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WESTERN UNION TELEGRAM

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

SF-1201 (4-60)

W. P. MARSHALL, PRESIDENT

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

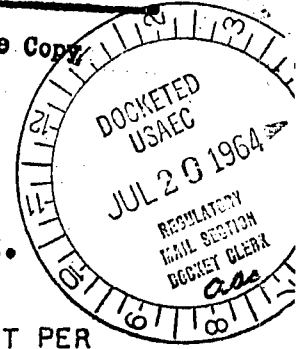
257P EDT JUL 20 64 PA192

P BRMN006 DL PD
WUX BRMN BALTIMORE MD 7/20
U.S. ATOMIC ENERGY COMMISSION
DIVISION OF MATERIAL LICENSING
4915 ST ELMO
BETHESDA MD

DOCKET NO. 70-58

ATTN: MR K E LAUTERBACH

File Copy



THANK YOU FOR EXPEDITIOUS ACTION ON OUR JULY 7 APPLICATION.
REPLY IS IN ORDER OF YOUR REQUEST.

1. MINIMUM FACE VELOCITY OF COATING HOOD IS 100 LINEAR FEET PER MINUTE.
- 2.

BOTH HIGH AND LOW VOLUME BREATHING ZONE SAMPLES ARE COLLECTED DURING INITIAL PHASES INCLUDING LOADING AND UNLOADING OF THE PROCESS BATCH AND ACTUAL COATING OPERATION . BREATHING ZONE AIR

3818

B/26
[Handwritten signature]

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7/27/67

SAMPLES ARE COLLECTED UNTIL IT IS ESTABLISHED THAT THE AIR CON-
CENTRATION DURING THE PARTICULAR OPERATION IS WITHIN ACCEPTABLE
TOLERANCE LEVWS. ENVIRONMENTAL (GENERAL AREA) SAMPLES ARE COLLECTED

THEREAFTER. THIRTY-SEVEN (37) BREATHING ZONE SAMPLES COLLECTED
DURING RECENT COATING OPERATIONS AVERAGED 2.3×10^{-11} UC/ML ALPHA.
IN ADDITION TO BREATHING ZONE SAMPLES COLLECTED DURI/G VARIOUS
OPERATIONS, A LOW VOLUME AIR SAMPLER IS USED TO COLLECT DAILY
24 HOUR SAMPLES OF THE GENERAL WORK AREA ATMOSPHERE. 53 RECFT
24 HOURS (ENVIRONMENTAL) SAMPLES OF THE ROOM IN WHICH THE COATING
OPERATION TAKES PLACE AVERAGED 7×10^{-12} UC/ML ALPHA.
EXHAUST EFFLUENT FROM THE COATING HOOD ENTERS A COMMON EXHAUST DUCT
DOWNSTREAM FROM THE ABSOLUTE FILTER SERVING THE COATING HOOD AND

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Approved 3

IS AGAIN FILTERED PRIOR TO DISCHARGE TO UNRESTRICTED AREAS. THE EFFLUENT IS SAMPLED DAILY (24 HR SAMPLES). AN AVERAGE OF 81 RECENT SAMPLES COLLECTED FROM THIS EXHAUST SYSTEM INDICATED 3.9×10^{-13} UC /ML

3. ALL URANIUM POWDERS INTRODUCED INTO THE COATING DRUM ARE IN A DRY CONDITION. TO PROVIDE A SPRAY MEDIA ONLY, A TOTAL OF 5500 CC WATER AND 2200 CC ALCOHOL IS USED FOR A BATCH OF POWDER EQUIVALENT TO 950 GMS UO₂ AS AEROSOL COMPONENTS TO PROVIDE A SPRAY MIST OF THE METAL POWDER BEING USED. ACTUALLY THIS QUANTITY IS SUPPLIED IN AN AVERAGE OF 10 TO 15 SPRAY BOTTLE CHANGES DURING THE SPRAYING OF A BATCH OF URANIUM POWDER. HEAT LAMPS SHOWN IN THE PICTURE PROVIDED IN A PREVIOUS SUBMISSION IMMEDIATELY EVAPORATE THE WATER AND ALCOHOL USED IN THE MIST. EXACT WEIGHT BALANCES BEFORE AND AFTER COATING HAVE INDICATED COMPLETE EVAPORATION OF THE WATER AND

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P. B. ... 6/4

ALCOHOL OF THE MIST. EASE OF POWDER FLOW OF COATED MATERIAL HAS ALSO SHOWN COMPLETE DRYNESS.

IN SUMMARY, THE COATING OPERATION MAY BE CONSIDERED A DRY OPERATION

WITH REGARD TO INTRODUCTION OF HYDROGENOUS MATERIAL INTO THE URANIUM BEARING POWDER.

4. METALS OR ELEMENTS USED FOR COATING SHALL BE LIMITED TO THOSE WHOSE ATOMIC NUMBER IS GREATER THAN 12 UNLESS PRIOR AEC APPROVAL IS OBTAINED.

MARTIN CO C W KELLER 845 7/20 0900A EDT

7 1. 100 2. (37) 2.3 10-11 24 53 24 7 10-12 24 81 3.9 10-13

3. 5500 2200 950 U02 10 15 4. 12 845 7/20 0900A EDT.

*Recy provided compliance
104 CB, 104 PDR K.S.K. 7/22/64*

CRITICALITY ANALYSIS -

K_{eff} CALCULATION

$$B^2 = \left(\frac{\pi}{a}\right)^2 + \left(\frac{\pi}{b}\right)^2 + \left(\frac{\pi}{c}\right)^2$$

$$B^2 = 0.0245$$

where a, b, & c are the critical dimensions which include reflector savings. (26.3 x 31.4 x 199 cm resp.)

F. L_c². Equation (49)

$$L_c^2 = \frac{L_m^2}{1.1}$$

where L_m = 2.88 cm. Moderator thermal neutron diffusion length.

$$\xi = \frac{\sum a_{n1}}{\sum a_{n2}}$$

$$\xi = \frac{0.0374 + 0.0052}{0.0206} = 1.97$$

$$L_c^2 = \frac{8.3}{2.97}$$

$$L_c^2 = 2.8$$

G. The denominator of equation (1.0) can now be determined -

$$(1 + L_2^2 B^2) (1 + L_1^2 B^2) (1 + L_3^2 B^2) (1 + L_7^2 B^2) (1 + L_4^2 B^2)$$

$$(1.0688) (1.493) (1.197) (1.103) (1.0245)$$

$$= 2.07$$

H. and the K_{eff} of the system is

$$K_{eff} = \frac{1.20}{2.07} = 0.58$$

(Ref. 10)

I. Based on this K_{eff} the total interaction steradians (Ω)
allowed for an array calculation is (Ω = 10K) or

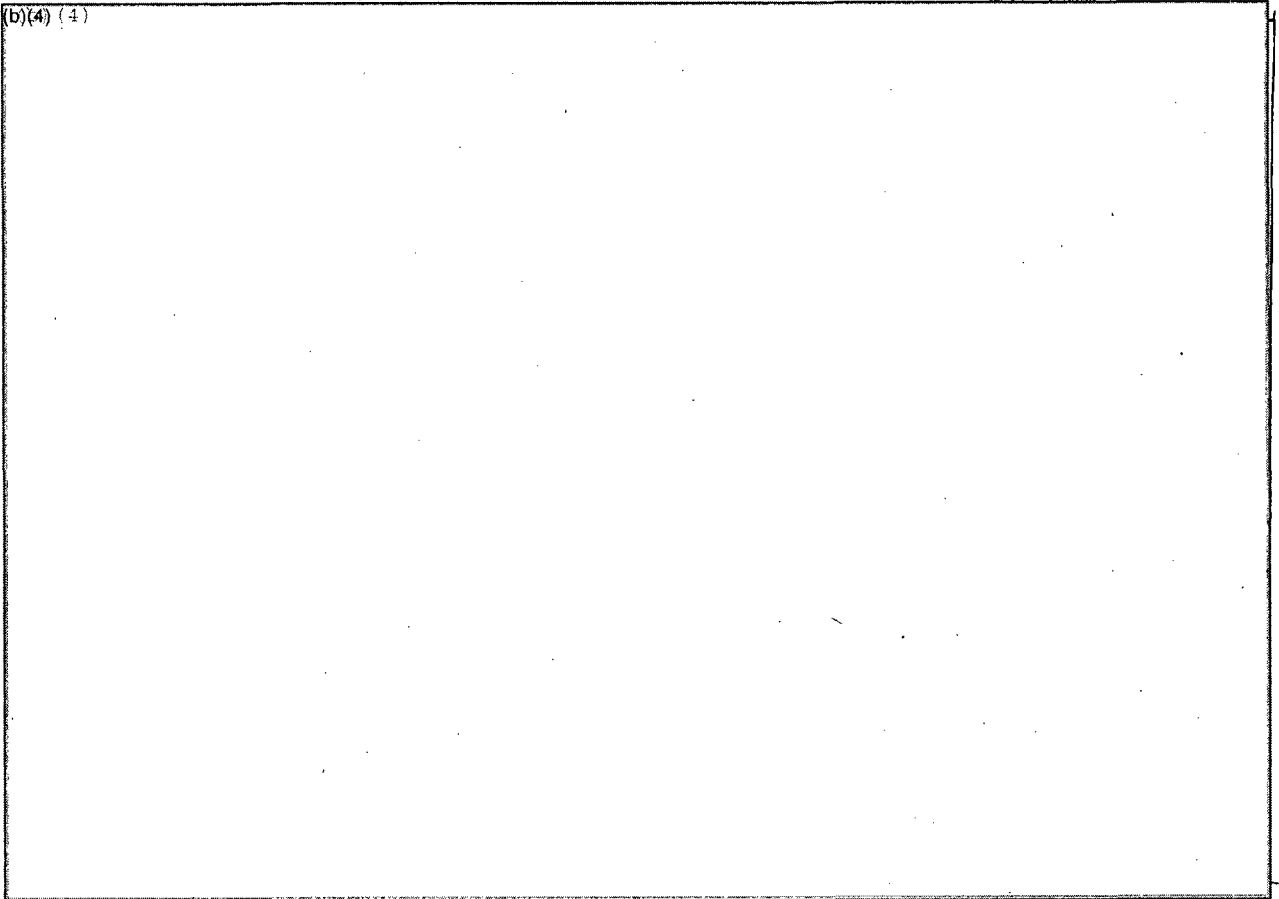
$$3.23$$

J. References.

- (1) Principles of Nuclear Reactor Engineering, Glasstone, Equation
- (1) Principles of Nuc. Reactor Engr., Glasstone, Equation 3.162.1
- (2) " " " " Section 3.114
- (3) " " " " Equation 3.167.2
- (4) " " " " Section 3.162
- (5) " " " " Figure 3.17
- (6) " " " " Section 3.100
- (7) " " " " Section 3.135
- (8) " " " " Section 3.135
- (9) " " " " Equation 3.213.2
- (10) Nuclear Safety Guide, TID-7018, Rev. 1 (1961), Figure 26

CRITICALITY ANALYSIS -
ARRAY CALCULATIONS

4. ASSUMPTIONS: A maximum of 100 fuel elements will be allowed in the cleaning room at one time, and will be loaded in four rack racks as shown in the sketch. Determine the maximum interaction steradian angle possible for these racks in the cleaning room.
5. DESIGN: An allowable total interaction steradian angle of 5.00 for 4 rack locations as shown in the following sketch.



Obviously the center of each rack is 12 ft from the center of each rack by 12 ft. The projected area of each rack is $2.5 \times 2.5 = 6.25 \text{ m}^2$. The distance from the center of rack 1 (top) to the center of rack 2, 3, 4 is 12, 12, and 12 feet. The total interaction steradian angle is:

$$S_t = \frac{4 \times 6.25}{171 + 171 + 171} = \frac{25}{513} = 4.90$$

- C. CONCLUSION: This configuration is safe if 12 inch separation is maintained between racks within a given bay, mechanical room, etc. A distance is not specified for racks common to all array calculations.



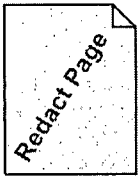
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Fuel Element Assembly

When a set of 104 fuel tubes have been accepted for use in a fuel element, they will be assembled into the grid structure to form a completed fuel element. Figure 12 illustrates the positioning of the fuel tubes in the grid structure and tabulates the minimum critical dimensions. As in the case of the storage boxes, safe geometry is the controlling factor. A limit of one element per work area shall be permitted and transfer of the completed element to storage will be effected prior to the fabrication of another fuel element.

Completed fuel elements will be stored in the nuclear storage area in the D Building. Since safe geometry is the controlling factor for individual elements, a maximum total solid angle of 1.0 steradians is required. Vertical storage of the elements on five foot centers will be maintained by Martin Nuclear Materials Management, which has jurisdiction over the storage area. Calculation of the storage array is presented in Figure 13.



Pages 9 through 10 redacted for the following reasons:

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