INDIANA & MICHIGAN ELECTRIC COMPANY
DONALD C. COOK NUCLEAR PLANT

PROCEDURE COVER SHEET

Procedure No. 12 PMP 3150 PCP.001
Revision No. 2

TITLE RADIOACTIVE WASTE PROCESS CONTROL MANUAL

SCOPE OF REVISION Rewrite, including incorporation of temporary change sheets and deletion of urea formaldehyde solidification of evaporator concentrates.

Rev. 2: Rewritten to incorporate temporary change sheets including cement solidification of resin, to change references to Nuclear Engineering Company, Inc. to U.S. Ecology, Inc., and to update several of the Check-off and Information Sheets.

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INDIANA & MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT

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INDIANA & MICHIGAN ELECTRIC COMPANY
DONALD C. COOK NUCLEAR PLANT

RADIOACTIVE WASTE PROCESS CONTROL PROGRAM

1.0 OBJECTIVE

This manual is to give the necessary directions to insure that all plant generated radioactive wastes are transferred, packaged and shipped such that radioactive waste shipment and burial regulations are satisfied.

2.0 REFERENCES

2.1 Code of Federal Regulations Title 49 Parts 170-179

2.2 Code of Federal Regulations Title 10 Parts 19-71, 150

2.3 NRC Radioactive Material License No. 46-13536-01

2.4 State of South Carolina, Radioactive Materials License No. .097.

2.5 State of Maryland Radioactive Materials License No. MD 27-001-02.

2.6 Technical Specifications, Appendix A to License No. DPR-58.

2.7 Technical Specifications, Appendix A to License No. DPR-74.

2.8 U.S. Ecology Incorporated, State of Nevada, Department of Human Resources, Division of Health, Radioactive Materials License No. 13-11-0043-02.

2.9 U.S. Ecology Incorporated, NRC, Radioactive Materials License No. 04-03766-01.

2.10 U.S. Ecology, Incorporated, State of Washington Radioactive Materials License No. WN-1019-02.

2.11 U.S. Ecology Incorporated, NRC, Washington License 16-19204-01.

2.12 Application to transport "Large Quantity" shipments of radioactive material in Michigan should be made pursuant to the requirements of R29.553 of Act No. 207 of the Public Acts of 1941, as amended, being 29.3C of the Michigan Compiled Laws (Department of State Police - State Fire Safety Board) and Section 9 of Act No. 380 of the Public Acts of 1965, as amended, and Sections 2226, 2233, and 13521 of Act No. 368 of the Public Acts of 1978, as amended, being § 16.109, 333.2226, 333.2233 and 333.13521 of the Michigan Compiled Laws (Michigan Department of Public Health).

2.13 Oregon Administrative Rules Chapter 345 Division 60 for the Oregon Radioactive Materials Transport Permit requirements.

2.14 Hittman Nuclear and Development Corporation Radwaste Handling Service Manual.

2.15 Chem Nuclear Radwaste Handling Service Manual.

3.0 PRECAUTIONS

3.1 No oil or petroleum products will be poured into any Auxiliary Building floor drains. All oils removed from any pump, etc. in the Auxiliary Building or containment area must be placed into a container, and removed from the area. All spills must be kept from entering floor drains and must be cleaned up immediately.

3.2 No package will be loaded for shipment if it has any indication of a hole, failure, or weak spot. Any package which has an opening or weak spot must be labeled "Do Not Ship." Particular attention will be paid to welds, insuring no holes, failures or weak spots exist. Any package which has a hole, failure or weak spot and is marked "Do Not Ship" will be placed in a larger package for shipment or will be emptied and cut up or smashed prior to placing in a package for shipment.

3.3 The use of any epoxy materials to seal any openings in a package for shipment of radioactive material is strictly prohibited.

3.4 The shipment of 1000 gallon and 1500 gallon tanks manufactured by Highland Tank Co., for radioactive waste is strictly prohibited.

4.0 CHECK OFF AND INFORMATION SHEETS

Attachment I	Truck/Trailer Inspection Check-Off Sheet
Attachment II	Cement Solidification Verification Log
Attachment III	Cement Waste Solidification Data Sheet
Attachment IV	Calculation Sheet for Cement Solidification of Resin
Attachment V	Waste Management Simple Flow Diagram
Attachment VI	Responsibility
Attachment VII	U.S. Ecology, Inc. Radioactive Shipping Record
Attachment VIII	Chem Nuclear Systems, Inc., Radioactive Shipping Record
Attachment IX	Washington Low Level Radioactive Waste Shipment Certification
Attachment X	Nevada Low Level Radioactive Waste Shipment Certification
Attachment XI	Nevada Certification
Attachment XII	Driver Instructions for Maintenance of Exclusive Use Shipment Controls
Attachment XIII	State Police Notification Forms
Attachment XIV	Radioactive Waste Truck Radiation/Contamination Survey
Attachment XV	South Carolina Radioactive Waste Shipment Certification Form
Attachment XVI	South Carolina Prior Notification and Manifest Form
Attachment XVII	Radioactive Waste Shipment Notification Form
Attachment XVIII	Radioactive Waste Shipment Checkoff Sheet
Attachment XIX	HN-100 Liner
Attachment XX	Filter Change Sign-Off Sheet
Attachment XXI	Low Level Waste Box Inventory
Attachment XXII	Demineralizer Resin Calculation Sheet

5.0 DETAILS

The plant waste processing equipment (demineralizers, evaporators, etc.) are designed to process wastes in the chemical and physical forms which exist in the operating plant systems. Plant administrative procedures dictate the plant system's chemical operating parameters, and routine sampling of these systems insure that all parameters are kept within the operating limits. Other procedures are in effect which prevent materials which effect waste system operation from entering these systems.

If alternate or additional equipment such as filters, demineralizers, incinerators, etc. are required for waste processing they will be operated by the philosophy established in this manual to assure that the final forms meet all the regulations for shipping and burial. Prior to the operation of any alternate equipment, procedures will be written and approved.

A. Liquid Processing And Solidification

The waste evaporators are operated by the instructions given in one of the following plant procedures:

1 OHP 4021.002.005	Operation of Waste Evaporator
1 OHP 4021.024.002	Pumping of Waste Evaporator Bottoms
12 OHP 4021.022.008	Placing In Service and Operation Of The South Boric Acid Evaporator Including System Line Up As A Waste Evaporator
1 OHP 4021.022.009	"S" Boric Acid Evaporator Cooldown And Pump Out of Evaporator Bottoms Operating As A Waste Evaporator

The evaporators are operated for the purpose of reducing the liquid waste activity levels such that these liquids can be released to the environment at concentrations within the limits of 10 CFR Part 20. Liquids which are within the limits, can be released directly without further processing. With these releases being made the total volume of liquids which require solidification is reduced. This reduction in solidified volume makes it possible for fewer shipments of radioactive materials and less volume to be buried.

The limit of volume reduction is dependent on concentration of several chemical and radiochemical species (See Table I).

If the concentration of boron is allowed to increase above the limits of Table I the concentrates crystallize in the evaporator when cooled down for pump-out, creating mechanical problems for the evaporator and pumps. To prevent crystallization of evaporator concentrates the concentration of boron is kept below the limits of Table I and sodium hydroxide is added as required to maintain an elevated pH to convert the H_3BO_3 to sodium tetraborate which is much more soluble than H_3BO_3.

$$4H_3BO_3 + 2NaOH \rightarrow Na_2B_4O_7 + 7\ H_2O$$

The concentration of chlorides in the evaporator concentrates is kept below the limit of Table I in order to prevent material damage to the evaporator. If the concentration is allowed to increase above the limit of Table I there is a possibility of corrosion of the evaporator internal surfaces, including the heater tubes. If these tubes are corroded to the point where they would leak, activity would enter the steam system. These tubes would then have to be plugged or replaced.

The activity levels in the evaporator concentrates are monitored as an aid to evaluate the need for shielded transport equipment.

Samples are taken periodically by Chemical Section personnel during the batch evaporator operation to maintain the evaporator bottoms within the limits of Table I, however, evaporator bottoms maybe properly solidified for shipping and burial within the limits of Table II by the use of the procedures given in this program.

TABLE I

Waste Evaporator Normal Operating Limits

BORON, B	20,000 to 30,000 ppm as B
pH	>9.0
CHLORIDES, Cl	500 ppm
Gross By total	0.2 uci/cc

TABLE II

Waste Evaporator Concentrates Limits For Solidification

BORON	0 - 40,000 ppm
pH	3 - 11
CHLORIDES	0 - 1000 ppm
ACTIVITY OF	0 - 0.0001 Millicurie/gram Transport Group I
FISSION AND	0 - 0.005 Millicurie/gram Transport Group II
ACTIVATION PRODUCTS	0 - 0.3 Millicurie/gram Transport Group III

SOLIDIFICATION BY USE OF CEMENT

SYSTEM DESCRIPTION

The systems described herein are designed to handle the solidification of liquids, evaporator bottoms and other concentrated liquids, spent resin, or other miscellaneous wastes.

Waste Feed System

The waste feed system consists of an electric motor driven pump and waste supply line to transfer waste to the liner. The Waste Evaporator Bottoms Storage Tank Transfer Pump takes suction from the liquid waste storage tank and pumps waste into the liner. When using temporary concentrates holding tanks, waste is pumped through flexible hose directly to the liner with a portable electric pump. The liner is filled until a pre-set level is reached as detected by a level sensor suspended from the liner. (See Attachment XIX)

Cement Feed System

Cement and sodium metasilicate are put into hoppers and are augered into the liner. Upon contacting the liquid waste, the sodium metasilicate begins to act, shortening the set time of the cement. Each liner is supplied with an internal mixing device designed to provide thorough mixing of the entire liner contents. A mixing motor mounted on the top of the liner prior to the filling operation is started prior to the addition of cement. Mixing continues for approximately twenty minutes after addition of the cement and sodium metasilicate or until the motor automatically trips off due to high resistance to mixing.

The cement feed system also has a vent line to control cement dust. Flexible hose is connected at the loading flange. When cement is augered into the liner from the hoppers a vacuum on this line draws off the air being vented from the liner. The air is then conveyed to the vent air filter.

COLLECTION AND ANALYSIS OF SAMPLES

General Requirements

The PCP shall be used to verify the solidification of at least one representative test specimen from at least every tenth batch of each type of wet radioactive waste (e.g. evaporator bottoms, boric acid solution).

For the purposes of the PCP a batch is defined as the amount in the WEBST at the time of sampling prior to pumping to the solidification equipment.

If any test specimen fails to solidify, the batch under test shall be suspended until such time as additional test specimens can be obtained, alternative solidification parameters can be determined in accordance with the Process Control Program, and a subsequent test verifies solidification. Solidification of the batch may then be resumed using the alternate solidification parameters determined.

If the initial test specimen from a batch of waste fails to verify solidification then representative test specimens shall be collected from each consecutive batch of the same type of waste until three (3) consecutive initial test specimens demonstrate solidifications. The process shall be modified as required to assure solidification of subsequent batches of waste.

For high activity waste, where the handling of samples could result in personnel radiation exposures which are inconsistent with the ALARA Principle, representative nonradioactive samples will be produced and tested. These samples should be as close to the actual waste in their physical and chemical properties as possible to verify proper solidification parameters.

Waste Solidification Data Sheet Attachment III

A Waste Solidification Data Sheet will be maintained for each test sample solidified. Each data sheet will contain pertinent information on the test sample and the batch numbers of wastes solidified based on each test sample.

The Waste Solidification Data Sheet will contain pertinent information on the characteristics of the test sample solidified so as to verify solidification of the subsequent 10 batches of similar wastes without retesting.

The Test Sample Data will include, but not be limited to, the type of waste solidified, major radioactive constituents pH, volume of sample, identification of oil in samples and the ratio of the sample to the final volume of the solidified product.

The Waste Solidification Data Sheet will include the batch number, batch volume, and date solidified, for each batch solidified based on the sample described on the test sample data sheet.

Collection Of Samples

Two samples of the batch of liquid to be solidified shall be taken for analysis. Sample sizes shall be compatible with the standard size sample used for the radioactivity analysis and the second for the chemical analysis. If the radioactivity levels are too high to permit full size samples to be taken then smaller samples shall be taken with the results corrected accordingly.

TEST SOLIDIFICATION AND ACCEPTANCE CRITERIA

Test Solidification

Test Solidifications should be conducted using a 1000 ml disposable beaker or similar size container. Mixing should be accomplished by stirring until a homogeneous mixture is obtained. (Minimum stirring time 5 minutes.)

Measure into the mixing vessel 438 ml. of the waste to be solidified.

Measure out 479 grams of (Portland I) cement and 68.56 grams of sodium metasilicate (anhydrous) and add this to the waste to be solidified. The cement and sodium metasilicate (anhydrous) must be from the same lot of materials which are to be used for the solidification. If two lots are to be used then the test must be made with the exact proportions of each lot which are to be used in the liner.

Mix the cement (Portland I) and sodium metasilicate (anhydrous) together and slowly add this mixture to the test sample while it is being stirred.

After ten (10) minutes of mixing and a homogeneous mixture is obtained allow the waste to stand for a minimum of 60 minutes.

Solidification Acceptability

The following criteria defines an acceptable solidification process and process parameters.

The solidification is considered acceptable, if upon visual inspection of the sample, the waste appears that it would hold its shape if removed from the beaker and it resists penetration, and no more than 0.5% of the total volume of the beaker is free water.

Solidification Unacceptability

If the waste fails any of the criteria set forth above, the solidification will be termed unacceptable and a new set of solidification parameters will need to be established.

If the test solidification is unacceptable then the same test procedures must be followed on each subsequent batch of the same type of waste until three (3) consecutive test samples are solidified.

Alternate Solidification Parameters

If a test sample fails to provide acceptable solidification of the waste the following procedures should be followed:

1. Mix equal volumes of dry cement and water to ensure that the problem is not a bad batch of cement.

2. Add additional caustic solution to the sample to raise the pH above 8, if required.

3. If the waste is only partially solidified, use lower waste to cement ratios.

   Prepare test as follows allowing at least one hour for each test to solidify. If each test doesn't solidify, go to the next set of parameters.

	TEST			=	LINER		
	MLS Waste	GM Cement	GM Sodium Meta Silicate (Anhydrous)	Gallons Waste	Bags Cement	Bags Sodium Meta Silicate (Anhydrous)
1.	400	523	75.4	712	83	11
2.	375	567	82.3	668	88	12
3.	350	592	89.1	623	94	13
4.	325	624	96.0	579	99	14

Packages of cement solidified liquid wastes will be held for a minimum of twenty four (24) hours after solidifications, and verification of compliance will be just prior to loading for shipment and will be documented on Attachment II.

Solidification of liquids other than evaporator bottoms may become necessary and will be done such that compliance with all the appropriate regulations is verified prior to shipment.

B. Compressibles Wastes

All contaminated or potentially contaminated compressible waste will be taken to a designated area near the hydraulic baler. The waste will then be compressed into drums.

Material which would be in noncompliance with the appropriate regulations will not be placed into a package for baling.

All drums which have been filled will be documented as to the number of the package, description of the contents, date and initials of person filling package and radioactive survey data. Each package will be sealed and stored until loaded for shipment and burial.

Prior to loading, the package must be checked by Environmental Section personnel for any indication of holes, failures or weak spots at the seams, welds or otherwise.

All of the above operations are performed within the limits of the following procedure:

12 THP 6010 RAD.303 Solid Waste Handling and Drumming

C. Noncompressible Waste-Filters

All liquid process type filters should be removed by the specific individual filters change procedure (See Attachment VI, page 5 of 5) and transported to the Drumming Room. To ensure adequate drain time for removal of free standing liquid, filters must be drained as follows:

Filter	Type	Minimum Drain Time
Reactor Coolant	double-stage stainless steel pleated paper	15 minutes
Seal Water Injection	single-stage stainless steel pleated paper	15 minutes (10*)
Spent Fuel Pit	double-stage stainless steel pleated paper	15 minutes
Spent Fuel Pit Skimmer	double-stage stainless steel pleated paper	15 minutes
Refueling Water Purification	double-stage stainless steel pleated paper	15 minutes
Seal Water Return	double-stage stainless steel pleated paper	15 minutes
CVCS Ion Exchange	single-stage stainless steel pleated paper	15 minutes (10*)
B.A. Evaporator Concentrates & Condensate	single-stage stainless steel pleated paper	15 minutes (10*)
Boric Acid	30" cloth wrapped	15 minutes**
Waste Evaporator Feed and Condensate	30" cloth wrapped	15 minutes**
Temporary-Reactor Cavity and Spent Fuel Pit	20" cloth wrapped 10" cloth wrapped	15 minutes (10*) 15 minutes (5*)

Large filters or high activity filters should be stored in the drum they were originally placed in when removed. Place all drums in storage area per 12 THP 6010 RAD.303: Solid Waste Handling and Drumming.

* Minimum drain time determined by testing.
**Maximum number of this type of filter is 8 per drum.

For proper documentation required during filter changes, see Attachment XX.
Filters not analyzed or solidified can not be shipped to the Barnwell Burial Site.

Miscellaneous-Including Absolute, and Hepa Filters

All miscellaneous noncompressible waste must be placed in a metal box as soon as possible after determination the item is to be disposed of. No liquid or damp items of any kind are to be placed in metal boxes. No metal box is to be sealed until it has been visually inspected by Environmental Section personnel, has been numbered and a description of the contents, including approximate item size and amount, is completed on the Low Level Waste Box Inventory, Attachment XXI.

NOTE: Any box which is greater than 640 cubic feet must be placarded on both sides and both ends.

Scintillation Vials

NOTE: Insure the following procedure is followed for packaging and shipping scintillation fluids.

1. Obtain a fifty-five (55) gallon waste drum (DOT 17H), place in the hot lab and label "For scintillation vials Only - DO NOT Ship to Barnwell". Line the drum with a minimum four (4) mil plastic liner.

2. The final product to absorbent material ratio must not exceed one-to-two.

*3. Place approximately 3" of absorbent at the bottom of the drum.

4. Place 6" of vials (not to be opened) in the container.

5. Place 6" of absorbent in the container.

6. Place 6" of vials in the container.

7. Fill the remainder of the container with absorbent material.

8. Close container and take to the 587' Drumming Room.

9. Replace with new barrel and follow above steps for filling.

*Approved absorbents
1. Diatomaceous Earth (Medium Grade)
2. Super Fine (Diatomite)
3. Speedi Dry
4. Hi - Dry
5. Calatom (M-P78)
6. Floor Dry 85 Superfine
7. Instant - Dri
8. Safe - T - Sorb (Pentrasorb)

D. RESINS

Spent resins are normally transferred to the spent resin storage tank to await packaging for shipment. The proper liner and cask to be used for the resin shipment will be determined by the activity of the resin to be packaged (Attachment IV). The cask to be used is determined from those available from Chem-Nuclear and Hittman Nuclear and Development Corp., in their Radwaste Handling Service Manuals. After the proper cask is decided on and received at the plant (including checking for contamination as per procedure 12 THP 6040 PER.467 it should be prepared for shipment using 12 THP 6040 PER.470 "Resin Transfer From Spent Resin Storage Tank To A Cask", 12 THP 6040 PER.467 "Cask Handling", and this Process Control Manual.

The package, when full, will be checked for free water periodically until shipped. The check for free water will include dewatering for each check. This will be done by pumping liquid off the top or draining or pulling suction from the bottom. Each different type of package used will be tested such that the volume of liquid which may be remaining in the package is known for each dewatering method used. The volume which could be remaining will always be under the volume allowed by the NRC, DOT and Burial Site regulations at the time of shipping.

If regulations require resin solidification it will be done after dewatering by use of the cement solidification outline which follows and Attachment IV.

Collection of Samples

1. Radiological protection

1.1 Comply with applicable Radiation Work Permits.

1.2 Test samples which use actual waste shall be disposed of by placing in the disposal liner after solidification.

1.3 A Waste Solidification Data Sheet will be maintained for each test sample solidified. Each data sheet will contain pertinent information on the test sample and the batch number of waste solidified based on each test sample.

Waste Solidification Data Sheet

The Waste Solidification Data Sheet will contain pertinent information on the characteristics of the test sample solidified so as to verify solidification of subsequent batches of similar wastes without retesting.

1. The test sample data for spent resin will include, but not necessarily be limited to, the type of waste solidified, volume of sample and ratio of sample volume to the final volume of the solidified product.

2. The waste solidification data sheet will include the Batch Number, Batch Volume, and Date Solidified, for each batch solidified based on sample described.

Collection of Samples

1. One sample shall be taken for analysis. The sample shall be compatible with the standard size sample used for the gamma isotopic analysis. If the radioactivity levels are too high to permit full size samples to be taken, then smaller samples shall be taken with the results corrected accordingly. Sample sizes shall be determined by Radiation Protection personnel.

2. Samples should be drawn to allow adequate time to complete the required testing and verification of solidification prior to the planned waste solidification procedure.

Test Solidification and Acceptance Criteria

1. Waste Conditioning

   1.1 If large (i.e., foam causing) quantities of detergents are present, the sample should be treated with an anti-foaming agent. The quantity of anti-foaming agent required shall be recorded on Attachment III.

1.2 If oil is present in quantities greater than 1% by volume, the oil should either be removed by skimming, or emulsification agents should be used to break up the oil. The quantity of any substance added to the sample for this purpose shall be recorded on Attachment III.

Test Solidification

1. Any sample to be solidified shall be pretreated as specified in Section 1 under Test Solidification and Acceptance Criteria.

2. Test Solidifications should be conducted using a 1000 ml. disposal beaker or similar size container. Mixing should be accomplished by stirring with an electric mixer until a homogeneous mixture is obtained, but in no case for less than three (3) minutes.

3. For the test solidifications of resin, measure into two mixing vessels 240 gms of uncompacted dewatered resin each and add 90 ml of water.

4. Measure out the required quantities of cement and anhydrous sodium metasilicate as shown below. Volumes are for loose, uncompacted material.

	Grams Cement		Grams Anhydrous Sodium Metasilicate	
Waste	Sample A	Sample B	Sample A	Sample B
Resins	189	236	19	24
Resins	265	346	27	35

5. Slowly add the cement to the test sample while it is being mixed.

6. After all of the cement is added, slowly add the anhydrous sodium metasilicate to the test sample while it is being mixed.

7. After sufficient (3 minutes after all cement and anhydrous sodium metasilicate is added) mixing so that a homogeneous mixture is obtained allow the waste to stand for a minimum of 4 hours.

Solidification Acceptability

The following criteria define an acceptable solidification process and process parameters:

1. The sample solidifications are considered acceptable if there is no visual or drainable free water.

2. The sample solidifications are considered acceptable if upon visual inspection the waste appears that it would hold its shape if removed from the beaker and it resists penetration by a rigid stick.

3. The sample solidifications establish a range from the ratios of cement to waste that will result in an acceptable product.

Solidification Unacceptability

1. If the waste fails any of the criteria set forth in the Section Solidification Acceptability, the solidification will be termed unacceptable and a new set of solidification parameters will need to be established under the procedures in the Section Alternate Solidification Parameters.

2. If the test solidification is unacceptable then the same test procedures must be followed on each subsequent batch of the same type of waste until three consecutive test samples are solidified.

Alternate Solidification Parameters

If a test sample fails to provide acceptable solidification of the waste the following procedures should be followed:

1. Mix equal volumes of dry cement and water to ensure that the problem is not a bad batch of cement.

2. If the waste is only partially solidified, use lower waste to cement and anhydrous sodium metasilicate ratios. Using the recommended quantities of cement and anhydrous sodium metasilicate, reduce the waste sample volume to 215 gms and continue reducing the sample volume by 25 gms until the acceptability criteria are met.

NOTES:

1. The weight of anhydrous sodium metasilicate is 10 percent of the cement weight.

Packages of cement solidified resins will be held for a minimum of twenty-four (24) hours after solidifications, and verification of compliance will be just prior to loading for shipment and will be documented on Attachment II.

E. LOADING

Prior to loading a Truck/Trailer Inspection shall be made using check off sheet Attachment I. All transport vehicles arriving on site for shipment of radioactive waste will have a contamination and radiation survey taken prior to entry into the Auxiliary Building. If the vehicle will not be entering the Auxiliary Building, the survey must be performed prior to loading. Loading of a cask onto a truck will be as per 12 THP 6040 PER.467 "Cask Handling". Loading of the cask or truck will be such that the packages will be loaded as to minimize the exposure toward the front of the truck. The Barnwell, South Carolina burial site requires that mixed (barrels and boxes) shipments of low specific activity materials on sole use vehicles be arranged so that all boxes are placed toward the back of the truck. The Beatty, Nevada burial site doesn't have this requirement and boxes and barrels can be mixed on the truck with the one requirement being that barrels be placed on barrels and boxes be placed on boxes. All loads must be braced to minimize movement of packages during normal transport. After December 31, 1982, all drum shipments to the Barnwell Burial Site will be palletized or shipped in open top vans or on flat bed trailers.

F. NOTIFICATION SCHEDULE

For "Large Quantity" Shipments

Application to transport a "large quantity" *radioactive material shipment in Michigan should be made pursuant to the requirements of R29.553 of Act. No. 207 of the Public Acts of 1941, as amended, being 29.3 c of the Michigan Compiled Laws (Department of State Police - State Fire Safety Board) and Section 9 of Act. No. 380 of the Public Acts of 1965, as amended, and Sections 2226, 2233, and 13521 of Act No. 368 of the Public Acts of 1978, as amended being § 16.109, 333.2226, 333.2233 and 333.13521 of the Michigan Compiled Laws (Michigan Department of Public Health).

The governor or his designee of each state through which the aforementioned shipment will travel must be given advance notification in accordance with Title 10-Energy Code of Federal Regulations. Part §71.5a.

* A "large quanitity" shipment is that which is greater than 200 curies of Group III and IV radionuclides.

As burial space is required

Both the Beatty, Nevada and Richland, Washington burial sites do not have volume allocation plans. For burial space call:

Beatty, Nevada - Steve Carpenter - 702-553-2203
U.S. Ecology, Inc.

Richland, Washington - Vern D. Apple - 509-377-2411
U.S. Ecology, Inc.

At least 3 months before shipment

The Barnwell, South Carolina Burial Site has a volume allocation plan. For burial space and allocation numbers call:

Barnwell, S. C.	-	Angie Jones	- 803-259-3577
VAP/PNP Dept.		Linda Bragg	803-259-3578
(CNSI)		Lewis Rouse	

Call Hittman Nuclear and Development Corporation for transportation and scheduled shipment date confirmation and follow with a letter.

HNDC - Chuck Stout - 312-232-6133

At least 7 days prior to shipment

Notify the Michigan Department of Public Health of the scheduled date of shipment and estimated curie content.

Mich. Dept. of Public Health - Joe Hennigan
Mike McCarty 517-373-1578

Prior Notification and Manifest must be sent to the State of South Carolina and the Barnwell Burial Site to be received 72 hours prior to shipment arrival.

Verify that the proposed carrier has a valid permit to transport radioactive materials in the State of Oregon. This verification is only required when the consignee is the Richland Burial Site.

Day of shipment, prior to departure

Notify burial site being shipped to. For shipments to the Barnwell Site, the route through South Carolina must be given.

Barnwell Burial Site - Chem-Nuclear Systems, Inc.	Angie Jones Linda Bragg	803-259-3577 803-259-3578
Beatty Burial Site - U.S. Ecology, Inc.	Steve Carpenter	702-553-2203
Richland Burial Site	Vern D. Apple	509-377-2411

If there are any changes in the Prior Notification and Manifest for the Barnwell Site, the State of South Carolina must be notified in addition to the Burial Site.

State of S. C.	Virgil Autry Betty Bethea Kim Noble	803-758-7806

Notification of the Michigan State Police must be given prior to shipment. (See Attachment XIII)

Michigan State Police - 616-469-1111

G. SHIPPING

All shipping of radioactive materials for burial or for other reasons are required by procedure to comply with all NRC and DOT regulations. All packaging in the above steps of this program are designed to insure compliance with all the appropriate regulations. The following procedures are used to insure and/or verify compliance with the regulations.

PMI 3150	Receipt And Shipment Of Radioactive Materials.
THI 3150	Receipt And Shipment Of Radioactive Materials.
12 THP 6010 RAD.304	Shipment Of Radioactive Materials
12 THP 6040 PER.467	Cask Handling

The following will be the order in which the Radioactive Shipment Records (RSR) are to be completed prior to any forms being distributed to the respective personnel.

1. Completion of shipping records
2. RP Supervisor for signature
3. Environmental Section for signature and correction check on RSR forms.
4. Carrier for signature
5. Three (3) copies of the Chem Nuclear (RSR), and U.S. Ecology, Inc. (RSR) are to be made.

Distribution As Follows:

The originals of the Shipping Papers will go to the following personnel, with copies also listed:

D. C. COOK NUCLEAR PLANT

State Police Notification Form
Radioactive Waste Shipment Notification Form
Radioactive Waste Shipment Checkoff Sheet
Truck/Trailer Inspection Check-Off Sheet

Original	To Environmental Section

Demineralizer Resin Calculation Sheet

Original	To RP
1 Copy	To Environmental
1 Copy	To Driver

BARNWELL WASTE MANAGEMENT FACILITY - RSR

White Original	To Driver
Canary Original	To Environmental Section
Pink Original	To Driver
1 Copy	To Stores
1 Copy	To RP Section
1 Copy	To HNDC

STATE OF S. C. PN&M AND CERTIFICATION FORMS

3 Copies	South Carolina Prior Notification and Manifest Form to Driver
1 Copy	South Carolina Prior Notification and Manifest Form to Environmental Section
Original	South Carolina Radioactive Waste Shipment Certification Form to Driver
1 Copy	South Carolina Radioactive Waste Shipment Certification Form to Environmental Section

DRIVER OF TRANSPORT VEHICLE

Original	Hittman Nuclear & Development Corp. Driver Instructions for Maintenance of Exclusive Use Shipment Controls
Original	Washington Low Level Radioactive Waste Shipment Certification
White Original	Barnwell Waste Management Facility (RSR)
Pink Original	Barnwell Waste Management Facility (RSR)
*1 Copy	Resin Gamma Spectrum Printout
2 White Disposal Site Copies	U.S. Ecology, Inc. (RSR)
1 Carrier Copy	U.S. Ecology, Inc. (RSR)
Original	Nevada Low Level Radioactive Waste Shipment Certification
*1 Copy	Demineralizer Resin Calculation Sheet
Original	Nevada Certification
3 Copies	South Carolina Prior Notification and Manifest Form
1 Copy	South Carolina Radioactive Waste Shipment Certification
1 Copy	Radioactive Waste Truck Radiation/ Contamination Survey

NOTE: The driver of the transport vehicle will be given two or more extra placards/placard holders for replacement purposes if any of the affixed placards become lost or damaged during transit. For transport vehicles which the placard holder is permanently affixed on all four (4) sides, extra placards will not need to be given to the driver.

ENVIRONMENTAL SECTION

Canary Original	Barnwell Waste Management Facility (RSR)
Original	State Police Notification Form
Original	Radioactive Waste Shipment Notification Form
Original	Radioactive Waste Shipment Checkoff Sheet
Copy	Radiation/Contamination Truck Survey
*Copy	Resin Gamma Spectrum Printout
Customer Copy	U.S. Ecology, Inc. (RSR)
Copy	Nevada Low Level Radioactive Waste Shipment Certification
Copy	Nevada Certification
Copy	Washington Low Level Radioactive Waste Shipment Certification
Copy	South Carolina Prior Notification and Manifest Form
Copy	South Carolina Radioactive Waste Shipment Certification
Original	Truck/Trailer Inspection Check-Off Sheet
*Copy	Demineralizer Resin Calculation Sheet

*Only when resin is being shipped. A gamma spectrum printout and a Demineralizer Resin calculation sheet must be provided for each package containing resin being shipped.

RADIATION PROTECTION SECTION

1 Copy	Barnwell Waste Management Facility (RSR)
Original	Radiation/Contamination Truck Survey
1 Copy	U.S. Ecology, Inc. (RSR)
Original	Demineralizer Resin Calculation Sheet

H. TRAINING

Personnel who routinely handle and ship radioactive waste (see Attachment VI) will be trained at least annually on the current regulations (see References Section) and the plant instructions and procedures which apply to Waste Handling.

TRUCK/TRAILER INSPECTION CHECK-OFF SHEET

SHIPMENT NO._____ DATE_____

Prior to loading, the following items are to be examined and documented on this checklist for each vehicle transporting radioactive waste from the plant site:

		INITIALS
(1)	Truck/Trailer Tires	
	Remarks_____	_____
(2)	Truck/Trailer Wheels	
	Remarks_____	_____
(3)	Trailer Bed and Frame	
	Remarks_____	_____
(4)	Load Tie-Downs	
	Remarks_____	_____
(5)	Truck/Trailer Lights	
	Remarks_____	_____
(6)	Truck/Trailer Placarded	
	Remarks_____	_____

Initials indicate inspection was made and results were acceptable. If items affecting safe transportation of load are found, contact Hittman Nuclear and Development. (312-232-6133)
Person Contacted_____ Date_____

Vehicle inspection criteria as follows:

(1) Truck/Trailer Tires - A minimum of 1/16" tread, no fabric exposed on sidewall, no cuts or injuries into fabric.

(2) Truck/Trailer Wheels - Check for visible cracked wheels, loose lug nuts or missing studs.

(3) Trailer Bed and Frame - Check visually for cracks and breaks. Check main rails for any visible cracks in rails and associated welds. On any drop frame trailers, the drop area is the most susceptible to cracking. If any cracks are observed in main rails, trailer should be deadlined and carrier immediately notified.

(4) Load Tie-Downs - Check cable tie down points on trailer for any visible cracks. Cables should be in good condition, tight, crossed and without crimps. Cask should be positioned so that cables do not rub each other. Ratchets and shackles shall be free of cracks.

(5) Truck/Trailer Lights - Checks for operation of head-lights, tail-lights, brake-lights and directional signals.

(6) Truck/Trailer Placarded - Placarding on front, sides and rear as required.

Cement Solidification Verification Log

Liner No. _____ Date Time _____ Completion Date _____ Verification Date _____

Liner Volume _____ Time Start _____ Completion Time _____ Verification Time _____

Cement lbs./bag _____ Cement Lot #/or Date Received _____ Verified By _____

Sodium Metasilicate lbs./bag (Anhydrous) _____ Sodium Metasilicate (Anhydrous) Lot #/ or Date Received _____ Ship Date _____

DATE	TIME	GALLONS WASTE	PROCESSED FROM	BAGS CEMENT	BAGS METSO	COMMENTS	INITIALS

Solidification Verification

I hereby certify that a visual inspection of the HNX liner has been conducted at least 24 hours after the indicated completion date and time and that there was not any indication of freestanding liquid.

Date _____

Time _____

HNX Supervisor _____

12 PMP 3150 PCP.001
ATTACHMENT III
Batch No:_____
Sample No:_____
Date:_____

CEMENT WASTE SOLIDIFICATION DATA SHEET FOR

_____
(Type of Waste)

Batch No:_____ Sample No:_____

Sample Volume, ml:

pH[1]:

Indications of Oil/Detergent:

Other Major Constituents:

Quantity of Cement Added: _____ Cement Lot #/or Date Received _____

Quantity of Sodium Meta Silicate (Anhydrous) _____ Sodium Metasilicate (Anhydrous) Lot #/or Date Received _____

Final Product to Waste Ratio:

Product Acceptability:

Radionuclides Present:
(Isotopes & Concentrations)

[1]If pH adjustment is required note chemical used, quantity used and pH after adjustment.

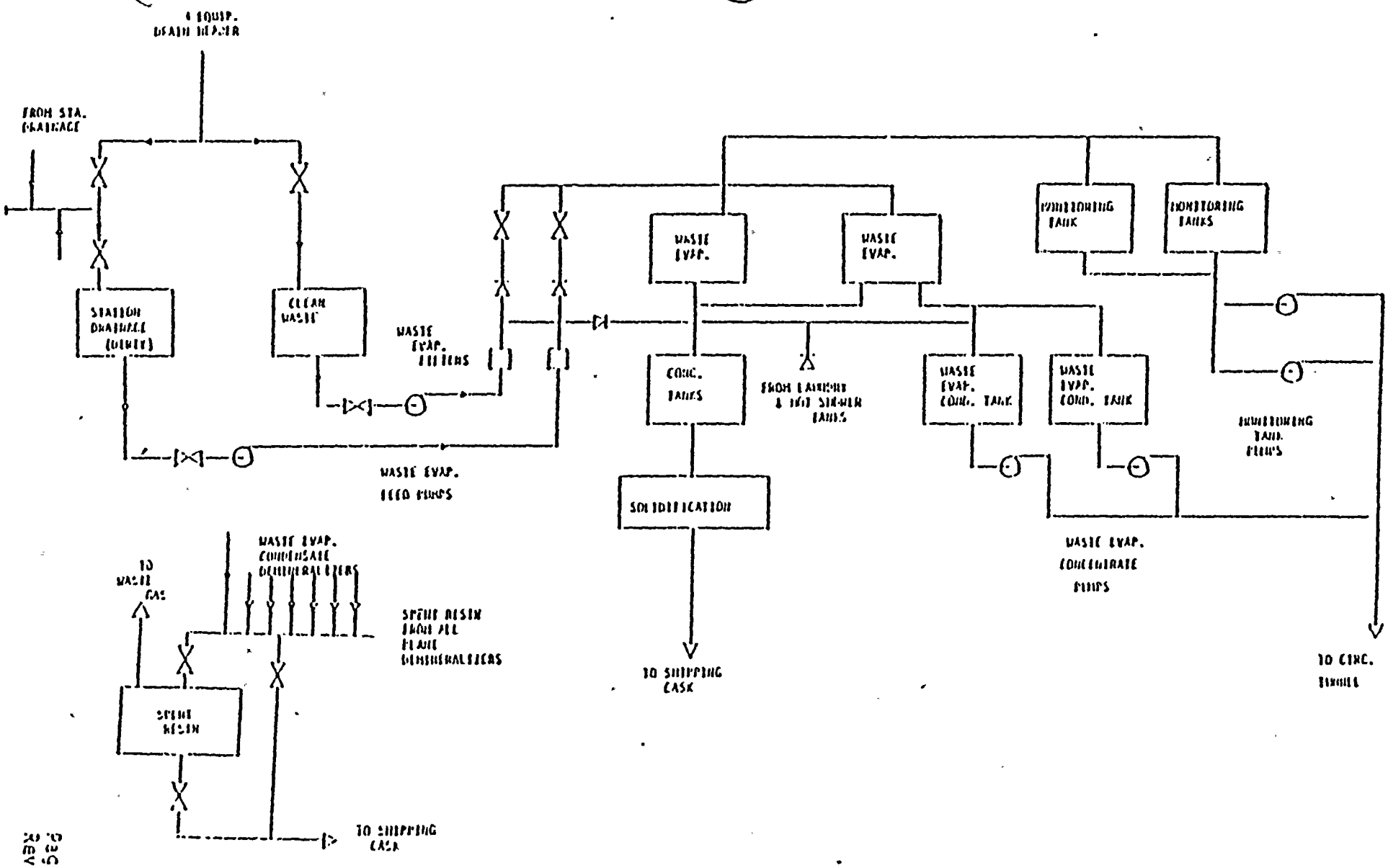
SOLIDIFICATION DATA TABLES

SUMMARY

For bead resin, the licensed cask payload is limiting for the HN-100 Series 1 and HN-100 Series 2. Weight is not a limiting factor for the HN-600, HN-100 Series 3, HN-100S, and HN-200.

Bead Resin

	HN-100 Series 1	HN-100 Series 2	HN-100 Series 3	HN-100S	HN-200	HN-600
Usable Liner Volume, ft^3	142	142	142	142	60	65
Max. Solidfied Waste Vol. ft^3	125.4	120.3	142	142	60	65
Max. Resin Vol. Dewatered, ft^3	103.0	98.8	116.5	116.5	49.3	53.4
Water Added at Max. Resin Vol. gal.	223.5	214.5	253.2	253.2	106.9	115.9
Cement Added 1 $ft.^3$ bags	52.1	50	59	59	25	27
Metso Added Pounds 100# bags	4.9	4.7	5.5	5.5	2.4	2.5
Max. Radiation Level R/h Contact	12	12	12	5	800	100



SOLID WASTE MANAGEMENT SYSTEM

12 FHP 3150 PSP .001
Attachment 7

Page 1 of 1
Rev. 2

RESINS

PROCESS	PERFORMED BY	PROCEDURE	SUPERVISED BY	VERIFIED BY	TRAINING BY
Transfer Resin to The SRST	Utility Operator Auxiliary Equip. Operator	12 OHP 4021.004.004 12 OHP 4021.006.008	Unit Supervisor Assistant Shift Supervisor	Radiation Protection Personnel	Unit Supervisor Assistant Shift Supervisor
Transfer to Cask	Utility Operator Auxiliary Equip. Operator	PER.470	Environmental Personnel	Environmental Personnel	Environmental Personnel
Dewatering And Verification of Dewatering	Environmental Personnel	PER.470	Environmental Personnel	Environmental Personnel	Environmental Personnel
Cask Closure	Maintenance Mechanic	PER.467	Environmental Personnel	Environmental Personnel	Environmental Personnel
Activity-Curie Content	Radiation Prot./ Environmental	RAD.304/PCP	Radiation Prot. Supervisor/ Environmental	Radiation Protection Supervisor/ Environmental	Radiation Prot. Supervisor/ Environmental
Activity-Isotopic Ratio	Chemical Technician	LAB.069	Chemical Super./ Environmental	Chemical Supervisor/ Environmental	Chemical Supervisor
Cask Labeled	Radiation Prot. Technician	RAD.304	Radiation Prot. Supervisor	Radiation Protection/ Environmental Personnel	Radiation Prot/ Environmental Personnel
Cask Loaded	Maintenance Mechanic	PER.467	Environmental Personnel	Environmental Personnel	Environmental Personnel
Truck and Cask Inspection and Survey	Radiation Prot. Personnel/ Environmental	RAD.304 PER.467 PCP	Radiation Prot. Supervisor/ Environmental	Radiation Protection/ Environmental Personnel	Radiation Prot/ Environmental Personnel
Radioactive Shipping Record	Radiation Prot./ Environmental	RAD.304/PCP	Radiation Prot. Supervisor/ Environmental	Plant Radiation Prot. Super/ Environmental	Radiation Prot/ Environmental Personnel
Prior Notification	Environmental	PCP	Environmental	Environmental	Environmental
Solidification and Verification of Solidification	Contract Personnel/ Environmental	PCP	Environmental Personnel	Environmental Personnel	Environmental Personnel

NON-COMPRESSIBLE WASTE

PROCESS	PERFORMED BY	PROCEDURE	SUPERVISED BY	VERIFIED BY	TRAINING BY
Waste Transport to Box-Barrel	Contract/Maint. Personnel	RAD.303	Radiation Prot. Maintenance Supervisor	Radiation Protection Maintenance Supervisor	Radiation Prot/ Maintenance Supervisor
Box-Barrel Filling	Contract/Maint. Personnel	RAD.303	Radiation Prot./ Maintenance Supervisor	Radiation Protection Supervisor/ Environmental	Radiation Prot/ Maintenance Supervisor
Radioactive Content-Isotopic Ratio	Radiation Prot./ Chemical Tech.	RAD.304	Radiation Prot. Supervisor	Radiation Protection Supervisor/Environ. Personnel	Radiation Prot Supervisor
Package Sealed and Labeled	Radiation Prot./ Contract Personnel	RAD.304	Radiation Prot. Supervisor/ Envir. Personnel	Radiation Prot./ Environmental Personnel	Radiation Prot/ Supervisor/ Envir. Personn.
Package Quality Verification	Environmental Personnel	RAD.304/PCP	Environmental Personnel	Environmental Personnel	Environmental Personnel
Truck Loading	Maintenance Mechanic	PCP	Environmental Personnel/Maint. Supervisor	Environmental Personnel	Environmental Personnel
Truck and Package Inspection and Survey	Radiation Prot. Personnel/ Environmental	RAD.304 PCP	Radiation Prot. Supervisor/ Environmental	Environmental Personnel	Radiation Prot/ Environmental Personnel
Radioactive Shipping Record	Radiation Prot./ Environmental	RAD.304/PCP	Radiation Prot. Supervisor/ Environmental	Plant Radiation Prot. Super/ Environmental	Radiation Prot/ Environmental Personnel
Prior Notification	Environmental	PCP	Environmental	Environmental	Environmental

COMPRESSIBLE WASTE

PROCESS	PERFORMED BY	PROCEDURE	SUPERVISED BY	VERIFIED BY	TRAINING BY
Waste Transport to Drumming Room	Contract/Maint. Personnel	RAD.303	Radiation Prot./ Maintenance Supervisor	Radiation Protection/ Maintenance Supervisor	Radiation Prot/ Maintenance Supervisor
Baler Operation	Contract/Radiation Protection Personnel	RAD.303	Radiation Prot. Supervisor	Radiation Protection Supervisor	Radiation Prot Supervisor
Radioactive Content Isotopic Ratio	Radiation Prot./ Chemical Tech.	RAD.304	Radiation Prot. Supervisor	Radiation Protection Supervisor/Environ. Personnel	Radiation Prot Supervisor
Package Sealed and Labeled	Radiation Prot./ Contract Personnel	RAD.303	Radiation Prot. Supervisor/ Envir. Personnel	Radiation Prot./ Environmental Personnel	Radiation Prot Supervisor/ Environmental
Package Quality Verification	Environmental Personnel	RAD.303/PCP	Environmental Personnel	Environmental Personnel	Environmental Personnel
Truck Loading	Maintenance Mechanic/Contract Personnel	PCP	Environmental Personnel/Maint. Supervisor	Environmental Personnel	Environmental Personnel
Truck and Package Inspection and Survey	Radiation Prot. Personnel/ Environmental	RAD.304/PCP	Radiation Prot. Supervisor/ Environmental	Environmental Personnel	Radiation Prot Supervisor/ Environmental
Radioactive Shipping Record	Radiation Prot. Environmental Personnel	RAD.304/PCP	Radiation Prot. Supervisor/ Envir. Personnel	Plant Radiation Protection Super/ Environmental	Radiation Prot Supervisor/ Envir Person.
Prior Notification	Environmental	PCP	Environmental	Environmental	Environmental

EVAPORATOR CONCENTRATES

PROCESS	PERFORMED BY	PROCEDURE	SUPERVISED BY	VERIFIED BY	TRAINING BY
Evaporator Operation and Concentrates Transfer	Utility Operator Auxiliary Equip. Operator	1 OHP 4021.002.003 12 OHP 4021.022.008 1 OHP 4021.024.002 1 OHP 4024.022.009	Unit Supervisor Assistant Shift Supervisor	Unit Supervisor Assistant Shift Supervisor	Unit Supervisor Assistant Shift Supervisor
Solidification	Contract Personnel	Process Control Plan	Environmental Personnel	Environmental Personnel	Environmental Personnel
Water Removed By	Contract Personnel	Process Control Plan	Environmental Personnel	Environmental Personnel	Environmental Personnel
Product Quality Verification	Environmental Personnel	Process Control Plan	Environmental Personnel	Environmental Personnel	Environmental Personnel
Activity-Curie Content	Radiation Prot. Technician/ Environmental	Process Control Plan RAD.304	Radiation Prot. Supervisor/ Environmental	Radiation Protection Supervisor/ Environmental	Radiation Prot. Supervisor/ Environmental
Activity-Isotopic Ratio	Chemical Technician	LAB.069	Chemical Supervisor	Chemical Supervisor/ Environmental Person.	Chemical Supervisor
Package Sealed and Labeled	Radiation Prot. or Contract Personnel	RAD.304	Radiation Prot. Supervisor	Environmental Personnel	Radiation Prot Supervisor/ Environmental
Package Quality Verification	Environmental Personnel	Process Control Plan	Environmental Personnel	Environmental Personnel	Environmental Personnel
Truck Loading	Maintenance Personnel	PCP	Maintenance Supervisor/ Envir. Person.	Environmental Personnel	Maintenance Supervisor
Final Truck and Package Inspection and Survey	Radiation Prot. Personnel/ Environmental	RAD.304/PCP	Radiation Prot. Supervisor/ Environmental	Environmental Personnel	Radiation Prot Supervisor/ Environmental
Radioactive Shipping Records	Radiation Prot./ Environmental Personnel	RAD.304/PCP	Radiation Prot. Supervisor/ Envir. Personnel	Plant Radiation Prot. Supervisor/Environ. Personnel	Radiation Prot Supervisor/ Envir. Person.
Prior Notification	Environmental	PCP	Environmental	Environmental	Environmental

FILTERS

PROCESS	PERFORMED BY	PROCEDURE	SUPERVISED BY	VERIFIED BY	TRAINING BY
Vent - Drain Filter Housing	Utility Operator Auxiliary Equip. Operator	1 OHP 4021.003.008 2 OHP 4021.003.008 1 OHP 4021.003.009 2 OHP 4021.003.009 PCP	Unit Supervisor Assistant Shift Supervisor	Unit Supervisor Assistant Shift Supervisor	Unit Supervisor Assistant Shift Supervisor
Filter Removal and Transfer to Drumming Room	Maintenance Personnel	MHP 5021.001.001 RAD.303 RAD.313	Radiation Prot./ Maintenance Supervisor	Radiation Protec./ Maintenance Personnel	Radiation Prot/ Maintenance Supervisor
Barrel Filling	Maintenance Personnel	MHP 5021.001.001 RAD.303	Radiation Prot./ Maintenance Supervisor	Radiation Protec. Supervisor/Envir. Personnel	Radiation Prot/ Maintenance Supervisor
Package Sealed and Labeled	Radiation Prot./ Contract Personnel	RAD.304	Radiation Prot. Supervisor/ Envir. Personnel	Radiation Protec./ Environmental Personnel	Radiation Prot. Supervisor/Env. Personnel
Radioactive Content Isotopic Ratio	Radiation Prot./ Chemical Technician	RAD.304	Radiation Protection Supervisor	Radiation Protec. Supervisor Environmental Person.	Radiation Prot. Personnel
Package Quality Verification	Environmental Personnel	RAD.304 PCP	Environmental Personnel	Environmental Personnel	Environmental Personnel
Barrel Loading into Cask	Maintenance Mechanic	PER.467	Environmental Personnel	Environmental Personnel	Environmental Personnel
Cask Closure	Maintenance Mechanic	PER.467	Environmental Personnel	Environmental Personnel	Environmental Personnel
Truck and Cask Inspection-Survey	Radiation Prot./ Environmental Personnel	RAD.304 PCP	Radiation Prot. Supervisor/ Environmental	Radiation Prot. Supervisor/Envir. Personnel	Radiation Prot Supervisor/ Envir. Person.
Radioactive Shipping Record	Radiation Prot./ Environmental Personnel	RAD.304/ PCP	Radiation Prot. Supervisor/ Envir. Personnel	Plant Radiation Prot. Supervisor/Environ. Personnel	Radiation Prot Supervisor Envir. Person.
Prior Notification	Environmental	PCP	Environmental	Environmental	Envir. Person.

GENERATOR NUMBER

GENERATOR NAME

ADDRESS

CITY STATE

CONTACT

PHONE

USER PERMIT NO SHIPMENT NO

RADIOACTIVE WASTE SHIPMENT & DISPOSAL FORM

US ECOLOGY, INC.

EXECUTIVE OFFICE: (502) 426-7160
P.O. BOX 7246 • LOUISVILLE, KENTUCKY 40207
Illinois Office: (815) 454-2376

Consigned To:

[ ] P.O. Box 638
Richland, WA 99352
(509) 377-2411

[ ] P.O. Box 578
Beatty, NV 89003
(702) 553-2203

USE THIS NO. ON ALL CONTINUATION PAGES **No. 3724** PAGE 1 OF ______

AGENT/BROKER

ADDRESS

CITY STATE

CONTACT

PHONE USER PERMIT NO

CARRIER SHIPPING DATE

TYPE OF CASK RADIATION READING

TOTALS

TOTAL QUANTITY	PROPER SHIPPING NAME & HAZARD CLASS (PER 49 CFR 172.101)	IDENTIFICATION NUMBER	TOTAL WEIGHT IN POUNDS
	Radioactive Device, N.O.S. – Radioactive Material	UN2911	
	Radioactive Material, Fissile, N.O.S. – Radioactive Material	UN2918	
	Radioactive Material, Low Specific Activity, N.O.S. – Radioactive Material	UN2912	
	Radioactive Material, N.O.S. – Radioactive Material	NA9181	
	Radioactive Material, Limited Quantity, N.O.S. – Radioactive Material	UN2910	
	Radioactive Material, Special Form, N.O.S. – Radioactive Material	NA9182	

Total # of Pkgs This Shipment	Total Activity This Shipment	Total Volume This Shipment
	[ ] ci [ ] mci	cu ft

Authorized Signature Date

DISPOSAL SITE COPY

GENERATOR #:

GENERATOR NAME:

AGENT/BROKER:

US ECOLOGY, INC.

CONTINUATION SHEET

NO. ______

PAGE ____ OF ____

Item No.	Container Type	Container Volume	Container Weight	Physical Form	Waste Description	Solidification or Absorbent Media	Chemical Form	[illegible]	Activity	Special Nuclear Material	Source Material	Radiation Levels: Contact Surface	Radiation Levels: [illegible]	[illegible]	[illegible]	Label

PAGE TOTALS

DISPOSAL SITE COPY

12 PMP 3150 PCP .001
Attachment VII

BARNWELL WASTE MANAGEMENT FACILITY

Operated by: CHEM-NUCLEAR SYSTEMS, INC.
P. O. Box 726, Barnwell, South Carolina 29812
(803) 259-1781
RADIOACTIVE SHIPMENT RECORD FORM

Page ______ of ______

(4) Volume Allocation No ______________

(1) FROM Company Name ______________
Address ______________
____
Contact ______________
Phone # ______________

(2) TO ______________
____

CARRIER ______________
DRIVER SIGNATURE ______________
DATE AND TIME RECEIVED ______________

(5) Shipping Date ______________
Shipment No ______________
Type of Cask ______________
Trailer No ______________
[illegible] SERIAL # ______________

CNSI USE ONLY

Arrival date ______ ASI ______
Date/Time Buried ______ By ______
Radiation Readings ______ Weight ______
Trench # ______ LOC ______ WCC ______
Total Personnel Exp ______ (mRem)
CSNI Project # ______

(3) — (a) Description of Materials	(b) Total # of Pkgs This Shipment	(c) Total Activity This Shipment	(d) Total Volume This Shipment	(e) Type Containers This Shipment
( ) RADIOACTIVE MATERIAL, LSA, NOS ( ) RADIOACTIVE MATERIAL, NOS ( ) RADIOACTIVE MATERIAL, SPECIAL FORM NOS ( ) RADIOACTIVE DEVICE NOS RAD MATERIAL		mCi	Cu ft	

(6) Item No	(7) Radio-nuclide each container	(8) Percent Abundance Each Nuclide	(8) (or) Activity Each Nuclide (mCi)	(9) Physical form	(10) Chemical form	(11) Waste Description	(12) U 235 (grams)	(13) U 238 Th 232 (pounds)	(14) Disposable Container Weight (pounds)	(15) Disposable Container Volume (Cu Ft)	(16) Container Spec	(17) RADIATION LEVELS Disposable Container Surface	(17) Package Surface	(17) 3 Ft (TI)	(18) Removable Contamination Package Surface (a) DPM/100cm² (B-Y)	(18)	(19) Transport Group	(20) Label Used
(21) TOTAL																		

(22) ( ) Yes ( ) No THIS VEHICLE IS CONSIGNED EXCLUSIVE USE. LOADING AND UNLOADING MUST BE ACCOMPLISHED BY CONSIGNOR OR CONSIGNEE OR HIS DESIGNATED AGENT.

(23) IMPORTANT This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Signature ______________

Company ______________ Date ______________

(See Reverse Side for Instructions for Completing This Form)

(24) Certification is hereby made to the South Carolina Department of Health and Environmental Control that this shipment of low level radioactive waste has been inspected in accordance with the requirements of South Carolina Radioactive Material License No. 097 as amended, and the Nuclear Regulatory Commission License No. 46-13536-01 as amended, and the Chem-Nuclear Barnwell Site Disposal Criteria within 48 hours prior to shipment, and further certification is made that there are no known violations of non-compliance with all applicable laws, rules and regulations.

Date ______________ By ______________

Title and Organization ______________

Telephone No ( ) ______________

Form No. CNS 701 (4/80)

White: Accompany Shipment Yellow: Customer Pink: Carrier

12 PMP 3150 PCP .001
Attachment VIII

DEPARTMENT OF SOCIAL AND HEALTH SERVICES
OLYMPIA, WASHINGTON

LOW-LEVEL RADIOACTIVE WASTE SHIPMENT CERTIFICATION FOR
COMMERCIAL GENERATOR/PACKAGERS, AND BROKERS AND CARRIERS

The following certification, completed as applicable, is made to the State of Washington:

Certification is hereby made to the State of Washington that Radiation Shipment Record No. _____ of low-level radioactive waste has been inspected in accordance with requirements of the Governor of Washington's Executive Order dated November 19, 1979, prior to its shipment. Further certification is made that the inspection has revealed no items of non-compliance with all applicable laws, rules and regulations.

The undersigned shall indemnify and hold harmless the State of Washington, in an amount not to exceed $1,000,000.00 per individual who may be injured, provided that indemnification shall not exceed $3,000,000.00 in total, for each occurrence, from any and all claims, suits, losses, damage, injury and expenses to any person whomsoever or to property arising or growing out of or in any manner connected with the activities performed under this order.

Except for any violation of applicable existing state or federal statute or regulation respecting packaging and shipment, inspection and acceptance of any item, or container or material covered by this certification by the State of Washington or a duly authorized contractor shall release the party who executed this certificate from any and all requirements of indemnification from injury or loss.

SECTION A:
FOR THE GENERATOR/PACKAGER: _____
(Company Name)

PERMIT NUMBER: _____

VOLUME OF WASTE IN THIS SHIPMENT: _____

DATE: _____ BY: _____

TITLE: _____

SECTION B:
FOR THE BROKER: _____
(Company Name)

PERMIT NUMBER: _____

VOLUME OF WASTE IN THIS SHIPMENT: _____

DATE: _____ BY: _____

TITLE: _____

SECTION C:
FOR THE CARRIER: _____
(Company Name)

VOLUME OF WASTE IN THIS SHIPMENT: _____

DATE: _____ BY: _____

TITLE: _____

DSHS 419-31A
[illegible] (4/80)

STATE OF NEVADA
DEPARTMENT OF HUMAN RESOURCES
DIVISION OF HEALTH
BUREAU OF CONSUMER HEALTH PROTECTION SERVICES
CAPITOL COMPLEX
CARSON CITY, NEVADA 89710

TELEPHONE
(702) 885-4750

LOW-LEVEL RADIOACTIVE WASTE SHIPMENT CERTIFICATION

As required by Executive Order dated July 24, 1979, issued by the Governor of the State of Nevada, the following certification, as applicable, is made to the State of Nevada:

SECTION A: _____

GENERATOR/PACKAGER: _____
(Company Name)

Certification is hereby made to the State of Nevada that shipment no. _____ of low-level radioactive waste has been inspected in accordance with requirements of the Governor of Nevada's Executive Order dated July 24, 1979, prior to its shipment and further certification is made that the inspection has revealed no items of non-compliance with all applicable laws, rules and regulations. It is further certified that in the case of solidified waste, there is no free-standing liquid in any container in this shipment.

BY: _____

DATE: _____ TITLE: _____

SECTION B: _____

BROKER: _____
(Company Name)

Certification is hereby made to the State of Nevada that shipment no. _____ of low-level radioactive waste has been inspected in accordance with the requirements of the Governor of Nevada's Executive Order dated July 24, 1979, prior to its shipment and further certification is made that the inspection has revealed no items of non-compliance with all applicable laws, rules and regulations.

BY: _____

DATE: _____ TITLE: _____

SECTION C: _____

CARRIER: _____
(Company Name)

Certification is hereby made to the State of Nevada that the vehicle transportation shipment no. _____ of low-level radioactive waste is properly placarded and that the load is secure for transport and that all shipping papers as required by the United States Department of Transportation (U. S. DOT) have been properly executed and delivered.

BY: _____

DATE: _____ TITLE: _____

BY: _____

DATE: _____ TITLE: _____

BY: _____

CERTIFICATION

THIS IS TO CERTIFY THAT I HAVE READ AND UNDERSTAND THE REQUIREMENTS OF LICENSE #13-11-0043-02 ISSUED TO U.S. ECOLOGY, INC. BY THE NEVADA DEPARTMENT OF HUMAN RESOURCES FOR THE RECEIPT AND DISPOSAL OF RADIOACTIVE MATERIALS AT BEATTY, NEVADA, AS DESCRIBED IN PARAGRAPHS 5.1.1.3; 5.1.1.4; 5.1.1.5; 5.1.1.6 and 5.4.6.1 OF THE U.S. ECOLOGY, INC. SITE OPERATIONS MANUAL, AND I FURTHER CERTIFY THAT THE MATERIALS IN THIS SHIPMENT ARE IN CONFORMITY WITH THOSE REQUIREMENTS.

_____
COMPANY

_____
AUTHORIZED SIGNATURE

_____
TITLE

_____
DATE

INSTRUCTIONS FOR MAINTENANCE OF EXCLUSIVE USE SHIPMENT CONTROLS

This shipment is to be maintained as an exclusive use shipment. Loading must be performed by a single consignor having the exclusive use of the vehicle. Unloading must be done by the consignee, and only at the designated destination.

Repositioning or movement of any loaded material without the written permission of the consignor or Hittman Nuclear & Development Corporation is prohibited.

STATE POLICE NOTIFICATION FORM

A. CARRIER'S NAME _____

B. COLOR AND NUMBER OF CAB _____

C. COLOR, NUMBER, AND LENGTH OF TRAILER _____

D. ROUTE FROM PLANT THROUGH MICHIGAN AND INDIANA _____

E. TYPE AND DESCRIPTION OF CONTAINER _____

F. DESCRIPTION OF SHIPMENT _____

G. MAXIMUM RADIATION LEVEL IN MR/HR AT 6 FEET FROM TRAILER _____

H. TOTAL CURIE CONTENT OF SHIPMENT _____

I. TIME AND DATE OF SHIPMENT _____

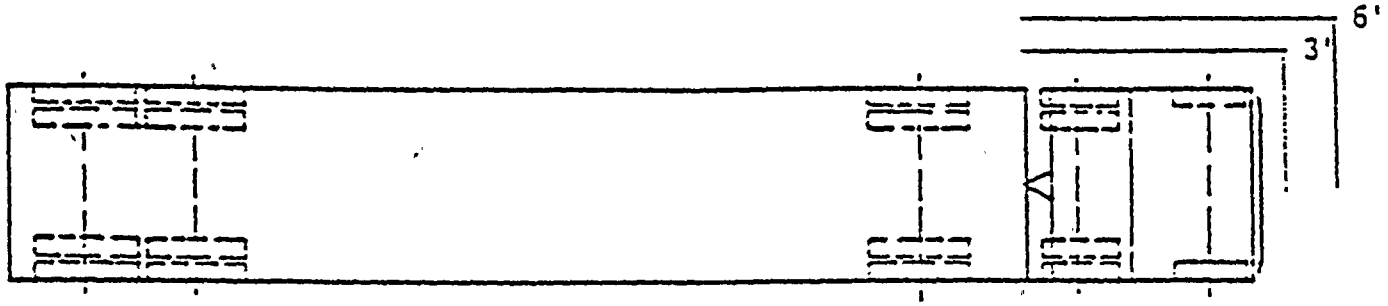
J. COMPANY NAME I & M Electric Co. D. C. Cook Plant Bridgman, MI.

K. YOUR NAME _____

INCOMING SURVEY - FLATBED

*All smears <50 dpm and all readings <.2 mR/hr, unless noted.

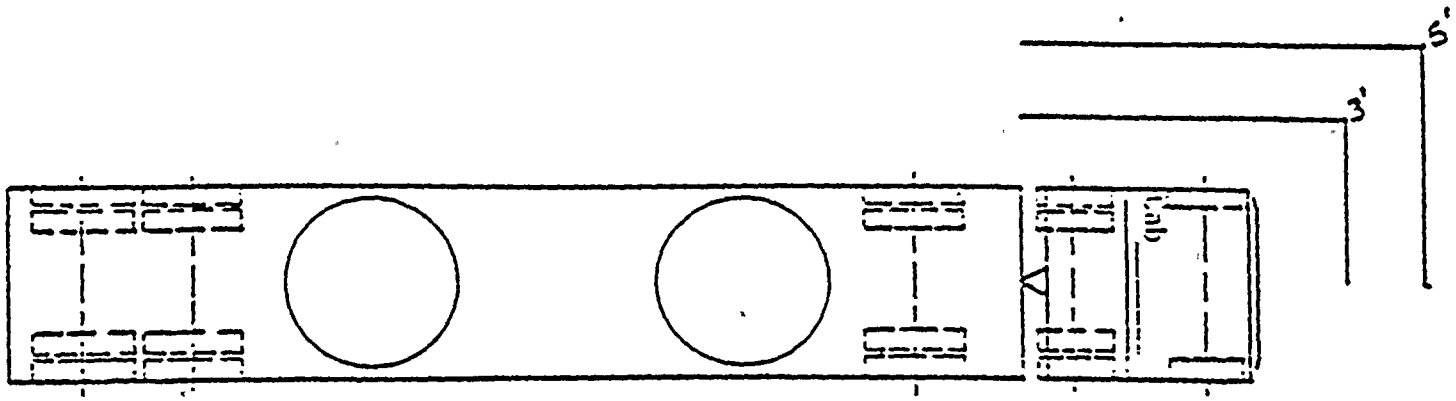
Trailer# _____



Date _____ Technician _____

Time _____ Instrument _____

OUTGOING SURVEY - FLATBED



Carrier _____

Trailer# _____ Date _____

Max. Rad. Level (C) _____ Time _____

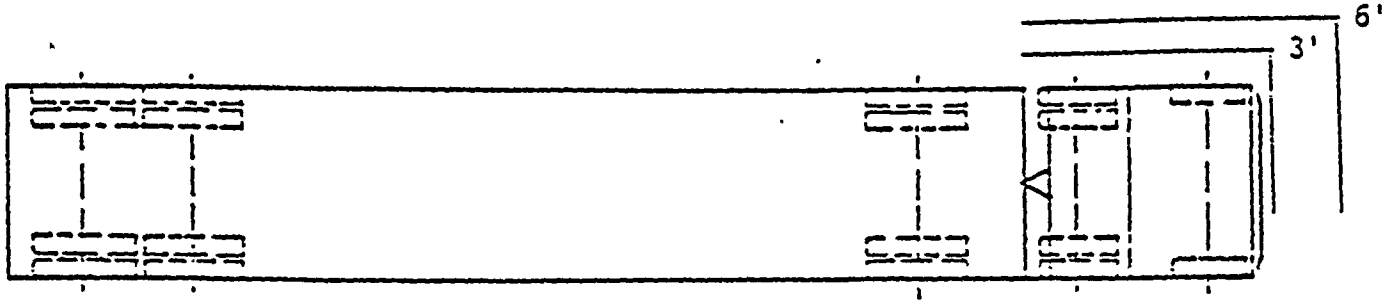
Max. Rad. Level (6') _____ Technician _____

Max. Rad. Level (3') _____ Instrument _____

INCOMING SURVEY - VAN OR RAGTOP

*All smears <50 dpm and all readings <.2 mR/hr, unless noted.

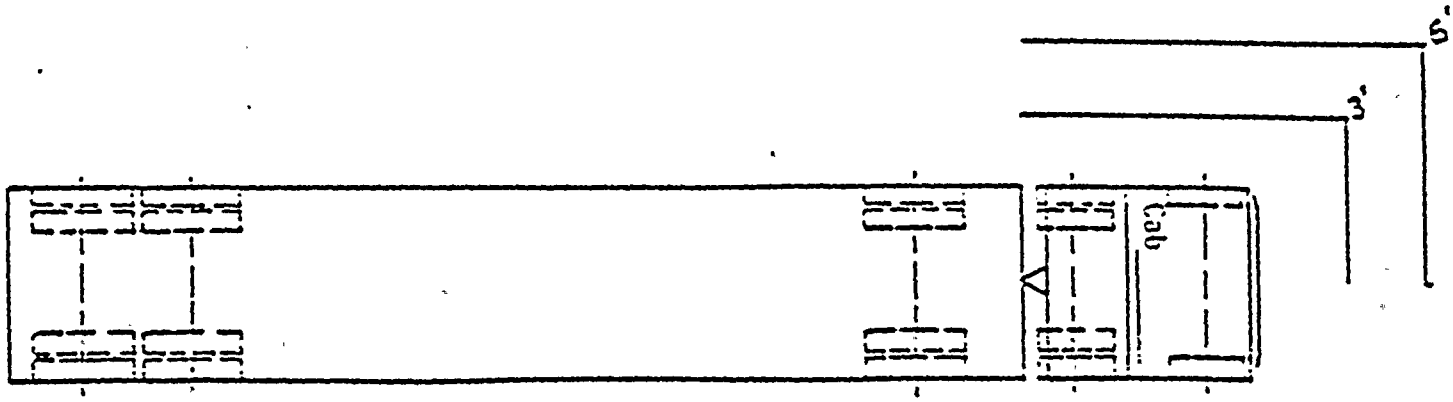
Trailer# _____



Date _____ Technician _____

Time _____ Instrument _____

OUTGOING SURVEY - VAN OR RAGTOP



Carrier _____

Trailer# _____ Date _____

Max. Rad. Level (C) _____ Time _____

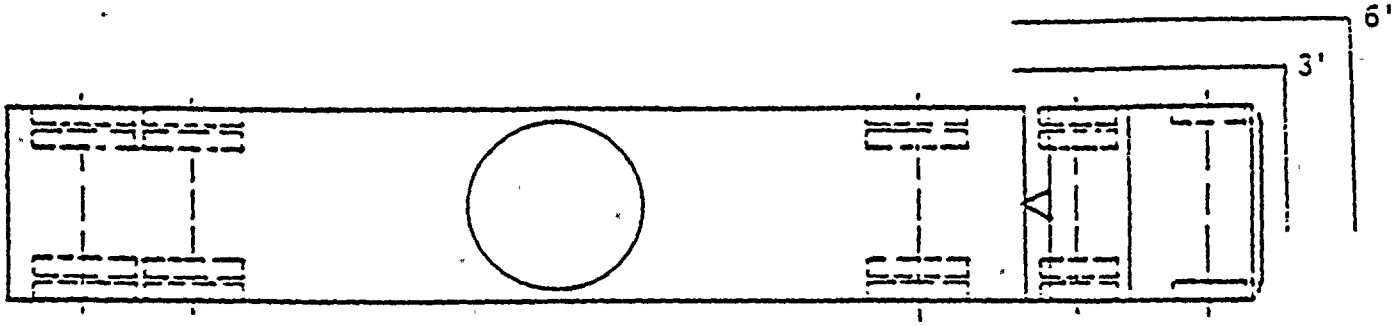
Max. Rad. Level (6') _____ Technician _____

Max. Rad. Level (3') _____ Instrument _____

INCOMING SURVEY - CASK

*All smears <50 dpm and all readings <.2 mR/hr, unless noted.

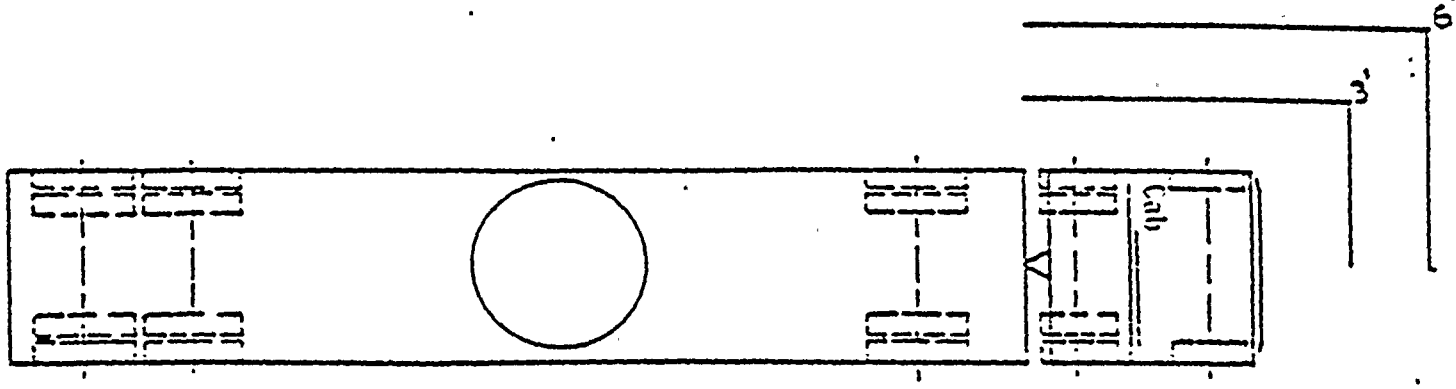
...ler# _____



Date _____ Technician _____

Time _____ Instrument _____

OUTGOING SURVEY - CASK



Carrier _____

Trailer# _____ Date _____

Max. Rad. Level (C) _____ Time _____

Max. Rad. Level (6') _____ Technician _____

Max. Rad. Level (3') _____ Instrument _____

Form, RHA-CT
(5/90)

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Radioactive Waste Shipment Certification Form

12 PMP 3150 PCP.001
Attachment XV

General Instructions and Information: This is a two part form to be used by shippers and carriers of radioactive waste. The certifications contained herein satisfy the requirements of Section 13-7-150, of Act No. 499 of 1980, the South Carolina Radioactive Waste Transportation and Disposal Act. This certification along with a copy of the prior notification form shall accompany each shipment of radioactive waste into and within the State of South Carolina. The shipper is to complete his portion of the form and present it to the carrier as part of the shipping documents. Upon receipt, the carrier shall complete his portion of the form. Upon delivery of the shipment to the consignee, a copy of this certification form, and a copy of the Prior Notification and Manifest form with the consignee acknowledgement, shall be returned to the Department.

Part I: Shipper's Certificate of Compliance

1. Name of Shipper and Address:

Telephone No. ( )

2. Shipment Identification No.

3. Transport Permit No.

In compliance with Act No. 499 of 1980, the South Carolina Radioactive Waste Transportation and Disposal Act, I hereby certify on behalf of the above-named shipper to the South Carolina Department of Health and Environmental Control that the above-named shipper has complied with all provisions of Act No. 499 of 1980, and all applicable laws and administrative rules and regulations, both State and Federal, regarding the packaging, transportation, storage, disposal and delivery of such wastes. I further certify that this shipment of radioactive waste has been inspected within 48 hours of the time of departure and that no items of non-compliance with applicable laws, rules or regulations were found.

Date_____

Typed Name and Title of Agent of Shipper

Signature

Part II: Carrier's Certification

1. Name of Carrier and Address:

Telephone No. ( )

2. Shipment Identification No.

3. Transport Trailer No.

4. Scheduled Date of Departure of Shipment:

5. Estimated Date of Arrival of Shipment:

Certification is hereby made to the South Carolina Department of Health and Environmental Control that: (a) the shipper has provided the carrier with a copy of the shipment manifest, the certificate of compliance, and the routing instructions; (b) the shipment of radioactive waste has been properly placarded for transport according to applicable U.S. Department of Transportation Regulations; (c) all shipping papers originated or reproduced by the carrier have been properly executed; (d) the transport vehicle has been inspected according to applicable State and Federal regulations within the prescribed intervals and that all safety and operational components are in good working order and meet the requirements of regulations; (e) all drivers who will operate the vehicle within the State of South Carolina are qualified to transport hazardous materials as specified by applicable U.S. Department of Transportation regulations; (f) the Department shall be immediately notified of any variance, occuring after departure, from the shipper's notification of primary routes in South Carolina and estimated date of arrival; (g) all applicable laws and administrative rules and regulations, both State and Federal, regarding the transportation of radioactive wastes will be complied with.

Date_____

Typed or Printed Name and Title

Signature

OMRC 8:3
(5/90)

(Copies of this form may be reproduced locally as needed)

Form 3UA-1
(5/80)

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Radioactive Waste Shipment Prior Notification and Manifest Form

UN 2912

See Reverse Side for Instructions

1. Name and Address of Shipper:	2. Person Responsible for Radioactive Waste Shipment: (a) Name (b) Title (c) Telephone No. ( )
3. Radioactive Waste Transport Permit No.	4. Shipment Identification No.:
5. Location from which waste will be shipped:	6. Name and Address of Consignee
7. Scheduled Date of Departure of Shipment:	8. Estimated Date of Arrival of Shipment:

9. Carrier:	10. Type of Transport Vehicle:	11. Trailer No. and Owner

12. Routes shipment will follow in State of South Carolina (Be Specific):

Manifest Summary

13. Type Container or Class:	14. Container Spec.	15. Total No. of Containers
16. Waste Description: Physical and Chemical Form	17. Prominent Radionuclides:	
18. Total Curies:	19. Transport Group:	20. Total Cubic Feet:

21. Waste Classification:

		Normal Form	Special Form	Fissile
[] Radioactive LSA	[] Bulk LSA			
[] Radioactive LSA greater than Type A quantities	[] Limited quantities and radioactive devices	[] Type A quantity [] Type B quantity [] Large quantity	[] Type A quantity [] Type B quantity [] Large quantity	[] Class I [] Class II [] Class III

Certification

I hereby certify on behalf of the above-named shipper to the South Carolina Department of Health and Environmental Control that the information provided herein is complete and correct to the best of my knowledge; and that the shipper has complied with all the provisions as required by Act No. 499 of 1980, the South Carolina Radioactive Waste Transportation and Disposal Act.

Date _____

Typed Name and Title of Agent of Shipper

Signature

Consignee Acknowledgement

This acknowledges to the South Carolina Department of Health and Environmental Control that the above-described radioactive waste shipment was received.

Date of Delivery

Signature of Consignee or Authorized Agent

Typed or Printed Name and Title

Page 1 of 1
Rev. 2

DHEC 302
(5/80)

(Copies of this form may be reproduced locally as needed)

DONALD C. COOK NUCLEAR PLANT

Radioactive Waste Shipment Notification

Telecon Date_____ Person Notified_____

ARRIVAL DATE	SHIPMENT DATE	DEPARTURE TIME	VEHICLE TYPE	CURIE CONTENT (EST)	BURIAL SITE DESTINATION	SHIPMENT DESCRIPTION	COMMENTS

Radioactive Waste Shipment Check Off Sheet

Prior to Shipment Date

Shipment No._____ Allocation No._____

Prior Notification Forms Mailed

Requirement: At least seven (7) days prior to date of shipment

Site	Date	Initial
Barnwell		
Beatty		
Richland		

State	Date	Initial
Michigan		
South Carolina		

Prior Notification Forms Telecopied *(If Mailing Requirement Is Not Met)

Requirement: At least seventy-two (72) hours prior to arrival of shipment at the Burial Site.

Site	Date	Initial
Barnwell		
Beatty		
Richland		

Prior Notification Given (Telephone)

Requirement: At least seven days prior to date of shipment.

State	Date	Initial
Michigan		

Shipment Schedule Arranged (Telephone)

Requirement: When shipping schedule has been determined with applicable Burial Site.

HNDC Personnel Contacted	Date	Initial

Shipment Schedule Arranged (Mail)

Requirement: On day of telephone notification.

HNDC Personnel Forms Mailed To (Name)

Date of Shipment

State Police Notification

Requirement: At least one hour prior to shipment departure.

Date	Time	Officer Notified	Initial

Burial Site Notification

Requirement: To be given when shipment departs plant site.

Date	Time	Personnel Contacted	Site	Initial
			Barnwell Beatty Richland	

State Notification

Requirement: Notification given only if there is a change in the PN&M Form.

Date	Time	Personnel Contacted	State	Initial
			South Carolina	

Radioactive Shipment Record (RSR) Check For Completeness

Requirement: Thorough check of every column on RSR for proper wording and correct information.

Date	Time	RSR	Initial
		Chem-Nuclear U.S. Ecology, Inc.	

Vehicle/Package Check

Date	Time	Vehicle	Initial	Package	Initial
		Placarded Surveyed		Labeled Sealed Surveyed	

1 FILTER ELEMENTS
2 DEWATERING LINE
3 MIXER ASSEMBLY
4 DEFLECTION CONE
5 DRIVE CONNECTION

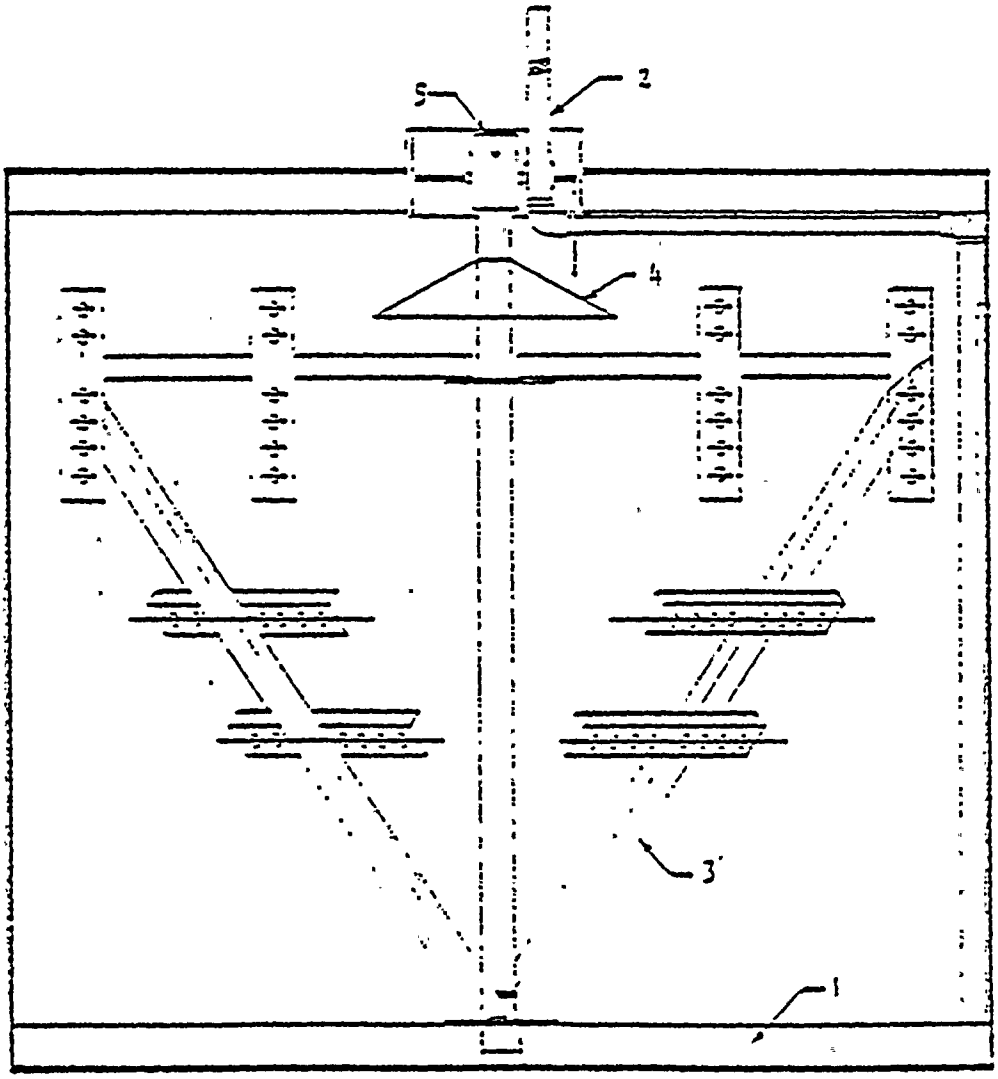


Figure III
HN-100 Liner
In-Container Cement Solidification

SHEET_____ OF_____

BOX NO._____

LOW LEVEL WASTE BOX INVENTORY

NOTE: NONCOMPRESSIBLE SOLID TRASH ONLY. NO LIQUID OR LIQUID FILLED CONTAINERS.

DESCRIPTION	APPROX. SIZE AND AMOUNT	DATE	INITIALS

SMEAR RESULTS

TOP _____

SIDES_____

BOTTOM_____

RAD LEVELS

CONTACT _____

3' _____

DATE SEALED_____

DATE SHIPPED_____

WEIGHT_____

FILTER CHANGE SIGN-OFF SHEET

NOTE: The time period between Step 1 and Step 2 must be greater than or equal to 15 minutes.

	OPERATIONS	DATE / TIME / BY
STEP 1:	Filter-Vented and Drained (Clearance hung) Place this form on RWP Paper at job site.	_____/_____/_____
	MAINTENANCE	
STEP 2:	Remove Filter, Transport to 587' Drumming Room and place in Drum (time filter removed from housing).	_____/_____/_____
	NOTE: Filter must not have a continuous flow of water coming from it. It should only be dripping.	Caution: Use extreme care, when placing the filter into the receiving barrel to avoid spreading contamination.
STEP 2	time minus STEP 1 time =	
	Total Drain Time_____Minutes	_____/_____/_____
	Maintenance personnel should give form to RP personnel covering the job.	
	RADIATION PROTECTION	
	Filter_____	NOTE: If the contamination results are greater than 2200 dpm/100 cm² the barrel must be deconned until the levels are less than 2200 dpm/100 cm² and recorded.
	Filter type_____	
	Drum Number_____	
	Drum Location_____	
	Contact Radiation Reading_____	
	3' Radiation Reading_____	
		_____/_____/_____

After completing of this sheet, RP should forward to the Environmental Section.

DEMINERALIZER RESIN CALCULATION SHEET

ISOTOPE	CONCENTRATION FROM LAB	(a) FRACTION OF TOTAL CONCENTRATION	(b) τ/10	(c) EXPOSURE CONTRIBUTION (a) x (b)	TOTAL ACTIVITY IN RESIN (a) x (e)
Mn-54			0.47		
Co-57			0.09		
Co-58			0.55		
Co-60			1.32		
Ag-110m			1.43		
I-131			0.22		
Cs-134			0.87		
Cs-136			0.94		
Cs-137			0.33		
BaLa-140			2.37		
Zr-95			0.41		
Nb-95			0.42		
Sb-124			0.98		
TOTAL		1.00			

Exposure Contribution (c) = Fraction of total concentration (a) x τ/10 (b)

Exposure at 1 meter from 100 ml sample = _____ R/hr

If reading taken at 3 ft., R/hr at 1 meter = R/hr at 3 ft. x .836
_____ x .836

(B) Resin volume factor = ft^3 in cask x 283.2

= _____ x 283.2

= _____ x (d)

(A) Total activity is resin = $\frac{\text{Exposure at 1 meter x resin volume factor (d)}}{\text{Total exposure contribution (c)}}$

$$= \frac{(\text{\_\_\_\_\_ R/hr} \times \text{\_\_\_\_\_})}{(\text{\_\_\_\_\_})}$$

= _____ Ci (e)

Performed by _____

Approved by _____

Date _____

Shipment Number _____