40-6767

STAUFFER CHEMICAL COMPANY

STAUFFER METALS DIVISION

1201 SOUTH 47TH STREET

RICHMOND 4, CALIFORNIA

TELEPHONE
LANDSCAPE 4-7227

March 22, 1962

Director, Division of Licensing and Regulation
United States Atomic Energy Commission
Washington 25, D. C.

Gentlemen:

One of the primary activities of the Stauffer Metals Division is the melting of very high purity metals and alloys by the electron-beam process. We performed this service for the National Lead Co. of Ohio about one year ago, in which case uranium metal was melted. It is recognized at this time that our facilities lend themselves to the melting of uranium and its alloys by both arc-melting and electron-beam melting and that we could perform this service for others under a Source Materials License.

It is thus our intention in making application for this license to be in a position to solicit and bid on jobs of this kind. The accounting for metals received for each specific melting job will be accomplished in the same manner as that employed by the Division in accounting for refractory metals with a record of all operations involving unaccountable losses.

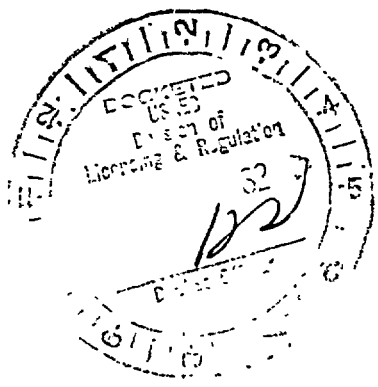
We shall be happy to discuss any aspects of our proposed operations with you and to answer any questions you may have.

Very truly yours,

John M. Fitzpatrick

JOHN M. FITZPATRICK
Chief, Technical Services

JMF/nb
Enclosures



A1

FORM AEC-2
(2-61)
Previous editions are obsolete.

40-6767

FORM APPROVED
BUREAU OF BUDGET NO. 38-R002 8.

UNITED STATES ATOMIC ENERGY COMMISSION

APPLICATION FOR SOURCE MATERIAL LICENSE

Lab File Copy

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. _____
- ☐ (d) Previous License No. _____

2. NAME OF APPLICANT
Stauffer Chemical Co.
Metals Division

3. PRINCIPAL BUSINESS ADDRESS
1201 S. 47th St.
Richmond, California

4. STATE THE ADDRESS(ES) AT WHICH SOURCE MATERIAL WILL BE POSSESSED OR USED
Same as 3.

5 BUSINESS OR OCCUPATION
Metals Fabricator

6 (a) IF APPLICANT IS AN INDIVIDUAL, STATE CITIZENSHIP
Not Applicable

(b) AGE
Not Applicable

7. DESCRIBE PURPOSE FOR WHICH SOURCE MATERIAL WILL BE USED
Material will be election-beam and/or arc-melted into ingots, in various diameters from 1½" to 12" and in lengths from 4" to 60".

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*)
NORMAL URANIUM	Metal	Solids & turnings	5000 lb
URANIUM DEPLETED IN THE U-235 ISOTOPE	Metal	Solids & turnings	5000 lb
THORIUM			

(e) MAXIMUM TOTAL QUANTITY OF SOURCE MATERIAL YOU WILL HAVE ON HAND AT ANY TIME (*in pounds*)
5000 lb.

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 HAZARDS ASSOCIATED WITH EACH STEP OF THOSE OPERATIONS.

See attached supplemental sheets.

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).

See attached supplemental sheets.

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-monitoring and other survey equipment as appropriate. The description of radiation detection instruments should include the type of radiation detected and the range(s) of each instrument.)

See attached supplemental sheet.

(b) METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED IN (a) ABOVE (for film badges, specify method of calibrating and processing, or name supplier.)

See attached supplemental sheet.

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11(c). VENTILATION EQUIPMENT WHICH WILL BE USED IN OPERATIONS WHICH PRODUCE DUST, FUMES, MISTS, GASES, ETC.

Ventilation equipment is discussed in Item 9 on attached supplemental sheets.

12 DESCRIBE PROPOSED PROCEDURES TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE AND PROPERTY AND RELATE THESE PROCEDURES TO THE OPERATIONS LISTED IN ITEM 9; INCLUDE:
(a) PROCEDURES FOR USE OF NUCLEAR MATERIALS AND SAFETY FEATURES AND PROCEDURES TO AVOID NONNUCLEAR ACCIDENTS, SUCH AS FIRE, EXPLOSION, ETC., IN SOURCE MATERIAL STORAGE AND PROCESSING AREAS.

Proposed procedures to protect health and minimize danger to life and property are described in Item 9 on attached supplemental sheets.

(b) EMERGENCY PROCEDURES IN THE EVENT OF ACCIDENTS WHICH MIGHT INVOLVE SOURCE MATERIAL.

See attached supplemental sheet.

(c) DETAILED DESCRIPTION OF RADIATION SURVEY PROGRAM AND PROCEDURES.

See attached supplemental sheets.

13. WASTE PRODUCTS: *If none will be generated, state "None" opposite (a), below. If waste products will be generated, check here* ☒ *and explain on a supplemental sheet:* Discussed in Item 9 on attached supplemental sheet.
(a) Quantity and type of radioactive waste that will be generated.
(b) Detailed procedures for waste disposal.

14. IF PRODUCTS FOR DISTRIBUTION TO THE GENERAL PUBLIC UNDER AN EXEMPTION CONTAINED IN 10 CFR 40 ARE TO BE MANUFACTURED, USE A SUPPLEMENTAL SHEET TO FURNISH A DETAILED DESCRIPTION OF THE PRODUCT, INCLUDING:
(a) PERCENT SOURCE MATERIAL IN THE PRODUCT AND ITS LOCATION IN THE PRODUCT.
(b) PHYSICAL DESCRIPTION OF THE PRODUCT INCLUDING CHARACTERISTICS, IF ANY, THAT WILL PREVENT INHALATION OR INGESTION OF SOURCE MATERIAL THAT MIGHT BE SEPARATED FROM THE PRODUCT.
(c) BETA AND BETA PLUS GAMMA RADIATION LEVELS (*Specify instrument used, date of calibration and calibration technique used*) AT THE SURFACE OF THE PRODUCT AND AT 12 INCHES.
(d) METHOD OF ASSURING THAT SOURCE MATERIAL CANNOT BE DISASSOCIATED FROM THE MANUFACTURED PRODUCT.

CERTIFICATE

(This item must be completed by applicant)

15 *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 40, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.*

Stauffer Chemical Co.
Metals Division
(Applicant named in Item 2)

Dated March 22, 1962

BY: John M. Fitzpatrick

Chief, Technical Services
(Title of certifying official authorized to act on behalf of the applicant)

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.

U S GOVERNMENT PRINTING OFFICE 16—76548-1

Stauffer Chemical Co.
Metals Division
1201 S. 47th St.
Richmond, California

ITEM No. 9

The principal uses of the above named source materials will be in the preparation and consolidation of both unalloyed ingots and ingots composed of the source materials and non-radioactive materials such as molybdenum, silicon, iron, zirconium, chromium, columbium, and vanadium.

Metal will be melted by electron beam techniques, by consumable-electrode, vacuum-arc techniques or by combinations of these.

Starting material will be in such forms only as are readily consolidated into feed for the electron-beam furnace or into consumable electrodes for the arc furnace. This implies that materials must be in regularly shaped pieces that can be welded together or mechanically fastened together. Chips, metal turnings, and powders will not be used as feed materials to the furnaces nor will pressings of such materials be used.

Bars for side feeding the electron-beam furnace can be prepared by welding massive pieces of metal together when any one piece weighs as little as 1/10 lb (or approximately the geometry of a 1/2 inch cube of uranium). Typical of a contemplated operation would be the consolidation of bars roughly 1 inch square by 12 inches long by welding in a dry box. Such bars would be side fed into the electron-beam furnace and melted into a cylinder. This cylinder may then become the consumable electrode in a subsequent arc-melt. In preparing the cylinder for arc melting or preparing it for shipment, sawing the ends, surface conditioning by machining and drilling and tapping of holes are contemplated operations.

Operations requiring cognizance of potential hazards are as follows:

A) Storage of Material

1) Hazards in storage are from fire (in the case of chips, sawdust, and turnings) and from ingestion or inhalation of oxides resulting from the handling of oxidized metal or from breathing fumes resulting from rapid oxidation as in the event of fire. No criticality hazard exists.

2) Measures of precaution to be taken include the following specific measures which are in addition to general rules and regulations described below under Items 10, 11, and 12.

a) Minimum quantities will be stored requisite to accomplishing each specific job. In no case will an amount exceeding 5000 pounds of either of the designated source materials be stored in any form or be in process at any one time.

b) Storage of massive pieces, each of which is under 25 pounds in weight, will be stored in metal drums with securely fastened lids, clearly marked as to contents. Storage of solid cylinders in excess of 25 pounds will be stored on a concrete floor or on metal racks and the pieces contained in plastic bags.

c) Machine turnings and saw chips will be stored under oil in steel drums of 5 gal. to 30 gal. capacity. These drums will be provided with loose fitting covers to provide for the release of gas which may result from oxidation of the chips and resultant breakdown of the oil. Not more than five containers will be stored at any one time and storage of any one container will be for a period not to exceed 21 days.

d) Storage of all source material will be in a segregated area, visible but accessible only through a locked gate.

e) During the course of any particular job, disposal of saw chips and turnings will be performed by a local licensed radioactive waste disposal company. This service will be on a regular basis with intervals not exceeding 3 weeks.

B) Machining and Sawing

1) A restricted or controlled area will be established for the sawing and machining of uranium metals and alloys. This area will be defined by ropes and suitable radiation hazard signs will be posted. No criticality hazard exists. The principal hazard in this operation is fire and resultant inhalation of uranium oxide fumes.

2) The following specific measures will be taken:

a) Metal-X powder fire extinguishers, two pound hand shaker type, will be available at the lathes and saws and the operators will be instructed in their use. A 30 pound metal-X nitrogen propelled type fire extinguisher will be available as a back-up to the hand type, and at the same station with the 30 pound extinguisher there will be two full face respirators for use by the operators in case of more extensive fire.

b) Upon the completion of an operation in which uranium bearing material is cut or turned and before the equipment is released for use for normal operation a thorough decontamination will be accomplished. This will include completely cleaning the lathe bed, disposing of the coolant and chips, and wiping down of all metal parts. Smear tests will then be taken to assure complete decontaminatinn. A similar procedure will be followed with the metal saw. All chips, cleaning solvents, wiping papers and rags will be put in metal drums and disposed of through the contracted services of a licensed disposal company.

c) Ventilation of saw and lathe will be accomplished through the use of a commercial vacuum cleaner with a water-tub attachment. A sucker hose with a metal chip filter will be used to assure that fines and dust do not become air-borne. Any fines that are taken into the vacuum hose will be precipitated in the water-tub.

d) In addition to ventilation, and primarily for the prevention of fire, all metal cutting will be done using a water-soluble oil coolant flow on the work piece.

C) Removal of Castings from Molds.

The only hazard involved in this operation is from inhalation of air-borne particulate dust. Since the melting operations are performed under high vacuum and the metal is allowed to cool to room temperature prior to removal from the furnace, it is expected that air-borne radioactive material will be substantially below the maximum permissible limit. Here again, no criticality hazard exists. In the case of the unloading of ingots from the arc furnace molds, this will be performed on a concrete floor area adjacent to the ~~furnace. Personnel~~ doing the work will wear respirators while unloading and until the ingot and the surrounding floor area have been vacuum cleaned. This operation will be monitored using an air sampler during the first several unloadings to determine the necessity for respirators or the period of time their use is required. This operation will take place in the restricted or controlled area.

In unloading the electron-beam furnace, the same general procedure will be followed except that in this case, the furnace is located in a special isolated facility which constitutes a second restricted or controlled area.

D) Melting

1) The potential hazard in melting is in a "burn through" of a crucible in arc-melting thus allowing cooling water to come in contact with molten uranium. Such an event could cause a rapid build-up of pressure (water vapor) and hydrogen to the point that the furnace could rupture in an explosive manner. This, of course, would lead to the secondary hazard of spreading uranium oxide into the working area. This type of hazard does not exist in the electron-beam furnace operation to the same extent since any slight rise in pressure resulting from water leakage into the system causes the electron-beam circuit to short-out thus preventing further operations. Even a severe water leak resulting in oxidation would not cause explosive pressures to build up since the system is under dynamic vacuum and is very large in relation to the volume of molten metal.

2) Specific measures will be employed as follows:

a) In the case of arc-melting, the valve systems will be interlocked to provide either for blow-out or pump-out to occur when a positive pressure of 0.1 mm Hg is reached during melting.

b) The effluent gases will be discharged to the outside atmosphere and will not constitute a hazard in an unrestricted area. Particles will be trapped either in a filter attached to the blow-out port or in the vacuum pump oils.

Stauffer Chemical Co.
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ITEM No. 1

The supervisory personnel who will be responsible for the radiation safety programs will be Dr. Jack K. Y. Hum and Mr. John M. Fitzpatrick. The backgrounds of these individuals are outlined on the following pages.

A) A radiation safety program will be explained to each employee prior to working with radioactive materials and the hazards involved in each operation to be performed by the employee will be discussed.

B) The use of fire fighting equipment and respirators will be demonstrated.

C) Prior to start-up of any job, the services of a qualified consultant will be procured to check out proposed procedures.

JACK K. Y. HUM

HEAD, RESEARCH AND DEVELOPMENT DEPARTMENT

EXPERIENCE

Stauffer Metals Division, 1 year, Head, Research and Development Department.
U.C. Lawrence Radiation Laboratory, 7 years, Group Leader, Metallurgical Research.
Oak Ridge Laboratories, 4 months, Metallurgist.
Bechtel Corporation, 1 year, Nuclear Engineer.
University of California, Berkeley, 2 years, Research Metallurgist and Lecturer.
Chemical Warfare Service Development Laboratory, 5 years, 1st Lieutenant.

As Chief Metallurgist and Head of the Research and Development Department, Dr. Hum directs all metallurgical research and development programs and has overall responsibility for the operational functions of the department. His research at Stauffer Metals Division has resulted in numerous patents pending on refractory metals and alloys. His past efforts include extensive experience with all refractory metals and several of the more exotic metals of interest in the AEC weapons program at the Radiation Laboratory. He was in charge of an ONR research project on temper brittleness of alloy steels and has conducted extensive research on materials of chemical warfare, particularly the synthesis of various organic chemicals dealing with flame throwers, mildew preventatives, war gases, gas detectors and various incendiary fuels.

EDUCATION

Massachusetts Institute of Technology	D. Sc. Metallurgy	1951
Massachusetts Institute of Technology	Doctoral Study, Chemical Engineering (War interrupted final completion of Ph.D. thesis)	
Massachusetts Institute of Technology	B.S. Electro-Chemical Engineering	1938.

PUBLICATIONS

"The Mechanical Properties of Some Ductile Niobium and Tantalum Base Alloys Prepared by Electron Beam Melting," J. of Less-Common Metals, Vol. 2, No. 2-4, April/August 1960 (with H. R. Smith, Jr., A. Donlevy and C. d'A. Hunt).

PUBLICATIONS (Dr. J.KY Hum)

"Some Stress Rupture Properties of Columbium, Molybdenum, Tantalum and Tungsten Metals and Alloys between 2400-5000°F.," presented to SAE National Aeronautic Meeting, New York, 1961 (with Al Donlevy).

JOHN M. FITZPATRICK

PRINCIPAL METALLURGIST

EXPERIENCE

Stauffer Metals Division, 1961, Principal Metallurgist
Nuclear Metals, Inc., 11 years, Assistant Manager, New Developments Division.
Massachusetts Institute of Technology, 2 years, Research Associate and Graduate Student
Wright Aeronautical Corporation, 2 years, Research Metallurgist

As Principal Metallurgist, Mr. Fitzpatrick is primarily concerned with project management, the initiation of new projects and technical liaison. He has particular experience in the metallurgy and fabrication of the materials used in the atomic energy industry. Prior to joining Stauffer Metals Division, Mr. Fitzpatrick was engaged in the development of reactor fuel-element fabrication techniques. Over a period of ten years, he has made several significant contributions to the development of methods for fabricating zirconium-and aluminum-clad uranium and uranium alloys.

EDUCATION

Massachusetts Institute of Technology	M.S. Metallurgy	1948
Montana School of Mines	B.S. Metallurgical Engineering	1942

PUBLICATIONS

"Manufacture of CP-5 Fuel Elements," Atomic Industrial Forum Course on Materials, Stanford University, July 1957.
"Manufacture of Fuel Elements (Extrusion)," Atomic Industrial Forum Course on Reactor Materials, New York University, November 1956.
"Grain Refinement of Cast Uranium" TID-7526, Part 3, Proceedings of the Metallurgy and Materials Information Meeting, Iowa State College, May 1956.
"Extrusion of Aluminum-Uranium Alloy," TID-5185, Part 2, Proceedings of the Metallurgy Information Meetings, Argonne National Laboratory, April 1954.
"Metallurgical Studies of Graphite-Melted Zirconium-Tin Alloys," TID-5151 Proceedings of Metallurgy Information Meeting, Brookhaven National Laboratory, April 1953.
"Zirconium-Oxygen and Zirconium-Hydrogen Alloys," TID-5061, Proceedings of the Metallurgy Information Meeting, Oak Ridge, April 1951.

MEMBERSHIPS

American Institute of Mining, Metallurgical and Petroleum Engineers
American Society for Metals

Stauffer Chemical Co.
Metals Division
1201 S. 47th St.
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ITEM NO. 11 (a)

In addition to the specific measures outlined in Item 9, above, the following equipment and procedures will be employed:

A) Protective clothing.

1) Laboratory coats or coveralls as required. These will be laundered by an approved, licensed facility.

2) Shoe covers will be used where uranium may be in contact with the floor.

B) Film badges will be worn by personnel when in the restricted or controlled area. Badges will be changed once each month and at the end of each job.

ITEM NO. 11 (b)

Suitable radiation detection equipment, including G. M. Counter, alpha meter and air monitoring equipment with a volometer will be available and procedures established for each job.

A) Smear and swipe samples will be taken at least twice per week and otherwise as the nature of the work indicates.

B) Instruments will be calibrated prior to start-up of each job by a qualified instrument-service firm. Calibration will be made at least every six months during any job.

(For Item No. 11 (c) see Form AEC-2)

Stauffer Chemical Co.
Metals Division
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ITEM No. 12 (b) and ITEM No. 12 (c)
(For Item No. 12 (a) see Form AEC-2)

ITEM NO. 12 (b)

Emergency Procedures in the Event of Accidents Which Might Involve Source Materials.

A) The person designated as responsible for health and safety shall be notified immediately when an emergency occurs in a controlled area.

1) In cases of personal injury or suspected ingestion or inhalation of radioactive material, the medical consultant will be notified and all pertinent data concerning the accident will be recorded and sent to the medical consultant.

2) Cuts or scratches that are suspected of being contaminated with radioactive materials shall be flushed thoroughly with water as a first aid treatment and further treated as directed by the medical consultant.

B) Emergencies of fire or explosion involving source material will be handled in order of severity.

1) Remove injured from hazard area.

2) Evacuate all other personnel from hazard area (except firefighters wearing respirators).

3) Extinguish fire using prescribed methods and equipment.

4) Isolation of room or area if possible.

5) Perform survey to determine level of air-borne contamination.

6) Take swipe samples on equipment suspected of being contaminated and analyze samples.

7) Decontaminate area in normal manner, i.e. by vacuum cleaning and wiping down equipment and disposing of waste in prescribed manner.

8) Perform bioassay urine studies of all persons suspected of having been exposed.

ITEM NO. 12 (c)

Detailed Description of Radiation Survey Program and Procedure.

A) Air Monitoring

1) Monitoring will be performed daily in areas where there is a probability of air-borne radioactivity.

2) Weekly monitoring will be conducted in all areas where radioactive materials are handled or processed.

3) Additional monitoring will be performed as may be deemed necessary to safeguard personnel.

4) Exhaust systems will be sampled weekly to insure that air-borne radioactive contamination is within the accepted tolerance for unrestricted areas.

5) Collected samples will be analyzed by a commercial radiation detection company.

6) Permissible levels will be in accordance with Title 10, Part 20, Appendix B.

B) Smear Sampling.

1) Smear samples will be taken daily during operating periods at exit points from controlled areas.

2) Daily random samples will be taken from floors and equipment in the controlled areas.

3) Smear samples will be taken by wiping an area (preferably about 100 cm^2 so that results may be expressed in dpm/100 cm^2) with a suitable filter paper.

4) Smear samples will be analyzed by a commercial radiation detection company.