

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

Page 1 of 1 Page

License Number 24-1113-15  
(D65)

AMENDMENT NO. 1

Monsanto Chemical Company  
800 N. Lindbergh Boulevard  
St. Louis 66, Missouri

Attention: R. J. McManis  
L. C. Weger  
C. H. Adams  
H. W. Mohrman

In accordance with letter dated January 24, 1964, signed by L. C. Weger, License No. 24-1113-15 is amended as follows:

Conditions No. 12, 15, and 16 are amended to read:

12. Byproduct material shall be used by, or under the supervision of, R. J. McManis, L. C. Weger, C. H. Adams, or H. W. Mohrman.
15. Maintenance, repair, and initial radiation survey of devices containing byproduct material and leak testing, installation, replacement, and disposal of sealed sources containing byproduct material used in devices shall be performed only by Nuclear-Chicago Corporation, or by other persons specifically authorized by the Commission to perform such services.
16. 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 April 15, 1963, and letter dated January 24, 1964, from L. C. Weger.

80

Date FEB 28 1964

**DUPLICATED**  
FOR DIV. OF COMPLIANCE

For the U. S. Atomic Energy Commission  
Original Signed by  
Robert E. Brinkman

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

1 *Gene Ham*  
9702140080 970106  
PDR FOIA  
NEITZEL96-314 PDR

*RGB 2/28/64*

DATE RECEIVED	EXPIRATION DATE	ISSUE DATE	REVIEWER
CONTROL NO.	REFERENCE NO.	LICENSE NO.	AMENDMENT NO.
ISOTOPE	FORM	POSSESSION LIMIT	
	A.	A.	
	B.	B.	
	C.	C.	
	D.	D.	
	E.	E.	
	F.	F.	
	G.	G.	
	H.	H.	

**AUTHORIZED USE**

**REMARKS:** Letters, Phone Calls, Visits, Exemptions, Etc. (Use reverse side if necessary)

Card 12: add C.H. Adams, H.W. Muhammad

Card 15: Maintenance, repair, & initial... etc (as before)

Card 16: app. del. April 15, 1963, & del. del Jan 24, 1964, from L.C. Weger

MAILED TO:	DATE MAILED	REVIEWER	DATE
L.C. Weger	FEB 28 1964	BAC KGB	2/28/64 2/28/64

A/347

(1-63)

Date Received	Expiration Date <i>April 15, 1965</i>	Issue Date	Tech. Review <i>REB</i>
Control No.	Reference No.	License No. 2b-1113-15 D65	Amendment No.
Isotope	Form	Possession Limit	
A. <i>C 137</i>	A. <i>sealed source (Nuclear - Chicago Model RK-138)</i>	A. <i>One source not to exceed 500 milligrams</i>	
B.	B.	B.	
C.	C.	C.	
D.	D.	D.	
E.	E.	E.	
F.	F.	F.	
G.	G.	G.	
H.	H.	H.	

Authorized Use

*A. To be used in Nuclear - Chicago Model 506 Gauge for continuous density measurements*

REMARKS: Letters, Phone Calls, Visits, Exemptions, Etc. (Use reverse side if necessary)

*(11)*  
*(19) R. J. McManis - L. C. Weyer*  
*(25)*  
*(39) Region III*  
*(34) - Nuclear Chicago Corp. & other persons specifically authorized by the Commission to perform such services*  
*(4) exp. dated April 15, 1963*

Conditions			
1. A B C	6.	11.	16.
2. A B C	7.	12.	17.
3. A B C D	8.	A B C 13.	18.
4. A B	9.	A B C 14.	A B C 19.
5.	10.	15.	20.
			21.

Mail To: <i>F. C. Wellington</i>	Date Mailed <i>APR 20 1963</i>	Approve <input checked="" type="checkbox"/> Void <input type="checkbox"/>
		Tech. Reviewer <i>REB</i> Date <i>4/29/63</i>
		Chief Date

ACKNOWLEDGED

MANUFACTURING METHODS PROCEDURES


INDUSTRIAL ENGINEERING DEPARTMENT

DATE ISSUED 1 December 1955

PROCEDURE NUMBER 5

DATE REVISED 25 October 1956

PAGE 1 OF 5

- A. TITLE: BUCKING BARS - METHOD OF RADIOACTIVATION
- B. PURPOSE: To establish a procedure and fix responsibility for processing bucking bars to contain radioactive sources suitable for detection and in compliance with the Atomic Energy Commission requirements.
- C. EQUIPMENT AND SUPPLIES:
- Shielded Carriers, Model L-7, NRD Instrument Co., or equiv.
  - Steel Plugs containing 1 Microcurie of Cs 137 per Mfg. Proc. Spec. No. 5.
  - Steel Plugs containing 4 Microcuries of Cs 137 per Mfg. Proc. Spec. No. 5.
  - #680, Size 3/32, D.C. rod, Eutectic Low Temp. Welding Alloys, or equiv.
  - Thync Survey Meter, NRD Instrument Co., Model CS-10, or equiv.
  - Radioactivity Symbol  steel stamp.
  - Radiation Material*
  - CONTAINS RADIOACTIVITY decals printed in magenta on yellow, Scotchlight, Continental Decalcomania Co., or equiv.
- D. FORMS:
- TOOL SHOP BUCKING BAR LOG
  - TOOL INSPECTION BUCKING BAR LOG
  - TOOL REJECTION tag (NAC 407)

E. RESPONSIBILITY AND HANDLING:

TOOL CRIB PERSONNEL:

1. Deliver the bucking bars to be processed to the area selected for processing.

TOOL DESIGN:

2. Locate properly charged plugs in bucking bars with consideration of the contained Cs 137 charge per the following chart:

Micro-curies of Cs137 in Steel Plugs	Min. Width of Bar	Min. Depth of Bar	Min.Amt. of Steel Shielding Around Charge	Max. Thickness of Steel Around Charge	C to C Min. Bet. Equally Charged Plugs With Min. Shielding
1	.53	.822	.195	.95	2.50
4	.94	1.231	.400	2.50	2.00

Enclosure (2)  
 Ref: AEC-551-901  
 25 March 1959

A1348



McDONNELL AIRCRAFT CORPORATION

MANUFACTURING METHODS PROCEDURES

INDUSTRIAL ENGINEERING DEPARTMENT

DATE ISSUED 1 December 1955

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TOOL DESIGN:  
(Continued)

2. a. Two plugs, each containing a 1 Microcurie charge, may be spaced a minimum of .25 C to C provided the minimum steel shield around the sources is .285. The maximum distance from these sources to any outside surface of the bar shall not exceed 1.60.  
b. Two plugs, each containing a 4 Microcurie charge, may be spaced a minimum of .25 C to C provided the minimum steel shield around the sources is 1.00.
3. Select a non-bucking area on each bucking bar to locate a hole(s) to contain a loaded plug(s) per Para. E.2.  
a. When a 1 Microcurie (.1875 dia. x .500) plug is selected, the hole shall be .191 dia. (#11 drill) and a depth such that the plug, when bottomed, will be .060  $\pm$  .015 below the surface of the bar.  
b. When a 4 Microcurie (.250 dia. x .687) plug is selected, the hole shall be .257 dia. (F drill) and a depth such that the plug, when bottomed, will be .060  $\pm$  .015 below the surface of the bar.
4. Where the bar has a depth greater than the minimum shown in Para. E.2., the hole shall be drilled to a depth 1/8 inch greater than 1/2 the depth of the bar. A hardened drill rod plug shall, in this case, be located above the charged plug. The drill rod plug shall be so dimensioned that a .06 depression will remain for weld metal.
5. Where the bar is of such a size that one (1) charged plug will not satisfy the requirements of Para. E.2., locate two holes on diametrically opposite surfaces in compliance with Para. E. 2. and Para. E.3.
6. In the case of a long, thin bar, the maximum shielding around a capsule may exceed the specification of Para. E.2. for an arc of 20° provided the remainder of the bar conforms.
7. Where a bar is of such size and shape that the minimum steel shield requirement of Para. E.2. cannot be satisfied, a steel cylinder may be welded to the bar. This cylinder shall be dimensioned for compliance with shielding requirements and located so as not to interfere with the usage of the bar.

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TOOL DESIGN:  
(Continued)

8. Steel plugs shall be ARC WELDED in the bar, using EUTECTIC LOW TEMP. WELDING ALLOYS - #680 - Size 3/32 - D.C. rod, or equiv.

9. Excess weld metal shall be ground off and the weld steel stamped with the radioactivity symbol.

TOOL SHOP PERSONNEL:

10. Where additional shielding is required per Para. E.7:

a. Make up steel cylinder(s) to Tool Design specifications.

b. Weld cylinder(s) to bar in location designated by Tool Design.

11. Drill holes for plugs as specified by Tool Design.

TOOLING INSPECTION:

12. Place plug(s) containing the correct Cs 137 charge into the bar. Insert charged end first and bottom plug in hole. Refer to NOTE, Para. E.14.

TOOL SHOP PERSONNEL:

13. When required, insert a drill rod plug, per Para. E.4.

14. Seal plug(s) in bar with arc weld per Para. E.8.

NOTE: Operations outlined in Paras. E.12., E.13., and E.14. shall be performed as a continuous process.

15. Grind off excess weld.

16. Steel stamp weld with the radioactivity symbol.

17. Etch serial number on bar. Serial numbers shall be as follows:



NOTE: Omit dashes in serial number.

Section 1 - The last two (2) digits of the year in which the bar is charged.

Section 2 - The consecutive number of each bar charged during the year. (Begin with one (1) each year).

Section 3 - The letter "A" to signify radioactivity and prevent tampering with the serial number.

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TOOL SHOP  
PERSONNEL:  
(Continued)

TOOLING  
INSPECTION:

17. As the serial number is etched on each bar, list that number in the TOOL SHOP BUCKING BAR LOG to insure that two bars will not have the same number.
  18. Conduct progressive inspection of bucking bars as they are processed.
  19. Check bucking bar with survey meter for acceptable radiation level to satisfy the following requirements:
    - a. With the probe 30 inches from the bar and the bar positioned so that the largest amount of steel will shield the probe from the charge, the average reading shall be .25 above the background radiation level on the middle scale of the instrument.
      1. For bars processed per Para. E.6., the minimum reading requirement (.25) may be waived for an arc of 20°, or less, provided the remainder complies.
    - b. With the probe 12 inches from the center of the charge and the bar positioned so that shielding is minimum, the average reading shall not exceed 2.4 above background radiation level on the least sensitive (high) scale.
- NOTE: The desirable background radiation level for checking bucking bars is about .5 on the middle scale.
20. Signify complete acceptance of a bar by placing a decal reading CONTAINS RADIOACTIVITY on a non-bucking surface.
    - a. Clean area selected for decal with denatured alcohol before application.
  21. When a bar fails to meet specifications, complete a TOOL REJECTION tag.
  22. Record the serial number, tool description, number and type of radioactive charges, date of first inspection and stamp of acceptance or TOOL REJECTION number for each bar in the TOOL INSPECTION BUCKING BAR LOG.
  23. Return accepted bucking bars to Department 126 Warehouse.



McDONNELL AIRCRAFT CORPORATION

MANUFACTURING METHODS PROCEDURE

INDUSTRIAL ENGINEERING DEPARTMENT

DATE ISSUED 1 December 1955

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TOOLING  
INSPECTION:  
(Continued)

24. Initiate procurement action, as required, to purchase and maintain adequate supply of steel plugs containing C<sub>8</sub> 137 per Mfg. Proc. Spec. No. 5. This supply is to be stored by supplier, at his facility, subject to immediate MAC requirements. The receiving of these plugs, at MAC, shall be accomplished by certified personnel only.
25. An adequate supply of charged plugs, not to exceed 100 of each magnitude, shall be maintained at MAC and handled by certified personnel only.
26. All plugs containing C<sub>8</sub> 137 shall be stored in Shielded Carriers. Carriers shall be locked at all times, except when loading bars and receiving plugs. Keys shall be under the control of authorized personnel only.
27. An adequate supply of decals shall be maintained and handled by Tooling Inspection personnel only.

APPROVED

*H. E. Christensen*  
H. E. Christensen

DATE 25 Oct. 56

HKW:jm



MCDONNELL AIRCRAFT CORPORATION

MANUFACTURING PROCUREMENT SPECIFICATIONS

INDUSTRIAL ENGINEERING DEPARTMENT

DATE ISSUED 13 July 1955

SPECIFICATION NUMBER 5

DATE REVISED 9 April 1956

PAGE 1 OF 2

A. TITLE: PLUGS CONTAINING RADIOACTIVE MATERIAL

B. PURPOSE: To establish specifications for subject Plugs.

- C. SPECIFICATIONS:
1. Plugs containing four (4) microcuries of Cesium ( $Cs$ ) 137 shall conform to the following:
    - a. Material, commercial drill rod .250 in. diameter x .687 in. long.
    - b. A 9/64 in. (.1406) hole shall be drilled in the center of one end to such a depth that .4 in. of steel shall separate the bottom of the hole and the opposite end of the plug.
    - c. A Rockwell hardness of C55 to C60.
    - d. A capsule containing four (4) microcuries of Cesium ( $Cs$ ) 137 shall be inserted in the 9/64 in. hole; capsule shall conform to Paragraph 3.
    - e. The capsule shall be hermetically sealed in the steel plug by a baked in yellow porcelain sealer.
    - f. The steel plug shall have no active contamination on the outside.
  2. Plugs containing one (1) microcurie of Cesium ( $Cs$ ) 137 shall conform to the following:
    - a. Material, commercial drill rod .1875 in. diameter x .500 in. long.
    - b. A 9/64 in. (.1406) hole shall be drilled in the center of one end to such a depth that .195 in. of steel shall separate the bottom of the hole and the opposite end of the plug.
    - c. A Rockwell hardness of C55 to C60.
    - d. A capsule containing one (1) microcurie of Cesium ( $Cs$ ) 137 shall be inserted in the 9/64 in. hole; capsule shall conform to Paragraph 3.
    - e. The capsule shall be hermetically sealed in the steel plug by a baked in yellow porcelain sealer.

Enclosure (3)

Ref: AEC-551-901

25 March 1959

McDONNELL AIRCRAFT CORPORATION

MANUFACTURING PROCUREMENT SPECIFICATIONS

INDUSTRIAL ENGINEERING DEPARTMENT

DATE ISSUED 13 July 1955

SPECIFICATION NUMBER 5

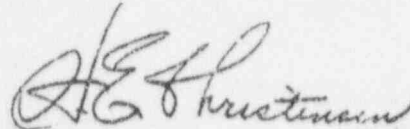
DATE REVISED 9 April 1956

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f. The steel plug shall have no active contamination on the outside.

3. Capsules containing Cesium ( $C_{88}$ ) 137 shall conform to the following:

- a. Capsules shall be of ductile metallic tubing 1/8 in. O. D. x 1/4 in. long, hermetically sealed at both ends.
- b. Sealed Capsules shall contain the quantity of micro-curries of dry Cesium ( $C_{88}$ ) 137 Sulphate with radiation matched  $\pm 10\%$  specified in Paragraphs 1. and 2.
- c. Capsules shall have no active contamination on the outside, conforming to U. S. Atomic Energy Commission regulations as outlined in the bulletin "Sealed Sources Containing Beta and/or Gamma Emitting Radio Isotopes".



H. E. Christensen

HEC:jes