



REGULATORY OPERATIONS
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UNION CARBIDE CORPORATION P. O. BOX 324, TUXEDO, NEW YORK 10987
MEDICAL PRODUCTS DIVISION TELEPHONE NUMBER: (914) 351-2131

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Region I Action
70-687

U. S. Nuclear Regulatory Commission
Office of Nuclear Materials Safety & Safeguards
Willste Building
7915 Eastern Avenue
Silver Spring, MD 20910

Attn: Mr. Raymond Jackson
Mail Stop 881

Subj: UCC FNMC Plan, Revision



Dear Mr. Jackson:

The enclosed revised pages of the subject Plan are forwarded for your consideration and incorporation into the Plan. The changes included therein are described as follows:

Section 3.1.E. (p-16) is amended to allow the delayed neutron method of U-235 analysis to be used for a wider range of U concentrations in solution. This change will allow two alternate methods for U-235 analysis in solution form which will provide more reliability.

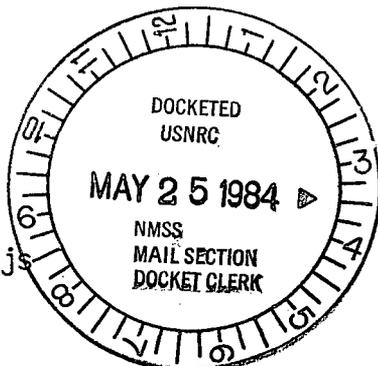
Section 3.3.4 (p-18) is amended to change the size of solution flask from 3L to 4L. The larger volume is required to allow more dilute solutions to be processed in the U Waste Form process.

Section 7.3.d (p-67) is amended to allow either a total U measurement or an U-235 measurement to be used for the radioactive fission waste solutions. This change will allow an alternative method for assay at this point which will provide more reliability.

These changes will not reduce the effectiveness of the UCC FNMC Plan and are submitted under the allowance of 10 CFR 70.32.c.(1). The changes are highlighted in the margin of each page for easy reference.

Very truly yours,

James J. McGovern
James J. McGovern
Business Manager
Radiochemicals



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CHAPTER 3

3.1 MEASUREMENTS

The various types of measurements are described briefly below. These assays are made at a number of points during a process cycle. The flow diagram in Figure "D" shows the process flow. Assay procedures are included in the SNM Measurement Q.A. manual.

- A. An initial qualitative measurement by gamma radiometric assay is made on the Uranium Oxide powder as received from the vendor to determine that it is enriched U-235. This is done on the oxide after a bulk weighing of the material to verify amount of oxide shipped and prior to dissolution of the oxide in 1:5 HNO₃. This measurement is done within 24 hours of receipt of material. (Reference 7.1.1).
- B. Initial quantitative measurements are made on the UO₂ (NO₃)₂ Feed in 1:5 HNO₃. At this point, a volume measurement is made and samples are removed for isotopic and for total uranium analysis.
- C. A plating solution is made from this UO₂ (NO₃)₂ Feed material. The volume of this plating solution is measured and samples are taken for isotopic analysis for U-235 and chemical analysis for total uranium.
- D. When targets are made by electrophoresis the Uranium Oxide will be weighed into individual plating "batches" simultaneously with dissolving a weighed amount of the Uranium Oxide Feed in HNO₃. The UO₂ (NO₃)₂ in solution is then analyzed for element and isotope.
- E. After each plating operation there are two items to measure, the plated target capsules and the spent plating solution.
 - 1. Strip solutions and most plating waste are reused in new plating solutions.
 - 2. The spent plating solution, if it is waste, will have its volume measured and then be sampled for both U-235 assay and total U assay as in Paragraph C above.

- F. The sealed target tubes will be assayed by nondestructive radiometric assay for U-235 content. Knowing the enrichment factor from previous measurements of plating solutions or feed material, a value for total U will be calculated for each target.
- G. After the targets have been irradiated and the fission product separation is performed, the waste solutions will be measured for volume and samples will be taken for isotopic analysis for U-235 or chemical assay for total U prior to shipment for recovery or disposal.
- H. Solid waste containing very low amounts of U shall be assayed radiometrically prior to disposal.

3.2 MASS MEASUREMENT

A preliminary check of the incoming UO_2 or U_3O_8 from the supplier is made by weighing at point (A) in Figure "D". Individual batches of UO_2 or U_3O_8 for the electrophoresis process are weighed at point (Ab) in Figure "D". These weight measurements shall be made on a balance having a + 10 mg accuracy. Certified reference weights are measured prior to each process measurement.

3.3 VOLUME MEASUREMENT

With the exception of the target capsules and incoming Uranium Oxide powder and solid waste drums, all material will be in liquid form at each material assay point as shown in Figure "D".

- 3.3.1 At point (Aa) the Uranium Oxide is dissolved in HNO_3 and then diluted to 1 liter in a 1-liter volumetric flask.
- 3.3.2 At point (Ba) the plating solution volumes are measured using vessels made of polyethylene or polypropylene which have been calibrated in 1 or 2 liter increments using standard 1 or 2 liter analytical volumetric flasks. Liquid levels are inscribed onto the vessel's side for measurement use. Typical total volumes are 16 liters.

3.3.3 At point (Cb) the depleted plating solution volumes are measured using vessels made of polyethylene or polypropylene which have been calibrated in two liter increments using standard 2 liter analytical volumetric flasks. Liquid levels are inscribed onto the vessel's side for measurement use. Typical total volumes are 80 liters.

3.3.4 At point (E) the fission product waste solution volume is measured using calibrated 4 liter flasks. The waste from several batches is combined and brought up to the calibrated volume (typically 4 liters).

3.4 SAMPLING SYSTEM

3.4.1 There is no sampling done at point (A).

3.4.2 All sampling of the material for chemical analysis at points (Aa), (Ab), (Ba), (Ca), (Cb), and (E) is done using analytical pipets as described in the Measurement Q.A. Manual.

3.4.3 All sampling of the material for radiometric or delayed neutron nondestructive assays at points (Aa), (Ba), (Ca), (Cb), and (E) will be done using pipets as described in the Measurement Q.A. Manual.

3.4.4 There is no sampling done at point (D). The whole target capsule is assayed nondestructively.

3.5 ANALYTICAL MEASUREMENTS

3.5.1 All analytical measurements for element at points (Aa), (Ab), (Ba), (Ca), (Cb), and (E) will be done using the procedures described in the SNM Measurement Q.A. Manual, Part 2.

3.6 NONDESTRUCTIVE RADIOMETRIC ASSAY MEASUREMENTS

3.6.1 All radiometric or delayed neutron assays for isotope at points (Aa), (Ab), (Ba), and (Ca), (Cb), (D) and (E) will be done using the gamma spectrum analysis procedures described in the SNM Measurement Q.A. Manual, Part 2.

3.7 SAMPLING AND MEASUREMENT UNCERTAINTIES

All sampling and measurement uncertainties are shown in terms of relative standard deviations in the Q.A. Manual, Part 3.

Typical maximum values are shown in Appendix "B".

These targets are loaded into the reactor and irradiated for varying periods of time as required for production. They are transferred into the Radiochemical Operations MBA IV and appropriate documentation is issued.

d. Radiochemical Operations MBA IV

Following removal from the reactor, the UO_2 plating on the targets is dissolved in acid, the resulting solution is drained from the target capsule, and the I-131, Xe-133 and Mo-99 isotopes are extracted, leaving a waste solution containing that U-235 which has not undergone a fission reaction, as well as large amounts of mixed fission products. Due to the extremely high level of radiation from these solutions, it is both difficult and dangerous to perform an assay on the solution until sufficient time has passed to allow the radioisotopes to decay. For this reason, the quantity of SNM determined by the non-destructive radiometric assay on the sealed targets is used to determine the amount on hand in the hot cells. Each individual batch of waste is stored in a plastic-coated glass bottle labelled with the appropriate production run number, which may be cross referenced in the radiochemical operations MBA IV logbook to the identification number of the particular targets used for that run.

Radioactive waste solutions are either converted to U oxide in the waste form process and shipped to DOE for recycle or are solidified in concrete and shipped to an approved burial site. In either case several individual batches of waste material that are traceable to original target serial numbers are combined to make a total batch size of no more than 200 grams U-235. Each batch is sampled and analyzed for U and U-235 prior to the waste form conversion process or the solidification process.

Prior measurements on the targets that make up a waste batch are manifested on form SP-04 (Figure "N") or in the waste form process batch record (Figure "O"). When SNM is not recovered through the waste form process, these values will be reported as the quantity shipped. SNM that is processed for recovery is sampled and either the total U or U-235 is assayed. Then, either U-235 or total uranium is derived from enrichment factors from prior measurements. The measured yield from the waste form process is subtracted from the values on the target weight manifest, the difference is declared process loss and the value is assigned to the solidified sludge residue from the waste form process that is shipped to a disposal facility.

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DESCRIPTION:

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05/30/84 INITIAL CEC incorporation into
the Plan.