FORM NRC-313 I
(6-78)
10 CFR 30

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE
INDUSTRIAL

See attached instructions for details.

Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.

1. APPLICATION FOR: *(Check and/or complete as appropriate)*

	a. NEW LICENSE
	b. AMENDMENT TO: LICENSE NUMBER
X	c. RENEWAL OF: LICENSE NUMBER 22-07944-01

2. APPLICANT'S NAME *(Institution, firm, person, etc.)*
Bemidji State University Division of Science and Math. Bemidji, MN 56601
TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
(218) 755 - 2920

3. NAME OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION
Dr. Alice Lindgren
TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
(218) 755-2798

4. APPLICANT'S MAILING ADDRESS *(Include Zip Code)*
Bemidji State University
Division of Science and Mathematics
Bemidji, MN 56601

5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED *(Include Zip Code)*
Bemidji State University
Sattgast Hall-Radioisotopes Lab
Bemidji, MN 56601

(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)

6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL
(See Items 16 and 17 for required training and experience of each individual named below)

	FULL NAME	TITLE
a.	Alice L. Lindgren	Assoc. Prof. of Biology
b.	William Giering Britton	Prof. of Chemistry
c.	Wesley W. Winter	Assoc. Prof. of Physics

7. RADIATION PROTECTION OFFICER
Alice L. Lindgren

Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.

8. LICENSED MATERIAL

LINE NO.	ELEMENT AND MASS NUMBER A	CHEMICAL AND/OR PHYSICAL FORM B	NAME OF MANUFACTURER AND MODEL NUMBER (If Sealed Source) C	MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTIVITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME D
(1)	See attached sheet #8			
(2)				
(3)				
(4)				

Applicant Check Returned
Check No. 1794
Amount/Fee Category $50 EX
Type of Fee Renewal
Date Check Rec'd MAR 27 1979
Received by Brown

RECEIVED BY LFMB
MAR 27 1979
Date Mar 27 67 Renewal
Log
By Brown
Orig. To
Action Compl. 3/28/79

9. DESCRIBE USE OF LICENSED MATERIAL
E

LINE NO.	
(1)	Classroom use at Bemidji State University. See application for renewal
(2)	of license 22-07944-01 dated March 25, 1974 for instructions to experiments
(3)	routinely done. Also experiments on red blood cell mass and survival,
(4)	thyroid function studies and DNA and RNA labeling.

FEE EXEMPT
FEE EXEMPT 170.11(a)(9)

FORM NRC-313 I (6-78)

7905040344

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9. STORAGE OF SEALED SOURCES

LINE NO.	CONTAINER AND/OR DEVICE IN WHICH EACH SEALED SOURCE WILL BE STORED OR USED. A.	NAME OF MANUFACTURER B.	MODEL NUMBER C.
(1)	Cobalt-60 slugs	DCPA	V-784 or 786
(2)			
(3)			
(4)			

10. RADIATION DETECTION INSTRUMENTS

LINE NO.	TYPE OF INSTRUMENT A	MANUFACTURER'S NAME B	MODEL NUMBER C	NUMBER AVAILABLE D	RADIATION DETECTED (alpha, beta, gamma, neutron) E	SENSITIVITY RANGE (milliroentgens/hour or counts/minute) F
(1)						
(2)	See attached sheet #10					
(3)						
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

X a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

Item #12 Nuclear Products
Rockland, Mass 02370
~~11/8/74~~

X b. CALIBRATED BY APPLICANT

Attach a separate sheet describing method, frequency and standards used for calibrating instruments.

see sheet #11

12. PERSONNEL MONITORING DEVICES

TYPE (Check and/or complete as appropriate.) A	SUPPLIER (Service Company) B	EXCHANGE FREQUENCY C
X (1) FILM BADGE	Searle Analytic	X MONTHLY
☐ (2) THERMOLUMINESCENCE DOSIMETER *(TLD)*		☐ QUARTERLY
☐ (3) OTHER *(Specify)*: ______		☐ OTHER *(Specify)*: ______

13. FACILITIES AND EQUIPMENT (Check were appropriate and attach annotated sketch(es) and description(s).

X a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS *(Include filtration, if any)*, ETC.

X b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING *(fixed and/or temporary)*, ETC. see sheet #13

☐ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.

☐ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC.

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED

Nuclear Engineering Corporation

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE.

See sheet #14

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Describe in detail the information required for Items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

15. RADIATION PROTECTION PROGRAM. Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures *(if needed)*, day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.

16. FORMAL TRAINING IN RADIATION SAFETY. Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.

    a. Principles and practices of radiation protection.

    b. Radioactivity measurement standardization and monitoring techniques and instruments.

    c. Mathematics and calculations basic to the use and measurement of radioactivity.

    d. Biological effects of radiation.

17. EXPERIENCE. Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

18. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, 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.

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.

a. LICENSE FEE REQUIRED *(See Section 170.31, 10 CFR 170)* $ 50.	b. CERTIFYING OFFICIAL *(Signature)* R. D. Decker c. NAME *(Type or print)* Robert D. Decker
(1) LICENSE FEE CATEGORY: 3 K Byproduct Mat.	d. TITLE President, Bemidji State Univ.
(2) LICENSE FEE ENCLOSED: $ 50.	e. DATE March 5, 1979

FORM NRC-313 I (6-78)

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Column A	Column B	Column C	Column D
1. Cobalt-60	Any		0.003 millicuries
2. Carbon-14	Any		1 millicurie
3. Calcium-45	Any		0.025 millicuries
4. Iodine-131	Any		1 millicurie
5. Phosphorus-32	Any		1 millicurie
6. Phosphorus-33	Any		0.100 millicurie
7. Sulfur-35	Any		0.200 millicuries
8. Iron-59	Any		1 millicurie
9. Hydrogen-3	Any		1 millicurie
10. Chromium 51	Any		1 millicurie
11. Iodine-125	Any		1 millicurie
12. Hydrogen-3	NEN Atom Light Model NEL-1		3000 millicuries
13. Cobalt-60	Civil Defense Model DCPA V-784 or DCPA V-786 Sealed Source set.		1 set, 30 millicuries total

	Column A	Column B	Column C	Column D	Column E	Column F
1.	Scaler	Nuclear Chicago	181 B	1	Alpa-beta gamma	1 - 10^5 cpm
2.	Scaler	Nuclear Chicago	151 A	2	Alpha-beta gamma	1 - 10^5cpm
3.	Scaler	Nuclear Chicago	8775	1	Alpha-beta gamma	1 - 10^5cpm
4.	Radiation Analyzer	Nuclear Chicago	1810	1	gamma	1-10^5 cpm
5.	Analyzer scaler	Nuclear Chicago	8725	1	gamma	1 - 10^5 cpm
6.	Well scin-tillation detector	Nuclear Chicago	DS 202V	1	gamma	1 - 10^5 cpm
7.	Scaler-ratemeter with audio	RCL	20324	1	alpha-beta gamma	1 - 10^5 cpm
8.	Liquid Scintillation Counter	Beckman	LS-100	1	beta	1 - 10^6 cpm
9.	Neutron Survey meter	Texas Nuclear	2673	1	neutrons	5 - 25000 N/cm^2/sec
10.	Scintillation Spect.	Packard	5210	1	gamma	1 - 10^6 cpm
11.	Electroscope	Bendix		3	alpha beta gamma	0.01 - 60 Milliroentgens per hour
12.	Cutie Pie Survey meter	Baird Atomic	04416	1	alpha beta gamma	1 - 10^5 Milliroentgens per hour.

Items 1 through 7:	Not calibrated
Item 8.	Calibrated with Beckman tritiated toluene in cocktail - sample provided with instrument. Also, series of quench standards made up with tritiated toluene of known DPM. This calibration done at least once a year.
Item 9.	Checked with 1 curie plutonium-beryllium source
Item 10	Not calibrated. Cs-137 source used to set the .661 Mev photopeak
Item 11	Calibrated with NEC 0.1 microcurie alpha source (Po-210) dated 7/72 and corrected for elapsed time. Calibration performed semi-annually
Item 12	Not calibrated by us.

13. a The nuclear science facilities are located in Sattgast Hall, the science building, on the campus of Bemidji State University. There are two rooms connected so that there is no need to go into a hallway to get from one room to the other. One of these rooms, the counting room, is 16 X 16 feet. This room houses most of the instruments. The other room, the wet lab, is 20 X 26 feet. It contains four fume hoods and a stainless-steel covered laboratory table that will accomodate eight student stations.

13. b Radioisotopes are stored in a metal locker just inside the wet lab door. Gamma emitters are surrounded by lead bricks and stored in the bottom of this locker. The sealed cobalt-60 civil defense slugs are stored under a stairway at the end of a tunnel. This stairway is seldom used. This storage area is kept locked. Some surplus physics equipment is also stored in this area.

Waste disposal

Cobalt-60. This isotope is used as an unsealed source for ion exchange separation of cobalt and nickel, an experiment done by students in nuclear science class and demonstrated to the first-year chemistry class. Approximately 0.1 microcuries are used per year. The waste is stored, then shipped to Nuclear Engineering Corp. for disposal.

Carbon-14. One use of this isotope is in classroom use of carbon dioxide in photosynthesis studies. It is used under a hood, and about 50 microcuries of carbon dioxide is discharged through the hood into the atmosphere per experiment. A maximum of 100 microcuries is discharged any one day and not over 300 microcuries per year. The carbon-14 that is fixed in the plant leaves is stored, then shipped to Nuclear Engineering Corp. for disposal.

Carbon-14 attached to DNA and RNA precursor compounds as well as to other biological molecules is stored until shipped to Nuclear Engineering for disposal. Contaminated animal carcasses and other biological materials are stored frozen until shipped to Nuclear Engineering Corp.

Some carbon-14 toluene is used to familiarize students with the operation of the liquid scintillation counter. Less than one microcurie is used per year. The cocktail containing the carbon-14 is allowed to evaporate under a hood.

Liquid scintillation cocktail containing C-14 is allowed to evaporate down in the hood and remaining liquid shipped by approved liquid container to Nuclear Engineering Corporation. Contaminated scintillation vials are shipped separately as solid waste.

Tritium The tritium in tritiated toluene is allowed to evaporate under a hood. The evaporation is accomplished by pouring the cocktail from the liquid scintillation counting vials into a large beaker and allowing this beaker to remain there until the solvent has evaporated. About 1 microcurie per year will be disposed of in this manner.

The tritium and tritium-contaminated biological material used for cell cycle determinations is stored frozen until shipped to Nuclear Engineering Corporation for disposal.

Lead-210/bismuth 210/polonium 210. This solution will be used to "milk" the polonium-210 into a silver disk to make an alpha source. The solution is also used to make long-lived beta sources by evaporating the solution on planchets. The solution and sources will not be disposed.

Iodine-125. Iodine-125 is used for thyroid in vitro assay and for radioimmunoassay. Waste is stored until shipped to Nuclear Engineering for disposal.

Short-lived isotopes. The remaining unsealed sources have half-lives short enough that storage until they decay to about three times background is practical. At that time they are disposed of in the sanitary sewer.

The Radiation Protection Program

Gamma emitters as unsealed sources.

Cobalt-60	.003 millicuries	total energy 2.5 Mev	.045 mr/hr at 1 ft.
Iodine-131	1 millicurie	total energy .633 Mev	3.798 mr/hr at 1 ft.
Iron-59	1 millicurie	total energy 1.29 Mev	7.74 mr/hr at 1 ft.
Chromium 51	1 millicurie	total energy .32 Mev	1.92 mr/hr at 1 ft.
Iodine-125	1 millicurie	total energy .035 Mev	.21 mr/hr at 1 ft.
		TOTAL	13. 713 mr/hr at 1 ft.

The dose rate approximated above was obtained by the relation

mr/hr at 1 ft = 6 X Energy in Mev X millicuries of sample

Lead shielding of these gamma emitters of 2 inches (about three half-value thicknesses) decreases the radiation to about 1.7 mr per hour at one ft.

Restricted Area

A person standing six feet away from the storage position would receive about .05 mr/hr. A person would be in that position no more than six hours per week and would receive about 3.6 mr per quarter.

Unrestricted Area

A person in the corridor on the other side of a wall, about 2 ft away, would receive about .4 mr/hr. It is highly unlikely a person would be there more than fifty hours per quarter. He would receive 20 millirems per quarter. The closest faculty desk in an unrestricted area is 24 feet away. At about 1000 hours per quarter, this faculty member would receive 3 millirems per quarter.

BETA EMISSION IS EFFECTIVELY ABSORBED BY THE METAL LOCKER AND IS NOT CONSIDERED IN THESE CALCULATIONS.

The sealed cobalt-60 civil defense slugs.

These slugs will not be opened. Each slug has a tag at least one inch square, attached, bearing a conventional radiation symbol. Civil defense authorities regularly leak-test these slugs at six month intervals. The leak test records are kept by Mr. Wesley Winter. These slugs are stored in the conventional civil defense lead pig, in a closet under some seldom used stairs. The door of this area is locked and posted with a radiation symbol. This area is ideal for storing these slugs. The closest classroom is 120 ft. distant. This is a ground-floor closet. There is no person spending any appreciable length of time closer than 75 ft. from these slugs.

The sealed tritium source.

The New England Nuclear Atom Light is stored in the metal locker along with the unsealed sources. Dr. Alice Lindgren supervises the use of this lamp and is responsible for its return to the locker.

Records

Whan an unsealed source arrives, the packing material is monitored using a thin window GM tube and an RCL scaler ratemeter with audio. If the activity is not over three times background, the packing material is moistened and the containers wiped with the material and the activity checked again. Any container showing evidence of surface contamination will be stored in a small beaker in the locker, properly labeled, as a sample with surface contamination.

Each source is given a number, and a record book, one page for each number, is kept in the locker. The complete history of every sample is recorded, including how it is used, and the method and date of disposal of the waste.

Work areas are monitored periodically with an RCL scaler with audio fitted with a thin-window GM tube. Records of counts, duration, and date are posted in each room.

Laboratory rules

Students and faculty handling unsealed sources are required to wear gloves and to monitor their hands and shoes before leaving the laboratory. All pipetting is done with safety pipettors. All laboratory work is done in large plastic or stainless steel trays. Contaminated glassware is labeled radioactive until it has been decontaminated with Isoclean (Isolabs Inc.). Glassware that has been contaminated is not removed from the isotopes laboratory. No eating or drinking or smoking is permitted in the lab. The person who is likely to receive the most radiation wears the one film badge available. Our level of radiation is so low that we are not required to provide personnel monitoring for everyone. Last year, the radiation report on the film badge was zero for every month.

Radiation Protection Officer

This person has the responsibility to determine that the laboratory is monitored, that the records of monitoring are properly kept, and that records of receipt and disposal of isotopes are kept. This person is responsible for enforcing the laboratory rules given above.

Alice L. Lindgren Radiation Protection Officer

Training:

B.A. Augsberg College 1958 Major, Biology

M.S. University of Minnesota 1961 Major, Cell Biology

Ph.D. University of Iowa 1970 Major, Radiation Biology

Courses:

Introductory Radiation Biology	4 sem hrs.	U. of Iowa	1965
Physics of Radiobiology I,II	8 sem hrs.	"	1967-68
Mammalian Radiobiology	4 sem hrs.	"	1969
Cellular Radiobiology	4 sem hrs.	"	1968
Radioisotopes in Biological Res.	4 sem hrs.	"	1967
Research in Radiobiology	12 sem hrs.	"	1969-70
Two-day workshop at Argonne on Scintillation Counting			1972

Experience

Eight years teaching radioisotopes at Bemidji State University

One year teaching introductory radiation biology at University of Iowa

Continuing reasearch at the University of Iowa Radiation Research Laboratory periodically since 1970.

William G. Britton

Training:

B.S. Millikin Univ. 1943 Major Chemistry

M.S. Univ. of Illinois 1947 Major Inorganic Chemistry

Ph.D. Univ. of Colorado 1956 Major Physical Chemistry

NSF Summer Institute for College Chemistry Teachers
Univ. of North Carolina 1959

AEC/NSF Summer Institute for College Chemistry and Physics Teachers
Oak Ridge Institute of Nuclear Studies 6 weeks 1960

Courses

Radiochemistry lecture Univ. Colorado 3 sem hrs. 1950

Tracer Techniques Lab Univ. Colorado 1 sem hrs. 1950

Six weeks summer institute at Oak Ridge Institute of Nuclear Studies.

Generally microcurie levels of tracers were handled.

A rad cell containing 100 curies of cobalt-60 was handled.

Also, amples irradiated in a graphite pile were handled using remote handling equipment. 1960

Workshop on Nuclear Power at Argonne (two-day) 1973

Workshop on Scintillation Counting at Argonne (two-day) 1972

Experience

Inaugurated the nuclear science program at Bemidji State Univ. in 1960.

Taught at least one course per year in radioisotope techniques since that time.

Director of six AEC NSF sponsored summer institutes in Nuclear Science and Radioisotope Techniques for High School Teachers of Chemistry and Physics 1963-68

Wesley W. Winter

Training:

B.S. St. Cloud State University 1940 Major physics

M.S. Univ. of Wisconsin 1943 Major, physics

Graduate study Univ. of Wisconsin intermittently 1949-56

NSF/AEC Summer Institute on Radiation in the Physical Sciences for College Teachers of physics and chemistry, Iowa State Univ. 1962

NSF/AEC Summer Institute on Activation Analysis Texas A and M Univ. 1966

Experience

Granted by an AEC letter dated April 6, 1962 an amendment to license 22-3904-2 to provide training of radiological defense instructors as well as instrument operators. Supervisor of civil defense material including the sealed cobalt-60 sources.

Instructor in six NSF/AEC sponsored summer institutes in nuclear science and radioisotope techniques for high school teachers, held at Bemidji State University, 1963-68.

Application to Renew License 22-07944-01   Sheet # 17

Please see sheet #16.   Experience is given there.

2/13 DCS
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FORM NRC-313 I
(1-79)
10 CFR 30

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE
INDUSTRIAL

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(Check and/or complete as appropriate)

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x	c. RENEWAL OF: LICENSE NUMBER 22-07944-01

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TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
(218) 755-2920

3. NAME OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION
Alice L. Lindgren, Ph.D.
TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
(218) 755-2798

4. APPLICANT'S MAILING ADDRESS *(Include Zip Code)*
Bemidji State University
Division of Science and Mathematics
Bemidji, MN 56601

5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED *(Include Zip Code)*
Bemidji State University
Sattgast Hall - Radioisotopes Lab.
Bemidji, MN 56601

AUG 2 1979

(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)

6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL
(See Items 16 and 17 for required training and experience of each individual named below)

	FULL NAME	TITLE
a.	Alice L. Lindgren	Associate Professor of Biology
b.	William G. Britton	Professor of Chemistry
c.	Wesley W. Winter	Associate Professor of Physics

7. RADIATION PROTECTION OFFICER
Alice L. Lindgren

Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.

8. LICENSED MATERIAL

LINE NO.	ELEMENT AND MASS NUMBER (A)	CHEMICAL AND/OR PHYSICAL FORM (B)	NAME OF MANUFACTURER AND MODEL NUMBER *(If Sealed Source)* (C)	MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTIVITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME (D)
(1)	See attached sheet #8			
(2)				
(3)				
(4)				

DESCRIBE USE OF LICENSED MATERIAL
E

(1)	Classroom use at Bemidji State University. See application for renewal of
(2)	license 22-07944-01 dated March 25, 1974 for instructions to experiments routinely
(3)	done. In addition biological experiments on red blood cell mass and survival,
(4)	thyroid function, and on cellular DNA and RNA labeling are used.

FORM NRC-313 I (1-79)

AUG 2 1979

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(1)	Cobalt-60 slugs	DCPA	V-784 or 786
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(1)	See attached sheet #10					
(2)						
(3)						
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

☐ a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

☒ b. CALIBRATED BY APPLICANT

Attach a separate sheet describing method, frequency and standards used for calibrating instruments.

See sheet # 11

12. PERSONNEL MONITORING DEVICES

TYPE *(Check and/or complete as appropriate.)* A	SUPPLIER *(Service Company)* B	EXCHANGE FREQUENCY C
☒ (1) FILM BADGE	Searle Analytic	☒ MONTHLY
☐ (2) THERMOLUMINESCENCE DOSIMETER *(TLD)*		☐ QUARTERLY
☐ (3) OTHER *(Specify)*: ____		☐ OTHER *(Specify)*: ____

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☒ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS *(Include filtration, if any)*, ETC.

☒ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING *(fixed and/or temporary)*, ETC. See sheet #13

☐ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.

☐ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC.

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED

Nuclear Engineering or Atomic Disposal Co.

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE.

See sheet #14

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15. RADIATION PROTECTION PROGRAM. Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures *(if needed)*, day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.

    See attached Sheet #15.

16. FORMAL TRAINING IN RADIATION SAFETY. Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.

    a. Principles and practices of radiation protection. See previous renewal application, March 25, 1974

    b. Radioactivity measurement standardization and monitoring techniques and instruments.

    c. Mathematics and calculations basic to the use and measurement of radioactivity.

    d. Biological effects of radiation.

17. EXPERIENCE. Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

    See previous renewal application, March 25, 1979

18. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, 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.

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.

a. LICENSE FEE REQUIRED *(See Section 170.31, 10 CFR 170)* exempt status	b. CERTIFYING OFFICIAL *(Signature)* [signature]
	c. NAME *(Type or print)* Robert D. Decker, Ph.D.
(1) LICENSE FEE CATEGORY: 3K Byproduct Material	d. TITLE President, Bemidji State University
(2) LICENSE FEE ENCLOSED: $	e. DATE

FORM NRC-313 I (1-79)

Column A	Column B	Column C	Column D
1. Cobalt-60	Any		0.003 millicuries
2. Carbon-14	Any		1 millicurie
3. Calcium-45	Any		0.025 millicuries
4. Iodine-131	Any		1 millicurie
5. Phosphorus-32	Any		1 millicurie
6. Phosphorus-33	Any		0.100 millicurie
7. Sulfur-35	Any		0.200 millicuries
8. Iron-59	Any		1 millicurie
9. Hydrogen-3	Any		1 millicurie
10. Chromium 51	Any		1 millicurie
11. Iodine-125	Any		1 millicurie
12. Hydrogen-3	NEN Atom Light Model NEL-1		3000 millicuries
13. Cobalt-60	Civil Defense Model DCPA V-784 or DCPA V-786 Sealed Source set.		1 set, 30 millicuries total
14. Pu-Be neutron source - 1 Ci Plutonium 239		Mound Laboratory	16 grams

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Column A	Column B	Column C	Column D	Column E	Column F
1. Scaler	Nuclear Chicago	181 B	1	Alpa-beta gamma	1 - 10^5 cpm
2. Scaler	Nuclear Chicago	151 A	2	Alpha-beta gamma	1 - 10^5 cpm
3. Scaler	Nuclear Chicago	8775	1	Alpha-beta gamma	1 - 10^5 cpm
4. Radiation Analyzer	Nuclear Chicago	1810	1	gamma	1-10^5 cpm
5. Analyzer scaler	Nuclear Chicago	8725	1	gamma	1 - 10^5 cpm
6. Well scin-tillation detector	Nuclear Chicago	DS 202V	1	gamma	1 - 10^5 cpm
7. Scaler-ratemeter with audio	RCL	20324	1	alpha-beta gamma	1 - 10^5 cpm
8. Liquid Scintillation Counter	Beckman	LS-100	1	beta	1 - 10^6 cpm
9. Neutron Survey meter	Texas Nuclear	2673	1	neutrons	5 - 25000 N/cm^2/sec
10. Scintillation Spect.	Packard	5210	1	gamma	1 - 10^6 cpm
11. Electroscope	Bendix		3	alpha beta gamma	0.01 - 60 Milliroentgens per hour
12. Cutie Pie Survey meter	Baird Atomic	04416	1	alpha beta gamma	1 - 10^5 Milliroentgens per hour.

1. Neutron Survey Meter (Texas Nuclear) is checked with 1 curie plutonium-beryllium source.

2. Cutie Pie Survey Meter (Baird Atomic) is checked for operation before use.

3. Electroscope (Bendix) is calibrated with a polonium-210 alpha reference source, Model N-888 obtained from Nuclear Equipment Chemical Corporation.

13.a. Al[illegible]isotope use is restricted to 2 rooms located in Sattgast Hall, th[illegible]nce building, on the campus of Bemidji State University. One of [illegible] rooms is utilized as a wet lab. It contains four fume hoods and a stainless-steel covered laboratory table. The other room is utilized as a counting room and houses most of the instruments. These two room are connected so that there is no need to go into a hallway to get from one room to the other.

13.b. Radioisotopes are stored in a metal locker just inside the wet lab. door. Gamma emitters are stored in a lead box. The sealed cobalt-60 civil defense slugs are shielded with lead and stored in a locked cave. Keys are restricted to staff members.

Waste disposal

Cobalt-60. This isotope is used as an unsealed source for ion exchange separation of cobalt and nickel, an experiment done by students in nuclear science class and demonstrated to the first-year chemistry class. Approximately 0.1 microcuries are used per year. The waste is stored, then shipped to Nuclear Engineering Corp. for disposal.

Carbon-14. One use of this isotope is in classroom use of carbon dioxide in photosynthesis studies. It is used under a hood, and about 50 microcuries of carbon dioxide is discharged through the hood into the atmosphere per experiment. A maximum of 100 microcuries is discharged any one day and not over 300 microcuries per year. The carbon-14 that is fixed in the plant leaves is stored, then shipped to Nuclear Engineering Corp. for disposal.

Carbon-14 attached to DNA and RNA precursor compounds as well as to other biological molecules is stored until shipped to Nuclear Engineering for disposal. Contaminated animal carcasses and other biological materials are stored frozen until shipped to Nuclear Engineering Corp.

Some carbon-14 toluene is used to familiarize students with the operation of the liquid scintillation counter. Less than one microcurie is used per year. The cocktail containing the carbon-14 is allowed to evaporate under a hood.

Liquid scintillation cocktail containing C-14 is allowed to evaporate down in the hood and remaining liquid shipped by approved liquid container to Nuclear Engineering Corporation. Contaminated scintillation vials are shipped separately as solid waste.

Tritium The tritium in tritiated toluene is allowed to evaporate under a hood. The evaporation is accomplished by pouring the cocktail from the liquid scintillation counting vials into a large beaker and allowing this beaker to remain there until the solvent has evaporated. About 1 microcurie per year will be disposed of in this manner.

The tritium and tritium-contaminated biological material used for cell cycle determinations is stored frozen until shipped to Nuclear Engineering Corporation for disposal.

Lead-210/bismuth 210/polonium 210. This solution will be used to "milk" the polonium-210 into a silver disk to make an alpha source. The solution is also used to make long-lived beta sources by evaporating the solution on planchets. The solution and sources will not be disposed.

Iodine-125. Iodine-125 is used for thyroid in vitro assay and for radioimmunoassay. Waste is stored until shipped to Nuclear Engineering for disposal.

Short-lived isotopes. The remaining unsealed sources have half-lives short enough that storage until they decay to about three times background is practical. At that time they are disposed of in the sanitary sewer.

Students and faculty handling unsealed sources are required to wear gloves and to monitor their hands and shoes before leaving the laboratory. All pipetting is done with safety pipettors. All laboratory work is done in large lined plastic or stainless steel trays. Contaminated glassware is labeled radioactive until it has been decontaminated with an appropriate cleaner (Isoclean--Isolabs Inc.). Contaminated glassware is not removed from the isotopes laboratory. No eating, drinking, or smoking is permitted in the laboratory. The laboratory is monitored when appropriate after use.

When Fe-59, Cr-51, Co-60, or I-131 is used in an experiment, the instructor wears a film badge.

The Radiation Protection Officer has the responsibility to determine that the laboratory is monitored when appropriate after use and that the above rules are enforced.

The neutron source will be leak tested bi-annually by wiping the source with a filter pad which is then placed inside a Bendix Model 1050 radioassay electroscope to determine the alpha activity. If more than 0.005 microcuries of removable contamination is detected, the source will be returned to the manufacturer.