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WESTERN UNION
TELEGRAM
W. P. MARSHALL, PRESIDENT

SF-1201 (4-60)

SYMBOLS
DL = Day Letter
NL = Night Letter
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DOCKET NO. 70-58

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

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

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SAMPLES ARE COLLECTED UNTIL IT IS ESTABLISHED THAT THE AIR CONCENTRATION 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 X 10-11 UC/ML ALPHA. IN ADDITION TO BREATHING ZONE SAMPLES COLLECTED DURING 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 X 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

ABrmmou/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 X 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

P Burns 064

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.

2cy provided compliance
1cy CB, 1cy PDR K.S.K. 7/22/64

CRITICALITY ANALYSIS -
Keff CALCULATION

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

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

$$\boxed{B^2 = 0.0245}$$

F. L_c^2, Equation (40)

$$L_c^2 = Lm^2 / z+1$$

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

$$z = \Sigma_{a_m} / \Sigma_{a_{H_2O}}$$

$$z = \frac{.0374 + .0032}{.0206} = 1.97$$

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

$$\boxed{L_c^2 = 2.8}$$

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

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

$$(1.0688)\ (1.493)\ (1.147)\ (1.103)\ (1.0245) = \boxed{2.07}$$

H. and the Keff of the system is

$$K_{eff} = 1.20 / 2.07 = \boxed{0.58}$$

(Ref. 10)

I. Based on this Keff the total interaction steradians (Ω) allowed for an array calculation is (0 - 10K) or $\boxed{3.20}$

J. References.

(1) Principals of Nuclear Reactor Engineering, Glasstone, Equation
(1) Principals of Nuc. Reactor Engr., Glasstone, Equation 3.162.1
(2) " , Section 3.116
(3) " , Equation 3.147.2
(4) " , Section 3.162
(5) " , Figure 3.17
(6) " , Section 3.130
(7) " , Section 3.135
(8) " , Section 3.135
(9) " , Equation 3.213.2
(10) Nuclear Safety Guide, TID-7016, Rev.1(1961), Figure 26

CRITICALITY ANALYSIS –
ARRAY CALCULATIONS

A. PROBLEM: A [illegible] of 10[illegible] fuel [illegible] will be allowed in the cleaning room at one time, and will be loaded in four [illegible] racks as shown in the sketch. Determine the maximum interaction [illegible] angle [illegible] for these racks in the cleaning room.

B. GIVEN: An allowable total interaction [illegible] angle of 3.[illegible] [illegible] locations as shown in the following sketch.

(b)(4) (4)

[redacted]

Obviously [illegible] 2, 3, [illegible] each [illegible] 2, 3 [illegible] 360 in². [illegible] The distance [illegible] center of rack 1 [illegible] to the [illegible] 2, 3 [illegible] 12, [illegible] the total interaction [illegible] angle [illegible]

$$\Omega = [illegible] \frac{360}{17[illegible]} + \frac{[illegible]}{[illegible]} + \frac{[illegible]}{[illegible]} = 2.70$$

C. CONCLUSION: [illegible] configuration [illegible] 12 inch [illegible] within a given [illegible] mechanical [illegible] common to all [illegible] calculations.

Page 7 redacted for the following reason:

(b)(4)

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:

(b)(4)