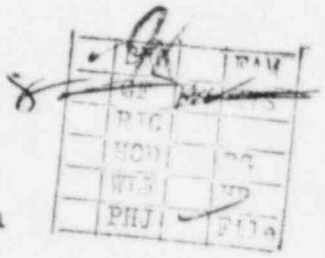
50-264

THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN 48640

December 30, 1971



Mr. Donald J. Skovholt
Assistant Director for
Reactor Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Skovholt:

This letter is in response to your letter dated October 5, 1971, requesting detailed information concerning radioactivity effluents from our reactor. The Dow TRIGA Reactor, AEC license No. R-108, Docket No. 50264, has been in operation since July 6, 1967. It is used primarily for activation analysis studies.

The radioactivity released to unrestricted areas on an annual basis results from the disposal of spent activated samples and the release of argon-41 stemming from the air contained in the "sample" rack and the pneumatic sample transfer system.

Most of the activated samples contain only short-lived isotopes. In 1970 and 1971, a minimum hold-up time of seventeen days was maintained between the time of activation and the time of disposal. From this procedure less than 0.0006 curies were released to unrestricted areas annually. The production of argon-41 accounted for an additional release of less than 0.0004 curies to unrestricted areas annually.

It has been the practice during this period to incinerate the radioactive waste in Dow's main incinerator. This unit is operated at approximately 1100°C with an air flow of 50,000 cubic feet per minute. The effluent temperature is approximately 200°C, and the effluent stack height is 200 feet. The incinerator is equipped with a triple spray wash system. The effluent water goes to Dow's water waste treatment facility. The amount of water effluent from this treatment facility is approximately 50 million gallons per day.

We assume that the 0.0006 curies of activated samples, when burned, were all released in the gaseous effluent from the incinerator. For this case, the concentration at the

G-4

point of release to an unrestricted area (the top of the stack) would be approximately 8 x 10^{-13} μ Ci/cc of air averaged over 1 year. Incinerations have been carried out only during favorable weather conditions to provide for maximum dispersion.

If we assume, on the other hand, that all the activity were washed down and released in the water effluent from the plant, the averaged concentration would have been 9 x 10-12 μ Ci/cc of water at the point of discharge.

The isotopes released in this manner consisted of the following:

Isotope	Amount (Ci)
Br - 82	<0.000010
Na - 24	<0.000001
Cr - 51	<0.000025
Fe - 59	<0.000070
Sb -124	<0.000060
P - 32	<0.000250
Sc - 46	<0.000050
Zn - 65	<0.000005
Co - 66	<0.000003
Hg -203	<0.000010
Ag -110m	<0.000020
Ba -131	<0.000005
Cd -115	<0.000025
S - 35	<0.000010
Se - 75	<0.000010
Ni - 63	<0.000001
Total Mixed	<0.000555

The argon-41 is released through a vent to the outside of the reactor building. The air flow through this vent is 1000 cfm. The concentration of the argon-41 at the point of release is then less than 3 x 10^{-11} μ Ci/cc of air.

The direct radiation levels to the unrestricted area from this facility is undetectable (less than 0.01 mr/hr and less than 10 milli-rem/month). The direct radiation level from the facility effluents is also undetectable (<1 x 10^{-14} μ Ci/cc of air of long lived isotopes, < 2 x 10^{-11} μ Ci/cc of air of short lived isotopes, and < 1 x 10^{-9} μ Ci/ml of water for all isotopes).

Several monitoring systems are used to determine radiation exposures to both staff and non-staff. In the reactor room itself, are located two area monitors. One is a Nuclear Measurement Corporation continuous air monitor which pumps air into a chamber (~2 liter capacity) and through a filter paper. Approximately, 1/4 inch from the filter paper is a thin end window Geiger-Mueller tube, shielded by about 2 inches of lead. The background of this monitor, stemming from radon daughters, is 1.7×10^{-11} μ Ci/cc of air. The second area monitor is a G-M tube located 13 feet from the top of the reactor. It is connected to a ratemeter and is sensitive to approximately 0.1 mr/hr.

Located in the water treatment system of the reactor is another G-M tube monitor, which continuously monitors the pool water and has a sensitivity of approximately 0.01 μ Ci/ml of water. All water in contact with the reactor core is cleaned up by means of demineralizers and recycled. The demineralizer bed is periodically changed, with the old one being first monitored and then incinerated. Its release of isotopes is included in the above calculations.

In addition to these area monitors, several "laboratory monitors" (mica-window G-M tubes connected to ratemeters) are continuously operated within the laboratory building housing the reactor. One of these is operated in the hood to which is connected the exhaust from the pneumatic sample transfer system of the reactor. The others are operated in adjacent laboratories. These monitors have a background of approximately 100 counts per minute. Many other portable, standard, health physics monitoring instruments are used in the building for routine surveys. These instruments are used for alpha, beta, gamma, and neutron radiation measurements. Several multi-channel analyzers, liquid scintillation, and proportional counters are also used for evaluating gaseous, liquid, and solid samples. The lower detection limit of these instruments are generally 1×10^{-7} μ Ci.

Film badges for beta, gamma, and neutron dose measurements are used to evaluate radiation exposures of individuals present in the facility. The film badges are supplied by R. S. Landauer, Jr. and Company and are sensitive to 10 milli-rems of X- and gamma radiation, 40 milli-rems of hard beta, 20 milli-rems fast neutron, or 10 milli-rems thermal neutron. Pocket dosimeters are also used to evaluate radiation exposures, and are sensitive to approximately 2 mr of X- or gamma radiation.

In addition, air samples are taken on top of nearby buildings on filters which are counted by gamma spectroscopy and by beta spectroscopy.

There are ten sampling locations in the reactor room, the building housing the reactor, and adjacent buildings.

The personnel film badges, changed once per month, have indicated that personnel are exposed to less than 100 milli-rem per year of X-, gamma, or beta radiation at our facility, and to less than detectable amounts of neutron radiation. Area film badges have indicated less than detectable amounts of all radiation.

Air samples in the reactor room have indicated that airborne concentrations of radioactivity to be at the background level of the monitor (1.7×10^{-11} μ Ci/cc of air) except during periods immediately following atmospheric testing of nuclear weapons. This has been confirmed by gamma spectroscopy and other routine measurements around the reactor.

Air samples taken daily on nearby buildings indicated no release of activity directly attributable to the operation of the reactor. Some activity (1×10^{-14} μ Ci/cc) of long lived isotopes, mainly radium, thorium, and their decay products, with some fission products following atmospheric testing of nuclear devices were, however, identified in these samples.

We hope that the above information will suffice your need. In case additional discussion of any of the above items appears desirable, please do not hesitate to contact us again.

Very truly yours,

Harold K Hoyle

Harold Hoyle, Chairman
Radiation Safety Committee
1701 Building

HRH:dda

GOVERNMENT ACCOUNTABILITY PROJECT
1555 Connecticut Avenue, N.W., Suite 202
Washington, D.C. 20036
(202) 232-8550

April 9, 1985

Freedom of Information Officer
United States
Nuclear Regulatory Commission
Washington, D.C. 20555

FREEDOM OF INFORMATION
ACT REQUEST

FOIA-85-256
rec'd 4/11/85

Dear Freedom of Information Officer,

Under the provisions of the Freedom of Information Act, 5 U.S.C. 552, the Government Accountability Project (GAP) is requesting copies of all licenses, permits, and any amendments to said licenses and permits, issued by the NRC and/or AEC to the Dow Chemical Company of Midland, Michigan. Please include all background and/or justification information which supported the NRC and/or AEC license and/or permit.

GAP requests that any fees be waived. As you know, the Act (5 U.S.C. 552(a)(4)(a)) permits you to waive any fees when the release of the information is considered as "primarily benefiting the public." GAP believes that this request fits that category.

For any documents or portions of documents that you deny due to a specific exemption under the Act, please provide an index itemizing and describing the documents or portions of documents withheld. The index should provide a detailed justification of your grounds for claiming each exemption, explaining why each exemption is relevant to the document or portion of document withheld.

GAP would appreciate your handling this request as quickly as possible, and we look forward to hearing from you within ten (10) days, as the Act stipulates.

Sincerely,

Steve Kohn
Staff Attorney

Richard Condit
Staff Associate

8507240062-1p

GOVERNMENT ACCOUNTABILITY PROJECT
1555 Connecticut Avenue, N.W., Suite 202
Washington, D.C. 20036
(202) 232-8550

April 9, 1985

FREEDOM OF INFORMATION ACT REQUEST

Freedom of Information Officer
United States
Nuclear Regulatory Commission
Washington, D.C. 20555

FOIA-85-258
rec'd 4/11/85

Dear Freedom of Information Officer,

Under the provisions of the Freedom of Information Act, 5 U.S.C. 552, the Government Accountability Project (GAP) is requesting copies of all reports, studies, and/or monitoring analyses done by and/or for the NRC and/or AEC on the incineration activities of the Dow Chemical Company of Midland, Michigan.

GAP requests that any fees be waived. As you know, the Act (5 U.S.C. 552(a)(4)(a)) permits you to waive any fees when the release of the information is considered as "primarily benefiting the public." GAP believes that this request fits that category.

For any documents or portions of documents that you deny due to a specific exemption under the Act, please provide an index itemizing and describing the documents or portions of documents withheld. The index should provide a detailed justification of your grounds for claiming each exemption, explaining why each exemption is relevant to the document or portion of document withheld.

GAP would appreciate your handling this request as quickly as possible, and we look forward to hearing from you within ten (10) days, as the Act stipulates.

Sincerely,

Steve Kohn
Staff Attorney

Richard Condit
Staff Associate

8507290064 1pp

GOVERNMENT ACCOUNTABILITY PROJECT
1555 Connecticut Avenue, N.W., Suite 202
Washington, D.C. 20036
(202) 232-8550

April 9, 1985

FREEDOM OF INFORMATION
ACT REQUEST

FOIA-85-259
rec'd 4/11/85

Freedom of Information Officer
United States
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Freedom of Information Officer,

Under the provisions of the Freedom of Information Act, 5 U.S.C. 552, the Government Accountability Project (GAP) is requesting copies of all information on record at the NRC and/or AEC which indicates, and/or has indicated, that the Dow Chemical Company of Midland, Michigan was not in compliance with any law and/or regulation and/or guideline(s) administered by the NRC/AEC and/or any other state or federal agency.

GAP requests that any fees be waived. As you know, the Act (5 U.S.C. 552(a)(4)(a)) permits you to waive any fees when the release of the information is considered as "primarily benefiting the public." GAP believes that this request fits that category.

For any documents or portions of documents that you deny due to a specific exemption under the Act, please provide an index itemizing and describing the documents or portions of documents withheld. The index should provide a detailed justification of your grounds for claiming each exemption, explaining why each exemption is relevant to the document or portion of document withheld.

GAP would appreciate your handling this request as quickly as possible, and we look forward to hearing from you within ten (10) days, as the Act stipulates.

Sincerely,

Steve Kohn
Staff Attorney

Richard Condit
Staff Associate

8507240044

GOVERNMENT ACCOUNTABILITY PROJECT
1555 Connecticut Avenue, N.W., Suite 202
Washington, D.C. 20036
(202) 232-8550

April 9, 1985

Freedom of Information Officer
United States
Nuclear Regulatory Commission
Washington, D.C. 20555

FREEDOM OF INFORMATION ACT REQUEST

FOIA-85-261
rec'd 4/11/85

Dear Freedom of Information Officer,

Under the provisions of the Freedom of Information Act, 5 U.S.C. 552, the Government Accountability Project (GAP) is requesting copies of any information compiled by and/or for the NRC/AEC regarding the Dow Chemical Company of Midland, Michigan which was compiled in order to comply with, and/or to determine the need to comply with, 10 CFR Parts 19, 20, 30, 31, 32, 33, 34, 35, 40, 51.4, 51.5, 51.6, 51.7, 70, 170, and/or 40 CFR Parts 1500.6.

GAP requests that any fees be waived. As you know, the Act (5 U.S.C. 552(a)(4)(a)) permits you to waive any fees when the release of the information is considered as "primarily benefiting the public." GAP believes that this request fits that category.

For any documents or portions of documents that you deny due to a specific exemption under the Act, please provide an index itemizing and describing the documents or portions of documents withheld. The index should provide a detailed justification of your grounds for claiming each exemption, explaining why each exemption is relevant to the document or portion of document withheld.

GAP would appreciate your handling this request as quickly as possible, and we look forward to hearing from you within ten (10) days, as the Act stipulates.

Sincerely,

Steve Kohn
Staff Attorney

Richard Condit
Staff Associate

8504290057 1p

NRC Form 374
(9-84)

U.S. NUCLEAR REGULATORY COMMISSION

Corrected Copy

MATERIALS LICENSE

Amendment No. 41

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 40 and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Dow Chemical Company	In accordance with application dated September 11, 1984 3. License number 21-00265-06 is amended in its entirety to read as follows:
2. Midland, MI 48640	4. Expiration date: November 30, 1989
	5. Docket or Reference No.: SNM-1451/0/001487

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
A. Any byproduct material between Atomic Numbers 1 and 83 inclusive	A. Any	A. Not to exceed 1 curie per radionuclide and 75 curies total, except as listed below: Carbon 14 6 curies Cobalt 60 2 curies Cesium 137 2 curies Hydrogen 3 75 curies Krypton 85 10 curies
B. Any byproduct material	B. Mixed fission products	B. 2 curies
C. Americium-241	C. NRC approved sealed sources	C. Not to exceed 10 curies per source 150 curies total
D. Californium-252	D. NRC approved sealed sources	D. Not to exceed 0.2 curies per source, 2 curies total
E. Curium-244	E. NRC approved sealed sources	E. Not to exceed 0.5 curies per source 3 curies total
F. Any byproduct material between Atomic Numbers 3 and 84	F. NRC approved sealed sources	F. Not to exceed 5 curies per source 400 curies total

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NRC Form 374A (9-84) U.S. NUCLEAR REGULATORY COMMISSION

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number
21-00265-06

Docket or Reference number

Amendment No. 41

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
G. Plutonium-238	G. Sealed Sources (Amersham Model PPC-X)	G. 5 sources not to exceed 30 millicuries per source
H. Plutonium-238	H. Sealed Sources (Amersham Model PPC-X)	H. ~~4 sources~~ 1 source not to exceed ~~30~~ 120 millicuries ~~per source~~
I. Cesium-137	I. Sealed Sources	I. 144 curies

9. Authorized Use:

A. through E. For research and development as defined in Section 30.4(q), Title 10, Code of Federal Regulations, Part 30, including animal studies. Carbon-14 may also be used in field and human studies.)

C. through F. To be used in NRC approved industrial productions gauges/source holders for physical measurements and analyses of materials or in Dow custom-made devices in accordance with protocol contained in application dated September 11, 1984.

G. For use in Telesec Model X-200 X-ray fluorescence analyzers for testing of materials.

H. For use in Texas Nuclear custom-designed thickness gauge for testing of materials.

I. To be used in Eberline Model 1000 instrument calibrator for instrument calibration.

CONDITIONS

10. Licensed material shall be used in facilities approved by the licensee's Radiation Safety Committee at the following locations:

A. Dow facilities located at and associated with the 1803 Building, Midland, Michigan.

B. Dow facilities located at and in conjunction with the 9001 Building, Agriculture Research Center, Midland, Michigan.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number
21-00265-06
Docket or Reference number

Amendment No. 41

C. Dow facilities located at and in conjunction with 4868 Wilder Road, Bay City, Michigan.

D. Dow facilities located at and in conjunction with Larkin Laboratories, Midland Michigan.

11. The licensee shall comply with the provisions of Title 10, Chapter 1, Code of Federal Regulations, Part 19, "Notices, Instructions and Reports to Workers; Inspections" and Part 20, "Standards for Protection Against Radiation."

12. Licensed materials may be used by or under the supervision of individuals designated by The Dow Chemical Company's Radiation Safety Committee, L. W. Rampy, Chairperson.

13. The use of licensed material in or on humans beings, shall be by, or under the supervision of a physician as defined in 10 CFR 35.3(b).

14. The Radiation Protection Officer for the activities authorized by this license is G. W. Engdahl and T. W. Parsons (according to duties outlined in application dated September 11, 1984).

15. A. (1) Each sealed source containing licensed 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 those sealed sources as specified by the manufacturer and specifically authorized by the Commission or an Agreement State may be leak tested at intervals not to exceed three years. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, a sealed source received from another person shall not be put into use until tested.

(2) Notwithstanding the periodic leak test required by this condition, any licensed sealed source is exempt from such leak tests when the source contains 100 microcuries or less of beta and/or gamma emitting material or 10 microcuries or less of alpha emitting material.

(3) Except for alpha sources as defined in 15.C. below, the periodic leak test required by this condition does not apply to sealed sources that are stored and not being used. The sources excepted from this test shall be tested for leakage prior to any use or transfer to another person unless they have been leak tested within six months prior to the date of use or transfer.

B. Each sealed source fabricated by the licensee shall be inspected and tested for construction defects, leakage, and contamination prior to use or transfer as a sealed source. If the inspection or test reveals any construction defects or 0.005 microcurie or greater of contamination, the source shall not be used or transferred as a sealed source until it has been repaired, decontaminated and retested.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number
21-00265-06
Docket or Reference number

Amendment No. 41

C. Each sealed source containing licensed 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.

D. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is permanently or semipermanently 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.

E. If the test required by Subsection A or C of this condition 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 (5) days of the test with the U.S. Nuclear Regulatory Commission, Region III, 799 Roosevelt Road, Glen Ellyn, Illinois 60137, describing the equipment involved, the test results, and the corrective action taken.

16 Each sealed source containing licensed material to be used outside of a shielded exposure device shall bear a durable, legible, and visible tag permanently attached to the source. The tag shall be at least one (1) inch square, shall bear the conventional radiation symbol prescribed in Section 20.203(a), 10 CFR 20, and a minimum of the following instructions: DANGER - RADIOACTIVE MATERIAL - DO NOT HANDLE - NOTIFY CIVIL AUTHORITIES IF FOUND. Repair or replacement of tags shall be accomplished by persons specifically licensed by the Commission or an Agreement State to perform this service.

16 Sealed sources containing licensed material shall not be opened.

17 In lieu of using the conventional radiation caution colors (magenta or purple on yellow background) as provided in Section 20.203(a)(1), Title 10, Code of Federal Regulations, Part 20, the licensee is hereby authorized to label detector cells and cell baths, containing licensed material and used in gas chromatography devices, with conspicuously etched or stamped radiation caution symbols without a color requirement.

18 A. Detector cells containing titanium tritide foil shall only be used in conjunction with a properly operating temperature control mechanism which prevents foil temperatures from exceeding 225 degrees Centigrade.

B. Detector cells containing scandium tritide foil shall only be used in conjunction with a properly operating temperature control mechanism which prevents foil temperatures from exceeding 325 degrees Centigrade.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number
21-00265-06
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Amendment No. 41

19. Experimental animals administered licensed materials or their products shall not be used for human consumption.

20. Installation, relocation, maintenance, repair, and initial radiation survey of devices containing licensed material and installation, replacement, and disposal of sealed sources containing licensed material used in devices shall be performed only by by the licensee or by other persons specifically authorized by the Commission or an Agreement State to perform such services.

21. A. Pursuant to Sections 20.106(b) and 20.302, 10 CFR 20, the licensee is authorized to dispose of licensed materials authorized in Subitem 6.A. by incineration provided the gaseous effluent from incineration does not exceed the limits specified for air in Appendix B, Table II, 10 CFR 20. Ash residues may be disposed of as ordinary waste provided appropriate surveys pursuant to Section 20.201 are made to determine that concentrations of licensed material appearing in the ash residues do not exceed the concentrations (in terms of microcuries per gram) specified for water in Appendix B, Table II, 10 CFR 20.

B. This license does not authorize commercial incineration, or the incineration of sealed sources, special nuclear, or source materials.

22. The licensee may transport licensed material or deliver licensed material to a carrier for transport in accordance with the provisions of Title 10, Code of Federal Regulations, Part 71, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Material Under Certain Conditions."

23. Except as specifically provided otherwise by this license, the licensee shall possess and use licensed material described in Items 6, 7, and 8 of this license in accordance with statements, representations, and procedures contained in application dated September 11, 1984; letter dated September 28, 1984. The Nuclear Regulatory Commission's regulations shall govern the licensee's statements in applications or letters, unless the statements are more restrictive than the regulations.

For the U.S. Nuclear Regulatory Commission

Original Signed
By George M. McCann
Materials Licensing Section, Region III

Date November 30, 1984

DOW CHEMICAL U.S.A.

MICHIGAN DIVISION
March 11, 1985

MIDLAND, MICHIGAN 48640

Mr. George M. McCann
U.S.N.R.C.
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

Dear Sirs:

This is notification as to our intent to purchase a 252-Californium neutron source from Amersham Corporation, Arlington Heights, Illinois. The source is NRC approved, #CVN-CY5, and is covered under our license 21-00265-06. This neutron source is 50 micrograms, 27 millicuries. This source will be used for research purposes.

Sincerely,

Ward L. Bigot

Ward L. Bigot
Assistant Reactor Supervisor
Dow Triga Research Reactor

nc

RECEIVED
MAR 13 1985
REGION III

G-2

CORRECTED COPY

MATERIALS LICENSE

Amendment No. 41

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 40 and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Dow Chemical Company	In accordance with application dated September 11, 1984 3. License number 21-00265-06 is amended in its entirety to read as follows:
2. Midland, MI 48640	4. Expiration date: November 30, 1989
	5. Docket or Reference No.: SNM-1451/07001487

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
A. Any byproduct material between Atomic Numbers 1 and 83 inclusive	A. Any	A. Not to exceed 1 curie per radionuclide and 75 curies total, except as listed below: Carbon 14 6 curies Cobalt 60 2 curies Cesium 137 2 curies Hydrogen 3 75 curies Krypton 85 10 curies
B. Any byproduct material	B. Mixed fission products	B. 2 curies
C. Americium-241	C. NRC approved sealed sources	C. Not to exceed 10 curies per source 150 curies total
D. Californium-252	D. NRC approved sealed sources	D. Not to exceed 0.2 curies per source, 2 curies total
E. Curium-244	E. NRC approved sealed sources	E. Not to exceed 0.5 curies per source 3 curies total
F. Any byproduct material between Atomic Numbers 3 and 84	F. NRC approved sealed sources	F. Not to exceed 5 curies per source 400 curies total

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G-3

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number
21-00265-06

Docket or Reference number

CORRECTED COPY

Amendment No. 41

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
G. Plutonium-238	G. Sealed Sources (Amersham Model PPC-X)	G. 5 sources not to exceed 30 millicuries per source
H. Plutonium-238	H. Sealed Sources (Amersham Model PPC-X)	H. 1 source not to exceed 120 millicuries
I. Cesium-137	I. Sealed Sources	I. 144 curies

9. Authorized Use:

A. through E. For research and development as defined in Section 30.4(q), Title 10, Code of Federal Regulations, Part 30, including animal studies. Carbon-14 may also be used in field and human studies.

C. through F. To be used in NRC approved industrial productions gauges/source holders for physical measurements and analyses of materials or in Dow custom-made devices in accordance with protocol contained in application dated September 11, 1984.

G. For use in Telesec Model X-200 X-ray fluorescence analyzers for testing of materials.

H. For use in Texas Nuclear custom-designed thickness gauge for testing of materials.

I. To be used in Eberline Model 1000 instrument calibrator for instrument calibration.

CONDITIONS

10. Licensed material shall be used in facilities approved by the licensee's Radiation Safety Committee at the following locations:

A. Dow facilities located at and associated with the 1803 Building, Midland, Michigan.

B. Dow facilities located at and in conjunction with the 9001 Building, Agriculture Research Center, Midland, Michigan.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number
21-00265-06

Docket or Reference number

CORRECTED COPY

Amendment No. 41

C. Dow facilities located at and in conjunction with 4868 Wilder Road, Bay City, Michigan.

D. Dow facilities located at and in conjunction with Larkin Laboratories, Midland Michigan.

11. The licensee shall comply with the provisions of Title 10, Chapter 1, Code of Federal Regulations, Part 19, "Notices, Instructions and Reports to Workers; Inspections" and Part 20, "Standards for Protection Against Radiation."

12. Licensed materials may be used by or under the supervision of individuals designated by The Dow Chemical Company's Radiation Safety Committee, L. W. Rampy, Chairperson.

13. The use of licensed material in or on humans beings, shall be by, or under the supervision of a physician as defined in 10 CFR 35.3(b).

14. The Radiation Protection Officer for the activities authorized by this license is G. W. Engdahl and T. W. Parsons (according to duties outlined in application dated September 11, 1984).

15. A. (1) Each sealed source containing licensed 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 those sealed sources as specified by the manufacturer and specifically authorized by the Commission or an Agreement State may be leak tested at intervals not to exceed three years. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, a sealed source received from another person shall not be put into use until tested.

(2) Notwithstanding the periodic leak test required by this condition, any licensed sealed source is exempt from such leak tests when the source contains 100 microcuries or less of beta and/or gamma emitting material or 10 microcuries or less of alpha emitting material.

(3) Except for alpha sources defined in 15.C. below, the periodic leak test required by this condition does not apply to sealed sources that are stored and not being used. The sources excepted from this test shall be tested for leakage prior to any use or transfer to another person unless they have been leak tested within six months prior to the date of use or transfer.

B. Each sealed source fabricated by the licensee shall be inspected and tested for construction defects, leakage, and contamination prior to use or transfer as a sealed source. If the inspection or test reveals any construction defects or 0.005 microcurie or greater of contamination, the source shall not be used or transferred as a sealed source until it has been repaired, decontaminated and retested.

MATERIALS LICENSE
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CORRECTED COPY

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C. Each sealed source containing licensed 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.

D. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is permanently or semipermanently 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.

E. If the test required by Subsection A or C of this condition 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 (5) days of the test with the U.S. Nuclear Regulatory Commission, Region III, 799 Roosevelt Road, Glen Ellyn, Illinois 60137, describing the equipment involved, the test results, and the corrective action taken.

Each sealed source containing licensed material to be used outside of a shielded exposure device shall bear a durable, legible, and visible tag permanently attached to the source. The tag shall be at least one (1) inch square, shall bear the conventional radiation symbol prescribed in Section 20.203(a), 10 CFR 20, and a minimum of the following instructions: DANGER - RADIOACTIVE MATERIAL - DO NOT HANDLE - NOTIFY CIVIL AUTHORITIES IF FOUND. Repair or replacement of tags shall be accomplished by persons specifically licensed by the Commission or an Agreement State to perform this service.

16. Sealed sources containing licensed material shall not be opened.

17. In lieu of using the conventional radiation caution colors (magenta or purple on yellow background) as provided in Section 20.203(a)(1), Title 10, Code of Federal Regulations, Part 20, the licensee is hereby authorized to label detector cells and cell baths, containing licensed material and used in gas chromatography devices, with conspicuously etched or stamped radiation caution symbols without a color requirement.

18. A. Detector cells containing titanium tritide foil shall only be used in conjunction with a properly operating temperature control mechanism which prevents foil temperatures from exceeding 225 degrees Centigrade.

B. Detector cells containing scandium tritide foil shall only be used in conjunction with a properly operating temperature control mechanism which prevents foil temperatures from exceeding 325 degrees Centigrade.

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Amendment No. 41

19. Experimental animals administered licensed materials or their products shall not be used for human consumption.

20. Installation, relocation, maintenance, repair, and initial radiation survey of devices containing licensed material and installation, replacement, and disposal of sealed sources containing licensed material used in devices shall be performed only by by the licensee or by other persons specifically authorized by the Commission or an Agreement State to perform such services.

21. A. Pursuant to Sections 20.106(b) and 20.302, 10 CFR 20, the licensee is authorized to dispose of licensed materials authorized in Subitem 6.A. by incineration provided the gaseous effluent from incineration does not exceed the limits specified for air in Appendix B, Table II, 10 CFR 20. Ash residues may be disposed of as ordinary waste provided appropriate surveys pursuant to Section 20.201 are made to determine that concentrations of licensed material appearing in the ash residues do not exceed the concentrations (in terms of microcuries per gram) specified for water in Appendix B, Table II, 10 CFR 20.

B. This license does not authorize commercial incineration, or the incineration of sealed sources special nuclear, or source materials.

22. The licensee may transport licensed material or deliver licensed mate ial to a carrier for transport in accordance with the provisions of Title 10, Code of Federal Regulations, Part 71, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Material Under Certain Conditions."

23. Except as specifically provided otherwise by this license, the licensee shall possess and use licensed material described in Items 6, 7, and 8 of this license in accordance with statements, representations, and procedures contained in application dated September 11, 1984; letter dated September 28, 1984. The Nuclear Regulatory Commission's regulations shall govern the licensee's statements in applications or letters, unless the statements are more restrictive than the regulations.

For the U.S. Nuclear Regulatory Commission

Original Signed
By George M. McCann
Materials Licensing Section, Region III

Date March 21, 1985

COPY

SEP 24 1980

Docket No. 50-264

Dow Chemical U.S.A.
ATTN: Dr. Larry W. Rampy
Radiation Safety Committee
Building 1803
Midland, MI 48640

Gentlemen:

This refers to the routine inspection conducted by Mr. P. C. Lovendale of this office on September 10-12, 1980, of activities at TRIGA Reactor Facility authorized by NRC Operating License No. R-108 and to the discussion of our findings with Dr. Anders and others at the conclusion of the inspection.

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

No items of noncompliance with NRC requirements were identified during the course of this inspection.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and the enclosed inspection report will be placed in the NRC's Public Document Room, except as follows. If this report contains information that you or your contractors believe to be proprietary, you must apply in writing to this office, within twenty days of your receipt of this letter, to withhold such information from public disclosure. The application must include a full statement of the reasons for which the information is considered proprietary, and should be prepared so that proprietary information identified in the application is contained in an enclosure to the application.

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We will gladly discuss any questions you have concerning this inspection.

Sincerely,

A. B. Davis, Chief
Fuel Facility and
Materials Safety Branch

Enclosure: IE Inspection
Report No. 50-264/80-02

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U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

Report No. 50-264/80-02

Docket No. 50-264 License No. R-108

Licensee: Dow Chemical U.S.A.
1803 Building
Midland, MI 48640

Facility Name: TRIGA Reactor

Inspection At: TRIGA Reactor Site, Midland, MI

Inspection Conducted: September 10-12, 1980

P. C. Lovendale

Inspector: P. C. Lovendale 9/22/80

W. L. Fisher

Approved By: W. L. Fisher, Chief 9/22/80
Fuel Facility Projects and
Radiation Support Section

Inspection Summary

Inspection on September 10-12, 1980 (Report No. 50-264/80-02)
Areas Inspected: Routine, unannounced inspection of radiation protection and radwaste management program, including: qualifications; audits; training; radiation protection procedures; instruments and equipment; exposure control; posting, labeling, and control; surveys; notifications and reports; records of effluents; radioactive waste; IE Bulletin No. 79-19; IE Circular No. 80-14; a previous item of noncompliance; and transportation activities. The inspection involved 13 inspector-hours onsite by one NRC inspector.
Results: No items of noncompliance or deviations were identified.

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DETAILS

1. Persons Contacted

*Dr. O. U. Anders, Reactor Supervisor
*Mr. K. J. Kelly, Assistant Reactor Supervisor
*Mr. J. M. Macki, Senior Research Manager
*Mr. E. E. Bickel, Health Physicist
*Dr. C. W. Kocher, Radiochemist
Mr. T. W. Parsons, Health Physicist

*Denotes those present at the exit interview.

2. General

This inspection, which began with visual observation of facilities and equipment, posting, labeling, and access controls at 10:30 a.m. on September 10, 1980, was conducted to examine the routine operational radiation protection and radwaste management program. During this and subsequent tours, the inspector used a licensee survey instrument to monitor the reactor area. The highest radiation level, about 7 mR/hr, was found at waist level above the reactor pool. No problems were noted.

3. Previous Item of Noncompliance

(Closed) Noncompliance (50-264/79-02): Failure of the Reactor Operations Committee to meet during second quarter of 1979. A "reminder board" is now in use to prevent recurrence (Paragraph 5).

4. Organization

The following changes in the reactor staff have been made since the last radiation protection inspection (October 1979): Mr. K. J. Kelly has been appointed Assistant Reactor Supervisor; Mr. J. M. Macki has replaced Mr. H. Gill as Research Manager in building 1602; Mr. E. E. Bickel has replaced Mr. T. W. Parsons as Reactor Health Physicist. No problems were identified.

5. Licensee Audits

Minutes of the Reactor Operations Committee (ROC) and Radiation Safety Committee (RSC) meetings held since October 1979 were reviewed. Membership and meeting frequencies for both committees were as required in Technical Specifications I.2 and I.5.

As a result of a previous inspection,[1/] the licensee instituted a "reminder board," which lists required due dates for ROC and RSC meetings so that they will not be missed.

No items of noncompliance were identified.

6. Training

Except for the reactor staff, no other individuals frequent the reactor area. The reactor staff receives radiation protection training during annual requalification, which meets the requirements of 10 CFR 19.12. Also, female employees receive additional training as outlined in Regulatory Guide 8.13.

No items of noncompliance were identified.

7. Radiation Protection Procedures

The inspector reviewed the procedures contained in the "TRIGA Operations Manual," including calibration procedures for the area radiation monitor, continuous air monitor, and water radiation monitor.

No items of noncompliance were identified.

8. Instruments and Equipment

a. Portable Survey Instruments

Operable and calibrated instruments capable of detecting beta, gamma, and neutron radiations are available at the reactor. Additional instruments are available from the Industrial Hygiene Office as needed. Records indicated that instruments are calibrated either quarterly (ionization type and neutron meters) or annually (Geiger-Mueller type meters). No problems were noted.

b. Area Radiation Monitors

Records reviewed indicate that the monitor was calibrated in March and August 1980. (Technical Specification G.3 requires an annual frequency.) The inspector observed a calibration check of this instrument and verified that the monitor's audible alarm was functional and that the alarm setpoint was correct. No problems were noted.

c. Continuous Air Monitor (CAM)

The inspector reviewed records of calibration and alarm setpoint checks performed since October 1979 and noted that the frequency

1/ IE Inspection Report No. 50-264/79-02.

was as required by Technical Specification G.3. The inspector observed a calibration check of this instrument and verified that the monitor's audible alarm and visual alarms were functional and that the alarm setpoint was correct. No problems were noted.

No items of noncompliance were identified.

9. Exposure Control

a. External Exposure

The vendor's film badge reports were reviewed for the period October 1979 to date. The greatest whole body and extremity doses received in CY1979 were 210 mrems and 180 mrems, respectively. No measurable whole body dose has been received in CY1980 to date; the highest extremity dose was 40 mrems. No problems were noted.

b. Internal Exposure

The licensee has no routine bioassay program for the reactor staff and relies on the CAM, contamination surveys, and pool activity measurements to define any problem areas. The inspector reviewed records of these indicators; no problems were noted. A previous inspection[2/] noted that pool water was last analyzed for tritium in 1971. The licensee has recently analyzed the pool water for tritium and found it to be less than approximately 1×10^{-5} µCi/ml, their lower detection limit. No problems were noted.

The inspector reviewed action taken by the licensee relating to IE Circular No. 80-14 "Radioactive Contamination of Plant Demineralized Water System and Resultant Internal Contamination of Personnel." The only possible means of contaminating the demineralized water storage tank is through a hose used to add makeup water to the reactor pool. The hose is short enough so that it can not be physically submersed into the pool. It is unlikely that contamination of the demineralized water tank could occur via this route. No problems were noted.

No items of noncompliance were identified.

10. Posting and Labeling

The licensee's compliance with posting and labeling requirements specified in 10 CFR 19.11 and 10 CFR 20.203 were reviewed.

No items of noncompliance were identified.

2/ IE Inspection Report No. 50-264/79-02.

11. Transportation Activities

The licensee stated that no radioactive material has been received under the TRIGA license since the last radiation protection inspection (October 1979). The inspector reviewed records of radioactive shipments made since October 1979. No problems were noted.

The licensee has not submitted a quality assurance program satisfying the requirements of 10 CFR 71, Appendix E and has no plans to do so. No shipments of greater than Type A quantities have been made.

The inspector reviewed the licensee's response to IE Bulletin No. 79-19. No problems were noted.

No items of noncompliance were identified.

12. Surveys

The reactor staff performs contamination and radiation surveys monthly. The Industrial Hygiene Office performs quarterly contamination surveys of the facility. Results of these surveys were reviewed. Only occasional low-level contamination is found in known contamination areas.

No items of noncompliance were identified.

13. Notifications and Reports

A review of records and discussions with licensee representatives indicated compliance with 10 CFR 19 and 10 CFR 20 requirements.

No items of noncompliance were identified.

14. Radioactive Waste

a. Liquid Radioactive Waste

The licensee stated that they do not release liquid radioactive waste from the facility. Any liquids requiring disposal are solidified and shipped to a licensed burial site.

b. The facility has no gaseous effluent monitor, since calculations in the SAR determined that 10 CFR 20 limits will not be exceeded with continuous rabbit operation. The rabbit system is used only a few hours per week.

Particulate effluents would be detected by the CAM. No significant particulate activity has been noted.

c. Solid Radwaste

Solid radioactive waste generated at the reactor facility is collected by the Industrial Hygiene Office and transferred (under NRC Byproduct License No. 21-00265-06) to a licensed disposal vendor. About one 55-gallon drum of waste is generated annually.

The inspector noted that the licensee has been incinerating by-product material (approximately 11 millicuries of carbon-14 and hydrogen-3 in CY 1979). The licensee stated that this practice has been conducted under Byproduct License No. 21-00265-06 for approximately seven years. The licensee further stated that the license did not specifically allow them to incinerate byproduct material, but that they had interpreted the regulations to mean that they could incinerate as long as the limits of 10 CFR 20 Appendix "B" Table II were not exceeded. This matter will be reviewed during a future inspection of Byproduct License No. 21-00265-06.

No items of noncompliance were identified.

15. Exit Interview

The inspector met with licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on September 12, 1980. The inspector summarized the scope and findings of the inspection.