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THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 OPERATING PROCEDURE 1104-28I
HITTMAN NUCLEAR AND DEVELOPMENTAL CORPORATION PROCESS CONTROL PROGRAM

Incontainer Solidification

CONTROL ROOM
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HITTMAN NUCLEAR AND DEVELOPMENT CORPORATION PROCESS CONTROL PROGRAM

Incontainer Solidification

1.0 PURPOSE

The purpose of the Process Control Program (PCP) for incontainer solidification is to provide a program which will assure a solidified product with no free liquid prior to transportation for disposal. The program consists of three major steps, which are:

a. Procedures for collecting and analyzing samples;

b. Procedures for solidifying samples;

c. Criteria for process parameters for acceptance or rejection as solidified waste.

2.0 SYSTEM DESCRIPTION

The systems described herein are designed to handle the solidification of liquids, evaporator bottoms, other concentrated liquids, contaminated oil, spent resin, filter sludge and other miscellaneous waste. Concentrated liquids are processed at elevated temperatures as required to keep the salts in solution. The various operations are as described below.

2.1 Waste Feed System

2.1.1 Concentrated Waste (Evaporator Bottoms)

The waste feed system consists of permanent plant pumps and piping for the recirculation of concentrated evaporator bottoms from the concentrated waste storage

tanks and permanent transfer piping terminating at the Hittman Building. The concentrated waste being recirculated with the CWST transfer pumps (WDL-P-12 A/B) is diverted to pump waste to the Hittman disposal liner. The pumps and the valve lineup is manually controlled and flow is discontinued when a predetermined level is reached in the liner.

2.1.2 Bead Resin and Powdered Resin

The waste feed system consists of TMI-1 resin recirculation hoses attached to the resin disposal and dewater return connections on the outside wall of the Auxiliary Building. Resin may be directed either to the disposal liner or back to the resin tank via the dewater return connection. The resin flow the liner is stopped when the resin slurry reaches a predetermined level. A dewatering pump operating during the fill cycle dewaters the liner prior to solidification until loss of flow is detected. The dewater pump, a positive displacement air operated diaphragm pump, is stopped. The resin flow is restarted and continued until the predetermined level is reached. The dewater pump is restarted. The fill and dewater procedure is repeated until the dewatering cycle no longer brings the resin level down below the predetermined level. Based on liner size used, a predetermined quantity of water is added back into the liner through the dewatering element to fluff the bed to relieve any bed packing.

Liners used for powederd resin have special bottom designs to preclude plugging of the dewatering elements.

2.1.3 Oily Waste

Due to the low activity levels associated with oil wastes, the liners in which the oil is to be solidified can be filled by hand or with a small pump. The liner is filled to a preset level (determined visually). The quantity of evaporator bottoms determined by the verification test is added as described in section 2.1.1.

2.1.4 Other Waste Streams

To support the operation of TMI-1, other waste streams are generated as a result of area/equipment decontamination, special operations and repairs. These waste streams vary from detergents to sludges. On a case by case basis, these wastes shall be solidified in lieu of processing in the liquid radwaste system.

2.2 Cement Feed Subsystem

Cement and chemical additives are batch loaded into the shipping container, where the actual mixing occurs, by means of a screw conveyor. This subsystem consists of:

a. Cement hopper with discharge adaptor

b. Screw feeder and drive motor

c. Container inlet valve

As a function of waste volume and container size, the appropriate amount of cement and additives for a single batch are pre-loaded into the cement hopper which, through the discharge adaptor, meters

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the cement to the screw feeder. Cement is conveyed through the flexible screw feeder to the top of the container, where it passes through the container inlet valve and falls by gravity into the radwaste while the mixing blades are turning.

Dusting is minimized by pre-loading the cement hopper with a known volume of cement, as determined by the Waste Solidification Data Sheet, and by the use of a dust collector as a feature of the vent air filter subsystem (see 2.4).

The cement container inlet valve and the vent line are in integral part of the container fill head assembly.

2.2.1 Emulsifier Feed (Oily Waste Only)

Liquid emulsifier is added using a small positive displacement or barrel pump prior to the addition of other liquid waste. The quantity of emulsifier required is determined through verification testing.

2.2.2 Anti-Foaming Agents (Detergents and Sump Sludges)

Liquid anti-foaming agents are added using a small positive displacement or barrel pump prior to the addition of other liquid waste. The quantity of anti-foaming agent required is determined through verification testing.

2.3 Mixing

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 or until the motor automatically trips off due to high resistance to mixing. The mixture will be completely firm within 4 hours and be suitable for transport.

2.4 Vent Air Filter Subsystem

The fill head also includes an elbowed vent line. The vent line is hard piped to the edge of the cask where hoses can be connected to allow the air being vented from the cask to be conveyed to the ventilation system. The vent line on the fill head is connected with flexible hose to a sealed 55 gallon drum used to detect an inadvertent over flow of the liner. A liquid level sensor in the drum will activate an audible alarm in the event that liquid enters the drum. The drum prevents moisture intrusion into the air filtration system. The filtration system consists of flat fabric filters to remove particulates (especially cement dust) from the vent air. The vent air then goes through a HEPA and a charcoal filter before being discharged to the TMI-1 Auxiliary Building. An auxiliary blower in the TMI-1 Auxiliary Buiding installed at the discharge of the vent line is installed to allow the vent line to be operated under a slight negative pressure.

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3.0 COLLECTION AND ANALYSIS OF SAMPLES

3.1 General Requirements

3.1.1 As required by the Radiological Effluent Technical Specifications for PWR's and BWR's the PCP shall be used to verify the solifidication 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, sodium sulfate solutions, resin and precoat sludge).

3.1.2 For the purpose of the PCP a batch is defined as that quantity of waste required to fill a disposable liner to the waste level indicator.

3.1.3 If any test specimen fails to solidify, solidification of 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.

3.1.4 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 the three (3) consecutive initial test specimens demonstrate solidifications. The Process Control Program shall be modified as requires to assure solifidication of subsequent batches of waste.

3.1.5 For high activity wastes, such as spent resin or used precoat, where handling of samples could result in personnel radiation exposures which are inconsisent with the ALARA principle, representative non-radioactive samples will be tested. These samples should be as close to the actual waste and chemical properties as possible. Typical unexpended mixed bed resin shall be used to simulate the spent bead resin and the appropriate mix of anion to cation powdered resin shall be used to simulate used precoat.

3.1.6 All Chemicals used to condition or solidify waste or simulated waste in solidification tests shall be representative of the actual chemicals to be used in full scale solidification. If chemicals of a different type or from a different manufacturer are used, the new material shall be tested to verify it produces a solid product prior to full scale solidification.

3.2 Collection of Samples

3.2.1 Radiological Protection

3.2.1.1 Comply with applicable Radiation Work Permits.

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

3.2.1.3 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 numbers of wastes solidified based on each test sample.

3.2.2 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.

3.2.2.1 a. The test sample data for concentrated waste will include, but not necessarily be limited to, the type of waste solidified, major constituents, percent solids, pH, volume of sample, amount of oil in sample and the ratio of the sample volume to the final volume of the solidification product.

b. The test sample data for spent resin and used precoat 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.

c. The test sample data for other waste streams will include, but not necessarily be limited to, the type of waste solidified, volume of sample, amount of oil in sample, pH and the ratio of sample volume to the final volume of the solidified product.

3.2.2.2 The Waste Solidification Data Sheet will include the Batch Number, Batch Volume, and Data Solidified, for each batch solidified based on sample described.

3.2.3 Collection of Samples

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3.2.3.1 Evaporator bottoms shall be kept heated or reheated to 130°F prior to testing.

NOTE: If the evaporator bottoms had previously been neutralized prior to solidification to prevent boric acid precipitation the sample may be tested at ambient temperatures.

3.2.3.2 Two samples shall be taken for analysis. One sample 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. Sample sizes shall be determined by the plant Radiological Controls staff.

3.2.3.3 Samples should be drawn at least six hours prior to the planned waste solidification procedure to allow adequate time to complete the required testing and verification of solidification.

3.2.3.4 The tank containing the waste to be solidified should be mixed by recirculating the tank contents for at least one volume change prior to sampling to assure a representative sample. For waste that is contained in drums awaiting solidification, manually mix contents for a representative sample with a long handled stirrer.

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3.2.3.5 If the contents of more than one tank are to be solidified in the same liner then representative samples of each tank should be drawn. These samples should be of such size that when mixed together they form samples of standard size as prescribed in Section 3.2.3.2. If the contents of a particular tank represents X percent of the total waste quantity to be solidified then the sample of that tank should be of such size to represent X percent of the composite samples.

4.0 TEST SOLIDIFICATION AND ACCEPTANCE CRITERIA

4.1 Waste Conditioning

4.1.1 For boric acid (up to 14 weight percent) prior to solidification, the pH of the sample should be adjusted to a range of 7.4 to 9.0 or greater than 11.5 with sodium hydroxide (NaOH). The quantity of sodium hydroxide added shall be recorded.

4.1.2 For bead or powdered resin, prior to solidification the pH of the sample should be adjusted to a range of 5 to 8 if Metro Beads are used or to a range of 8 to 10 if they are not used. The quantity of sodium hydroxide used shall be recorded.

4.1.3 For detergent, prior to solidification the pH of the sample should be adjusted to a range of 7 to 10 with sodium hydroxide. The quantity of sodium hydroxide used shall be recorded.

4.1.4 For sump sludge, prior to solidification the pH of the sample should be adjusted a range of 7 to 10 with sodium hydroxide. The quantity of sodium hydroxide used shall be recorded.

4.1.5 If foaming is apparent during the solidification testing the sample should be treated with an anti-foaming agent. The quantity of anti-foaming agent required shall be recorded.

4.1.6 If a floating oil film is present in quantities greater than 1 percent by volume, the oil should be broken up with Maysol or other emulsification agent. The quantity of emulsification agent added shall be recorded.

4.1.7 If oily waste is to be solidified, an emulsifier shall be added to pretreat the waste sample as follows:

1. Allow one sample to stand undisturbed until the water/oil interface is clearly discernible and determine the percent by volume of the oil. If this volume is greater than 40 percent add a sufficient quantity of waste (or other aqueous liquid to be solidified) to reduce the percent of oil by volume to less than 40 percent. Use the Waste Calculation Data Sheet to determine the quantity of liquid to add. When the correct oil to water ratio is reached, measure and record the pH (pH paper may be used if a measurement cannot be made with a meter because of oil fouling).

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2. Prior to the test sample solidification, the oily waste is treated with a predetermined quantity of emulsifier. For this application, Maysol 776 is used at a ratio of 1 part emulsifier to 5.1 parts oil by volume. The emulsifier has a density of one.

3. After the emulsifier is thoroughly mixed into the sample, a quantity of Metso Beads the weight of which is twice the weight of the emulsifier used, is mixed in thoroughly until the Metso Beads have completely dissolved.

4.2 Test Solidification

4.2.1 Any sample to be solidified shall be pretreated as specified in Section 4.1.

4.2.2 Test solidification should be conducted using a 1000 ml. disposal beaker or similar size container. Mixing should be accomplished by stirring with a rigid stirrer until a homogenous mixture is obtained, but in no case for less than five (5) minutes.

4.2.3 For the test solidification of resin, measure into two mixing vessels 90 ml. of water each and add a sufficient quantity of dewatered resin to yield a 330 ml. mixture. The degree of compaction of the resin will determine the volume of resin required. Measure out the required quantities of cement and Metso beads as shown in Table 1.

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4.2.4 For the test solidification of precoat sludge, measure into two mixing vessels 300 gms of dewatered powdered resin each and add 100 gms of water. Measure out the required quantities of cement and Metso beads as shown in Table 1.

4.2.5 For the test solidification of Concentrated Waste (Evaporator Bottoms), measure into two mixing vessels 400 ml. of pH adjusted waste each. Measure out the required quantities of cement and Metso beads as shown in Table 1.

4.2.6 For the test solidification of Concentrated Waste and Oily Waste measure 320 ml. of waste and Maysol No. 776 into two mixing vessels using the following proportions: (128 ml. oil, 167 ml. concentrated waste and 25 ml. Maysol). Stir mixture for no less than 5 minutes. Measure out the required quantities of cement and Metso Beads as shown in Table 1.

4.2.7 For the test solidification of detergents measure 320 ml. of waste into two mixing vessels. Add an anti-foaming agent as required to breakup the foaming and record the quantity used. Measure out the required quantities of cement and Metso Beads as shown in Table 1.

4.2.8 For the test solidification of sump sludge measure 410 ml. of waste into two mixing vessels. Measure out the required quantities of cement and Metso Beads as shown in Table 1.

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Table 1

Waste	Cement (grams)* Sample A	Sample B	Metso Beads (grams)* Sample A	Sample B
Bead Resin	189	236	19	24
Filters Sludge	223.4	364	14.7	36.4
Evaporator Bottoms	440	505	63	84.2
Oil and Conc. Waste	400	434	46.3	50.0
Detergent	400	533	40	53.3
Sump Sludge	492	524.8	49.2	52.5

*Volumes are for loose uncompacted material.

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> NOTE: Omit the following step if Metso Beads were previously added.

4.2.9 Mix the cement and Metso Beads together and slowly add this mixture to the test sample while it is being stirred.

4.2.10 After ten (10) minutes of mixing and a homogeneous mixture is obtained allow the waste to stand for a minimum of 4 hours.

4.3 Solidification Acceptability

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

4.3.1 The sample solidification is considered acceptable if there is not visual or drainable free water.

4.3.2 The sample solidification is 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.

> NOTE: The sample solidifications establish a range for the ratio of cement to waste that will result in an acceptable product.

4.4 Solidification Unacceptability

4.4.1 If the waste fails any of the criteria set forth in Section 4.3 the solidification will be termed unacceptable and a new set of solidification parameters will need to be established under the procedures in Section 4.5.

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

4.5 Alternate Solidification Parameters

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

1. Mix equal volumes of dry cement and water to ensure that the problem if not a bad batch of cement.
2. Add additional caustic solution to raise the pH above 8.
3. If the waste (other than waste oil) is only partially solidified, use lower waste to cement and Metso ratios. Using the recommended quantities of cement and Metso Beads, reduce the waste sample volume 25 ml. until the acceptability criteria of Section 4.3 are met.
4. If the waste oil mixture is only partially solidified try using lower waste to cement ratios. Reduce the quantity of waste by 20 ml. and the emulsifier by 1 ml., (This will result in a slightly higher concentration of emulsifier in the waste) and proceed with the test solidification. Continue with similar reductions until a satisfactory product is achieved.

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4.5.2 If the test sample fails to provide acceptable solidification of waste following the actions of Section 4.5.1 the following sample analysis should be performed. The waste should fall within the acceptable range.

SAMPLE ANALYSIS

For Boric Acid ≤ 14 Weight Percent (24000 ppm as B)

pH	7.4 to 9.0 or > 11.5
Percent Boric Acid	≤ 14
ppm as Boron	≤ 24000
Detergents	No appreciable foaming during agitation
Oil (floating)	< 1 percent by volume

For Bead and Powdered Resin

pH	> 5
Detergents	No appreciable foaming during agitation
Oil (floating)	< 1 percent by volume

Oily Waste Mixed with Evaporator Bottoms

pH	> 5
Percent Boric Acid	≤ 14 (prior to mixing)
ppm as Boron	≤ 24000 (prior to mixing)
Oil	≤ 40 percent by volume
Detergents	No appreciable foaming during agitation

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Batch No.: ______________

Sample No.: ______________

Date: ______________

WASTE SOLIDIFICATION DATA SHEET
for Boric Acid

Sample Volume, ml.: Sample A ________ Sample B ________ (1)

pH[1]:

Quantity of Oil percent:

Quantity of Cement Added: Cement Ratio[2] ________: (No./ft^3 Waste)

Sample A ________gms Sample A ________ (2)

Sample B ________gms Sample B ________ (3)

Quantity of Additive[3] Added: Additive Ratio[4] ______: (No./ft^3 Waste)

Sample A ________gms Sample A ________ (4)

Sample B ________gms Sample B ________ (5)

Final Waste to Product Ratio: Sample A ________ Sample B ________ (6)

Product Acceptable: Sample A____Yes ____No (If no, refer to Section 4.5 and proceed as directed)

Sample B____Yes ____No

Radionuclides Present: (Isotopes and Concentrations)

Additional batches solidified based on this simple solidification:

Batch No.	Batch Vol.	Date	Batch No.	Batch Vol.	Date	Batch No.	Batch Vol.	Date
2			5			8		
3			6			9		
4			7			10		

Test Solidifications Performed by: ________________ Date: ________

PCP Samples Approved by: ________________ Date: ________

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NOTES

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

2 For the ratios given in Section 4.2.5, cement-to-waste ratios are 68.6 to 78.8 pounds cement per cubic foot of boric acid for samples A and B respectively.

3 The additive used in this process is anhydrous sodium metasilicate as referenced in the text.

4 For the ratios giving in Section 4.2.5, additive-to-waste ratios are 9.8 to 13.1 pounds additive per cubic foot of boric acid for samples A and B respectively.

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SOLIDIFICATION CALCULATION SHEET

Waste Volume[1], ft^3: ______________________________ (1)

Cement Ratio, No./ft^3: Sample A ______________________________ (2A)

Sample B ______________________________ (2B)

Additive: ______________________________

Additive Ratio, No./ft^3: Sample A: ______________________________ (3A)

Sample B: ______________________________ (3B)

Cement Quantity[2]

__________ (1)[1] x __________ (2A) = __________ lbs. (4A)

__________ (1)[1] x __________ (2B) = __________ lbs. (4B)

Additive Quantity[2]

__________ (1) x __________ (3A) = __________ lbs. (5A)

__________ (1) x __________ (3B) = __________ lbs. (5B)

1 The quantity of waste to be solidified in a single liner cannot exceed the maximum waste volume listed on the attached Solidification Data Tables.

2 4A and 5A define the minimum quantity of cement and additive respectively that must be mixed with the waste to assure solidification. When these quantities of materials are mixed, additional cement and additive are to be mixed until further mixing is not possible or the values in 4B and 5B are reached.

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SOLIDIFICATION DATA TABLES

BORIC ACID

: NOTE: For the Recommended Amount of Cement and Additive. :

	HN-100 Series 1	HN-100 Series 2	HN-100 Series 3	HN-100S
Usable Liner Volume, (cu. ft.)	143	143	143	143
Max. Waste Vol. (cu. ft.)	77.6	75.7	97.1	93.3
Max. Solidified Waste Vol. (cu. ft.)	114.3	111.5	143	137.4
Cement Added at Max. Waste Vol.				
Weight (lbs.)	6,112.9	5,964.5	7,651.2	7,350.4
Volume (bags)	65	63.5	81.4	78.2
Anhydrous Sodium Metasilicate Added at Max. Waste Vol.				
Weight (lbs.)	1,016.2	991.6	1,272	1,222
Volume (bags)	10.2	9.9	12.7	12.2
Max. Radiation Level R/hr Contact	12	12	12	3

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Batch No.: ____________________

Sample No.: ____________________

Date: ____________________

WASTE SOLIDIFICATION DATA SHEET

FOR OILY WASTE

Volume percent Oils: ________________percent
(Maximum of 40 percent by volume)

Sample Volume, ml.: ________________

Major Composition of Non-oil Component: ________________

Quantity of Emulsifier Added, ml.: ________________

pH: ________________

Quantity of Cement Added, gm: ________________

Quantity of Anhydrous Sodium Metasilicate Added, gm: ____________________

Final Product to Waste Ratio (Volumetric) ________________percent

Product Acceptability: ________Acceptable ________Unacceptable
If unacceptable note why:

Radionuclides Present.
Isotopes and Concentrations

1. If the percent of oil in the sample exceeds the maximum allowable quantity the sample shall be diluted as required (See the Waste Calculation Data Sheet for Boric Acid). This new mixture will be thoroughly mixed, tested for percent oil and a new sample taken from this mixture as per Section 4.2.6. The volume of dilutant required will be recorded.

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WASTE SOLIDIFICATION DATA SHEET

FOR OILY WASTE

Complete Section A only if the initial samples shows oil in excess of 40 percent by volume, otherwise go to Section B.

SECTION A

Step 1 Original samples volume ________ ml. (1)

Volume percent oil in sample 0.________ (as decimal fraction) (2)

Step 2 Sample volume (ml.) multiplied by (2): =

________(ml.) X 0.________ = ________(ml.) (3)

Step 3 Divide (3) by 0.4: ________ ÷ 0.4 = ________ (4)

Step 4 Subtract original sample volume (1) from (4) to get quantity of liquid needed to dilute sample to 40 percent oil by volume:

________(4) - ________(1) = ________ml. (5)

SECTION B

Step 1 Volume of waste in liner, gallons: ________ (6)

(HN-100 liner contains 17.62 gallons/inch). The maximum allowable waste depth is 42 inches.

Step 2 If the volume percent oil is greater than 40 percent it is necessary to determine the amount of liquid (i.e. water) that must be added to the liner to reduce the percent oil to less than 40 percent (if the fluid level in the liner is close to 42 inches such that the addition of any liquid would raise the fluid level above the 42 inches level proceed to Step 3). Take the quantity of liquid (5), added to the test sample in Section A and divide it by the original sample volume (1). Multiply this decimal fraction increase by the volume of fluid in the liner to obtain the quantity of liquid needed to dilute the contents of the liner to less than 40 percent oil by volume.

________(5)ml / (1)ml. = 0.________ X (6)________gal = ________gal (7)

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Calculate new fluid level in liner. Add (7) to (6) and divide by 17.62 gallons/inch and add this increased depth to the original fluid depth.

$\frac{(6)+(7) \_\_\_\_\_\_ \text{gallons}}{17.62 \text{ gallons/inch}}$ = __________ inches (8)

(8)must not exceed 42 inches. If it does do not add any liquid to the liner but proceed to Step 3. If the fluid level (8) is less than or equal to 42" add the quantity of liquid calculated in (7) to the liner and proceed to Step 4.

Step 3 This step is to be completed only when the quantity of oil in the liner exceeds 40 percent by volume and diluting with water would raise the fluid level above 42 inches.

Multiply the original samples volume (1) by 0.4:

__________ (1)(ml) X 0.4 = __________ (9)

Subtract (9) from (3) above:

__________ (3) - __________ (9) = __________ ml. (10)

Divide (10) by the original sample volume (1) to obtain the decimal fractional decrease in sample oil volume to bring the percent oil down to 40 by volume.

__________ $\frac{(10)}{(1)}$ = 0.__________ (11)

Multiply the volume of waste in the liner (6) by this decimal fraction (11).

__________ (6) X __________ (11) = __________ gallons (12)

This represents the quantity of oil that must be removed from the liner, and replaced by an equal volume of liquid waste, to bring the percent oil down below 40 percent by volume. To do this first allow the fluid in the liner to stand undisturbed for a period of 15 minutes and then pump oil out using a rubber hose extended into the liner to a level just below the top of the oil layer.

Step 4 If the lab sample showed less than 40 percent oil by volume proceed without an additional sample and enter below the volume percent oil in the liner.

Vol. percent oil 0.__________ (13)

If liquid was added to dilute the oil (Step 2) or oil was removed (Step 3) mix the contents of the liner for 15 minutes and resample to confirm the volume percent oil in the liner and enter below. (If not applicable enter N/A).

Resample Vol. percent oil 0.__________ (14)

Measure the fluid level in the liner. Again this level must not exceed 42 inches.

Fluid level __________ inches (15)

Calculate the quantity of oil in the liner by multiplying the fluid level (in inches) by the gallons per inch (17.62 gallons per inch) by the percent oil by volume from either (13) or (14).

__________ inches(15) X 17.62 $\frac{\text{gallons}}{\text{inch}}$ X 0.__________ (13 or 14) =

__________ gallons (16)

Step 5 With the mixing motor "ON" add the emulsifier Maysol 776 at 1 part emulsifier to 5.1 parts oil by volume. To obtain the quantity of Maysol 776 required, divide the gallons of oil (16) by 5.1.

$$\frac{\_\_\_\_\_\_\_\_\_\_ \text{(16) gallons}}{\frac{5.1 \text{ gallons oil}}{\text{gallon emulsifier}}} = \_\_\_\_\_\_\_\_\_\_ \text{gallons of emulsifier} \quad (17)$$

Continue mixing until the oil is completely mixed and the contents of the liner is a uniform milky white in appearance. Record the mixing time.

__________ minutes mixing

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Note that mixing times of up to 120 minutes may be required to completely emulsify some oils.

Step 6 For every gallon of fluid in the liner add 10.4 to 11.3 pounds of uncompacted cement. This is equivalent to 78 to 84.2 pounds of cement for every cubic foot of waste.

To calculate the quantity of cement required multiply the fluid level (15) by 17.62 gallons per inch by 11.2 pounds cement per gallon of fluid.

__________(15) X 17.62 X 11.2 = __________pounds of cement (19)

Convert this to cubic feet of loose cement by dividing (19) by 94 pounds per cubic foot.

$$\frac{\_\_\_\_\_\_(19)\text{ pounds}}{94\text{ pounds per ft}^3} = \_\_\_\_\_\_\text{ ft}^3$$

This is equivalent to the number of one ft^3 bags required.

Add the cement slowly while mixing continually until all the cement is added.

Step 7 For every gallon of fluid in the liner, add 1.2 to 1.3 pounds of anhydrous sodium metasilicate. This is equivalent to 9.0 to 9.7 pounds of additive for every cubic foot of waste. To calculate the quantity of anhydrous sodium metasilicate required, multiply the fluid level (15) by 17.62 gallons per inch by 1.3 pounds additive per gallon of fluid.

__________(15) x 17.62 x 1.3 = __________pounds anhydrous sodium metasilicate (20)

Convert this to cubic feet of additive by dividing (20) by 100 pounts per cubic foot.

$$\frac{\_\_\_\_\_\_(20)\text{ pounds}}{100\text{ pounds per cubic foot}} = \_\_\_\_\_\_\text{ ft}^3$$

This is equivalent to the number of one ft^3 bags required. Add the anhydrous sodium metasilicate slowly and continue mixing the contents of the liner until all the additive has been added and the motor trips due to high resistance to mixing or for 20 minutes after the last bag is added.

FOR USE IN UNIT I ONLY

Batch No.: ____________

Sample No.: ____________

Date: ____________

WASTE SOLIDIFICATION DATA SHEET
for Powdered Resin

Sample Volume, ml.: Sample A ________ Sample B ________ (1)

pH[1]: ________ Quantity of Oil percent: ________

Other Major Constituents:

Quantity of Cement Added: Cement Ratio[2] (No./ft^3 Waste)

Sample A ________gms Sample A ________ (2)

Sample B ________gms Sample B ________ (3)

Quantity of Additive[3] Added: Additive Ratio[4] (No./ft^3 Waste)

Sample A ________gms Sample A ________ (4)

Sample B ________gms Sample B ________ (5)

Product Acceptable: Sample A ___Yes ___No (If no, refer to Section 4.5 and proceed as directed).

Sample B ___Yes ___No

Radionuclides Present: (Isotopes and Concentrations)

Additional batches solidified based on this simple solidification:

Batch No.	Batch Vol.	Date	Batch No.	Batch Vol.	Date	Batch No.	Batch Vol.	Date
2			5			8		
3			6			9		
4			7			10		

FOR USE IN UNIT I ONLY

FOOTNOTES

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

2 For the ratios given in Section 4.2.4, cement-to-waste ratios are 36.33 and 42.39 pounds per cubic foot of powdered resin. Note that the cement ratio for powdered resin is per cubic foot of waste; i.e., powdered resin plus water.

3 The additive used in this process is anhydrous sodium metasilicate as referenced in the text.

4 For the ratios given in Section 4.2.4, the additive-to-waste ratios are 2.39 and 5.92 pounds per cubic foot of powdered resin waste.

FOR USE IN UNIT I ONLY

FOR USE IN UNIT I ONLY

SOLIDIFICATION CALCULATION SHEET

Waste Volume to be Solidified[1]: ____________ ____

Cement Ratio, No./ft^3: Sample A ________________ (2A)

Sample B ________________ (2B)

Additive Ratio, No./ft^3: Sample A ______________ (3A)

Sample B ______________ (3B)

Cement Quantity[2]

__________(1) X __________(2A) = __________lbs. (6A)

__________(1) X __________(2B) = __________lbs. (6B)

Additive Quantity[2]

__________(1) X __________(3A) = __________lbs. (7A)

__________(1) X __________(3B) = __________lbs. (7B)

Quantity of Water to be added:

__________(1) X 2.36 = __________gallons (8)

Divide the Quantity of Water to be added (8) by the supply flowrate to determine how long water should be pumped to the disposal liner or use a premeasured quantity of water. (9)

________(8) ÷ ________gal/min (9) = ________minutes (10)

1 The quantity of waste to be solidifed in a single liner can not exceed the maximum waste volume listed on the attached Solidification Data Table.

2 6A and 7A define the minimum quantity of cement and additive respectively that must be mixed with the waste to assure solidification. When these quantities of materials are mixed, additional cement and additive are to be mixed until further mixing is not possible or the values in 6B and 7B are reached.

FOR USE IN UNIT I ONLY

FOR USE IN UNIT I ONLY

SOLIDIFICATION DATA TABLE

POWDERED RESINS

	HN-600*	HN-200**
Usable Liner Volume, ft^3	65	57.
Max. Solidified Waste Vol. ft^3	55.75	55.75
Max. Waste Vol., ft^3	42.4	42.4
Cement added at Max. Waste Vol.: Pounds	2532	2532
1 ft^3 bags	26.9	26.9
Anhydrous Sodium Metasilicate Added at Max. Waste Vol.: Pounds	253	253
100 bags	2.5	2.5
Max. Radiation Level R/hr Contact	100	800

* Based on 18" maximum depth of filter sludge in the liner and maximum cement and additive quantities.

** Based on 34" maximum depth of filter sludge in the liner and maximum cement and additive quantities.

FOR USE IN UNIT I ONLY

APPENDIX A

CONCENTRATION OF POWDERED RESIN SLURRIES FOR PCP SOLIDIFICATION

In order for powdered resin slurry samples to be solidified in accordance with this PCP, these samples must be concentrated to a higher weight percent solids. The simplest, easiest, and most accurate procedure to use is decanting, i.e. pouring off excess liquid until only a thin layer of liquid remains on the settled solids layer. Decanting is to be performed after the sample has been allowed to sit undisturbed for two hours. The excess water is then poured off, being careful not to lose any solids. If there is not enough sample to perform the PCP, the procedure is to be repeated until the required quantity is obtained.

If the radiation level of the sample is too high for such handling, a decanting apparatus may be assembled much like that shown in Figure 1. The materials used depend upon availability and H.P. requirements. This set up would allow for less physical handling of the sample by the person performing the test. The decant beaker should have the tube located at the 400 ml. mark. A two hour settling time is required. At that time, the stopcock (or clamp) is opened to allow the liquid to drain off of the solids layer. If more than a thin layer of water remains on the settled layer, the sample will have to be decanted as described above. Also, if less than the required slurry quantity results, additional waste must be decanted in the same manner to the prescribed amount.

Following this procedure will result in the proper weight percent slurry as required by the PCP. H.P. requirements will govern which of the two procedures should be used.

FOR USE IN UNIT I ONLY

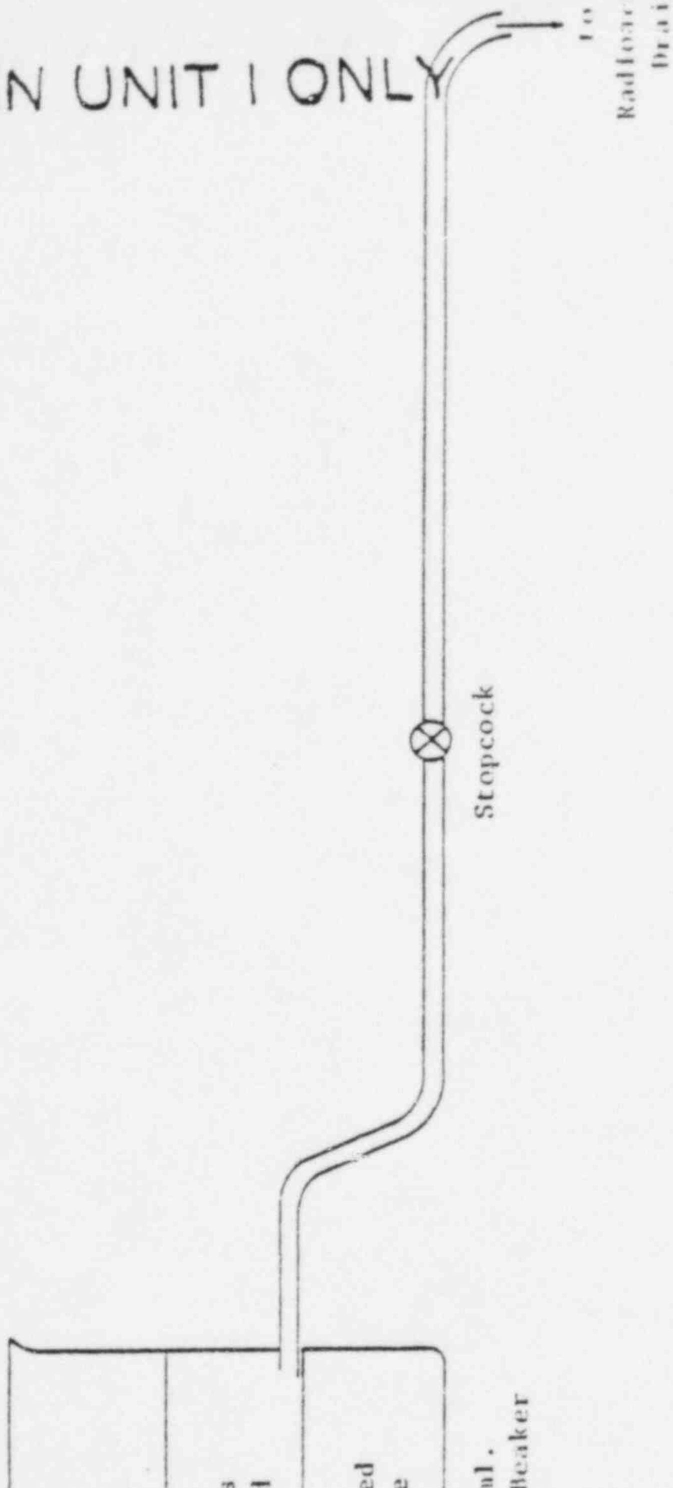

Figure 1. Decanting Apparatus Schematic

FOR USE IN UNIT I ONLY

Batch No.: ____________

Sample No.: ____________

Date: ____________

WASTE SOLIDIFICATION DATA SHEET
for Bead Resin

Sample Volume, ml.: Sample A ________ Sample B ________ (1)

pH(1):

Quantity of Oil Percent:

Quantity of Cement Added: Cement Ratio[2] ________: (No./ft^3 Waste)

Sample A ________gms Sample A ________ (2A)

Sample B ________gms Sample B ________ (2B)

Quantity of Additive Added: Additive Ratio[3] ______: (No./ft^3 Waste)

Sample A ________gms Sample A ________ (3A)

Sample B ________gms Sample B ________ (3B)

Final Waste to Product Ratio: Sample A ________ Sample B ________ (4)

Product Acceptable: Sample A ___Yes ___No (If no, refer to Section 4.5 and proceed as directed).

Sample B ___Yes ___No

Radionuclides Present: (Isotopes and Concentrations)

Additional batches solidified based on this sample solidification:

Batch No.	Batch Vol.	Date	Batch No.	Batch Vol.	Date	Batch No.	Batch Vol.	Date
2			5			8		
3			6			9		
4			7			10		

PCP Performed by: ____________________ Date: ________

Approved by: ____________________ Date: ________

FOR USE IN UNIT I ONLY

NOTES:

1 pH is taken for information only. This may be useful in determining additional steps to be taken in the event the sample solidification is unacceptable.

2 For the ratios given is Section 4.2.3, cement-to-dewatered resin ratios are 39.3 to 49.1 pounds of cement per cubic foot of dewatered resin for samples A and B respectively.

3 The additive ratio is defined as the pounds of additive required to solidify one cubic foot of dewatered waste. Ratios in this PCP yield additive ratios of 3.93 lbs/ft^3 and 4.91 lbs/ft^3 for samples A and B respectively.

FOR USE IN UNIT I ONLY

SOLIDIFICATION CALCULATION SHEET

Resin Volume[1],: ________________________________ (1)

Cement Ratio, No./ft^3: Sample A ____________________ (2A)

Sample B ____________________ (2B)

Additive: ________________________________

Additive Ratio, No./ft^3: Sample A: ____________________ (3A)

Sample B: ____________________ (3B)

Cement Quantity[2]

__________(1)[1] x __________(2A) = __________lbs. (4A)

__________(1)[1] x __________(2B) = __________lbs. (4B)

Additive Quantity[2]

__________(1)[1] x __________(3A) = __________lbs. (5A)

__________(1)[1] x __________(3B) = __________lbs. (5B)

Quantity of Water to be added - gallons (Resin only):

__________(1) x 2.25 = __________ (6)

Divide the Quantity of Water to be added (6) by the supply flowrate to determine how long water should be pumped to the disposal liner. (7)

__________(6) ÷ __________gal/min (7) = __________minutes (8)

1 The quantity of waste to be solidified in single liner cannot exceed the maximum resin volume listed on the attached Solidification Data Tables.

2 (4A) and (5A) define the minimum quantity of cement and additive respectively that must be mixed with the waste to assure solidification. When these quantities of materials are mixed, additional cement and additive are to be mixed until further mixing is not possible or the values in (4B) and (5B) are reached.

FOR USE IN UNIT I ONLY

SOLIDIFICATION DATA TABLES

BEAD RESIN

: NOTE: For the Recommended Amount of Cement and Additive. :

	HN-100					HN-600*			
	Series 1	Series 2	Series 3	100S	HN-200	S	G	S+G	R
Usable Liner Volume (cu. ft.)	143.0	143.0	143.0	143.0	59.5	59.6	64.6	57.7	64.6
Max. Dewatered Waste Vol. (cu. ft.)	95.8	93.3	112.8	112.8	47.0	47.0	51.0	45.9	51.0
Max. Solidified Waste Vol. (cu. ft.)	121.4	118.3	143.0	143.0	59.5	59.6	64.6	57.7	64.6
Cement Added at Max. Waste Vol.									
Weight (lbs.)	4702.1	4582.1	5539.8	5539.8	2305.0	2308.9	2502.6	2235.3	2502.6
Volume (bags)	50.0	48.8	58.9	58.9	24.5	24.6	26.6	23.8	26.6
Anhydrous Sodium Metasilicate Added at Max. Waste Vol.									
Weight (lbs.)	470.2	458.2	554.0	554.0	230.5	230.9	250.3	223.5	250.3
Volume (bags)	4.7	4.6	5.5	5.5	2.3	2.3	2.5	2.2	2.5
Water Added to Max. Waste Vol. (Gallons)	215.5	210.0	253.9	253.9	105.6	105.8	114.7	102.4	114.7
Max. Radiation Level R/hr Contact	12	12	12	3	800	100	100	100	100

* S = HN-600 Stackable
G = HN-600 Grappable
S+G = HN-600 Stackable - Grappable
R = HN-600 Regular

FOR USE IN UNIT I ONLY

Batch No.: ____________________

Sample No.: ____________________

Date: ____________________

WASTE SOLIDIFICATION DATA SHEET

DETERGENT

Sample Volume, ml.: Sample A __________ Sample B __________ (1)

Sample pH: __________ Volume NaOH solution used to adjust pH, ml.: __________ (2)

Quantity of Oil percent: __________

Temperature at Solidification, °F: ______________

Quantity of Cement Added: Cement Ratio[1] __________: (No./ft^3 Waste)

Sample A __________gms Sample A __________ (3)

Sample B __________gms Sample B __________ (4)

Quantity of Additive Added: Additive Ratio[2] ________: (No./ft^3 Waste)

Sample A __________gms Sample A __________ (5)

Sample B __________gms Sample B __________ (6)

Quantity of Anti-Foam Agent Added: Anti-Foam Ratio[3] (No./ft^3 Waste)

Sample A __________gms Sample A __________gms (7)

Sample B __________gms Sample B __________gms (8)

Packaging Efficiency: Waste to Product Sample A __________

Sample B __________ (9)

Product Acceptable: Sample A____Yes ____No (If no, refer to Section 4.5 and proceed as directed)

Sample B____Yes ____No

Additional batches solidified based on this simple solidification:

Batch No.	Batch Vol.	Date	Batch No.	Batch Vol.	Date	Batch No.	Batch Vol.	Date
2			5			8		
3			6			9		
4			7			10		

PCP Performed by:______________________________ Date: __________

1 The cement ratio is defined as the pounds of cement required to solidify one cubic foot of waste. Ratios in this PCP yield cement ratios of 78.0 lbs/ft^3 and 103.9 lbs/ft^3 for samples A and B respectively.

2 The additive ratio is defined as the pounds of additive required to solidify one cubic foot of waste. Ratios in this PCP yield additive ratios of 7.8 lbs/ft^3 and 10.39 lbs/ft^3 for samples A and B respectively.

3 The anti-foam ratio is defined as the pounds of anti-foam required to solidify one cubic foot of waste. The ratio in this PCP yields an anti-foam ratio of 0.025 lbs/ft^3 waste (0.0034 gallons/ft^3 waste).

FOR USE IN UNIT I ONLY

FOR USE IN UNIT I ONLY

SOLIDIFICATION CALCULATION SHEET

Waste Volume[1], ft^3: ______________________ (1)

Anti-Foam: ______________________

Anti-Foam Ratio, No./ft^3: Sample A ______________ (2A)

Sample B ______________ (2B)

Anti-Foam Ratio, Gal/ft^3: Sample A ______________ (3A)

Sample B ______________ (3B)

Cement Ratio, No./ft^3: Sample A ______________ (4A)

Sample B ______________ (4B)

Additive: ______________________

Additive Ratio, No./ft^3: Sample A: ______________ (5A)

Sample B: ______________ (5B)

Anti-foam Quantity

_________(1) x _________(2A) = _________lbs (6A)

_________(1) x _________(2B) = _________lbs (6B)

_________(1) x _________(3A) = _________gallons (7A)

_________(1) x _________(3B) = _________gallons (7B)

Cement Quantity[2]

_________(1) x _________(4A) = _________lbs. (8A)

_________(1) x _________(4B) = _________lbs. (8B)

Additive Quantity[2]

_________(1) x _________(5A) = _________lbs. (9A)

_________(1) x _________(5B) = _________lbs. (9B)

1 The quantity of waste to be solidified in a single liner cannot exceed the maximum waste volume listed on the attached Solidification Data Tables.

2 8A and 9A define the minimum quantity of cement and additive respectively that must be mixed with the waste to assure solidification. The recommended quantities of cement and additive to use are represented by 8B and 9B.

FOR USE IN UNIT I ONLY

SOLIDIFICATION DATA TABLES

DETERGENT

: NOTE: For the Recommended Amount of Cement and Additive. :

	Series 1	HN-100 Series 2	Series 3	HN-100S
Usable Liner Volume, (cu. ft.)	143	143	143	143
Max. Waste Vol. (cu. ft.)	69.9	68.2	88.0	84.1
Max. Solidified Waste Vol. (cu. ft.)	113.7	110.9	143	136.7
Cement Added at Max. Waste Vol.				
Weight (lbs.)	7262.2	7085.8	9137.5	8732.3
Volume (bags)	77.3	75.4	97.2	92.9
Anhydrous Sodium Metasilicate Added at Max. Waste Vol.				
Weight (lbs.)	726.2	708.6	913.8	873.8
Volume (bags)	7.3	7.1	9.1	8.7
Max. Radiation Level R/hr Contact	12	12	12	3

Liner No.: ____________

Sample No.: ____________

Date: ____________

WASTE SOLIDIFICATION DATA SHEET

FOR SUMP SLUDGE

Sample Volume, ml.: Sample A ________ Sample B ________ (1)

Sample pH: ________ Volume NaOH solution used to adjust pH, ml.: ________ (2)

Quantity of Oil percent: ________

Quantity of Emulsifier (20 percent of vol. of oil), ml.: ________

Temperature at Solidification, °F: ____________

Quantity of Cement Added: Cement Ratio[1] ________: (No./ft^3 Waste)

Sample A ________gms Sample A ________ (3)

Sample B ________gms Sample B ________ (4)

Quantity of Additive Added: Additive Ratio[2] ______: (No./ft^3 Waste)

Sample A ________gms Sample A ________ (5)

Sample B ________gms Sample B ________ (6)

Packaging Efficiency: $\frac{\text{Waste volume}}{\text{Solidified Waste Volume}}$ Sample A ________

Sample B ________ (7)

Product Acceptable: Sample A ___Yes ___No (If no, refer to Section 4.5 and proceed as directed)

Sample B ___Yes ___No

FOR USE IN UNIT I ONLY

Additional batches solidified based on this sample solidification:

Liner No.	Waste Vol.	Date	Liner No.	Waste Vol.	Date	Liner No.	Waste Vol.	Date
2			5			8		
3			6			9		
4			7			10		

PCP Performed by:____________________________ Date: ________

NOTES:

1 The cement ratio is defined as the pounds of cement required to solidify one cubic foot of waste. Ratios in this PCP yield cement ratios of 75.0 lbs/ft^3 and 80.0 lbs/ft^3 for samples A and B respectively.

2 The additive ratio is defined as the pounds of additive required to solidify one cubic foot of waste. Ratios in this PCP yield additive ratios of 7.50 lbs/ft^3 and 8.0 lbs/ft^3 for samples A and B respectively.

FOR USE IN UNIT I ONLY

SOLIDIFICATION CALCULATION SHEET

Waste Volume[1], ft^3: ____________________ (1)

Cement Ratio, No./ft^3: Sample A ____________________ (2A)

Sample B ____________________ (2B)

Additive: ____

Additive Ratio, No./ft^3: Sample A ____________________ (3A)

Sample B ____________________ (3B)

Cement Quantity[2]

____________(1) X ____________(2A) = ____________lbs. (4A)

____________(1) X ____________(2B) = ____________lbs. (4B)

Additive Quantity[2]

____________(1) X ____________(3A) = ____________lbs. (5A)

____________(1) X ____________(3B) = ____________lbs. (5B)

1 The quantity of waste to be solidifed in a single liner can not exceed the maximum waste volume listed on the attached Solidification Data Tables.

2 4A and 5A define the minimum quantity of cement and additive respectively that must be mixed with the waste to assure solidification. The recommended quantities of cement and additive to use are represented by 4B and 5B.

FOR USE IN UNIT I ONLY

FOR USE IN UNIT I ONLY

SOLIDIFICATION DATA TABLES

SUMP SLUDGE

NOTE: For the Recommended Amount of Cement and Additive.

	HN-100 Series 3	HN-100S
Usable Liner Volume, (cu. ft.)	143.0	143.0
Max. Waste Vol. (cu. ft.)	96.1	96.1
Max. Solidified Waste Vol. (cu. ft.)	143.0	143.0
Cement Added at Max. Waste Vol.		
Weight (lbs.)	7688.0	7688.0
Volume (bags)	81.0	81.8
Anhydrous Sodium Metasilicate Added at Max. Waste Vol.		
Weight (lbs.)	768.8	768.8
Volume (bags)	7.7	7.7
Max. Radiation Level R/hr Contact	12	3

CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL FOR RADIOACTIVE LIQUID AND GASEOUS EFFLUENT

Background

The Offsite Dose Calculation Manual (ODCM) is utilized for compliance with 10 CFR 20, 10 CFR 50 Appendix I, and the TMI-1 Technical Specifications. The copy attached is Revision 3 of this Manual and includes the changes listed below.

A. Table of Contents

Page i - Page numbers changed to accomodate the changes made in Revision 3.

B. List of Tables

Page ii - The List of Tables was changed to reflect the deletions of Tables 4-1, 4-2, 4.1.2. These were tables of precalculated values which were omitted since the individual factors can be obtained from other documents. Also deleted were table 3-2, 4.2.1(a), 4.2.1(b), 4-2.2b and 4-2.2c which will be included in Radiological Controls Procedure 9100-IMP-4200.02 (Dose Calculations for Liquid and Gaseous Effluents). The page numbers were changed to accommodate the deletion of the tables.

Page 3 - The definition of D_v in the equation for 2.2 was changed to 'the annual average atmospheric dispersion factor for the worst-case sector. . .'.

Page 4 - The definition of MPC_i was changed to reflect the correct Appendix reference.

Page 5 - Administrative changes to the definition of DFij in equation 3.2.2. The paragraphs that referenced deleted Tables were also deleted.

Page 6 - Deleted paragraph that referenced deleted Tables.

Page 7 - The definition of D_V in the equation for 4.1.2 was changed to 'the annual average atmospheric dispersion factor for the worst case sector. . .'. The paragraphs referencing deleted Tables were deleted.

Page 8 - The definition of $\overline{X/Q}$ in equations 4.2.1.1 and 4.2.1.2 was changed to 'the annual average relative concentration for the worst case section. . .'. The paragraphs that referenced deleted Tables were also deleted.

Page 9 - The definition of D_V in the equation 4.2.2 was changed to 'the annual average atmospheric dispersion factor for the worst case section. . .'. The paragraphs that referenced deleted Tables were also deleted.

Page 13 - Deleted the letter "a" on the title of Table 4-2.2a, so the new title is Table 4.2.2, since Table 4.2.2b was deleted.

Page 46 - Deleted all asterisks and their definitions from Appendix D Table D-1, "Bioaccumulation Factors To Be Used in the Absence of Site-Specific Data'.

Page 10 through Page 77 Rev. 2 - These pages were renumbered in Revision 3 from Page 10 through Page 58 to accommodate the changes and Table deletions listed above.

Revision 3 to the ODCM represents editing changes to the existing manual. The changes are administrative in nature and do not reduce the accuracy or reliability of dose calculations or setpoint determinations. The changes were reviewed pursuant to TMI-1 Tech Spec Section 6.5.1.1, and the Safety Review is included with the copy of the ODCM Revision 3 which is attached.

CHANGES TO THE PROCESS CONTROL PROGRAM FOR RADIOACTIVE WASTE SOLIDIFICATION

Background

Since the last submittal to the Semi-Annual Report the TCN (No. 1-82-0152) was processed as a PCR and incorporated into the procedure. This PCR also continued the addition of some Tables described below.

Additions to PCP:

1. Test Solidification Table 1 Pg. 14.0
2. Waste Solidification Data Sheet for Boric Acid (notes) Pg. 20.0
3. Solidification Data Tables - Boric Acid Pg. 22.0
4. Waste Solidification Data Sheet for Oily Waste - Section 6 & 7 Pg. 27.0.
5. Waste Solidification Data Sheet for Powdered Resin (footnotes) Pg. 27.0
6. Waste Solidification Data Sheet for Bead Resin Pg. 36.0.
7. Solidification Data Tables - Bead Resin Pg. 38.0.

Items 1 through 7 above are additions to the PCP which incorporate new quantities for waste, and the additives required to perform the verification testing of various waste streams. The data contained within these Tables and Notes is a result of laboratory testing performed by Hittman Nuclear and Development Corp., to increase waste volumes for each solidification. They were added to assure that the TMI-1 PCP is consistent with Hittman procedures, since we utilize their processes. They do not reduce the overall conformance of solidified waste product to existing criteria for solid wastes. These additions were reviewed pursuant to TMI-1 Tech Spec Section 6.5.1.1 and the Safety Review is included with the copy of the referenced PCR (No. 1104-28I, Rev. 2) which is attached.