DIV. OF COMPLIANCE

For the U. S. Atomic Energy Commission

Date ~~March 22, 1961~~

by ~~Chief, Isotopes Branch~~
Division of Licensing and Regulation
Washington 25, D. C.

3-23-61

FORM AEC-374A
(12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE
Supplementary Sheet

License Number 50-7032-1
(A63)

AMENDMENT NO. 1

Department of the Army
SM-1A Operations
U.S. Army Engineer Reactors Group
Process Control Section
Fort Greely, Alaska

Attention: MSGT William R. Gwinn
CWO Severt L. Sundine

In accordance with letter dated March 6, 1961, License No. 50-7032-1 is amended as follows:

Items 6B, 7B, 8B, and 9B are amended to read:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
B. Strontium 90	B. Jordan Electronics, Inc. Model EB-1010 Sealed Sources.	B. 8 microcuries contained in two sources of 4 microcuries each.

9. Authorized use

B. Internal calibration sources in Jordan Electronics Model AGB-10XB-SN Radectors.

For the U. S. Atomic Energy Commission

Date March 22, 1961

by ______
Division of Licensing and Regulation
Washington 25

FORM AEC-374
(12-57)

"" S. ATOMIC ENERGY COMMIS"ON
BYPRODUCT MATERIAL LICEN .

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 30, Licensing of Byproduct Material, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, own, possess, transfer and import byproduct material listed below; and to use such byproduct material for the purpose(s) and at the place(s) designated below. This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Name: Department of the Army SM-1A Operations	3. License number: 50-7082-1 (A63)
2. Address: U.S. Army Engineer Reactors Group Process Control Section Fort Greely, Alaska	4. Expiration date: January 31, 1963
	5. Reference No.

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may posses at any one time
A. Polonium 210 (See page 2)	A. Mound Laboratory Sealed Polonium-Beryllium Neutron Source.	A. One source of 30 curies.

9. Authorized use

A. Reactor start-up source.

(See page 2)

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

11. The licensee shall comply with the provisions of Title 10, Part 20, Code of Federal Regulations, Chapter 1, "Standards for Protection Against Radiation".

12. Byproduct materials shall be used by, or under the direct personal supervision of, MSGT William R. Gwinn or CWO Severt L. Sundine.

13. Byproduct material as sealed sources shall not be opened.

14. Except as otherwise specifically provided for in the license, the licensee shall possess and use byproduct material described in Items 6, 7 and 8 of this license in accordance with statements, representations, and procedures contained in his application dated November 23, 1960.

(See page 2)

FORM AEC-374A
(12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE
Supplementary Sheet

License Number 50-7082-1
(A63)

CONTINUED:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
B. Strontium 90	B. Jordan Electronics, Inc. Model BB-1010 Sealed Source.	B. One source of 8 microcuries

9. Authorized use

B. Internal calibration source in Jordan Electronics Model AGB-10KG-SR Radector.

CONDITIONS

15. A. Each sealed source containing Polonium 210 and Strontium 90 shall be tested for leakage and/or contamination at intervals not to exceed six (6) months, except that sealed sources designed as an alpha emitting source shall be tested at intervals not exceeding three (3) months. In the absence of a certificate from a transferor indicating that a test has been made within six (6) months prior to the transfer, the sealed source shall be put into use until tested.

B. The test shall be capable of detecting the presence of 0.005 microcurie of removable contamination on the test sample. The test sample shall be taken from the sealed source or from appropriate accessible surfaces of the device in which the sealed source is permanently or semipermanently mounted or stored. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.

C. If the test reveals the presence of 0.005 microcuries or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within five (5) days of the test with the Director, Division of Licensing and Regulation, U.S. Atomic Energy Commission, Washington 25, D.C., describing the equipment involved, the test results and the corrective action taken. A copy of such report shall be sent to the manager of the nearest AEC operations office listed in Appendix D of Title 10, Code of Federal Regulations, Part 20.

D. Tests for leakage and/or contamination shall be performed in accordance with procedures entitled "Polonium-Beryllium Neutron Source Leak Test" and "Strontium 90 Source Leak Test" submitted with application dated November 23, 1960.

(See page 3)

FORM AEC-374A
(12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE
Supplementary Sheet

License Number 50-7082-1
(A63)

CONTINUED:

CONDITIONS

16. Leak testing of the Polonium 210-Beryllium Neutron Source required by Condition 15 shall not apply when the source is in the reactor pressure vessel provided that the source shall be leak tested upon removal from the reactor pressure vessel if more than three months has elapsed since the date of the previous leak test.

For the U. S. Atomic Energy Commission

DUPLICATED FOR DIV OF COMPLIANCE

Date January 24, 1961

by ~~Chief, Isotopes Branch~~
Division of Licensing and Regulation
Washington 25, D. C.

1-24-61

FORM AEC-374
(12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 30, Licensing of Byproduct Material, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, own, possess, transfer and import byproduct material listed below; and to use such byproduct material for the purpose(s) and at the place(s) designated below. This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Name: Department of the Army SM-1A Operations	3. License number: 50-7032-1 (A63)
2. Address: U.S. Army Engineer Reactors Group Process Control Section Fort Greely, Alaska	4. Expiration date: January 31, 1963
	5. Reference No.

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may posses at any one time
A. Polonium 210 (See page 2)	A. Mound Laboratory Sealed Polonium-Beryllium Neutron Source.	A. One source of 30 curies.

9. Authorized use

A. Reactor start-up source.

(See page 2)

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

11. The licensee shall comply with the provisions of Title 10, Part 20, Code of Federal Regulations, Chapter 1, "Standards for Protection Against Radiation".

12. Byproduct materials shall be used by, or under the direct personal supervision of, MSGT William E. Gwinn or CWO Severt L. Sundine.

13. Byproduct material as sealed sources shall not be opened.

14. Except as otherwise specifically provided for in the license, the licensee shall possess and use byproduct material described in Items 6, 7 and 8 of this license in accordance with statements, representations, and procedures contained in his application dated November 23, 1960.

(See page 2)

FORM AEC-374A
(12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE
Supplementary Sheet

License Number 50-7032-1
(A63)

CONTINUED:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
B. Strontium 90	B. Jordan Electronics, Inc. Model RS-1010 Sealed Source.	B. One source of 8 microcuries

9. Authorized use

B. Internal calibration source in Jordan Electronics Model AGB-10KG-SR Radector.

CONDITIONS

15. A. Each sealed source containing Polonium 210 and Strontium 90 shall be tested for leakage and/or contamination at intervals not to exceed six (6) months, except that sealed sources designed as an alpha emitting source shall be tested at intervals not exceeding three (3) months. In the absence of a certificate from a transferor indicating that a test has been made within six (6) months prior to the transfer, the sealed source shall be put into use until tested.

B. The test shall be capable of detecting the presence of 0.005 microcurie of removable contamination on the test sample. The test sample shall be taken from the sealed source or from appropriate accessible surfaces of the device in which the sealed source is permanently or semipermanently mounted or stored. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.

C. If the test reveals the presence of 0.005 microcuries or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within five (5) days of the test with the Director, Division of Licensing and Regulation, U.S. Atomic Energy Commission, Washington 25, D.C., describing the equipment involved, the test results and the corrective action taken. A copy of such report shall be sent to the manager of the nearest AEC operations office listed in Appendix D of Title 10, Code of Federal Regulations, Part 20.

D. Tests for leakage and/or contamination shall be performed in accordance with procedures entitled "Polonium-Beryllium Neutron Source Leak Test" and "Strontium 90 Source Leak Test" submitted with application dated November 23, 1960.

(See page 3)

For the U. S. Atomic Energy Commission

FORM AEC-374A
(12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE
Supplementary Sheet

License Number 50-7032-1
(A63)

CONTINUED:

CONDITIONS

16. Leak testing of the Polonium 210-Beryllium Neutron Source required by Condition 15 shall not apply when the source is in the reactor pressure vessel provided that the source shall be leak tested upon removal from the reactor pressure vessel if more than three months has elapsed since the date of the previous leak test.

For the U. S. Atomic Energy Commission

Date January 24, 1961

HEADQUARTERS
DEPARTMENT OF THE ARMY
OFFICE OF THE SURGEON GENERAL
WASHINGTON 25, D. C.

IN REPLY REFER TO
MEDPS-PO

17 January 1961

Isotopes Branch
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

Gentlemen:

Recommend approval of inclosed application for Byproduct Material License for Fort Greeley, Alaska for one source of 30 curies of Polonium 210 and one source of 8 microcuries of Strontium 90.

Sincerely,

CHARLES W. KRAUL
Lt. Colonel, MC
Preventive Medicine Division

1 Incl
Form AEC-313 (in trip)

RECEIVED
JAN 18 1961
U.S.A.E.C.
Isotopes Branch
Div. of L & R

31870

MEDPS-PO 17 January 1961

Isotopes Branch
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

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CHARLES W. KRAUL
Lt. Colonel, MC
Preventive Medicine Division

RECEIVED
JAN 18 1961
U.S.A.E.C.
Isotopes Branch
Div. of L & R

Form AEC-313 (5-58)

ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved Budget Bureau No. 38-R027.4

INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only Items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail three copies to: U. S. Atomic Energy Commission, Washington 25, D. C. Attention: Isotopes Branch, Division of Licensing and Regulation. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30 and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital, person, etc.)*

Dept of the Army
SM-1A Operations
US Army Engineer Reactors Group
Fort Greely, Alaska (~~APO 733~~ Seattle~~, Wash.~~)

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1 (a).)*

Not Applicable/.

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Process Control Section/.

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

45-6380-1 (MSGT W. R. GWINN only.)

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

MSGT WILLIAM R. GWINN, Senior Plant Process Control Technician (Principle).
SGT OSCAR A. VOGTSBERGER JR., Process Control Technician (Alternate).
CWO SEVERT L. SUNDINE, Plant Superintendant (Alternate).

5. RADIATION PROTECTION OFFICER *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)*

CWO SEVERT L. SUNDINE.

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*	(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*
(1) Polonium - 210 (w/Be-9 target)/.	(1) Sealed Neutron Source (Mound Laboratory Item VII), One Source of 30 curies/.
(2) Strontium - 90/.	(2) Sealed Source (Jordan Electronics, Inc., Model BB-1010), One Source of 8 microcuries/.

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)*

(1) Po-Be neutron source is to be used as reactor start-up source; the source will be located within the SM-1A reactor pressure vessel/.
(2) Sr source is to be used as an internal calibration source for a Jordan Electronics, Inc., Model AGB-10KG-SR instrument/.

DUPLICATED FOR DIV. OF COMPLIANCE

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(Continued on reverse side)

Form AEC-313 (5-58) Page Two

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 *(Use supplemental sheets if necessary)*

8. TYPE OF TRAINING MSGT W. R. GWINN (See Incl 1 for Alternates)	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	Nuclear Power Plant Operators Course and SM-1 (APPR-1) Nuclear Power Plant, Fort Belvoir, Virginia/.	2½ yrs	Yes (circled) No	Yes (circled) No
b. Radioactivity measurement standardization and monitoring techniques and instruments	(Same)	" "	Yes (circled) No	Yes (circled) No
c. Mathematics and calculations basic to the use and measurement of radioactivity	(Same)	" "	Yes (circled) No	Yes (circled) No
d. Biological effects of radiation	(Same)	" "	Yes (circled) No	Yes (circled) No

9. EXPERIENCE WITH RADIATION. *(Actual use of radioisotopes or equivalent experience.)* MSGT W. R. GWINN (See Incl 1 for Alternates)

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Co-60	57 mc	SM-1, Fort Belvoir, Virginia	1½ yrs	Instrument Calibration
Pu-239	100 mc	(Same)	1½ yrs	" "
Po-210	100 mc	(Same)	1½ yrs	" "

10. RADIATION DETECTION INSTRUMENTS. *(Use supplemental sheets if necessary.)*

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm²)	USE (Monitoring, surveying, measuring)
a. Neutron Survey Instr. Nuclear Chicago Model # 2112 N	1	thermal and slow neutrons	0-10,000cpm	BF_3 Tube	monitoring
b. Juno Survey Instr. Technical Associates Model # 7	2	beta-gamma	0-5r/hr	36	monitoring

c. Additional instruments, other than the specifically pertinent ones above, include those identified in Inclosure 2/.

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.
a. (above) Calibrated using a standard Pu-239 source, once a month.
b. (above) Calibrated using a standard U-238 source, once a month.

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. *(For film badges, specify method of calibrating and processing, or name of supplier.)*
Film badges are supplied and processed by the Sacramento Signal Depot, US Army, Sacramento, California on a weekly basis. Self reading dosimeters, gamma and neutron sensitive, will be worn by operating personnel and recharged daily.

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. (Circle answer) Yes (circled) No See Inclosures 3 and 4/.

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.
See Inclosures 5, 6, 7 and 8/.

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. See Paragraph 7., Inclosure 5/.

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

SM-1A Operations
USA Engineer Reactors Group
Applicant named in item 1

Date 23 Nov 1960

By RICHARD L. HARRIS, Capt, CE

Officer-In-Charge, SM-1A Oper
Title of certifying official

RECEIVED JAN 18 1961 U.S.A.E.C. Isotopes Branch Div. of L & R

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.

Form AEC-313
(5-58)

Item 8 (Continued):

TYPE TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON-THE-JOB	FORMAL COURSE
SGT O. A. VOGTSBERGER JR.				
a.	Nuclear Power Plant Operators Course and SM-1 (APPR-1) Nuclear Power Plant, Fort Belvoir, Virginia	1½ yrs	Yes	Yes
b.	(Same)	" "	Yes	Yes
c.	(Same)	" "	Yes	Yes
d.	(Same)	" "	Yes	Yes
CWO S. L. SUNDINE				
a.	University of Virginia; Alco Products, Inc., Schenectady, N.Y.; and SM-1 (APPR-1) Nuclear Power Plant, Fort Belvoir, Virginia	4½ yrs	Yes	Yes
b.	(Same)	" "	Yes	Yes
c.	(Same)	" "	Yes	Yes
d.	(Same)	" "	Yes	Yes

Item 9 (Continued):

SGT O. A. VOGTSBERGER's and CWO S. L. SUNDINE's experience with isotopic radiation is as shown for MSGT W. R. GWINN; the duration of VOGTSBERGER's experience is six (6) months, and the duration of SUNDINE's experience is three (3) years.

(Inclosure 1)

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ADDITIONAL RADIATION DETECTION INSTRUMENTS

NAME	NO.	TYPE	RADIATION	RANGE	APPLICATION
1. Radiac Set An/PDR-39 USA Sig C	2	I.C.	Gamma-x Radiation	0-50,000mr/hr	Monitoring personnel, areas and objects for contamination and are surveys of low to moderate dose intensities.
2. Radiac Set AN/PDR-53 USA Sig C	1	I.C.	Alpha, Beta and Gamma	0-5000mr/hr 0-1.6x10⁷α CPM	Same as 1. above to include alpha monitoring.
3. Radiac Set AN/PDR-27 USA Sig C	2	G.M. Tube	Beta, Gamma-x Radiation	0 to 500mr/hr	Same as 1. above for low dose intensities.
4. Portable Radiation Monitor, Jordan, Model # AGB-10K-SR	2	I.C.	Gamma	0-500r/hr	Same as 1. above to high dose intensities.

(Inclosure 2)

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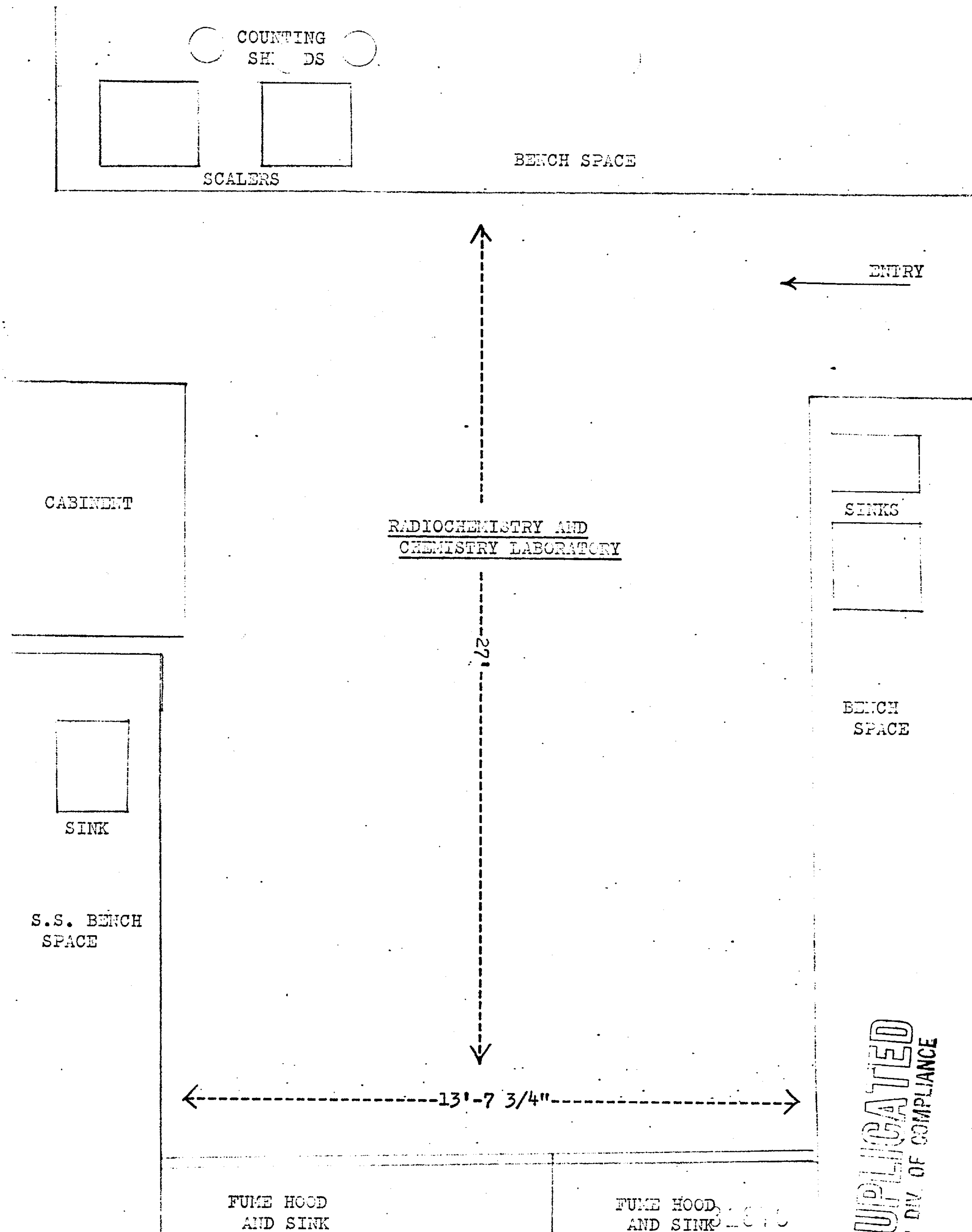
PERTINENT FACILITIES AND EQUIPMENT

1. Po-Be Neutron Source: Laboratory and storage facilities will not normally be required for this source. The source will be taken directly from the shipping cask, a 700# parafin barrel, within the vapor container and transferred to the reactor pressure vessel. A seven foot remote handling tool is available at the site for this operation. Should temporary storage be required, the source will be kept in its shipping cask and placed in the hot waste tank storage area, two rooms, below ground level, designated as permanent radiation area. Equipment for leak testing this source are indicated on Inclosure 7; other facilities are identified below and on Inclosure 4.

2. Sr-90 Source: Laboratory and storage facilities will not normally be required for this source, since the source is mounted within the Jordan instrument. However, if removal becomes necessary, the following facilities and equipment are available, in addition to those identified in Inclosure 8 and on Inclosure 4: Two remote handling tools, one 7 feet in length and one 18 inches in length; storage containers consisting of a 5 inch OD, 1 inch ID, lead container, 4½ inches deep; and a source well storage facility constructed of concrete with 6 inch ID steel lined wells, lead capped and locked. The latter facility has overall dimensions of 18" x 60" x 31" with five wells; it is physically located in the plant demineralizer room which is also designated a permanent radiation area.

(Inclosure 3)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(Inclosure 4)

SM-1A CONTAMINATION CONTROL PLAN

1. GENERAL:

Effective upon the date of SM-1A facilities transfer to the Government, the procedures and instructions relating to contamination control, set forth below, shall be implemented.

2. DEFINITIONS:

a. Radiation Hazard: Any possible condition that might result in exposure of person in excess of the limits established for a "Radiation Area".

b. Radiation Area: Any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 5mr, or in any five consecutive days a dose in excess of 100mr. An area may be designated a Permanent Radiation Area if radiation levels are such that the area would routinely be defined as a Radiation Area.

c. Control Area: The area under the supervisory control of the Plant Superintendent, that is the area within the SM-1A security fence, access to which is controlled by a security guard.

d. Radiological Survey: An analysis and evaluation of the radiation hazards under a specific set of conditions. The evaluation includes a physical survey of the disposition of materials, equipment and personnel within the radiation hazard area; measurement or analytical estimates of the levels of radiation and contamination that are or may be involved; and a prediction of hazards resulting from expected or possible changes in materials, equipment, arrangements or practices, including accidents.

3. ACCESS PROVISIONS:

Prior to entry preparations for access to the Vapor Container or any other Radiation Area, a Personnel Contamination Control Point and a Radiation Work Area shall be established. The Contamination Control Point will be established at the point of entry to the Radiation Work Area; the Radiation Work Area will be established coincident with or adjacent to the Radiation Area, as may be operationally appropriate. In any event the Radiation Area served will be included within a Radiation Work Area.

4. RADIATION WORK AREAS:

a. A Radiation Work Area will be defined by chains or tape, marked with appropriate signs and the floor covered with strong, moisture-resistant paper.

(Inclosure 5)

b. Entry to the Radiation Work Area will be made through a Personnel Contamination Control Point or Points.

c. All work on or with any equipment or materials in or removed from a Radiation Area will be done in the Radiation Work Area, unless:

(1) No spreadable radioactivity is detected, (smear indications on an AN/PDR 27 survey instrument of less than 0.05 mrad/hr scale reading above background or 25 cpm above background using mica-end window countings) and;

(2) No abrasive or welding operation is to be performed on or with the materials or equipment, or;

(3) An Equipment Release Form is attached to the material or equipment and the Radiation Work Permit is completed.

d. Radiation Work Permits will be used for each type of task to be performed on or with the equipment or materials in a Radiation Work Area.

5. PERSONNEL CONTAMINATION CONTROL POINTS:

a. Entry to and exit from Radiation Areas and Radiation Work Areas will be through a Contamination Control Point.

b. Protective clothing and equipment, as indicated on the Radiation Work Permit for work and/or inspection, shall be obtained from plant supply by the individual requiring their use.

c. Each individual will sign in and out of the Radiation Work Area at the Contamination Control Point and on the applicable Radiation Work Permit.

d. No protective clothing worn inside a Radiation Area or Radiation Work Area shall be worn past the Contamination Control Point into a "clean" area (beyond the defining chains or tape). Protective clothing shall be removed without touching the outerside of the garment with the bare hands. Clothing shall be placed in appropriately marked clothing containers. No protective clothing shall be re-used until washed, dryed, surveyed and released by the Senior Plant Process Control Technician.

e. Personnel shall check themselves for beta-gamma contamination, after removing protective clothing, with an AN/PDR 27 survey instrument.

f. Skin contamination upon leaving the Contamination Control Point must be less than 0.1 mrad/hr at 1 inch; contamination in excess of this limit will be removed with hot, soapy water or a potassium paramanganate solution, as indicated, under the supervision of a Process Control Technician.

6. DISPOSAL OF EQUIPMENT AND MATERIALS:

a. All disposable equipment or materials will be placed in the radioactive waste cans located within the Radiation Work Area, if the dose rate measured is less than 20 mrem/hr at 1.5 inches. Material or equipment having dose rate exceeding this limit shall be removed to an interim retention area. No disposable equipment or materials shall be removed to the plant exterior except in, or during planned transfer operations to high and low level waste containers provided by the Chemical Corps. No change will be made in a radioactive waste interim retention area (e.g. the demineralizer room) without the approval of the Non Commissioned Officer-In-Charge or Plant Superintendent.

b. All non-disposable materials and equipment used in a Radiation Work Area shall be checked for contamination prior to removal from the area; the individual using such materials and equipment is responsible for checking and cleaning, as indicated. The following release limits will be observed for these items:

(1) Refer to subparagraph 4.c. (1) above.

(2) Contact dose rate shall be less than 0.1 mrad/hr scale reading using an AN/PDR 27 survey instrument.

Equipment or materials exceeding the above limits will be decontaminated of spreadable activity and removed to the demineralizer room or other designated interim retention area. Such equipment will not be re-used until released by the Senior Plant Process Control Technician.

7. DISPOSAL OF RADIOACTIVE WASTE:

a. Solid Waste:

(1) Under the provisions of AR 755-380, staff supervision of the disposition of this waste is the responsibility of the Chief Chemical Officer, US Army. This supervision is exercised within USARAL by the Chemical Officer, USARAL; removal, transport and disposition of solid waste will be effected by the Chemical Officer, USARAL.

(2) Interim Waste Retention at SM-1A:

(a) A Radiation Area, external to the SM-1A and within the Control Area, will be established for interim retention of solid waste, pending disposition by the Chemical Officer, USARAL. This area will be used only for filled waste containers, (see subparagraph 6.a. above).

(b) Solid waste, high and low level, will be accumulated in disposable containers provided the SM-1A by the Chemical Officer, USARAL; the OIC, SM-1A, is responsible for waste accumulation, transfer of waste materials to the disposable containers, radiological survey and security of the waste during interim retention, and the provision of concrete caps for the filled disposable containers.

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(c) The OIC, SM-1A will make immediate arrangements for the shipment of filled, disposable containers in order to prevent undue accumulation of solid waste at SM-1A; the period of interim retention is not to be considered a "cooling off period", but rather a convenience to permit planned materials transfer and accumulation prior to movement and disposition by the Chemical Officer, USARAL.

(d) The Chemical Officer, USARAL will assume responsibility for the waste and containers at the SM-1A and at the time of pick-up for disposition.

(e) The OIC, SM-1A will make available to representatives of the Chemical Officer, USARAL, at the time of waste transfer referred to above, assistance to include: radiological survey of materials and personnel, radiological and administrative data pertinent to the shipment, and labor.

(f) A record of each shipment of waste will be maintained to show: shipment date and destination, description of materials (waste) shipped, description of container, estimate of total activity, external dose measurements, mode of shipment, and individual authorizing the release of the waste for shipment. A cumulative record of waste disposal shipments will be maintained.

b. **Liquid Waste:**

(1) Liquid waste will be accumulated at SM-1A in three (3) hot waste tanks of a total capacity of 20,000 gallons and two (2) laboratory waste tanks of a total capacity of 250 gallons. The radioactive liquid waste generated within the plant will be stored in the available tankage during the months of the year when Jarvis Creek is not flowing.

(2) The undiluted waste will be pumped through a closed, pressurized pipe to a dilution facility located near or in the stream bed of Jarvis Creek. The dilution facility will include pumps, mixers and a means of metering and monitoring the discharge.

(3) Water from Jarvis Creek will be used to dilute the liquid waste. Capacity of the system will permit a dilution ratio of 1 to 2000 initially and will be capable of expansion at a later date to allow a 1 to 10,000 dilution ratio.

(4) The pumping and dilution of the radioactive liquid waste will be accomplished only when the flow of water in Jarvis Creek is sufficient to permit dilution and disposal of liquid waste in Jarvis Creek at the maximum permissable concentration of radioactivity (10^{-7} microcuries per cc). Throughout the period of discharge the effluent will be continually monitored and sampled. No discharge will be effected without prior notification to and approval of the Commanding Officer, Fort Greely, or his designee. No waste will be discharged by plant personnel without written order of the Plant Superintendent or OIC, SM-1A.

(5) A record of each discharge event will be maintained to show: discharge date and time (interval, if appropriate), volume of waste discharged, specific and total activity of waste, and rate of disposition. A cumulative record of discharge events will be maintained.

LEAK TESTING AND SERVICING

Leak Test procedures are included on Inclosures 7 and 8. Leak tests will be performed by the Principle designated in paragraph 4 of the Application.

Upon receipt of the sources, preliminary and continuing periodic area surveys will be performed in the areas of use or storage. The sources will be monitored with the instruments identified in paragraph 10 of the Application within the shipping container or Jordan instrument initially, and periodically thereafter, and continuously during any period of removal from these containers. The Po-Be source will not be monitored subsequent to its placement in the reactor pressure vessel until removal.

Any servicing, maintenance or repair required for these sources will be referred to the supplier or other facility properly licensed to handle this byproduct material.

(Inclosure 6)

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Polonium - Beryllium Neutron Source Leak Test

Purpose — Leak testing shall be performed periodically to insure that no leakage exists from the handling, storage and use of sealed radioactive sources.

Procedure — Leak testing shall be performed under the provisions of a radiation work permit and precautions taken to minimize personnel exposure during such testing. Each source to be tested will be wiped or "smeared" on a 2" diameter laboratory grade filter paper, using long-handled tongs or other adequate means for radiation protection. The filter paper will then be counted in a laboratory counter using a GM tube operating in the alpha proportional voltage region. The counter will be previously checked against a uranium alpha source to insure proper operation. If the result is positive the source will be considered as leaking. Sources that leak or are suspected of leaking will be immediately placed in a sealed container and either sent for repair or disposed of as radioactive waste

Instruments — 1 each — Radiation Instrument Development Laboratory (RIDL) Decade Scaler, Model NO. 49-51

1 each — Counting Shield, including mount for mica window counter, sample trays and lucite mount Model No. 60-10 as manufactured by RIDL

1 each — Mica Window Geiger Tube, Model No. TGC-2 by Tracerlab having a window thickness of 1.4 - 1.9 mg/cm^2 operating in the proportional voltage region and having approximately a 20% efficiency for alpha's.

Frequency of the Test — A leak test shall be performed upon the receipt of all new sources at the site and at 3 months intervals thereafter, except when the sources are installed in inaccessible locations such as in the reactor pressure vessel.

Sensitivity — Assuming that a level of radiation equivalent to background where background is conservatively selected as 2 cpm, the lower level of detection with a counter of 20% efficiency would be equal to 4.5×10^{-6} uc which is significantly more sensitive than is required. If the activity is greater than 500 d/m the source will be considered as leaking and removed from use.

Records — A permanent record shall be maintained which contains the date of performance and results of all source leak tests.

(Inclosure 7)

Strontium - 90 Source Leak Test

Purpose

Leak testing shall be performed periodically to insure that no leakage exists from the handling, storage and use of sealed radioactive sources.

Procedure

Leak testing shall be performed under the provisions of a radiation work permit and precautions shall be taken to minimize personnel exposure during such testing. A smear using a 2 " diameter laboratory grade filter paper will be made on an accessible surface of the source container and counted using a Geiger-Mueller beta sensitive detector. Positive results will be regarded as indicative of a leak and the instrument will be returned to the manufacturer for repair or replacement.

Instruments

1 each — Radiation Instrument Development Laboratory (RIDL) Decade Scaler, Model No. 49-51

1 each — Counting Shield including mount for mica window counter, sample trays and lucite mount Model No. 60-10 as manufactured by RIDL.

1 each — Mica Window Geiger Tube, Model No. TGC-2 by Tracerlab, having a window thickness of 1.4 - 1.9 mg/cm^2.

Frequency of the Test

A leak test shall be performed upon the receipt of the Jordan instrument at the site and at 3 month intervals thereafter.

Sensitivity

Assuming that a level of radiation equivalent to background on the scaler which is selected as 20 cpm, the lower level of detection of a counter of approximately 10% efficiency would be equal to 9.0×10^{-5} uc which is significantly more than is required.

Records

A permanent record shall be maintained which contains the date of performance and results of all source leak tests.

(Inclosure 8)

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Strontium - 90 Source Leak Test

Purpose

Leak testing shall be performed periodically to insure that no leakage exists from the handling, storage and use of sealed radioactive sources.

Procedure

Leak testing shall be performed under the provisions of a radiation work permit and precautions shall be taken to minimize personnel exposure during such testing. A smear using a 2 " diameter laboratory grade filter paper will be made on an accessible surface of the source container and counted using a Geiger-Mueller beta sensitive detector. Positive results will be regarded as indicative of a leak and the instrument will be returned to the manufacturer for repair or replacement.

Instruments

1 each — Radiation Instrument Development Laboratory (RIDL) Decade Scaler, Model No. 49-51

1 each — Counting Shield including mount for mica window counter, sample trays and lucite mount Model No. 60-10 as manufactured by RIDL.

1 each — Mica Window Geiger Tube, Model No. TGC-2 by Tracerlab, having a window thickness of 1.4 - 1.9 mg/cm^2.

Frequency of the Test

A leak test shall be performed upon the receipt of the Jordan instrument at the site and at 3 month intervals thereafter.

Sensitivity

Assuming that a level of radiation equivalent to background on the scaler which is selected as 20 cpm, the lower level of detection of a counter of approximately 10% efficiency would be equal to 9.0×10^{-5} uc which is significantly more than is required.

Records

A permanent record shall be maintained which contains the date of performance and results of all source leak tests.

(Inclosure 8)