

Donald A. Nussbaumer, Chief
Source & Special Nuclear Materials Branch, DML

April 21, 1965

Charles D. Luke, Chief
Criticality Branch, DML

UNITED NUCLEAR CORPORATION, WOOD RIVER JUNCTION, RHODE ISLAND - NEW
SCRAP RECOVERY OPERATIONS - DOCKET NO. 70-820, MARCH 31, 1965

SYMBOL: DML:RHO

United Nuclear has requested a license amendment to operate a Destructive Distillation Unit (D.D.U.) and a dissolver for uranium compounds containing chlorine.

Combustible wastes such as rags, sponges, mops, paper, air filters, and other materials will be charged to the DDU retort (25" x 25" x 41.5"). The applicant proposes that the unit be mass limited to 550 g U-235, as determined from shipper's estimate and visual inspection during charging. Following distillation and furnacing, the material is to be collected in one-gallon bottles and processed as provided in the license.

Uranium compounds containing chlorine are to be loaded into one-gallon bottles and loaded into a 6" I.D. pyrex pot. Following dissolution by nitric acid, the solution will drain to a vertical 6" I.D. pyrex column. Liquid N_2O_4 will then be added to react with the liquid already in the column. Once the reaction is completed, the solution will be air sparged and the dechlorinated solution will be sampled for chloride content before transfer to the 5" I.D. Assay Tanks (1-D-34's).

Off gases from both systems pass through safe geometry scrubbers.

UNC has submitted a calculation to demonstrate a 6.656" O.D. x 6.0" I.D. pyrex glass pipe containing 3.7 w/o B in the glass is safe ($k_{eff} = 0.83$) for 93.5 w/o U-235 enriched uranium solution optimally moderated and reflected.

As a part of the analysis to justify their calculative technique, UNC calculated a k_{eff} for a cadmium wrapped 6" I.D. infinite cylinder. The calculated k_{eff} appears low; therefore, we request that in addition to the questions delineated below, the following be incorporated in a letter to the applicant:

"We have independently calculated a k_{eff} of 0.93 for a flooded, cadmium wrapped 6" I.D. infinite cylinder containing optimally moderated $U(93.5)O_2F_2$ solution. In our calculation we assumed the flooded, cadmium wrapped column to be of the same reactivity as a nominally reflected cylinder. This is a higher reactivity than your calculated k_{eff} of 0.84. However, we agree that the proposed use of the 6" pyrex column does not present a criticality hazard.

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- "1. Your plans do not include an independent verification of the shipper's estimate of the U-235 content of the scrap material which is charged to the unsafe geometry Retort (2-R-2). In order to insure the safety of this operation, please confirm that only dry materials will be charged to the unit, or submit additional information to justify your procedures.
- "2. The application does not provide your plans for removing and disposing of the solids collected in the Off-Gas Condensing Unit (2-F-4). Please describe these plans.
- "3. The application does not consider all possibilities of solution flowing from the safe diameter column (2-C-1) to unsafe geometry. For example, potential hazards would exist if unsafe quantities of uranium entered unsafe geometry liquid N₂O₄ storage tanks, air lines, or the Dissolving Hood (2-L-1). The Dissolving Hood is of concern because the overflow level of the columns is at a higher elevation than the top of the hood. Please furnish your evaluation of these potential hazards."

The above questions and comments were discussed during a telecon on April 20, 1965, between Frank Cronin of UNC and R. L. Layfield and R. H. Odegarden of this Division.

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