FORM AEC-2
(3-64)

FORM APPROVED
BUREAU OF BUDGET NO. 38-R0002

UNITED STATES ATOMIC ENERGY COMMISSION

APPLICATION FOR SOURCE MATERIAL LICENSE

Pursuant to the regulations in Title 10, Code of Federal Regulations, Chapter 1, Part 40, application is hereby made for a license to receive, possess, use, transfer, deliver or import into the United States, source material for the activity or activities described.

1. (Check one)
- ☐ (a) New license
- ☐ (b) Amendment to License No. _____
- ☒ (c) Renewal of License No. SUB-986
- ☐ (d) Previous License No. _____

2. NAME OF APPLICANT
KERR-McGEE CORPORATION

3. PRINCIPAL BUSINESS ADDRESS
McGee Tower
Okla. City, Okla. 73125

4. STATE THE ADDRESS(ES) AT WHICH SOURCE MATERIAL WILL BE POSSESSED OR USED
Technical Center, Kerr-McGee Corp., 3301 N.W. 150th St., Okla. City, OK
Physical Science & Measurement Dept., KM Center, Okla. City, OK 73125

5. BUSINESS OR OCCUPATION
Prod. of Nuclear Fuel Mat'ls.

6. (a) IF APPLICANT IS AN INDIVIDUAL, STATE CITIZENSHIP
N/A

(b) AGE
N/A

7. DESCRIBE PURPOSE FOR WHICH SOURCE MATERIAL WILL BE USED
Thorium materials used in solvent extraction process for the separation and purification of thorium.
Uranium material - provide radiation sources of known composition for experimental work, design and calibration of new instruments and related investigations.

8. STATE THE TYPE OR TYPES, CHEMICAL FORM OR FORMS, AND QUANTITIES OF SOURCE MATERIAL YOU PROPOSE TO RECEIVE, POSSESS, USE, OR TRANSFER UNDER THE LICENSE

(a) TYPE	(b) CHEMICAL FORM	(c) PHYSICAL FORM (*Including % U or Th.*)	(d) MAXIMUM AMOUNT AT ANY ONE TIME (*in pounds*)
NATURAL URANIUM	U_3O_8	Ore (0.1-0.4% U) Yellowcake (85-90%U)	500 pounds
URANIUM DEPLETED IN THE U-235 ISOTOPE			
THORIUM (ISOTOPE)	Natural Thorium ThO_2, $ThCl_4$, $Th(NO_3)_4$	Wet cakes and Solutions 10% Thorium	300 pounds

(e) MAXIMUM TOTAL QUANTITY OF SOURCE MATERIAL YOU WILL HAVE ON HAND AT ANY TIME (*in pounds*)
800 pounds (Uranium plus Thorium)

9. DESCRIBE THE CHEMICAL, PHYSICAL, METALLURGICAL, OR NUCLEAR PROCESS OR PROCESSES IN WHICH THE SOURCE MATERIAL WILL BE USED, INDICATING THE MAXIMUM AMOUNT OF SOURCE MATERIAL INVOLVED IN EACH PROCESS AT ANY ONE TIME, AND PROVIDING A THOROUGH EVALUATION OF THE POTENTIAL RADIATION HAZARDS ASSOCIATED WITH EACH STEP OF THOSE PROCESSES.
Thorium - Extracted with organic solvent from impure solutions; Solvent stripped with water, purify thorium by precipitation. Maximum of 30 lbs. with negligible radiation hazard.
Uranium - diluted with portions of natural sand and used in the calibration & standardization of instruments; research on radiation measurements.

10. DESCRIBE THE MINIMUM TECHNICAL QUALIFICATIONS INCLUDING TRAINING AND EXPERIENCE THAT WILL BE REQUIRED OF APPLICANT'S SUPERVISORY PERSONNEL INCLUDING PERSON RESPONSIBLE FOR RADIATION SAFETY PROGRAM (OR OF APPLICANT IF APPLICANT IS AN INDIVIDUAL).
Responsible Personnel - at least 10 yrs. experience in the handling and processing of radioactive materials. At least 5 yrs. directly associated with radiological health. W. J. Robertson - 14 yrs. experience; H. C. Eberline - 24 yrs. experience. Addendum paragraph 10, page 1

11. DESCRIBE THE EQUIPMENT AND FACILITIES WHICH WILL BE USED TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE OR PROPERTY AND RELATE THE USE OF THE EQUIPMENT AND FACILITIES TO THE OPERATIONS LISTED IN ITEM 9. INCLUDE: (a) RADIATION DETECTION AND RELATED INSTRUMENTS (including film badges, dosimeters, counters, air sampling, and other survey equipment as appropriate. The description of radiation detection instruments should include the instrument characteristics such as type of radiation detected, window thickness, and the range(s) of each instrument).
Addendum paragraph 11(a), Page 1
Addendum paragraph 11(a), Page 3

(b) METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED IN (a) ABOVE, INCLUDING AIR SAMPLING EQUIPMENT (for film badges, specify method of calibrating and processing, or name supplier).
Addendum paragraph 11(b), page 1
Addendum paragraph 11(b), page 3

ADDENDUM TO APPLICATION FOR RENEWAL
OF
SOURCE MATERIAL LICENSE (URANIUM)
SUB-986
KERR-McGEE CORPORATION
Oklahoma City, Oklahoma

10. Personnel responsible for supervision of use of source material and for radiation safety will have had at least 10 years of responsible experience in the handling and processing of radioactive materials and at least 5 years directly associated with radiological health and safety programs.

For the foreseeable future, both overall supervision and safety will be the responsibility of Howard C. Eberline who has had 24 years of experience in the nuclear field, including design, production and operation of radiation measurement instruments and systems, and supervision of health safety programs for the AEC.

11. (a) Approximately 50% of the source material will be buried in sealed test pits located out-of-doors on a 160-acre fenced site and some 250 yards from normal working areas. The containers will be fabricated of 12-gauge galvanized steel, 6 feet in diameter x 12 feet long with welded bottoms. The source material will be about 3 feet below grade and will be covered by 3 feet of sand and 4 inches of concrete. Access to the material will be through a center fiber glass tube which will be protected by a locked steel cover when not in use.

That portion of source material not placed in test pits will be kept in locked cabinets or rooms adequately marked with approved radiation warning signs. Air samples will be taken every 30 days or oftener if conditions require.

In addition to various scintillation and Geiger-type instruments with which we will be working, periodic radiation checks will be made using the following or equal:

1. Personnel film badges.
2. Alpha Counter (Eberline Instrument Co., Model PAC-3G).
3. Air sampling equipment (Eberline Instrument Co.).
4. Geiger Counter, range 0-20mr (Eberline Instrument Co., Model E-112).

(b) Radiation instruments will be calibrated using small radium or standard isotopic sources for which AEC license is not required. Calibration will be done routinely every 30 days or oftener if conditions require. Personnel film badges are supplied by Landauer on a monthly basis.

(c) Test pits will be out-of-doors with no special ventilation needed. The residual source material will be kept in closed containers so that no dust will be released.

12. (a) The location and storage conditions for the source material are such that the chances of nonnuclear accidents are extremely remote. For that portion kept indoors, normal fire protection is afforded by the fact that (1) the building is rated fireproof and (2) fire extinguishers are readily accessible. Access will be restricted to personnel who are competent to handle such material.

11. (a) The bulk of the thorium used in these studies will be in solution. Solutions and thorium cakes will be stored in covered containers well marked with approved warning signs.

Radiation monitoring will be accomplished by the following means:

1. Personnel film badges
2. Alpha Counter, range 0-100,000 dpm (Eberline Instrument Company, Model PAC-3G)
3. Geiger Counter, range 0-50 mr (Eberline Instrument Company, Model E-120)

(b) Radiation instruments will be calibrated quarterly using standard isotopic sources. Personnel film badges are supplied by Landauer on a monthly basis.

(c) Materials will be received as pure thorium compounds or wet cakes, and actual work will be done with solutions. No dusty operations are envisioned. Ordinary chemical laboratory hoods (face velocity 70-80 fpm) are available for solution preparation.

12. (a) The severity of a possible accident is minimized by the limited size scale of the proposed operations. Although flammable solvents will be used, the quanity on hand at any time is restricted so as not to constitute undue hazard. The building and storage areas are rated as fireproof construction. Normal safety procedures applicable to a good chemical laboratory are adhered to.

(b) In case of accident involving source material, the affected area will be evacuated until adequate clean-up and decontamination procedures are carried out. A physician who has specialized in nuclear medicine is a consultant for the corporation. He has established a working arrangement with the University of Oklahoma Medical Center staff for assistance in case of emergency.

(c) The radiation survey program comprises:

1. Personnel film badges (plus control badges).

2. Routine survey on a monthly basis of the areas where source materials are stored or used. This includes use of a beta-gamma instrument and an alpha survey instrument.
3. Any additional monitoring for which a need develops as the material is used.

Note: Paragraph 12(b) and (c) are applicable to uranium and/or thorium source material.

13. (a) Small amounts of raffinate solution from thorium extraction containing Ra-228 and Ac-228, will be generated. Analytical residues containing small quantities of natural thorium will also be generated.

(b) These solutions will be disposed of within the limits of 10 CFR 20.