Form AEC-313
8-64
Fo w/1 ab

UNITED STATES ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved
Budget Bureau No. 38-R027

INSTRUCTIONS – Complete Items 1 through 16 if this is an initial application or an application for renewal of a license. Information contained in previous applications filed with the Commisson with respect to Items 8 through 15 may be incorporated by reference provided references are clear and specific. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail two copies to: U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Isotopes Branch, Division of Materials Licensing. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

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

McDonnell Company
P. O. Box 516
St. Louis, Missouri 63166

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

Same

2 DEPARTMENT TO USE BYPRODUCT MATERIAL

Manufacturing & General
Engineering Departments

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

24-2261-3

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

Same as previous license

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

T. C. Linck - Same as previous license.

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

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

(1) Cesium - 137	150 millicuries (increase present limit of 100 millicuries to 150 mc). Sealed sources (Nuclear Consultants, Inc.)
(2) Hydrogen -3	2 millicuries sealed source for F&M Co., Model 2-2837 electron capture detector.
(3) Nickel - 63	200 millicurie sealed source for F&M Co., Model 2-2837 electron capture detector.

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

Cs-137-Tagging bucking bars and seat ejection safety pins for detection after manufacture.

H-3 Sealed sources to be used in F&M gas chromatograph. Model 2-2837 holder.
N_i-63

93609

93609

(Continued on reverse side)

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

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection			Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments	Same as previous license.		Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
		Same as previous license.		

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

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

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

Same as previous license.

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

Same as previous license.

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS IN DUPLICATE

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

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

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

CERTIFICATE (This item must be completed by applicant)

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

Date 10 April 1967

McDonnell Company
Applicant named in item 1

By: W. L. Kistler

Chairman, Safety Committee
Title of certifying official

RECEIVED APR 13 1967 U.S. ATOMIC ENERGY COMMISSION Safety Section

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 : 1964 O—749-531

FORM AEC-374A
(10-61)

U. S. ATOMIC ENERGY COMMISSION

MATERIAL LICENSE

Supplementary Sheet

License Number 24-02261-03

Amendment No. 15

McDonnell Aircraft Corporation
St. Louis, Missouri 63166

In accordance with application dated April 10, 1967, License Number 24-02261-03 is amended as follows:

Item 8.J. is increased to read:

8.J. 150 millicuries; no single source to exceed 4 microcuries

To Add:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity whi licensee may possess at any one time
N. Hydrogen 3	N. Foil in F & M Model 2-2837 detector cells	N. Not to exceed 200 millicuries per cell
O. Nickel 63	O. Sealed sources in F & M Model 2-6195 detector cells	O. Not to exceed 2 millicuries per cell

9. Authorized use

N. and O. To be used with F & M Scientific Company (Hewlett-Packard) gas chromatography equipment for sample analysis.

A/397

For the U. S. Atomic Energy Commission

Original Signed By
Robert E. Brinkerhoff

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

Date APR 19 1967

REB/cjh REB 4/12/67

0701210052 1p

MCDONNELL DOUGLAS CORPORATION

Ref: USAEC-220-53[illegible]

United States Atomic Energy Commission
Washington, D. C. 20545

Attention: Isotopes Branch
Division of Materials Licensing

Subject: Application for Modification of Byproduct Material License

Enclosures: (1) Form AEC-313 (2 copies)
(2) Calculation of Maximum Dose from 8 Microcurie Cesium-137 Sources
(3) Doubly Encapsulated Plugs for use in Tagging Tools

1. Forms AEC 313, Enclosure (1), are submitted for modification of byproduct material license #24-2261-03 issued to the McDonnell Company (formerly McDonnell Aircraft Corporation).

2. Previous license applications have described our radioisotope tagging program in detail. This is a program in which cesium-137 is used as an aid in detecting foreign objects which may have been inadvertently sealed into the interior of an aircraft during manufacture.

3. The complexity of modern vehicles has increased to the point where radiation levels used in the past are in many instances inadequate. Tests have showed that this difficulty can be overcome in these marginal cases by doubling the quantity of radioactive material.

4. Calculation, Enclosure (2), and experimental measurements confirm the fact that radiation levels produced by our proposed increased quantities of radioisotope are not sufficiently great to create a hazard to personnel. The highest levels encountered are approximately 1 mr/hr at the surface and 0.05 mr/hr at 6" from a tagged tool.

A/398

5. In view of the foregoing, it is requested that our license be modified to permit possession and use of larger quantities of cesium-137. Specifically, we wish to change Item 8J in our present license to read, "250 millicuries; no single source to exceed 8 microcuries". This doubles the quantity of cesium allowed in a single source and also increases total maximum quantity licensed. Further, Item 7J should be changed to read, "sealed sources (Mallinckrodt Chemical Works, Nuclear Division; custom sources)". Enclosure (3) describes the sources to be used.

6. Should you require further information, do not hesitate to contact me.

Very truly yours,

MCDONNELL COMPANY, St. Louis

W. L. Kester
Scientist
Research Division

WLK:emc

Form AEC-313
6-64)
10 CFR 30

UNITED STATES ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved
Budget Bureau No. 38-R027

INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application or an application for renewal of a license. Information contained in previous applications filed with the Commission with respect to Items 8 through 15 may be incorporated by reference provided references are clear and specific. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail two copies to: U.S. Atomic Energy Commission, Washington, D.C., 20545 Attention: Isotopes Branch, Division of Materials Licensing. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

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

McDonnell Company
P. O. Box 516
St. Louis, Missouri 63166

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

McDonnell Company
P. O. Box 516
St. Louis, Missouri 63166

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

General Engineering Div.
Research Div.
Manufacturing Div.

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

24-2261-03

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

T. C. Linck
W. L. Kester

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

T. C. Linck

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

Cesium-137

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

Encapsulated Source - Custom.
Mallinckrodt Chemical Works, Nuclear Division

250 millicuries maximum,
8 microcuries maximum per source

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

Tagging tools and ejection seat safety pins used in aircraft manufacture.

C03[illegible]

(Continued on reverse side)

9701210024-S

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

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	SAME AS ORIGINAL APPLICATION		Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments			Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
		SAME AS ORIGINAL APPLICATION		

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

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

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

SAME AS ORIGINAL APPLICATION

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

SAME AS ORIGINAL APPLICATION

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS IN DUPLICATE

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

SAME AS ORIGINAL APPLICATION

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

SAME AS ORIGINAL APPLICATION

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

SAME AS ORIGINAL APPLICATION

CERTIFICATE (This item must be completed by applicant)

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

McDonnell Company
Applicant named in item 1

Date 8 February 1968

By William L. Kester

Chairman, Isotope Committee
Title of certifying official

FEB 12 1968

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 : 1964 O—745-582

Calculation of Maximum Dose from 8 Microcurie Cesium-137 Sources

Using the formula

$$I\gamma = 0.156\ n\ E(10^5\ \mu_a)$$

where

$I\gamma$ = dose in mr/hr/mc at one meter

n = number of gammas per disintegration

E = gamma photon energy in Mev

μ_a = true linear energy absorption coefficient for air

We have for cesium-137

$$I = 0.156 \times 0.92 \times 0.661 \times 3.4 = 0.32 \text{ mr/hr/mc at 1 meter}$$

This transforms to

$$0.32 \times 43 = 13.8 \text{ mr/hr/mc at 6"}$$

For 8 μcuries

$$I = 0.112 \text{ mr/hr at 6".}$$

This value is obtained with no shielding and so represents a maximum value. Since 8 μc sources will be sealed into plugs of at least 0.436" steel, the attenuation will reduce the radiation levels to approximately one half.

$e^{\mu x}$ for steel 0.435" thick is ~ 1.9.

From this we find that the radiation level from 8 μc Cs-137 sources is well below the hazardous level

The manner in which these bars are used and stored is such that there would never be sufficiently great numbers in one area so as to raise the radiation levels by more than a factor of ten, or to a value which is still less than 1 mr/hr at 6".

Doubly Encapsulated Plugs for Use in Tagging Tools

Our original supplier of custom made plugs was Nuclear Consultants, Inc.. They have been acquired by Mallinckrodt Chemical Works, Nuclear Division who will continue to supply our needs.

The new supplier will modify this source to the extent described below in an effort to furnish a better product.

Cesium - containing plugs will be fabricated by pipeting an aliquot of cesium chloride solution into a section of copper tubing 0.250" in length by 0.180" O.D.

This tube, sealed at both ends with ceramic cement is thoroughly dried, then it is inserted into a drilled steel plug as described in earlier communications. The only change has been the addition of the inner copper encapsulation which should give better protection in case of failure of the ceramic seal in the outer steel jacket.

Enclosure (3)
of W. L. Kester's
Letter No. 5396
Dated 8 February 1968

FORM AEC-374C
(4-66)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE

Supplementary Sheet

License Number 24-02261-03

Amendment No. 16

McDonnell Company
St. Louis, Missouri 63166

In accordance with application dated February 8, 1968, License Number 24-02261-03 is amended as follows:

Item 1. is amended to read:

1. McDonnell Company

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

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
J. Cesium 137	J. Sealed sources (custom; Nuclear Consultants or Mallinckrodt)	J. 250 millicuries, no single source to exceed 8 microcuries

9. Authorized use

J. Tagging tools and ejection seat safety pins used in aircraft manufacture.

A/397

For the U. S. Atomic Energy Commission
Original Signed by
Robert E. Brinkman
by Isotopes Branch
Division of Materials Licensing
Washington, D. C. 20545

MAR 4 1968
Date

REB/eg

9012210005 +P

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MCDONNELL DOUGLAS CORPORATION

23 APR 1968
USAEC-220-5497

United States Atomic Energy Commission
Washington, D.C. 20545

Attention: Isotopes Branch
Division of Material Licensing

Subject: Application for Modification of Byproduct Material License

Enclosures: (1) Form AEC-313 (2 copies)

Gentlemen:

1. Forms AEC-313, Enclosure (1), are submitted for modification of Byproduct Material License #24-2261-03 issued to the McDonnell Company.

Yours very truly,

MCDONNELL COMPANY, St. Louis

W. L. Kester
Scientist
Research Division

WLK:emc

A/400

01974

9701310312 1P

Form AEC-313
8-64
10 CFR 30

UNITED STATES ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved
Budget Bureau No. 38-R027

INSTRUCTIONS. – Complete items 1 through 16 if this is an initial application or an application for renewal of a license. Information contained in previous applications filed with the Commisson with respect to items 8 through 15 may be incorporated by reference provided references are clear and specific. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail two copies to: U.S. Atomic Energy Commission, Washington, D.C., 20545, Attention: Isotopes Branch, Division of Materials Licensing. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

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

McDonnell Company
P. O. Box 516
St. Louis, Missouri 63166

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

Same as 1. (a)

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Advanced Electronic Techniques

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

24-2261-03

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

D. H. Cowd[illegible]ck

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

T. C. Linck

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

Promethium-147

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

Encapsulated source

3M Company Model 1E2J

3 sources; maximum of 1 curie each source.

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

Self luminous markers, sealed into fused silica.

C1974

(Continued on reverse side)

Attachment 20

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

8 TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a Principles and practices of radiation protection	Same as original application		Yes No	Yes No
b Radioactivity measurement standardization and monitoring techniques and instruments			Yes No	Yes No
c Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d Biological effects of radiation			Yes No	Yes No

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
		Same as original application		

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

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

11 METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE

Same as original application

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

Same as original application

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS IN DUPLICATE

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

Same as original application

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

Same as original application

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

Same as original application

CERTIFICATE (This item must be completed by applicant)

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

McDonnell Company
Applicant named in item 1

Date 19 April 1968

By: W. L. Kester
W. L. Kester
Chairman, Isotope Committee
Title of certifying official

WARNING.—18 U. S. C., Section 1001; Act of June 25, 1948; 62 Stat. 749, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

* U. S. GOVERNMENT PRINTING OFFICE : 1964 O—708-381

DML:IB:RJD (01974)

MAY 27 1968

McDonnell Company
P. O. Box 516
St. Louis, Missouri 63166

Attention: Mr. W. L. Kester
Scientist
Research Division

Gentlemen:

Enclosed is Amendment 17 to License No. 24-02261-03 authorizing the use of promethium 147 sealed sources. If you wish to add Mr. D. H. Cowdrick to this license as an authorized user, please complete Items 8 and 9 of Form AEC 313.

Sincerely yours,

Original Signed by
Robert E. Brinkman

Robert E. Brinkman
Isotopes Branch
Division of Materials
Licensing

Enclosures:
1. Amend. 17
2. Form 313 w/instr.

bcc: Standard Branch Dist.
CO, Region III
DML

A/401

OFFICE ▶	DML:IB	DML:IB				
SURNAME ▶	RJDube/dhs	REBrinkman				
DATE ▶	5/24/68	5/27/68				

Form AEC-318 (Rev. 9-53) U.S. GOVERNMENT PRINTING OFFICE : 1969—O-214-829

~~07012100 10 IP~~

FORM AEC-374C
(4-66)

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

License Number 24-02261-03

Amendment No. 17

McDonnell Company
P. O. Box 516
St. Louis, Missouri 63166

In accordance with application dated April 19, 1968, License Number 24-02261-03 is amended as follows:

To add:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
P. Promethium 147	P. Sealed sources (3M Model 1E2J)	P. 3 sources, not to exceed 1 curie per source

9. Authorized use

P. To be used as self-luminous markers.

For the U. S. Atomic Energy Commission
Original Signed By
Robert E. Brinkman
by Isotopes Branch
Division of Materials Licensing
Washington, D. C. 20545

Date MAY 27 1968

RGB RTO/sig

1

A701218014 10

MCDONNELL DOUGLAS
CORPORATION

11 JUN 1968
Ref: USAEC-220-5595

United States Atomic Energy Commission
Washington, D.C. 20545

Attention: Isotopes Branch
Division of Materials Licensing

Subject: Application for Renewal of Byproduct Material License

Enclosures: (1) Form AEC-313 (2 copies)

(2) Supplemental Sheets to Encl. (1) (2 copies)

1. Enclosed are forms AEC-313 with attachments in application for renewal of Byproduct License 24-2261-03 issued to the McDonnell Company.

2. Should you require any further information do not hesitate to contact us.

Very truly yours,

MCDONNELL COMPANY, St. Louis

K. L. Kester

W. L. Kester
Scientist
Research Division

WLK:emc

A1402

03203

9706240015 1P

Form AEC-313 (5-58)

ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved Budget Bureau No. 38-R027.4

INSTRUCTIONS.–Complete items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail three copies to: U.S. Atomic Energy Commission, Washington, D.C., 20545. Attention: Isotopes Branch, Division of Licensing and Regulation. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30 and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

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

McDonnell Company
P. O. Box 516
St. Louis, Missouri 63166

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

Same as 1.(a)

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Manufacturing, Quality control, advanced electronics, Research, General engineering

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

24-2261-03

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

D. L. Holt
W. L. Kester
N. A. Lamb
C. J. Wolf
T. C. Linck
F. C. McCallister (~~Radiography~~)

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

T. C. Linck
D. L. Holt*

*Attachment 8 & 9 enclosed

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

See Attachment

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

See Attachment

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

See Attachment

0.295

(Continued on reverse side)

Q-70121-017 SPP

Form AEC-313 (5-58) Page

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

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection			Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments	See Attachment		Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
		See Attachment		

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

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

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

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

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

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

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

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

CERTIFICATE (This item must be completed by applicant)

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

Date 10 June 1968

RECEIVED JUN 13 1968

McDonnell Company
Applicant named in item 1

By W. L. Kester
William L. Kester
Chairman, Isotope Committee
Title of certifying official

WARNING.—18 U. S. C., Section 1001; Act of June 25, 1948; 62 Stat. 749, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

GPO 885-815

McDonnell Company
P.O. Box 516
St. Louis, Missouri 63166

FORM AEC-313

6.(a)

A. Any byproduct material with atomic numbers 3 to 89, inclusive.

B. Any byproduct material with atomic numbers 3 to 83, inclusive.

C. Americium 241

D. Americium 241

E. Cobalt 60

F. Cesium 137

G. Hydrogen 3

H. Hydrogen 3

I. Strontium 90

J. Nickel 63

K. Promethium 147

6.(b)

A. Any chemical form; 25 millicuries each nuclide.

B. Irradiated parts and components; 1 curie total.

C. Any chemical form; 1 millicurie

D. Sealed sources; Foil manufactured by Radiation Research Corp;, and contained in Lion Research Corp. carbon dioxide detector; 20 millicuries, not to exceed 1 millicurie per detector.

E. Sealed sources (wire), not to exceed 200 millicuries

F. Sealed sources, (custom, Nuclear Consultants or Mallinckrodt); 250 millicuries, no single source to exceed 8 microcuries.

G. Foil in Jarrell-Ash Model 28-750 or 28-751 Detector cells; not to exceed 100 millicuries per cell.

H. Foil in F&M Model 2-2837 detector cells; not exceed 200 millicuries per cell.

I. Foil in Jarrell-Ash Model 28-752 or 28-755 detector cells; not to exceed 20 millicuries per cell.

J. Sealed source in F&M Model 2-6195 detector cells; not to exceed 2 millicuries per cell.

K. Sealed sources (3M Model 1E2J); 3 sources not to exceed 1 curie per source.

McDonnell Company
P.O. Box 516
St. Louis, Missouri 63166

FORM AEC-313

7. A,B&C. Research and Development as described in Section 30.4 (q), 10 CFR 30.

D. Testing and calibration of carbon dioxide sensors.

E. Instrument calibration

F. Tagging bucking bars and seat ejection safety pins for detection after manufacture.

G & I. To be used in Jarrell-Ash Company gas chromatograph for sample detection.

H & J. To be used with F & M Scientific Company gas chromatograph for sample detection.

K. To be used on self-luminous markers.

TRAINING AND EXPERIENCE WITH RADIOACTIVITY

DENVER L. HOLT

8. Type of Training	Where Trained	Duration of Training	On The Job	Formal Course
a. Principles and practice of radiation protection.	(Re: 8-a, b, c, d) Mallinckrodt Chemical, Uranium Division, Health Department (MCW).	9 years	yes	no
b. Radioactivity measurement, standardization and monitoring techniques and instruments.	(Re: 8-a, c) AEC personnel at MCW; course on criticality safety.	1 week	yes	yes
c. Mathematics and Calculations basic to the use and measurement of radioactivity.	(Re: 8-a, b) AEC, Nevada Test Site; Radiological Assistance Team Training Course.	1 week	yes	yes
d. Biological effects of radiation.				

9. Experience With Radiation

Isotopes	Maximum Amount	Where Experience Was Gained	Duration of Experience	Type of Use
anium-Natural	Tons in process	MCW	Nine years	Radiation protection for refining and metal fabrication.
anium-1.5% Enriched	Tons in process	MCW	One year	Radiation protection for refining and metal fabrication.
orium-Natural	Tons in process	MCW	Two years	Radiation protection for refining operations.
226 and various small sources	10 mc ≤ 10 mc	MCW	Nine years	Alpha, beta, gamma source for monitoring and counting equipment calibration

FORM AEC-374
(7-68)
10 CFR 30

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE

License No. 24-02261-03
Page 1 of 4 Pages
Amendment No. 18

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Parts 30, 32, 33, 34, and 35, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, own, possess, transfer and import byproduct material listed below; and to use such byproduct material for the purpose(s) and at the place(s) designated below. This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. McDonnell Company	In accordance with application dated June 10, 1968
2. P.O. Box 516 St. Louis, Missouri 63166	3. License number 24-02261-03 is amended in its entirety to read as follows:
	4. Expiration date July 31, 1973
	5. Reference No.

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
A. Any byproduct material between Atomic Nos. 3 and 83, inclusive	A. Any	A. Not to exceed 25 millicuries per radionuclide
B. Any byproduct material between Atomic Nos. 3 and 83, inclusive	B. Irradiated parts and components	B. 1 curie total
C. Americium 241	C. Any	C. 1 millicurie
D. Americium 241	D. Foils	D. 20 millicuries
E. Cobalt 60	E. Sealed Sources	E. 200 millicuries
F. Cesium 137	F. Sealed Sources	F. 250 millicuries, not to exceed 8 microcuries per source
G. Hydrogen 3	G. Foils for detector cells	G. Not to exceed 200 millicuries per cell
H. Strontium 90	H. Foils for detector cells	H. Not to exceed 20 millicuries per cel
I. Nickel 63	I. Foils for detector cells	I. Not to exceed 2 millicuries
J. Promethium 147	J. Sealed sources	J. 3 sources not to exceed 1 curie per source

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9. Authorized use

A., B., C. Research and development as defined in 10 CFR 30.
D. Testing and calibration of carbon dioxide sensors.
E. Instrument calibration.
F. Tagging bucking bars and seat ejection safety pins for detection after manufacture.
G., H. and I. Gas chromatograph units for sample analysis.
J. Self-luminous markers.

CONDITIONS

10. Byproduct material may only be used at the licensee's address stated in Item 2 above.

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

12. Byproduct material shall be used by, or under the supervision of, D. L. Holt, W. L. Kester, N. A. Lamb, C. J. Wolf, T. C. Linck, or F. C. McCallister.

13. A(1) Each sealed source containing byproduct material, other than Hydrogen 3, with a half-life greater than thirty days and in any form other than gas shall be tested for leakage and/or contamination at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, the sealed source shall not be put into use until tested.

13. A. Continued

(2) Notwithstanding the periodic leak test required by the preceding paragraph, any licensed sealed source containing byproduct material is exempted from periodic leak tests provided the quantity of byproduct material contained in the source does not exceed ten times the quantity specified for the byproduct material in Column II, Schedule A, Section 31.100, 10 CFR 31.

(3) 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. 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 mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.

C. If the test reveals the presence of 0.005 microcurie or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within 5 days of the test with the Director, Division of Materials Licensing, U. S. Atomic Energy Commission, Washington, D. C., 20545, describing the equipment involved, the test results, and the corrective action taken. A copy of such report shall also be sent to the Director, Region III, Division of Compliance, USAEC, 799 Roosevelt Road, Glen Ellyn, Illinois, 60137.

CONDITIONS

13. Continued

    D. Tests for leakage and/or contamination shall be performed by the licensee or by other persons specifically authorized by the Commission or an agreement State to perform such services.

14. Notwithstanding and in lieu of the requirements of Section 20.203(f), 10 CFR 20, the licensee is authorized to label or stamp tagged bucking bars and tagged seat ejection pins with an uncolored standard radiation symbol and the legend "Contains Radioactive Material, AEC License 24-02261-03."

15. Detector cells containing Hydrogen 3 foil shall only be used in conjunction with a properly operating temperature control mechanism which prevents foil temperatures from exceeding 225 degrees Centigrade.

16. 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 byproduct material and used in gas chromatography devices, with conspicuously etched or stamped radiation caution symbols without a color requirement.

17. Except as specifically provided otherwise by this license, the licensee shall possess and use byproduct material described in Items 6, 7, and 8 of this license in accordance with statements, representations, and procedures contained in application dated October 6, 1958, March 21, 1961, and February 8, 1968 and related documents and amendments as follows:

    A. "Safe Practice Procedures" submitted May 22, 1959.

    B. Letter dated May 13, 1959.

For the U. S. Atomic Energy Commission

Date JUL 1 1968

Original Signed By
Robert E. Brinkman
by Isotopes Branch
Division of Materials Licensing
Washington, D. C. 20545

KEB/fe

MCDONNELL DOUGLAS CORPORATION

23 SEP 1968

Ref: USAEC-220-5726

United States Atomic Energy Commission
Washington, D.C. 20545

Attention: Isotopes Branch
Division of Materials Licensing

Subject: Application for Modification of Byproduct Material License.

Enclosures: (1) Form AEC-313 (2 Copies)

(2) Supplemental Sheets to Encl. (1) (2 Copies)

1. Forms AEC-313 with attachment are submitted in application for modification of byproduct license #24-2261-03 issued to the McDonnell Company.

2. In section 1(a) of our previous application, dated 10 June 1968, we listed "McDonnell Company". In view of recent changes that have been made, the appropriate name is now "McDonnell Douglas Corporation". The address given should serve to restrict applicability of this license to St. Louis and to those facilities specifically called out in either the license or its amendments.

3. Should you require any further information do not hesitate to contact us.

Very truly yours,

W. L. Kester
Scientist
Research Division

WLK:emc

A/404

05561

Saint Louis, Missouri 63166

9701210020 17

Form AEC-313
(2-57)

ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

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

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

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

McDonnell Douglas Corporation
P. O. Box 516
St. Louis, Missouri 63166

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

Same as 1.(a)

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

General Engineering Division

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

24-2261-03

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

Same as application dated 10 June 1968

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

Same as application dated 10 June 1968

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

Promethium-147

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

Sealed Sources - See Attachment

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

See Attachment

05561

(Continued on reverse side)

~~A70121-023-20~~

Form AEC-313 2 57

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

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	Same as application dated 10 June 1968		Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments			Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
		Same as application dated 10 June 1968		

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

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

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

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

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

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

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

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

CERTIFICATE (This item must be completed by applicant)

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

RECEIVED SEP 25 1968 U.S. ATOMIC ENERGY COMMISSION Regulatory Main Section

McDonnell Douglas Corporation
Applicant named in item 1

Date 20 Sept 68 By William L. Kester
William L. Kester
Chairman, Isotope Committee
Title of certifying official

WARNING.—18 U. S. C., Section 1001; Act of June 25, 1948, 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE : 1957 O-F—424008

McDonnell Douglas Corporation
P. O. Box 516
St. Louis, Missouri 63166

FORM AEC-313 (Modification of Byproduct License)

6.(b) Promethium-147 in the form of microspheres manufactured by the Minnesota Mining and Manufacturing Co. (3M). The microspheres are sealed into a quartz disc by means of "Glassrock" ceramic material.

66 sources not to exceed 300 millicuries per source.
Total 19.8 curies.

7. Byproduct material in the form of ceramic spheres is mechanically mixed with a phosphor and a binder to form a luminescent marker to be used on the docking target of the Apollo Lunar Excursion Module (LEM).

Targets assembled by Grumman Aircraft are sent to 3M for assembly of luminous markers. The completed units are then forwarded to Manned Space Center at Houston, Texas for attachment to LEM. One of these units is to be assigned to McDonnell Douglas for test purposes.

Manned Space Center authorization for possession of these items is contained in byproduct material license # 42-09388-01, amendment 15. The cognizant authority is Shell E. Martin.

FORM AEC-374C
(4-68)

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

License Number 24-02261-03

Amendment No. 19

McDonnell Douglas Corporation
P. O. Box 516
St. Louis, Missouri 63166

In accordance with application dated September 20, 1968, License Number 24-02261-03 is amended as follows:

Items 1. and 2. are amended to read:

1. McDonnell Douglas Corporation

2. P. O. Box 516
St. Louis, Missouri 63166

To Add:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
K. Promethium 147	K. Sealed Luminous Sources	K. 20 curies total

9. Authorized use

K. Testing of Apollo docking target.

A/405

For the U. S. Atomic Energy Commission
Original Signed by
Robert E. Brinkman
by Isotopes Branch
Division of Materials Licensing
Washington, D. C. 20545

Date OCT 1 1968

REB

REB/cjp

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MCDONNELL DOUGLAS CORPORATION

2 9 OCT 1970

USAEC-256-002

United States Atomic Energy Commission
Washington, D.C. 20545

Attention: Isotopes Branch
Division of Material Licensing

Subject: Application for Modification of Byproduct Material License

Enclosure: (1) Form AEC-313 (2 copies)

Gentlemen:

1. Forms AEC-313, Enclosure (1), are submitted for modification of Byproduct Material License #24-2261-03 issued to the McDonnell Douglas Corporation.

Yours very truly,

MCDONNELL DOUGLAS CORPORATION

W. L. Kester
Chairman
Isotope Committee

WLK:jg

A/406

16512

AEC-313
8-64
10 CFR 30

UNITED STATES ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved
Budget Bureau No. 38-R0027

INSTRUCTIONS. – Complete Items 1 through 16 if this is an initial application or an application for renewal of a license. Information contained in previous applications filed with the Commission with respect to Items 8 through 15 may be incorporated by reference provided references are clear and specific. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail two copies to: U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Isotopes Branch, Division of Materials Licensing. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

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

McDonnell Douglas Corporation
P. O. Box 516
St. Louis, Missouri 63166

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

Same

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Research & General Engineering

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

24-2261-03, 24-2261-04, 24-2261-05

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

W. R. Binns
Research Scientist

W. L. Kester

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

T. C. Linck
D. L. Holt

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

Cf-252

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

The Cf-252 will be in a chloride solution. Source will be 0.1 micrograms or 60 microcurie.

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

The Cf-252 will be used as a calibration source inside a sealed ionization chamber which has 1/4" aluminum walls.

COPIES SENT TO COMPLIANCE

16512

(Continued on reverse side)

9401210037 [illegible]

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

8 TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a Principles and practices of radiation protection	Colorado State University		Yes No	Yes No
b Radioactivity measurement standardization and monitoring techniques and instruments	Colorado State University		Yes No	Yes No
c Mathematics and calculations basic to the use and measurement of radioactivity	Colorado State University	4 years	Yes No	Yes No
d Biological effects of radiation	Colorado State University		Yes No	Yes No

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
AM 241	1 microgram	Washington University	2 years	Calibration Source
Sr 90	1 microgram	Washington University	1 year	Calibration Source

10 RADIATION DETECTION INSTRUMENTS (Use supplemental sheets if necessary)

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

11 METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE

Alpha wipe tests - all work will be done on disposable paper - Periodic alpha wipe tests will be performed to insure against contamination.

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

Same as Original Application

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS IN DUPLICATE

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

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

See Attachment

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

CERTIFICATE (This item must be completed by applicant)

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

McDonnell Douglas Corporation
Applicant named in item 1

Date 27 OCT 70

By: Wm. L. Kisten

Chairman, Isotope Committee
Title of certifying official

WARNING.—18 U. S. C., Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

☆ U.S. GOVERNMENT PRINTING OFFICE : 1966 O—316-327

14. The primary radiation control will be that described in previous requests. Californium-252 is to be used as an internal calibrating source in a cosmic ray detector, and as such, it will be permanently sealed in the interior of an ionization detector. Under these conditions it will be treated as a sealed source.

Realizing that californium is somewhat different from the usual radioisotope we will take the following additional precautions in handling it:

> All preliminary work with the californium will be done in plastic trays lined with absorbant paper to trap any material lost in case of a spill. All waste materials generated during this procedure will be checked for activity prior to discard. Wipe test will be made using absorbant paper which will be digested, dried and assayed for alpha activity by use of a 2π gas flow counter. Any stray activity will be removed by detergent-versene treatment.

0.1 microgram of Californium-252 corresponds to 56.5 microcuries. The low energy gamma associated with this isotope creates no special radiation hazard and the alpha particles it emits will be completely absorbed by the 1/4 inch thick walls of the chamber in which the material is housed.

Our problem then, is to determine the neutron emission and its hazard.

Spontaneous fission of 0.1 microgram of Cf-252 yields 2.5×10^5 neutrons/sec. These will be thermalized by a shield made of a 4 inch thickness of parafin. Around this will be placed a 0.032 inch layer of cadmium. The equilibrium of Cd with 2.5×10^5 neutrons/sec will produce approximately 6.7μCi gamma with energies up to 1.3 MeV. This radiation will be distributed over the entire surface of the shield and at no point would the radiation be greater than 2 mr/hr. This low level eliminates the need for additional shielding about the assembly.

Dr. Kesler – McDonald Douglas

we can go along, provided kept in glove box and your describe program for control plus the evaluation of containment in irradiation chamber.

11/6/71

Kessler – will submit revised application use of 0.1 μC source

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ked to Dr. Kester
11/18/70
will call back.
Going to discuss with chemist. Get source received as plated material

Talked To Dr. Kester 12/17/70
Will have answer next week