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**UNITED NUCLEAR**  
CORPORATION  
FUELS DIVISION

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September 14, 1964

Mr. Harold L. Price  
Director of Regulation  
U. S. Atomic Energy Commission  
Washington 25, D. C.

RECEIVED  
1964 SEP 16 AM 10:35  
J. S. ATOMIC ENERGY COMM.  
REGULATORY  
MAIL SECTION

Dear Sir:

The Inventory Procedure for Fuels Recovery Plant has been revised and expanded to incorporate the suggestions by your personnel and is now submitted for your approval.

If there are any further questions, please let me know.

Very truly yours,

Robert C. Johnson, Acting Manager  
Chemicals Operation

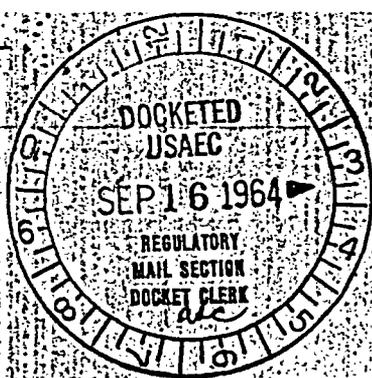
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ACKNOWLEDGED

DR-1273



UNITED NUCLEAR CORPORATION  
 FUELS RECOVERY PLANT  
 WOOD RIVER JUNCTION, RHODE ISLAND  
 POST-ACCIDENT  
PHYSICAL INVENTORY PROCEDURE

DR-1273

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A. GENERAL

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1. The objective of the physical inventory of the entire plant is to establish the uranium balance of the categories of material at each of several stages in the process. The extent of the uranium losses resulting from the nuclear incident can be determined using this uranium balance.
2. The procedure will consist of sampling and analyzing all uranium bearing materials in containers in storage and in process equipment. Containers in storage that have not been transferred into the Process Account from the Storage Account will be inventoried as received.
3. The execution of these procedures will be under the direct on-site surveillance of the named Nuclear Safety Supervisor. The responsibilities of the Nuclear Safety Supervisor will be to:
  - (1) Audit the performance and adherence to these procedures.
  - (2) Carry the authority to halt procedures for any reasons.
  - (3) Resolve any questions concerning Nuclear Safety which may arise during the inventory, these questions will be resolved before the affected material may be moved.
  - (4) Approve changes to these procedures initiated by the Fuels Recovery Supervisor on the Inventory Team when such changes are deemed necessary.
4. The categories of material to be inventoried and the sequence, are as follows:
  - a. ADU contained in 1 gal. jars.
  - b. Solutions in Overhead Storage Tanks 1-D-9 & 10.
  - c. Solutions in 1 gal. jars, 11 liter bottles and 55 gallon drums, excluding irradiated material which has already been sampled. 11 liter bottles are 5" diameter by 48" high.

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- d. The contents of the Pickle Liquor Adjustment and Storage Tanks.
  - e. Solutions in Pulse Columns, Organic Storage Tank, Filtrate and Slop Tanks.
  - f. Solids and solution in miscellaneous lines and equipment.

Containers that have already been sampled may not be resampled. Determination for resampling will be made by the Inventory Team as defined in eight (8) below. The contents of these containers may be transferred to appropriate Storage Tanks after all uranium is accounted for in the systems.

- 5. Except as noted in paragraph seven (7) below, each section listed above will be handled separately before proceeding to the next section.
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- 6. Only one container will be in motion at a time. Only one container will be in the sampling area at one time, except in Sections F.1 & F.2 where several 11 liter bottles will be required to handle the organic and aqueous phases. Filled 11 liter bottles will be sampled, labeled with Physical Inventory Tags supplied by the named Division Accountability Representative, and moved to the 11 liter bottle storage area located under the 1-D-9 Overhead Storage Tanks. (504.2.1, General Information and Procedures Manual). A Fuels Recovery Plant Solution Tag will also be applied and solution handled as in D, 1 and F, 1.
  - 7. Incineration of burnables will be carried out while items listed in four (4) above are being inventoried. This will include mops, sponges, paper, shoe covers, etc., generated during the inventory. Incineration will take place in the Incinerator 1-H-7. The Exhaust Hood to the loading door will be fitted with two 12"x12"x5 1/2" absolute filters to replace the original 24"x12"x11 1/2" filter.
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- 8. The Inventory Team will consist of a named Fuels Recovery Supervisor, a named Division Accountability Representative responsible for the inventory, and no more than two (2) Chemical Operators. There will be only one (1) Inventory Team. The Accountability Representative will verify the identification of all bottles and all samples before transferring the sample to the Laboratory.

9. All samples will be placed in the standard four (4) oz. round Polyethylene sample bottle with an inside diameter measurement of one (1) inch. Storage of these bottles will be in the Laboratory Storage Rack. (Section 600.1 of the General Information and Procedures Manual).
10. Eleven (11) liter bottles will be stored and moved in dollies, described in TID-7019, sketch on page 37. A maximum of 24 dollies will be stored in the designated area. (Refer to 6 above)
11. When transferring solution from a 1 gallon jar to an 11 liter bottle, or from an 11 liter bottle to a 1 gallon jar, an edge to edge spacing of the containers will be maintained at a minimum of two (2) feet. The same conditions will apply when transferring solution from containers to the Precipitators. The equipment used to maintain these conditions will consist of 1/2" SS pipe with a funnel. This equipment will be of rigid construction and have a total volume capacity of less than 231 cubic inches.
12. Sample bottles and containers will be identified with the tags properly attached. (For purposes of this inventory, tags will be of the physical inventory type supplied by Accountability Representative and secured to the container or equipment by taping. Fuels Recovery Plant tags will also be applied in a like manner.)
13. A three (3) part form, also supplied by the Accountability Representative, will be filled out and used as back up data for the inventory.
14. When a change is necessary in the Physical Inventory Procedure to further carry out the inventory of uranium, the named Fuels Recovery Supervisor will prepare a procedure and present it to the named Nuclear Safety Supervisor in writing for his approval. The affected material will not be inventoried until approval is given.

B. PROCEDURE FOR DRY ADU

1. Remove a 1 gallon jar from the Storage Rack and transfer the jar to the Glove Box 1-L-16-B along a safe route. A pre-tagged and tared sample bottle will accompany the jar.

2. Remove a representative sample of approximately 5 grams by means of a thief sampler.
3. Re-weigh the ADU jar to establish the actual net weight of material and transfer the jar back to the Storage Rack.
4. Transfer the sample bottle to the Laboratory for analysis of uranium content. Obtain next jar and sample bottle.
5. This category is to be inventoried completely before proceeding to C.

C. SOLUTIONS STORED IN OVERHEAD TANKS AND ASSOCIATED EQUIPMENT

1. 1-D-10-A, B, and C Tanks, Evaporator and Precipitators

- a. Transfer the contents of 1-D-10-A Tank to 1-D-10-B Tank by way of the Evaporator and Pump 1-P-23.
- b. Transfer as much as possible of the contents from the Evaporator to 1-D-10-B by means of Pump 1-P-23.
- c. Drain the remainder of the solution from the Evaporator by means of a one inch deep pan. Pour the pan contents into a 1 gallon jar and transfer the contents of the jar to the Precipitator 1-D-20-A and/or B, C & D.
- d. With 1-D-10-A, and the Evaporator System completely drained, proceed to inventory the Storage Tanks, Evaporator and Precipitators. (Drain the level indicating lines on Tanks 1-D-10-A, B and C as required).
- e. Using a 1 gallon jar, drain solution from the 1-D-19 Precipitators and transfer this solution to an 11 liter bottle for sampling purposes.
- f. Place a 1 gallon jar directly under 1-D-20-A Precipitator and fill with solution from the Precipitators 1-D-20.
- g. Drain additional solution from 1-D-10-B and C Tanks into the 1-D-20 Precipitators until Overhead Tanks inventory is completed.
- h. When the 1 gallon jar is filled, pick up the jar, move horizontally across the floor to the base of the platform steps, and pour the contents of the jar into an 11 liter bottle (See A. 11).

- i. When the 11 liter bottle is filled, agitate the solution to assure uniformity.

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- j. Withdraw a representative solution sample with a thief sampler. Transfer the sample into a tagged and tared sample bottle.
- k. Weigh the 11 liter bottle to obtain the gross weight.
- l. Transport and pour the contents of the sampled container into:
  - (1) Evaporator feed leg (from platform) and pump the solution to 1-D-10-A by means of Pump 1-P-23 or
  - (2) Suction of the OK Liquor Transfer Pump 1-P-32, (must have been previously drained) and transfer the solution to 1-D-10-A or
  - (3) Three inch (3") stand pipe on the suction to the Filtrate Pump 1-P-17, and thence to 1-D-10-A.
- m. Weigh the emptied container for the tare weight in order to obtain the net transfer of solution.
- n. Subsequent solution transfers may be made to 1-D-10-B and/or 1-D-10-C after these tanks have been emptied of "un-inventoried" solution.
- o. Repeat steps (f) through (n) until all solution has been measured and returned to Overhead Tanks 1-D-10.
- p. Flush each Precipitator with approximately three (3) liters of 0.3 to 1.0 N nitric acid solution and drain this solution from the precipitation systems as in (e) or (f) above. Nitric acid solution will be used in order to dissolve any precipitated uranium which may be adhering to the internal components of the systems.
- q. Handle flush solutions as in (f) through (n) above and proceed next to Tanks 1-D-9.

2. 1-D-9 A, B, C, D, E and F Tanks

- a. To prepare for the inventory of these tanks, the valve which terminates line 1/2" LA6 must be removed, the line shortened and the valve replaced so that the valve is above Hoods 1-L-17 & 18. A short piece of 3/4" Tygon must be installed from this valve to Tank 1-D-43. A letter was written to the Criticality Supervisor, dated 9-2-64, requesting the removal and sub-

sequent replacement of this valve on the opposite side of the block wall. Verbal approval was received by telephone on 9-11-64 to change the valve location. A written confirmation will follow.

- b. Drain the 1-D-9 Tank with the least amount of contained solution into Tank 1-D-43 (Misc. Solution Hold Tank, 5" inside diameter by 8' long). Level indicating lines of the 1-D-9 Tanks will be drained as required and the drainings will be put into a 1 gallon jar. This latter material will be inventoried with other containers of solution.
- c. Transfer the solution from 1-D-43 to an Assay Tank 1-D-34.
- d. Agitate the contents of the Assay Tank with air and withdraw a representative sample into a previously tagged and tared sample bottle. (Agitate 15 minutes)
- e. Obtain the gross weight of the filled Assay Tank. (Approximately thirty (30) liters of solution capacity)
- f. Transfer the solution from the Assay Tank to the empty 1-D-9 Tank. (Subsequent transfers may be made to either an empty tank or a tank containing "inventoried" solution). Set the tank valves before transferring the solution to avoid mixing of inventoried and un-inventoried solutions.
- g. After the solution transfer, obtain the tare weight of the Assay Tank. Record the gross, tare and net weight of solution and also the sample number.
- h. Repeat steps (b) through (g) until the entire contents of the 1-D-9 Tanks have been inventoried.
- i. Drain any final solution heels from the 1-D-43 and 1-D-34 Tanks into a 1 gallon jar. Identify the jar and contents until containers of solution are inventoried as in (D) below. Place the jar on the storage shelf provided.  
(Section 504.3 General Information and Procedures Manual.)
- j. Proceed to D.

D. PROCEDURE FOR DILUTE AND CONCENTRATED AQUEOUS SOLUTIONS

1. 1 Gallon jars and 1l liter bottles. (Includes mop water)
  - a. Transfer the contents of one, one gallon jar at a time into the Stainless Steel Dissolver, 1-J-4, until at least 45 liters have been charged but no more than 55 liters.
  - b. Add  $\text{HNO}_3$  from Nitric Acid Head Tank, 1-D-27, until solution is acidic and then add 5 kgs of aluminum nitrate.
  - c. Agitate the solution for at least 15 minutes with air. Re-check the solution acidity and add acid until the solution is 3N excess nitric acid.
  - d. Valve in Filter 1-F-24-A and transfer solution through the filter to the Assay Tank, 1-D-34.
  - e. Agitate the contents of the Assay Tank and take a representative solution sample into a previously tagged and tared sample bottle.
  - f. Obtain the gross weight of the filled Assay Tank and transfer the solution into the 1-D-9 Storage Tanks.
  - g. Obtain the tare weight of the empty Assay Tank and the net weight of solution transferred. (100 gal. storage capacity in 1-D-9)
  - h. Repeat (a) through (g) until all 1 gallon jars of solution have been inventoried. (not to include irradiated materials which have been previously sampled).

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- i. For 1l liter bottles, transfer the solution to 1 gallon jars as in A.11. Proceed with the inventory as in (a) through (g) above. (Exclude carbonate from TCE washing)

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- j. Attempt to match solutions in the Dissolver to obtain a concentration of approximately 30 grams per liter.
- k. 1 Gallon jars will be rinsed and the rinsings consolidated into another 1 gallon jar. Process filled jars of rinse solution through the SS Dissolver. 1l Liter bottles will be rinsed in the same manner, placing the rinse in a 1 gallon jar.

1. Empty 1 gallon jars will be stored with caps removed in an inverted position on available storage shelves, and empty 11 liter bottles will be placed in a horizontal position under Hood 1-L-11 with caps removed.
  - m. Complete solution inventory of bottles and jars to include rinse of equipment. Incinerate filter papers as in G.
2. 55 Gallon Drums of Solution, Excluding Pickle Liquor,  
(which have not been transferred to process)

The drums contain mop water, which has been previously filtered and analyzed in always safe containers and consolidated into drums on a batch basis, and carbonate solution which has been removed from the TBP Scrub Column and previously analyzed. No drum contains more than 350 grams of uranium.

- a. Transport the drums of uranium solution to the Pickle Liquor Room for sampling.
- b. Agitate the drum contents with air for 15 minutes. Sparge the entire contents of the drum.
- c. Obtain a representative sample of the solution in a bottle properly tagged and tared.
- d. Weigh the drum on the scale before returning the drum to the previous storage spot.
- e. Obtain the tare weight of the drum from SS Accountability Clerk. The drums are serially numbered and have previously been tare weighed.

E. PICKLE LIQUOR ADJUSTMENT TANK 1-D-12 & STORAGE TANK 1-D-41

1. Skim the foreign material from the solution in the Liquor Adjustment Tank 1-D-12 and drain the contents of the tank into tagged and tared 55 gallon lined drums. Incinerate the foreign material.
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2. Before draining the solution from the Storage Tank 1-D-41 withdraw one gallon of solution and sample for uranium concentration. Return the remaining solution from the gallon jar to the 1-D-41 Tank.

3. When the results of the above sample analysis are available and if the uranium concentration of the solution is 5 grams per liter or less, drain the contents of the 1-D-41 Storage Tank into tared 55 gallon lined drums.
4. Agitate the contents of the drums by air for 15 minutes sparging from two (2) locations at the bottom of the drum.
5. Obtain a representative solution sample from each drum. Use a thief sampler.
6. Weigh the drums for gross weight in order to obtain the net contents.
7. Label the sample and drum with proper identification as in A. 12. except the tags will be attached with wire.
8. Transport the drums to outside storage.
9. Should the analysis of the sample taken from the 1-D-41 Storage Tank indicate the uranium concentration of the solution is more than 5 grams per liter, the contents of the Storage Tank will be transferred to the Slop Tanks (1-D-21) where it can be measured and recycled for a representative sample. The Slop Tanks are poisoned with Raschig Rings and the solution can be transferred to these tanks by connecting a short section of tubing between the feed inlet and raffinate discharge of the Extractor Column. Sampling of the Slop Tanks will be done as in F. 3. (Slop Tanks will hold the contents of 1-D-41. One Slop Tank is empty, and the other tank is only half full.) After the solution is measured and sampled, it can be returned to the 1-D-41 Storage Tank for reprocessing by installed piping.

F. PULSE COLUMNS, ORGANIC STORAGE TANK, FILTRATE & SLOP TANKS

1. Pulse Columns, 1-C-6, 7 & 8, Carbonate Column 1-C-9, TCE Column 1-C-10
  - a. Drain the contents of each column and separate the phases as necessary by utilizing a separatory funnel of two (2) liter capacity.
  - b. Take the jars of aqueous phase from draining the 1-C-6 Extractor Column and transfer the solution

to an 11 liter bottle to sample. Sampling will be done as in C. 1. (i) through (k). Temporarily store the 11 liter bottles in always-safe dollies in the designated storage area, properly tagged. Repeat this method for the 1-C-7 Scrub Column and the 1-C-8 Strip Column.

- c. Aqueous solution above 3 ppm and less than 5 grams per liter uranium concentration will be transferred to the Pickle Liquor Storage Tank through the Adjustment Tank 1-D-12. Solutions containing less than 3 ppm uranium concentration will be discarded by way of the Neutralization Tanks 1-D-14.
- d. Aqueous solution with uranium concentrations greater than 5 grams per liter will be handled through the Stainless Steel Dissolver and the Assay Tank as in D. 1. (i) through (m).
- e. The organic phase is to be held in 11 liter bottles and sampled.
- f. This organic will be returned to the Pulse Column from which it was drained after a water leg is charged to prevent the organic from transferring to the pulse or drain legs.
- g. The Carbonate Column was previously drained and washed to remove material involved in the incident as part of the decontamination procedure. This irradiated material has already been sampled and analyzed.
- h. Drain the TCE Column. Separate the phases and transfer the solutions into 11 liter bottles.
- i. Treat the TCE as in G-3.
- j. Sample and analyze the aqueous phase. Obtain a net weight of solution and handle as in C.1.m.

2. Organic Storage Tank 1-D-5

- a. The contents of the Organic Storage Tank 1-D-5 will be drained into a 1 gallon jar and transferred into 11 liter bottles.

- ~~b. Each 11 liter bottle will be placed in an "Always Safe" dollie in the hallway near the east exit of the building for the transfer of solution from the 1 gallon jar to the 11 liter bottle.~~
- c. Agitate organic solution in the filled 11 liter bottle and obtain a representative sample.
- d. Label the 11 liter bottle and transfer it to the designated storage area.
- e. Repeat (a) through (d) until tank is empty.
- f. Obtain the gross weight of bottles before returning the organic to the Storage Tank via Column 1-C-9. Obtain the net weight of organic returned.
3. Filtrate Tanks (1-D-24 A and B) Slop Tanks (1-D-21 A and B)
- a. Recycle the contents of each tank for one (1) hour.
- b. Obtain a representative sample. Use concentration per unit volume since the contents of these tanks are measured, not weighed.
- c. Measure the quantity of solution.

G. MISCELLANEOUS

1. Incinerator Ash

- a. Ash from incineration which has been generated during or prior to the inventory, has been placed in 1 gallon jars.
- b. Take a weighed representative sample from each jar and transfer the sample to the Laboratory for analysis.
- c. Obtain the net weight of material and return jars to storage shelves.

2. Pump Bodies and Solution Lines

- a. Pumps such as Feed Metering Pumps, Organic Feed Pump and Transfer Pumps are to be drained of solution that has not been inventoried. The solution is to be drained in a 1 gallon jar or 1" pan.

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- b. Lines containing solutions that have not been inventoried ~~will be drained into a 1-gallon jar or 1" deep pan.~~ (Extractor Feed line, Scrub Recycle line and Adjusted Pickle Liquor transfer lines are examples.)
  - c. Consolidate solutions into 11 liter bottles.
  - d. Agitate and sample the contents. Obtain a net weight of this solution.
  - e. According to uranium concentration of the solutions, transfer the solutions to the appropriate feed tank. Solutions with a uranium concentration of 5 grams per liter or less will be transferred to the 1-D-41 Tank. Solutions with a uranium concentration of more than 5 grams per liter will be transferred to the 1-D-9 Tanks.

3. T.C.E.

- a. Separate phases and place each in separate 11 liter bottles.
- b. Agitate and sample T.C.E. in bottles for uranium concentration.
- c. Obtain net weight of T.C.E.
- d. Hold T.C.E. in Storage in 11 liter bottles for subsequent processing and handle aqueous phase from (a) in item 4. below.

4. Other

- a. From the 11 liter bottle of uranyl nitrate crystals, obtain a batch charge of uranium in a 1 gallon jar. Charge the contents of this jar to the SS Dissolver. Add aqueous solution from 3.d. above and water to the Dissolver for dilution. Adjust the solution with nitric acid and aluminum nitrate and transfer to the Assay Tank.
- b. ~~Agitate the contents of the Assay Tank and obtain a representative sample of the solution.~~

- c. Obtain a gross weight of the Assay Tank and transfer its contents to 1-D-9 Tanks. Weigh empty tank to obtain net weight of solution transferred.
- d. Drain heel from SS Dissolver and associated piping and equipment. (Dissolver, Vent Bottle, Filter and lines to the Assay Tank). Solutions will be placed in an 11 liter bottle.
- e. Add to solution from d, the heel of the Assay Tank, solution from in-line filters.
- f. Agitate contents of the 11 liter bottle or bottles, sample, obtain net weight and transfer to 1-D-9 Tank by way of the Dissolver and Assay Tank.
- g. Inventory the used Organic stored in 55 gallon drums as in Section D.2. Solution was previously analyzed and no drum contains more than 350 grams of uranium.
- h. Agitate carbonate solution from T.C.E. washing (stored in 11 liter bottles, not inventoried in D.1.)
- i. Obtain sample, net weight of solution and hold in Storage Area for subsequent processing.