

# **ANALYTICAL CHEMISTRY LABORATORY (ACL) PROCEDURE COMPENDIUM**

## **Volume 7: Safety Operation Procedure for Hot Cell**

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**INTERIM CHANGE NOTICE  
(ICN)**

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**A.**

Document Number: See Attachment Revision Number:       

Document Title: See Attachment

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Effective Date  
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Change Requested by:  
AG King

**B. Action:** Place the attached procedures in PNL-MA-599 manual, Volume 7. Place this ICN and attachment with the Table of Contents.

**C. Effect of Change:** Incorporates the procedures from the PNL-MA-597 manual into PNL-MA-599.

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**D. Reason for Change/Description of Change:**

Incorporates the procedures from PNL-MA-597 manual into PNL-MA-599 manual by changing the procedure numbers. This eliminates the need for maintaining two sets of technical procedures. Procedural references in these procedures have been updated. See attachment for the procedures to be incorporated into PNL-MA-599 manual, Volume 7.

**E. Approval Signatures:**  
(Please sign and date)

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 Minor  Major

Process  
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New Doc#	Rev.	Author	Document Title	Old Doc#
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PNL-AL0-701	0	RT Steele	Removal of high-level dry waste	5-30.2
PNL-AL0-702	0	RT Steele	Cell transfers of high-level samples via transfer wheel	5-30.3
PNL-AL0-703	0	RT Steele	Cell transfer of low-level materials via transfer wheel	5-30.4
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PNL-AL0-707	0	RT Steele	Removal and replacement of wall plugs	5-30.8
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**Volume 7: Safety Operation Procedure for Hot Cell**

April 5, 1993

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PNL-ALC-703	0	0	CELL TRANSFER OF LOW-LEVEL MATERIALS VIA TRANSFER WHEEL	09/10/90
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## PNL TECHNICAL PROCEDURE

TITLE: PNL-AL0-700, (Replaces 5-30.1), INSTALLATION AND REMOVAL OF MASTER-SLAVE MANIPULATORS

### 1.0 APPLICABILITY

The six cells of the Shielded Analytical Laboratory (SAL) are equipped with twelve model 8 master-slave manipulators. The following is a procedure for the installation of boots and manipulators and their removal for servicing or replacement.

### 2.0 DEFINITION

None

### 3.0 RESPONSIBLE STAFF

Analyst

### 4.0 PROCEDURE

#### 4.1 Preparation

- (a) Collect the required equipment and materials and have them ready for use.
- (b) Paper the area under the wall tube if a manipulator is to be removed. Place brown Kraft paper against the wall from the wall tube to the floor, covering a width of about 3- to 4-ft; secure with masking tape. Cover an area of the floor with paper under the manipulator from the wall out to about 5-ft with a length of about 8-ft; secure with masking tape.
- (c) Contact Operational Health Physics (OHP) for assistance; put on required protective clothing and if radioactive contamination and/or exposure is expected, close the main entry to Room 201. Mark the room "on mask".
- (d) Remove glassware and other breakable equipment from the cell involved if possible. Use care at Step (c) of Subsection 4.3 if such equipment can't be removed.

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- (e) Bring in the dolly with the new manipulator and a dolly for the removal of the used manipulator if needed.

### 4.2 Removal of a Manipulator

- (a) Remove the tong; loosen the gauntlet from the wrist joint; extend the Y-motion to about 45 deg.; lock the manipulator motion.
- (b) Place the 8-ft step ladder(s) under the hoist trolley on the I-beam, and have one person climb up to a position where the trolley is an easy and natural reach. Have the second person hand up the 1/2-ton hoist and hook the hoist onto the trolley. Move the ladder(s) and the hoist to the manipulator position. Attach the lifting hook of the hoist to the manipulator using the nylon sling.
- (c) Unplug the manipulator power cord and attach it to an extension cord. Unfasten the roller-tube retainer capscrew with an Allen wrench.
- (d) Lift the manipulator slightly with the hoist. (As the weight is suspended the manipulator will move slightly out of the wall tube.) Pull the trolley, hoist, and manipulator about a foot away from the wall.
- (e) Extend the Y-motion to the horizontal position at this point; pull the manipulator another foot from the wall and take the first smear of the emerging portion for contamination check. Remove loose contamination with damp wipes if found.
- (f) Withdraw the manipulator from the cell; retract the Y-motion to the vertical position; lower the manipulator onto the dolly; clamp it in place; detach the hoist; transport the manipulator into Room 203 for repairs.

Minor repairs may be made while the manipulator is on the dolly or while it is suspended from the hoist.

### 4.3 Removal of Boot

- (a) Take exposure readings inside the wall tube and at the working position outside.
- (b) Wipe out the wall tube using swabs wet with water and then with methanol, and loosen the seal-ring screws with a long-handled Allen wrench.

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- (c) If exposure readings at the wall tube are too high, tap the seal ring into the cell with a broom handle and let it fall to the tray for later recovery. If exposure readings will permit two or more minutes of work, remove the screws and the outer metal ring and place them in a plastic bag. Push the other two rings into the cell, but do not drop them. Separate the parts; let the boot drop into the cell; retract the neoprene and inner metal ring into a plastic bag.
- (d) Remove and discard outer surgeon's gloves; survey personnel and work area; clean up as required.

### 4.4 Installation of Boot

- (a) Measure and cut 16 to 18 in. from the top end of the Model 8 boot.

The Model 8 boots are about 18 in. too long for the best fit.

- (b) Place the inner metal ring inside the end of the boot; place the neoprene ring around the outside of the boot and the lip of the inner ring; place the lip of the outer metal ring inside the neoprene ring. Align the three pieces and fasten them together with four capscrews but do not tighten.

During assembly be sure that the knobs on the inner surface of the metal rings are positioned at the sides and top of the wall tube and not at the bottom. In this position the boot should be so aligned that the "fingers" at the one end spread horizontally.

The neoprene ring will go into the wall tube in only one position because of slanted "compression grooves" in the outer surface. Be sure that this is placed correctly during assembly.

- (c) Stretch the boot out straight; place the tong end into the wall tube and permit the air flow to draw the boot into the cell until the seal rings contact the tube. Press the seal rings into the hole and tap through to the inner end of the tube with the marked tapping rod or broom handle.
- (d) Check to see that the seal ring has reached the inner end of the wall tube and that it is properly aligned in the tube. Then tighten the cap screws with the long-handled Allen wrench.

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### 4.5 Installation of Manipulator

- (a) Bring the manipulator into Room 201 on the dolly. Survey for contamination before coming through the door from Room 200.
- (b) Position the manipulator under the hoist; attach the hook; tighten the chain; remove the clamp to the dolly and hoist the manipulator up to the height of the wall tube.

The position of the manipulator must be such that its arm can be fully extended toward the cell wall without hitting the wall.
- (c) Plug the power cord into the extension cord; extend the arm (Y-motion) up to horizontal position; lock the motion.
- (d) Climb the ladder and guide the slave end into the wall tube. Continue pushing the manipulator into the wall tube until the Y-motion pivot joint is just inside the cell. Move slowly and make certain that the manipulator-tong end does not puncture or rip the boot.
- (e) Retract the Y-motion until the arm is about 45 deg. down and push the manipulator the rest of the way into the wall tube.
- (f) Lower the hoist until the manipulator rests in the wall tube when the manipulator is in place and the retaining screw on the bottom of the roller tube is correctly positioned.
- (g) Lock the retaining screw; remove the hoist from the manipulator and plug the manipulator power cord into the wall outlet.
- (h) Remove the hoist from the trolley and store. Remove ladder(s), tools, and extra equipment. Roll all the brown Kraft paper inward to confine any contamination and place it into the waste carton. Survey and clean up the area.
- (i) Extend the Y-motion of the manipulator to run the slave end into the tong end of the boot -- this requires the assistance of the other manipulator. Be careful not to tear the boot while accurately and firmly pulling it up onto the collar located just above the control "fingers". Attach the tong.

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### 4.6 Personnel Requirements

The manipulator is removed from the cell, repaired, and placed into the cell by millwrights from the laboratory maintenance section. Operating personnel perform all preparatory work, and may remove and replace a manipulator with millwright's assistance. At least two persons are required to remove and replace a manipulator. Assistance from OHP is required during the removal of the manipulator.

### 4.7 Equipment and Materials

- (a) Absorbent wipes; swabs and rags.
- (b) Allen wrenches.
- (c) Hoist; 1/2 ton.
- (d) Manipulator; new or repaired.
- (e) Manipulator Boot; with gauntlet and three-piece seal-ring.
- (f) Nylon Sling; 30-in. long with a lifting capacity of greater than 1850 lb.
- (g) Paper; brown Kraft or equivalent, 30- or 36-in. width.
- (h) Plastic Bags.
- (i) Radioactive Waste Container.
- (j) Rod; about 4-ft long, marked at the depth of the seal-ring portion in the wall tube. A broom handle works well.
- (k) Step Ladder; 8-ft, one is required -- two are desirable.
- (l) Tape; 1-1/2 in. masking.
- (m) Transport Dolly; for manipulator.
- (n) Wash Bottles; one each with water and methanol.

### 4.8 Protective Equipment

- (a) Gloves; surgeon, canvas, and leather.
- (b) Lab Coat and Coveralls.

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(c) Safety Shoes (recommended).

(d) Survey Instruments.

(e) Respiratory Protection

### 4.9 Job Hazards

- (a) Contamination spread and radiation exposure during the removal of the manipulator.
- (b) Falls, strains, bruises, pinches, and sprains from the use of ladders and the handling of heavy suspended objects.
- (c) Hand bruises when driving the boot seal-ring into place.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-ALO-701, (Replaces 5-30.2), REMOVAL OF HIGH-LEVEL DRY WASTE

### 1.0 APPLICABILITY

Hotcell dry solid waste is of two main types: transuranic and non-transuranic. The non-tru, noncorrosive, dry solid waste from the Shielded Analytical Laboratory (SAL) is removed in 1-gallon or 5-quart paint cans through either a 7-inch plug port into a shielded cask or via the hotcell transfer wheel. The cans may contain cloth, plastic, metal, chemicals and considerable amounts of paper products and glass. The contents will contain mixed or individual beta-gamma emitters.

The transuranic, noncorrosive, dry solid waste will leave the cells in either capped steel pipes through the normal irradiated sample shipping means or in one-gallon paint cans. Criticality requirements impose a 12 gram restriction of fissile material per container. Nuclear safeguards directives require strict accountability of all special nuclear materials at all times.

### 2.0 DEFINITIONS

None

### 3.0 RESPONSIBLE STAFF

Analyst

### 4.0 PROCEDURE

#### 4.1 Canning Waste

##### 4.1.1 High Level, Non-Transuranic

- (a) Remove the bail "ears" from the paint cans to be used.
- (b) Spray the inside and outside of each can with clear Krylon.

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The Krylon will help minimize corrosion of the cans.

- (c) Place each can into a 12-in. by 15-in. plastic bag and attach each bag to its can with a rubber band.
- (d) Place another 12-in. by 15-in. plastic bag inside of each can and fold the excess bag down over the outside of the can.
- (e) Attach and handle to each can lid as follows:
  1. Cut about a 9-in. piece of Permacel tape and place a dental roll or similar project onto the adhesive side in the middle of the strip.  
The dental roll should lay parallel to the width of the strip (perpendicular to the length).
  2. Fold from 1 to 2 in. of tape together around the dental roll such that the dental roll is inside the folded tape at the "top" end with two tails on the "bottom" end.
  3. Attach the folded tape to the outside (top) of the can lid using the tails to attach the tape.  
This will provide a handle with which to lift the can later inside the cells.  
The handle can be attached more securely by placing several short pieces of tape across the tails holding the handle to the lid.
- (f) Take the cans, lids, and one extra plastic bag for each can into the cells via the transfer wheel. See Procedure PNL-ALO-703.
- (g) Fill the cans with dry waste, packing tightly and leaving 20 percent empty space.
- (h) Record can contents on the Container Inventory Sheet (CIS).

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- (i) Fold the inner plastic bag over the waste in each can.
- (j) Place the lids on the cans and hammer the lids into place carefully but firmly; attach the locking tabs to the lids.
- (k) Strip the outside plastic bags from the cans and spray the outside of each can with clear Krylon as they are stored in Cell #1.

### 4.1.2 Low-Level, Non-Transuranic

This type of waste will be disposed on in accordance with Procedure PNL-ALO-703 of this document.

### 4.1.3 Transuranic

- (a) Dispose of neutral, noncorrosive, dry solid tru waste directly into a labeled pipe or numbered one-gallon paint can.
- (b) Tru liquids:
  1. Place in appropriate size beaker and evaporate to near dryness using the hot plate and fume hood in Cell 3.
  2. Add 10 times the solid volume of water to the cake and stir.
  3. Neutralize the cake-solution with acid or caustic using a pH electrode and meter. Resulting pH should be between 7 and 8.
  4. Evaporate neutralized solution to dryness.
  5. Crush the neutralized cake and beaker and place it into the labeled pipe or one-gallon can.
- (c) Record information on discarded waste on the CIS for that pipe or can being careful not to exceed the twelve gram fissile limit.

### 4.2 Preparation for Loadout

As previously mentioned, transuranic waste removal from the cells

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## PNL TECHNICAL PROCEDURE

may be handled as a routine sample shipment utilizing a 1-ton lab cask. See Procedure PNL-AL0-710 for loading and Procedure PNL-AL0-709 for shipping the cask.

### 4.2.1 High-Level, Non-Transuranic, Transuranic

- (a) Schedule the loadout operation in advance so that the effort of the various groups involved can be coordinated.

Besides the operating personnel in SAL, personnel from Occupational Health Physics (OHP), transportation, and the Post Irradiation Testing Laboratory are involved.

- (b) Collect the required equipment and materials and have them ready for use.
- (c) Put on required protective clothing and paper the floor and wall area around the plug to be removed. Paper the floor area where the ends of the shielded cask will be cleaned after loadout.

The loadout operation is always done in the rear operating area.

### 4.3 Waste Loadout

#### 4.3.1 High-Level, Non-Transuranic, Transuranic

- (a) Place the rack that will hold the removed plug on the hydraulic hoist table and cover the rack with a sheet of plastic large enough to wrap the plug after removal from the cell wall. See Procedure PNL-AL0-707.
- (b) Move the hoist table to the cell wall and place it against the wall and under the plug to be removed. Elevate the table until the rack is at the bottom level of the plug.
- (c) Attach a T-handle to the plug and carefully pull it from the wall onto the rack. Check the plug for smearable contamination and wipe with damp swabs if necessary to remove gross contamination. Wrap the plug with the plastic sheet.

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Fingers can be pinched between the plug and rack if care is not taken when removing the plug.

The contamination potential at this step is high. Dispose of all swabs used to wipe the plug into a plastic bag, which is discarded into a waste carton. OHP assistance at this step is required.

- (d) Move the hoist table to an out-of-the-way position.
- (e) Position the cask dolly under the monorail. Lift the shielded cask with the chain hoist and place it on the dolly. See Procedure PNL-ALO-705.
- (f) Move the dolly to the cell wall from which the plug was removed and position it so that the face (end) of the cask is flat against the wall with the cask opening aligned with the plug-port. There should be a plastic bag between the cask face and cell wall.
- (g) Open cask gate, release T-handle, and push the scoop through the plug-port into the cell.
- (h) Place the filled waste cans on the scoop, withdraw the scoop back into the cask and close the cask gate.
- (i) Move the dolly away from the cell wall.
- (j) Survey the face of the cask and the area around the cask and cell wall. Clean the areas surveyed if necessary.
- (k) Remove the cask T-handle and replace it with a short bolt designed to hold the scoop in place.
- (l) Replace plug into cell wall and roll up the paper, discarding in a waste carton.
- (m) Survey the entire work area and clean as necessary.
- (n) Ship the cask to the Post Irradiation Testing Lab (327 Bldg.) using Procedure PNL-ALO-709.

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## PNL TECHNICAL PROCEDURE

### 4.4 Personnel Requirements

A minimum of two operators are required along with the services of OHP for waste load out. For more efficient operation, additional operating personnel can be used.

### 4.5 Equipment and Materials

- (a) Absorbent wipes; swabs, rags, and cheesecloth.
- (b) Cask dolly.
- (c) Chain hoist.
- (d) Dental rolls.
- (e) Hydraulic hoist table (scissor).
- (f) Krylon; clear.
- (g) Locking tabs; for can lids.
- (h) Paint cans; 1-gal, with lids.
- (i) Paper, brown kraft or equivalent, 30- or 36-in. wide.
- (j) Plastic bags; 39-in. by 54-in. with 0.004-in. thickness, 12-in. by 15-in. with 0.002-in. thickness.
- (k) Plastic sheet.
- (l) Plug rack.
- (m) Radioactive waste containment.
- (n) Rubber bands; size #64.
- (o) Scissors.
- (p) Shielded cask; paint can cask.
- (q) T-handle.
- (r) Tape; 1.5-in. and 3-in. wide masking, 2-in. wide Permaceel cloth-back.
- (s) Tongs; 26-in. long.

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- (t) Wrench; 3/4-in. open end or box end.
- (u) Glass beakers, Pyrex, volume 150-400 ml.
- (v) NaOH pellets or solutions of various molarities.
- (w) Steel pipe, threaded, capped at both ends. Length 7" OD 2-3/4".

### 4.6 Protective Equipment

- (a) Gloves; surgeon, canvas, and leather.
- (b) Lab coats or coveralls.
- (c) Safety glasses.
- (d) Safety shoes (recommended).
- (e) Shoe covers or rubbers.
- (f) Survey instruments.

### 4.7 Job Hazards

- (a) Contamination spread when loading and emptying the shielded cask and when pulling a wall plug.
- (b) Strains, bruises, pinches, and sprains from handling heavy items and using mechanical equipment.
- (c) Crushed hands and feet from falling cask and other heavy equipment.
- (d) Being hit by an air hose when disconnecting couplings through which compressed air (90 psi) flows.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-ALO-702, (Replaces 5-30.3), CELL TRANSFERS OF HIGH-LEVEL SAMPLES VIA TRANSFER WHEEL

### 1.0 APPLICABILITY

This procedure provides instruction and requirements for taking highly radioactive samples into the cells via the "Lazy Susan" transfer wheel. Unusually such samples are contained in 20- or 75- lb pigs. Other types of shielded shipping containers used must fit into the tray of the transfer wheel and must be designed such that the sample can be easily removed by a master-slave manipulator. Although not a common practice, instructions are also given for removing high-level samples from the cells.

### 2.0 DEFINITIONS

None

### 3.0 RESPONSIBLE STAFF

Analyst

### 4.0 PROCEDURE

#### 4.1 General Requirements

- (a) Use care and mechanical aids where available when lifting or moving heavy shipping containers.
- (b) Whenever possible shipping containers shall be opened in a cell or a fume hood.
- (c) When opening a shipping container in a fume hood, a survey for radiation exposure and contamination must be made while opening the shipping container and appropriate action shall be taken as instructed by OHP.
- (d) Contaminated primary-sample containers within shipping containers can be removed from shipping containers outside

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of a Shielded Analytical Laboratory (SAL) cell only if done in a fume hood and if the radiation levels do not result in unwarranted exposure otherwise notify management of the problem.

### 4.2 Preparation

- (a) Collect the required equipment and materials and have them ready for use.
- (b) Contact Operational Health Physics (OHP) for assistance and put on required protective clothing.
- (c) If smearable contamination is expected, paper the exterior cell wall and floor around the transfer wheel.
- (d) Check the Radioactive Shipment Report accompanying the sample for conditions and warnings. Stop operation if that information indicates unusual or unexpected conditions. Continue only with supervision approval and OHP concurrence.

### 4.3 Transfers Into Cells

- (a) Check the lid of the shipping container to be sure that it can be removed by a master-slave manipulator.
- (b) Place the container on the tray (scoop) of the transfer wheel.
- (c) Turn the handle of the container (this applies primarily to pigs) to the open position and remove it to a plastic bag.
- (d) Rotate the transfer wheel so that the opening containing the tray turns to the cell. Attach the T-handle and push the tray into the cell.
- (e) Remove the sample (primary sample container) using forceps if necessary.

During the above operation, do not touch the tray with the manipulators; the manipulator tongs are grossly contaminated.

The work on the manipulators is done in the front operating area. To reduce work time, a second operator can do the manipulator work while the primary operator remains in the rear operating area.

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- (f) Pull the T-handle to withdraw the tray. Remove the T-handle and rotate the transfer wheel slowly so that the opening returns to the rear operating area.
- (g) Replace the lid.
- (h) Check the sample container for smearable contamination. Wipe with damp cloth to remove smearable contamination if necessary.
- (i) Place the container in a plastic bag and tape the bag closed. Check gloves, the bag and immediate area for contamination. Take appropriate action based on the results of that survey.  
If required by OHP, place the bagged container in a second bag. OHP will survey and label the bagged container for release to Waste Disposal and Decontamination Service.
- (j) Survey the entire work area, including the transfer tray. Clean-up as required and package waste as instructed by OHP.
- (k) Survey protective clothing before leaving the work area and remove outer gloves and shoe covers when leaving.
- (l) Survey personnel after leaving radiation zone.

### 4.4 Transfers Out of Cells

- (a) Place an empty pig or appropriate container on the tray (scoop) of the transfer wheel.  
The pig can be placed into a plastic bag to minimize the amount of contamination that will get on the pig while inside the cell.
- (b) Follow Steps (c) thru (h) of Subsection 4.3 with the following changes:
  1. At Step (e), place the sample into the empty pig.
  2. At Step (f), when removing samples from the cell an RPT must take radiation exposure readings as the opening approaches the rear operating area. If the radiation level found will cause unwarranted exposures, return the opening to the cell and consult supervision for subsequent action.

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3. At Step (h), the pig (container) is decontaminated in the fume hood if smearable contamination is found.
4. At Step (i), the pig containing the sample is now sent to Waste Disposal and Decontamination Service.

### 4.5 Personnel Requirements

Usually one person can handle this task with the services of OHP. If a difficult or hazardous situation develops, however, other operating personnel must be called for assistance, particularly if a contamination spread is likely to occur.

### 4.6 Equipment and Materials

- (a) Absorbent Wipes; swab, rags, cheesecloth, paper towels, tissue.
- (b) Forceps; 10-in.
- (c) Paper, brown Kraft or equivalent, 30- or 36-in. width.
- (d) Plastic Bags; 12-in. by 15-in. and 19-in. by 21-in.
- (e) Radioactive Waste Container.
- (f) Shears.
- (g) Tape; masking and cloth-back.
- (h) Tongs; 20-in. long.
- (i) Wash Bottles; one each containing dilute acid, water, and methanol.
- (j) T-Handle.

### 4.7 Protective Equipment

- (a) Gloves; surgeon, canvas, and heavy duty rubber.
- (b) Lab Coats or Coveralls.
- (c) Safety Glasses.
- (d) Safety Shoes (recommended).
- (e) Shoe Covers or Rubbers.

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## PNL TECHNICAL PROCEDURE

(f) Survey Instruments.

### 4.8 Job Hazards

- (a) Contamination spread during the removal of items from the cells.
- (b) Radiation exposure when the opening of the transfer wheel is turned to the rear operating area from inside the cell.
- (c) Strains, bruises, pinches, and sprains from handling heavy items and using mechanical equipment.
- (d) Crushed hands and feet from falling heavy shipping container.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-ALO-703, (Replaces 5-30.4), CELL TRANSFER OF LOW-LEVEL MATERIALS VIA TRANSFER WHEEL

### 1.0 APPLICABILITY

This procedure provides instructions and requirements for taking miscellaneous items into and out of the cells via the "Lazy Susan" transfer wheel. Included are specific instructions for taking out dilutions for use outside of Shielded Analytical Laboratory (SAL). This procedure is similar to Procedure PNL-ALO-702, Cell Transfers of High-Level Samples via Transfer Wheel.

### 2.0 DEFINITIONS

None

### 3.0 RESPONSIBLE STAFF

Analyst

### 4.0 PROCEDURE

#### 4.1 Preparation

- (a) Collect the required equipment and materials and have them ready for use.
- (b) Contact Occupational Health Physics (OHP) for assistance and put on required protective clothing.
- (c) If smearable contamination is expected paper the outside cell wall and floor around the transfer wheel.

#### 4.2 Transfers Into Cells

- (a) Place a paper towel on the tray (scoop) of the transfer wheel.

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## PNL TECHNICAL PROCEDURE

The towel protects the tray from contamination later when the tray is in the cell.

- (b) Place the item(s) to be transferred on the tray.
- (c) Rotate the transfer wheel so that the opening containing the tray turns to the cell. Attach the T-handle and push the tray into the cell.
- (d) Remove the item(s) from the tray with a master-slave manipulator, taking care to avoid contaminating the tray.

If the tongs of the manipulator touch the paper covering the tray, remove the paper also.

The work with the manipulators is done in the front operating area. To reduce work time, a second operator can do the manipulator work while the primary operator remains in the rear operating area.

- (e) Pull the T-handle to withdraw the tray. Remove the T-handle and rotate the transfer wheel slowly so that the opening returns to the rear operating area.
- (f) Check the paper and tray for smearable contamination. Remove contaminated paper and dispose of it. Wipe the tray with a damp cloth to remove smearable contamination if necessary.
- (g) Survey the entire work area, including the transfer tray. Clean up as required and package waste.
- (h) Survey protective clothing before leaving the work area and remove outer gloves and shoe covers when leaving.
- (i) Survey personnel after leaving radiation zone.

### 4.3 Transfer Out of Cells

The usual item taken out of the cells is low-level dry waste. All items taken out must be low-level. Two suggested methods are as follows:

#### 4.3.1 Method One:

- (a) Place a paper towel on the tray (scoop) of the transfer wheel.

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## PNL TECHNICAL PROCEDURE

- (b) Place an appropriate waste container (plastic bag or ice cream carton) on the tray.
- (c) Rotate the transfer wheel so that the opening containing the tray turns to the cell. Attach the T-handle and push the tray into the cell.
- (d) Rinse off the outside of the items(s) to be removed from the cell with water if water will not damage the item(s) or otherwise cause a problem.

This does not apply to dry waste.  
Washing helps to reduce the amount of smearable contamination on the item(s).
- (e) Place the item(s) to be removed into the carton or plastic bag on the tray.

If possible, do not touch the paper on the tray with the manipulator tong to minimize the contamination of the material coming out of the cell.

The work with the manipulators is done in the front operating area. To reduce work time, a second operator can do the manipulator work while the primary operator remains in the rear operating area.
- (f) Pull the T-handle to withdraw the tray. Remove the T-handle and rotate the transfer wheel slowly so that the opening returns to the rear operating area.

As the opening approaches the operating area, OHP must take radiation exposure readings. If the radiation found will cause unwarranted exposures, return the opening to the cell and consult supervision and OHP for subsequent action.
- (g) Place the container on the tray into a plastic bag or other carton and tape closed; or dispose of the container directly into a radioactive waste carton if appropriate and with OHP's concurrence.
- (h) Report Step (f) thru (i) of Subsection 4.2.

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### 4.3.2 Method Two

- (a) Place materials to be discarded into 4 or 5 quart paint cans.
- (b) Before placement into the cell attach a handle on the can lid as follows:
  1. Cut about a 9-in. piece of Permacel tape and place a dental roll or similar object into the adhesive side in the middle of the strip.

The dental roll should lay parallel to the width of the strip (perpendicular to the length).
  2. Fold from 1 to 2-in. of tape together around the dental roll such that the dental roll is inside the folded tape at the "top" end with two tails on the "bottom" end.
  3. Attach the folded tape to the outside (top) of the can lid using the tails to attach the tape.

This will provide a handle with which to lift the can later inside the cells.

The handle can be attached more securely by placing several short pieces of tape across the tails holding the handle to the lid.
- (c) Place the lids on the cans and hammer the lid into place carefully but firmly.
- (d) Make slight indentations on opposite sides of the bottom of a potato chip can, so that it will fit onto the scoop of the Lazy Susan.
- (e) Attach a handle on the potato chip can lid, as well as two long pieces of Permacel tape to help hold the lid in place when it is attached.
- (f) Place an empty potato chip can on the bare scoop of the Lazy Susan.

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## PNL TECHNICAL PROCEDURE

- (g) Rotate the transfer wheel so that the opening containing the tray (scoop) turns into the cell. Attach a T-handle and push the tray into the cell.
- (h) Using the master-slave manipulators, place a full, lid-secured four or five quart can into the empty potato chip can taking care to avoid contaminating either the outer surface of the potato chip can or the tray.
- (i) Pull the T-handle to withdraw the tray. Remove the T-handle and rotate the transfer wheel slowly so that the opening returns to the rear operating area.

As the opening approaches the operating area OHP must take radiation exposure readings. If the radiation found will cause unwarranted exposures, return the cell and consult supervision and OHP for subsequent action.
- (j) Place the lid on the potato chip can and secure it using the loose tape ends.
- (k) Using a plastic bag 21 1/2" x 21" x .0015 thick, remove the potato chip can from the tray, horse-tail and tape the bag closed and place it into an appropriate waste container.
- (l) If there are more sealed cans to remove from the cells, repeat Steps f-k of method two.
- (m) Check the tray for smearable contamination. Wipe the tray with methanol wetted swabs if smearable contamination is found.
- (n) Survey the entire work area, including the transfer tray. Clean up as required and package waste.

### 4.4 Transferring Dilutions From Cells

Dilutions are made to reduce radiation levels of sample solution sufficiently to permit taking samples out of the cells for analysis in other laboratories. Two suggested methods for transferring dilutions from cells are as follows:

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### 4.4.1 Method One:

- (a) Place a paper towel on the tray (scoop) of the transfer wheel.
- (b) Prepare the dilution bottle(s) as follows and place it on the tray.
  1. Select a bottle having the required volume.
  2. Add the required amount of the appropriate diluent.
  3. Add a stirring bar.
  4. Place the bottle into a cardboard cup, stuffing tissue paper around the bottle if necessary to hold it firmly in the cup.

The cup is used to handle (carry around) the bottle inside the cell to minimize the amount of contamination that will get on the bottle.

- (c) Repeat Steps (c) thru (i) of Subsection 4.2 with the following changes:
  1. At Step (d), the bottle is removed from the tray and taken to the place where the dilution is made. After making the dilution, the bottle is returned to the tray. If at all possible avoid touching the bottle with any object in the cell. Handle only the cup.
  2. At Step (f), before checking the paper and tray for smearable contamination, the bottle is removed from the cup and the cup is immediately discarded into a plastic bag and then into a waste carton. The bottle is decontaminated if necessary.

### 4.4.2 Method Two:

- (a) Place paper towel on the tray of the transfer wheel.

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- (b) Prepare the dilution as follows and place it on the tray in front of a lead block.
  1. Select either a 2 dram, 20 ml or 35 ml glass screw cap vial.
  2. Add the required amount of the appropriate diluent.
  3. Add a stirring bar.
  4. Place the vial into a cardboard cup, stuffing tissue around the vial to hold it firmly in place. Place the cap, screw threads down, inside the cup along side of the vial.
- (c) Rotate the transfer wheel so that the opening containing the tray turns into the cell. Attach the T-handle and gently push the tray into the cell.
- (d) Carefully remove the cup from the tray and make the required dilution.
- (e) Place the cup on a magnetic stirrer to thoroughly mix the sample and diluent.
- (f) Using a clean 10-in. pair of forceps with tygon or rubber tubing on the ends, secure the cap on the vial.
- (g) Lift the capped vial out of the cardboard holder using the clean forceps and gently place it in the lead block.
- (h) Pull the T-handle to withdraw the tray. Remove the T-handle and rotate the transfer wheel slowly so that the opening returns to the rear operating area.
- (i) Have a Radiation Protection Technician(RPT) take radiation readings.
- (j) Smear the vial and return it to the lead block making sure the lid is on tight.
- (k) Smear the block.

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## PNL TECHNICAL PROCEDURE

- (1) Check the paper and tray for smearable contamination. Remove contaminated paper and dispose of it if necessary.
- (n) Survey the entire work area, including the transfer tray. Clean up as required and package waste.

### 4.5 Personnel Requirements

Usually one person can handle this task with the services of OHP, although for Subsection 4.2 OHP services are optional. If a difficult or hazardous situation develops, however, other operating personnel must be called for assistance, particularly if a contamination spread is likely to occur. Since some manipulator work is required, the time needed to make cell transfers can be reduced if a second operator is available to do the manipulator work.

### 4.6 Equipment and Materials

- (a) Absorbent Wipes; swab, rags, cheesecloth, paper towels, tissue.
- (b) Cardboard Cup; usually 1/2 of a cardboard drug can.
- (c) Diluent. This can vary, depending upon the analysis for which a dilution is being made. A common diluent is 2 M  $\text{HNO}_3$ .
- (d) Dilution Bottle; 15-50-100 ml.
- (e) Forceps; 10-in.
- (f) Paper; brown Kraft or equivalent, 30- or 36-in. width.
- (g) Plastic Bags; 12-in. by 15-in., 19-in. by 21-in. and 21 1/2-in. by 21-in.
- (h) Shears or scissors.
- (i) Hammer.
- (j) Dental Rolls.
- (k) Paint Cans; 1 gallon or 5 quart with lids.
- (l) Potato chip cans with lids.

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- (m) T-handle.
- (n) Stirring bar.
- (o) Tape; masking and cloth-back.
- (p) Tongs; 10-in.
- (q) Wash bottles; one each containing dilute acid, water, and methanol.
- (r) Waste cartons; quart to gallon ice cream cartons, 4.5-ft<sup>3</sup> cardboard cartons (Radioactive Waste). Non-Tru waste drum.
- (s) Lead blocks bored out to accommodate glass screw cap vials.

### 4.7 Protective Equipment

- (a) Gloves; surgeon, canvas, and heavy duty rubber.
- (b) Lab Coats or Coveralls.
- (c) Safety Glasses.
- (d) Safety Shoes (recommended).
- (e) Shoe Covers or Rubbers.
- (f) Survey Instruments.

### 4.8 Job Hazards

- (a) Contamination spread during the removal of items from the cells.
- (b) Radiation exposure when the opening of the transfer wheel is turned to the rear operating area from inside the cell.
- (c) Stains, bruises, pinches, and sprains from using mechanical equipment.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-ALO-704, (Replaces 5-30.5), GLOVE BOX TRANSFERS USING PLASTIC BAGS

### 1.0 APPLICABILITY

This procedure provides instructions for taking materials into and out of gloveboxes using plastic bags attached to glovebox ports. The technique used is commonly called "bagging in (out)" by the "Twist-and-Tape" or the "Horsetail" method. This procedure covers transfers through bag ports of up to 15 in. in diameter. It does not cover transfers using airlocks, greenhouses, sphincter ports, or bagging operations using heat seals.

### 2.0 DEFINITIONS

None

### 3.0 RESPONSIBLE STAFF

Analyst

### 4.0 PROCEDURE

#### 4.1 Preparation

- (a) Collect the required equipment and materials and do the following before making any glovebox transfers:
  1. Check the size of the bag. It should be at least 18-in. longer than any single item being transferred.
  2. Check the item(s) being transferred for sharp corners and edges and for protrusions that might puncture the bag. If such conditions are found, place the item(s) in a metal can or ice cream carton if possible. If that is not possible, pad the corners edges, and protrusions to protect the bag.
  3. Check the conditions of the bag. If it shows evidence of deterioration, replace it with a new one (see Subsection 4.4).

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## PNL TECHNICAL PROCEDURE

(b) Put on required protective clothing and contact Occupational Health Physics (OHP).

The assault mask is required during the transfer out operation (subsection 4.2) at Step (g). Have the required number of masks ready at that point.

(c) Cover the floor area around and below the bag with wet cheesecloth to catch and hold any contamination that may fall from the bag.

### 4.2 Transfer Out

This procedure starts with the assumption that a full-size bag is already on the glovebox port. If not, see Subsection 7.4.

(a) Let the bag be slowly drawn into the glovebox.

The glovebox should be under reduced pressure.

(b) Place the item to be transferred against the end of the bag using a glove port adjacent to the bag port.

(c) Withdraw the bag with the item slowly through the port from outside the glovebox.

When the bag is fully withdrawn, the item should be near the end of the bag. Other items may be added to the bag from the glovebox, but care must be taken to avoid strain on the bag near the port. At least 18-in. of empty bag must remain.

(d) Twist the upper part of the bag so that there is a tight neck or tail extending to within 1 ft of the bag port.

(e) Tightly tape the entire neck with 2-in. pressure sensitive tape.

(f) Cut of two 4-in. lengths of plastic tape (2-in. width) and put them in a convenient place near the bag.

These pieces of tape will be used to cover the ends of the cut bag at Step (j).

(g) Place the room "on mask." Post "on mask" signs at all doorways.

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## PNL TECHNICAL PROCEDURE

Each person in the room at this point must put on a mask to remain in the room.

(h) Hold wet rags directly under the neck of the bag while cutting through the midpoint of the neck with a serrated knife using a sawing motion.

Important: Two persons must work together at this step. One holds the wet rags while the other cuts the bag.

(i) Immediately place the knife into the wet rags being held under the bag; fold the knife into the rags and place them into an appropriate container.

(j) Quickly cover the cut ends of the bag with the pieces of tape prepared for this purpose at Step (f) and place the detached bag in a waste container.

(k) Survey all exterior surfaces of the bag, the floor area, the surface of the glovebox, and personnel.

If contamination is found:

(l) Clean up contamination under the direction of OHP if necessary.

(m) Remove masks and take the room "off mask" when radiological conditions permit.

### 4.3 Transfer In

This procedure starts with the assumption that a full size bag is already on the glove port. If not, see Subsection 4.4.

(a) Let the bag be slowly drawn into the glovebox, making sure that the bag does not come into contact with sharp objects or hot surfaces inside the glovebox.

The glovebox should be under reduced pressure.

(b) Carefully place the item(s) to be transferred into the bag through the bag port, making sure that the bag is not stretched to the point of tearing or pulling away from the rim of the port.

(c) Follow Steps (b) through (g) of Subsection 4.4.

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## PNL TECHNICAL PROCEDURE

At the completion of Step (e) of Subsection 4.4, the item(s) being transferred will be in the glovebox inside the old bag with a new bag covering the bag port.

### 4.4 Changing Bag on Bag Port

- (a) Let the old bag or stub be slowly drawn into the glovebox, making sure that the bag does not come into contact with sharp objects or hot surfaces inside the glovebox.  
The glovebox should be under reduced pressure.
- (b) Carefully pull the tape off the bag-port rim, pulling the tape parallel to the face of the glovebox to avoid dislodging the bag. Survey the rim of the port and lip of the bag and if contamination is found retape the bag to the rim and proceed as directed by OHP.
- (c) Stretch the lip of the new bag over the old bag and into the inner groove of the rim, being careful not to dislodge the old bag from its position on the outer groove.
- (d) Work the old bag off the bag-port rim without pulling the new bag from its position on the rim.
- (e) Work the new bag onto the outer groove and tape the new bag to the rim using 1-in. plastic tape.
- (f) Gently twist the bag and wrap it with tape to prevent the bag from being drawn into the glovebox.
- (g) Survey entire area and clean up contamination under the direction of OHP if necessary.

### 4.5 PERSONNEL REQUIREMENTS

A minimum of two persons are required for all glovebox transfers using plastic bags. Personnel can be any combination of Operating and Waste Management personnel. Services of OHP are required.

### 4.6 Equipment and Materials

- (a) Absorbent Wipes; rags and cheesecloth.
- (b) Plastic Bag; with a diameter to fit the glovebox port (up to 15-in. diam.), 0.012-in. thickness, with O-ring at opening. Hanford DWG H-2-20983.

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- (c) Serrated Knife.
- (d) Tape; plastic, pressure sensitive, 1- and 2-in. widths.
- (e) Waste Container; radioactive, 4.5-ft<sup>3</sup>.

### 4.7 Protective Equipment

- (a) Assault mask.
- (b) Coveralls.
- (c) Gloves; surgeon.
- (d) Safety Glasses.
- (e) Shoe Covers or Rubbers.
- (f) Survey Instruments.

### 4.8 Job Hazards

- (a) Contamination spread, particularly when cutting the neck or tail of the twisted bag to detach the bag from the glovebox.
- (b) Extension radiation exposure, particularly if the material being removed is grossly contaminated or highly radioactive. The plastic bag used to remove the material offers no shielding protection.
- (c) Cut fingers or hand when cutting the bag with the knife.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-ALO-705, (Replaces 5-30.6), USE OF THE 3-TON AIR DRIVEN HOIST

### 1.0 APPLICABILITY

This procedure provides instructions and requirements for the operation of the air powered, monorail chain hoist in accordance with the Crane and Hoist Safety Manual. The hoist is operated by a motor driven by 90 psi of air pressure. It is suspended from an I-beam monorail with a hand-pulled chain driven trolley. The I-beam extends the length of the rear operation area of Shielded Analytical Laboratory (SAL) and out over the loading dock. The capacity of the complete hoist system is rated at 3 tons.

### 2.0 DEFINITIONS

None

### 3.0 RESPONSIBLE STAFF

Analyst

### 4.0 PROCEDURE

#### 4.1 Preparation

- (a) Determine whether the job is routine or nonroutine.
- (b) Do the following if the job is nonroutine.
  1. Determine if special equipment is required.
  2. Determine the weight, center of gravity, and lift point(s) if required.
  3. Arrange for assistance if needed and review the job in detail with persons assisting.
  4. Arrange for qualified rigger assistance if special rigging is required.

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- (c) Collect the required equipment and have it readily available.

Routine loads, such as casks, will have integral hoisting rings, yokes, bails, or eyes and the hook of the hoist can be attached directly to the load. The weight and center of gravity is known for routine loads.

- (d) Make the required inspection of the hoist and associated tackle and record the inspection on the Daily Inspection Record.

### 4.2 Lifting Operation

- (a) Move the hoist directly over the load using the trolley chain, or move the load directly under the hoist--whichever is appropriate.
- (b) Connect the high pressure air line to the hoist air line.
- (c) Run out the chain using the air control rope until the hook is in position to pick up the load.
- (d) Attach the hook to the lifting ring (or other appropriate device), close the safety latch, and run up the chain until it is just tight.

Check all connections and rigging for security and proper alignment.

- (e) Lift the load only about an inch and make a final check of the rigging. Make sure that the load brake will hold.
- (f) Lift the load just high enough to clear all objects in the craneway. Run the trolley along the monorail with the trolley chain and have an assistant (if needed) guide the load with a tag line or other means of remote control.
- (g) Raise or lower the load to the level of the location where it is to be placed. Center the load over the location and lower it slowly until it is resting firmly and securely with no danger of toppling.
- (h) Secure the load (if necessary) in the new location and remove the hook and other rigging.
- (i) Return the hoist to its stand-by area. Check and store the tackle and carefully disconnect the air line by grasping

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both ends of the connector firmly and twisting the release ring.

### 4.3 Personnel Requirements

The operation of the hoist is a one-person operation. Only qualified operators may use the hoist. Qualification is based upon the Crane and Hoist Safety Manual and it is certified by the manager responsible for SAL. When the hoist is used to lift unusual items or is used under nonroutine conditions, a qualified rigger or other specialized personnel may be required.

### 4.4 Equipment and Materials

- (a) Air; high pressure air, 90 lb per in<sup>2</sup>.
- (b) Chain Hoist; air driven, hand-pulled chain driven trolley.
- (c) Hose; high pressure air hose with quick-connect couplings.
- (d) Tackle; chokers, slings and tag lines. This equipment must meet the requirements of and be maintained in accordance with the Crane and Hoist Safety Manual.

### 4.5 Protective Equipment

- (a) Gloves; canvas or leather.
- (b) Lab Coat or Coveralls.\*
- (c) Safety Glasses.
- (d) Safety Shoes (recommended).
- (e) Shoe Covers or Rubbers.\*
- (f) Survey Instruments.\*

### 4.6 Job Hazards

- (a) Cuts and abrasions from sharp wire ends on chokers and slings.

\* This and other radiological safety equipment is not required for operation of the hoist as such, but it is normally required while in the rear operating area of SAL and when handling casks lifted by the hoist.

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- (b) Pinches and crushed body parts from handling mechanical and other heavy equipment. Pinched fingers can occur when handling the tackle and crushed body parts can occur from being under a heavy load that falls or from being caught between a heavy load and a solid object such as a wall.
- (c) Injury from using high pressure air. The most hazardous operation involving compressed air is the coupling or uncoupling of the air hose.
- (d) Injury or damage of equipment and facilities from using defective equipment. The principal hazard created by defective equipment is the dropping of a heavy object.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-AL0-706, (Replaces 5-30.7), USE OF 1/2 TON CHAIN HOISTS

### 1.0 APPLICABILITY

This procedure provides instructions and requirements for the operation of the two hand operated, 1/2 ton capacity chain hoists in accordance with the Crane and Hoist Safety Manual. The hoist is operated by a hand pulled chain. It is suspended from an I-beam monorail trolley or any secure, regulation lifting point.

### 2.0 DEFINITIONS

None

### 3.0 RESPONSIBLE STAFF

Analyst

### 4.0 PROCEDURE

#### 4.1 Preparation

- (a) Determine whether the job is routine or nonroutine.
- (b) Do the following if the job is nonroutine.
  1. Determine if special equipment is required.
  2. Determine the weight, center of gravity, and lift point(s) if required.
  3. Arrange for assistance if needed and review the job in detail with persons assisting.
  4. Arrange for qualified rigger assistance if special rigging is required.
- (c) Collect the required equipment and have it readily

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available. Routine loads, such as casks, will have integral hoisting rings, yokes, bails, or eyes and the hook of the hoist can be attached directly to the load. The weight and center of gravity is known for routine loads.

- (d) Suspend the hoist from the trolley or appropriate hoist hanger.
- (e) Make the required inspection of the hoist and associated tackle.

### 4.2 Lifting Operation

- (a) Move the hoist directly over the load, or move the load directly under the hoist -- whichever is appropriate.
- (b) Run out the chain until the hook is in position to pick up the load.
- (c) Attach the hook to the lifting ring (or other appropriate device), close the safety latch, and run up the chain until it is just tight. Check all connections and rigging for security and proper alignment. Attach tag line(s) if required.
- (d) Lift the load only about an inch and make a final check of the rigging. Make sure that the load brake will hold.
- (e) Lift the load only as high as is necessary. Run the trolley along the monorail as required and have an assistant (if needed) guide the load with a tag line or other means of remote control.
- (f) Raise or lower the load to near the level of the location where it is to be placed. Center the load over the location and lower it slowly until it is resting firmly and securely with no danger of toppling.
- (g) Secure the load (if necessary) in the new location and remove the hook and other rigging.
- (i) Return the hoist to its stand-by area. Check and store the tackle.

### 4.3 Personnel Requirements

The operation of the hoist is usually a one-person operation. Only qualified operators may use the hoist. Qualification is based upon the Crane and Hoist Safety Manual and it is certified

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by the manager responsible for Shielded Analytical Laboratory (SAL).

### 4.4 Equipment and Materials

- (a) Chain Hoist; hand-pulled chain driven.
- (b) Tackle; chokers, slings, and tag lines. This equipment must meet the requirements of and be maintained in accordance with the Crane and Hoist Safety Manual.

### 4.5 Protective Equipment

- (A) Gloves; canvas or leather.
- (b) Safety Glasses.
- (c) Safety Shoes (recommended).
- (d) Radiological Safety Equipment and Instruments as required by the Zone.

### 4.6 Job Hazards

- (a) Cuts and abrasions from sharp wire ends on chokers and slings.
- (b) Pinches and crushed body parts from handling mechanical and other heavy equipment. Pinched fingers can occur when handling the tackle and crushed body parts can occur from being under a heavy load that falls or from being caught between a heavy load and a solid object such as a wall.
- (c) Injury or damage of equipment and facilities from using defective equipment. The principal hazard created by defective equipment is the dropping of a heavy object.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-ALO-707, (Replaces 5-30.8), REMOVAL AND REPLACEMENT OF WALL PLUGS

### 1.0 APPLICABILITY

This procedure provides instructions for removing and replacing wall plugs. It is not applicable for the removal of the 3.5-in. diameter plug used in connection with the 1-ton lab cask. The most common type of plug involved is the service plug, which is used to provide temporary or permanent services to the cells such as gas lines, water lines, and instrument control cables. Occasionally a service plug must be removed from the wall during the installation of a service line. In addition, there may be a need to interchange plugs from time-to-time.

### 2.0 DEFINITIONS

None

### 3.0 RESPONSIBLE STAFF

Analyst

### 4.0 PROCEDURE

#### 4.1 Preparation

- (a) Collect the required equipment and materials and have them ready for use.
- (b) Arrange for Occupational Health Physics (OHP) services and other assistance if needed.
- (c) Paper the wall around the plug(s) to be removed, papering down to the floor and across the floor for several feet.
- (d) Put on the required protective clothing.
- (e) Establish the front operating area (Room 201) as a temporary radiation zone requiring protective clothing if the plug(s) is to be removed from the front side (face) of the cells.

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### 4.2 Removing, Storing and Replacing Plugs

(a) Place the plug rack on the back end of the hoist table and back the hoist table to the wall directly under the plug to be removed.

The end of the table on which the plug rack is placed should be under the plug.

(b) Attach the power cord to an electrical outlet and elevate the table until the rack is at the bottom of the plug.

(c) Cut off a sheet of plastic large enough to wrap the plug and drape it over the rack, letting a foot or more hang over the end of the table facing the wall.

The sheet should be large enough to completely cover the rack and the end of the table.

(d) If the plug is a front-face plug, release the locking ring by backing out the cap screw in the slot at the bottom of the plug.

(e) Attach the T-handle to the plug. Pull the plug a few inches out of the wall and survey. Wipe as necessary with wet wipes to remove loose contamination.

If the plug is too high to reach comfortably, either use a ladder to reach the plug or sit straddling the table ahead of the rack.

(f) Slowly withdraw the plug, surveying and wiping off loose contamination as it emerges.

When the plug has been completely withdrawn it should be resting on the rack.

(g) Immediately take a radiation exposure reading at the opening of the plug-port and provide radiation shielding or warning if necessary.

OHP takes the reading.

(h) Clean the plug and the inside of the plug-port with wipes wet with dilute  $\text{HNO}_3$ , water, and methanol in that order.

It may be necessary to scrub the plug and port with scouring powder and steel wool. Reasonable limits for contamination

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are less than 1000 and 2000 cpm smearable on the plug and in the port respectively.

- (i) Apply a light film of oil to the plug and port surfaces.
- (j) Continue at Step (L) if the plug is to be replaced in the wall. Follow Step (k) if the plug is to be stored.

The actions taken after a plug is pulled, cleaned, and oiled depend upon the purposes for which it was removed. The more common purposes are 1) cleaning and oiling to avoid excessive corrosion, 2) inserting service lines, and 3) changing its position in the wall.

- (k) Do the following if the plug is to be stored for a period of time:

1. Wrap the plug in the plastic sheet and secure the sheet with tape. Cover the plug-port and place a radiation zone sign on the cover.
2. Pull the hoist table a few inches away from the cell wall and lower the table to its lowest position.
3. Survey the table and wrapped plug and take appropriate actions to secure or remove contamination if found.
4. Pull the hoist table to the area in which the plug is to be stored.
5. Lift the rack holding the plug off of the table and place it in the storage location.

This is a two-man operation.

If the rack is required for further use, raise the end of the plug with the T-handle and raise the same end of the rack until the plug slides off the rack. Remove the rack and lower the plug so that it is resting length wise. Secure the plug with blocks or wedges on both sides to prevent rolling.

6. Continue at Step(s).

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- (1) Push the plug back into the plug-port until the "step" is contacted.  
The movement of the plug will stop when contact is made with the "step".
- (m) Lower the hoist table until the rack clears the plug and then lay a bar across the end of the rack nearest the wall.
- (n) Raise the table until the bar lifts the plug against the top of the plug-port.  
The bar serves as a fulcrum.
- (o) Press down and up on the T-handle while pushing inward on the plug and repeat until the plug passes the "step".
- (p) Continue pushing inward on the plug until it is in place.
- (q) Relock the locking ring (front-face plugs only). Remove the T-handle and fold up and discard the plastic sheet.
- (r) Lower the hoist table to its lowest position.
- (s) Survey the equipment and work area and clean if necessary. Return the equipment to storage.
- (t) Remove the paper from the wall and floor, rolling inward. Discard into a radioactive waste carton.
- (u) Make a final survey of work area and personnel. Take appropriate action if any contamination is found.

### 4.3 Personnel Requirements

This operation can be done by one operator. OHP services are required to evaluate the radiological conditions, particularly when a plug is removed and until any contamination on the plug or in the plug-port has been removed or fixed.

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## PNL TECHNICAL PROCEDURE

### 4.4 Equipment and Materials

- (a) Absorbent Wipes; swabs and rags.
- (b) Bar; steel or aluminum, >0.5-in. diam, 1-ft long.
- (c) Hydraulic Hoist Table (Scissor).
- (d) Ladder; 6-or 8-ft.
- (e) Oil; machine or automotive.
- (f) Paper; brown Kraft or equivalent, 30-or 36-in. wide.
- (g) Plastic Bags; 12-in. by 15-in. or 19-in. by 21-in.
- (h) Plastic Sheet.
- (i) Plug Rack.
- (j) Radioactive Waste Container.
- (k) Scouring Powder.
- (l) Steel Wool.
- (m) Tape; 1.5-in. masking and 1-in. plastic.
- (n) Tongs; 20-in.
- (o) T-Handle.
- (p) Wash Bottles; one each with dilute HNO<sub>3</sub>, water, and methanol.

### 4.5 Protective Equipment

- (a) Coveralls (2 pairs).
- (b) Gloves; surgeon and leather, canvas, or heavy rubber.
- (c) Assault Mask, Cap and Hood.
- (d) Safety Shoes (recommended).
- (e) Shoe Covers or Rubbers.

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### (f) Survey Instruments.

#### 4.6 Job Hazards

- (a) Contamination spread when pulling a plug from the cell wall.
- (b) Radiation exposure through a plug-port.
- (c) Falls from a ladder or the hoist table.
- (d) Pinches, bruises, and strains from handling heavy plugs and other equipment.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-ALO-708, (Replaces 5-30.9) CELL TRANSFER SORTING CELL AND STORAGE CELL

### 1.0 APPLICABILITY

This procedure provides instruction and requirements for transferring radioactive samples into and out of the sorting and storage cells. The amount of radiation encountered will vary with the sample and thus, samples may be received or transferred in different types and size of containers, varying from a 1-dram "peanut" vial to a 2700-lb cask. The size, weight, construction, and contents of a container must be known to determine the means of handling and the outside of each container must be free of smearable contamination.

### 2.0 DEFINITIONS

### 3.0 RESPONSIBLE STAFF

Analyst

### 4.0 PROCEDURE

#### 4.1 General Requirements

- (a) Use crane, mechanical aids, or other assistance when lifting or moving heavy transfer containers.
- (b) The samples must be free of smearable contamination, except for traces of beta-gamma contamination, before transfer into the cells. If any alpha contamination or more than a trace of beta-gamma contamination is present, the samples must go into the Shielded Analytical Laboratory (SAL) cells for preliminary preparation. With the concurrence and assistance of the Occupational Health Physics (OHP) the container may be opened to determine conditions. Care must be taken while the container is being opened to prevent unacceptable radiation exposure and release of contamination.

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## PNL TECHNICAL PROCEDURE

### 4.2 Preparation

- (a) Check the Radioactive Shipment Report and the packaging information accompanying the shipment for conditions and warnings. If unusual packaging conditions are indicated, seek help from someone familiar with the package.
- (b) Collect the required materials and equipment and have them ready for use.
- (c) Put on the indicated protective clothing.
- (d) Contact OHP for assistance.
- (e) If the samples are going into the sorting cell, smear the cell work tray and manipulator tongs with dry swabs and survey for smearable contamination. Remove any smearable contamination.
- (f) Place clean white paper on the work area of the cell tray and bring in clean forceps and other tools needed.

### 4.3 Transfer Into the Sorting Cell or Storage Cell From 2400 or 2700-1b Cask

- (a) Set the 4000-1b capacity hoist table to its lowest elevation, and with the 3-ton air hoist place the cask on the table. Center the cask laterally with the gate-end of the cask facing the side of the table nearest the fixed wheels and with the gate-end projecting about 2-3 in. over the edge of the table. Be sure that the cask will not roll or move when the table is moved.
- (b) Roll the table and cask into Room 203.
- (c) Relocate radioactive material in the cell such that it is as far from the 6 in. diameter entry port at the left front of the cell as possible without being in direct line of the opening. Then remove the plug and set it aside.
- (d) With the table near the cell and the cask facing the open port, elevate the table until the cask opening is aligned with the port.

Attach a plastic bag between the cask face and the cell wall. Push the table toward the cell placing the cask face as close to the cell face as possible.

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(e) Attach the T-handle to the cask scoop, open the cask endgate, release the scoop retainer and push the scoop into the cell until its position permits the removal of the samples.

1. Holding a clean swab in the manipulator, smear the scoop and contents. Retract the scoop and pass the swab out through the cell door into a plastic bag for the OHP monitor to check for smearable contamination. If any alpha or significant beta-gamma contamination is found, transfer the samples into the SAL cells.
2. If no alpha or little beta-gamma is noted, push the scoop back into the cell and remove the samples with the manipulator and place them in a location away from the open port and out of direct line with the opening.

(f) Withdraw the scoop into the cask, close the endgate, fasten the scoop retainer, remove the T-handle and back the table way from the cell wall.

(g) Replace the plug in the cell port and check for contamination by smears of the cell wall, the floor, and the cask. Remove any smearable contamination.

(h) Return the hoist table to its lowest elevation, roll it into Room 200, and remove the cask to a pallet for storage or to a truck for shipment as required.

4.4 Transferring Into or Out of the Sorting Cell or the Storage Cell by Other Means -- With or Without Shielding

(a) These cells must remain free from contamination and they must be routinely checked, and cleaned if necessary, to maintain this condition.

Check exposure with a Cutie Pie (CP) (or Geiger Mueller [GM]) and check for contamination by taking smears. Primary hazards are body strain from pulling open the heavy door and pinched or crushed fingers and hands by the door when it swings open or slams shut.

NOTE: When closing the cell door, hold onto the external handle of the door and prevent it from slamming hard and catching the latch. It can easily break its own latch off if it slams hard.

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- (b) When transferring any material in or out of a cell when a high radiation reading exists inside, OHP assistance must be requested and every effort must be made to follow ALARA policy. Check for contamination as in Step (a).
- (c) Using a 20, 75 or 90-lb pig for sample transfer.
  - 1. Set the pig inside the cell (get help to lift it if needed) following Step (a) or (b). Close the cell door and load or unload the pig remotely.  
Then reopen the door, remove the pig, and survey.
  - 2. With OHP agreement, the pig may be opened outside of the open cell door and sample containers transferred with a tong.

### 4.5 Personnel Requirements

Usually one person can handle this task with the service of OHP. If a difficult or hazardous situation develops, other operating personnel must be called for assistance, or assistance must be sought from someone familiar with a particular shipment or shipping container.

### 4.6 Equipment and Materials

(The items used from this list of equipment and materials for a transfer will depend on the conditions encountered for that particular operation.)

- (a) Pallets and pallet truck.
- (b) 4000-lb capacity hoist table.
- (c) Laboratory carts and dolly for pigs.
- (d) Absorbent wipes, paper towels, blotter paper, diaper paper, brown Kraft or "butcher" paper.
- (e) Forceps and tongs.
- (f) Various sized plastic bags.
- (g) Receptacle for low-level radioactive waste.
- (h) Shears.

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- (i) Tape-masking and cloth back.
- (j) Methanol.
- (k) Ice cream cartons, tin cans, sample vials, counting vials.

### 4.7 Protective Equipment

- (a) Gloves; surgeon, canvas, cotton.
- (b) Lab Coats or Coveralls.
- (c) Safety Glasses.
- (d) Safety Shoes (recommended).
- (e) Shoe Covers (preferred) or Rubbers.
- (f) Survey instruments.

### 4.8 Job Hazards

- (a) Use of crane.
- (b) Use of hoist table.
- (c) General hazards of handling heavy items, mechanical equipment, and radioactive material.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-ALO-709, (Replaces 5-30.10), RECEIPT/SHIPMENT OF CASKS

### 1.0 APPLICABILITY

This procedure provides instructions and requirements for the receipt or shipment of casks which range in size from a 20 lb shielded sample carrier to a 3400 lb sodium sample transfer cask.

### 2.0 DEFINITIONS

None

### 3.0 RESPONSIBLE STAFF

Analyst

### 4.0 PROCEDURE

#### 4.1 General Requirements

- (a) All radioactive material (RAM) shipments must be contained in approved shipping containers.
- (b) Casks must be externally free of smearable contamination on receipt or prior to shipment.
- (c) With the exception of intra-building shipments all RAM shipments must be accompanied by either an Offsite or Onsite Radioactive Shipment Record. In cases where special nuclear materials are involved, either a Shipping and Receiving Report or an Internal Transaction Report must accompany the shipment as well as a Transfer Authorization Form.

#### 4.2 Shipment of Casks

- (a) Coordinate the shipment schedule with the receiver.
- (b) Make out the appropriate paperwork to accompany the shipment.

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(c) Contact Transportation and arrange for a driver. In cases where special nuclear materials are involved the driver must have a "Q" level security clearance.

(d) When the truck arrives, obtain the services of a Radiation Protection Technologist (RPT).

**CAUTION: DO NOT ALLOW BOTH SETS OF AIRLOCK DOORS TO BE OPEN AT THE SAME TIME!**

(e) Transfer the cask into the double-door airlock in Room 200.

(f) Close the inner airlock doors.

(g) Open the outer doors of the airlock and transfer the cask out onto the parked truck.

(h) Return the hoist to Room 200 by placing it into the airlock, closing the outer doors and then opening the inner doors allowing access.

(i) Make certain the driver secures the cask in accordance with applicable tie-down procedures.

(j) Notify the receiver that the shipment is underway. If the shipment contains Type B radioactive material (RAM) or special nuclear material (SNM), write the name, date, and time of notification on the Offsite Receiving/Shipping Report (ORSR).

(k) If special nuclear material is being shipped, notify Safeguards that it has been sent and give them the estimated time of arrival at the destination and transfer authorization form number.

### 4.3 Receipt of Casks

(a) Upon arrival of shipment, notify OHP. A RPT must survey the incoming shipment before unloading.

(b) If SNM is involved, notify Safeguards of the time of receipt.

(c) If the appropriate paperwork does not accompany the shipment or if the shipping container does not meet standards --- do not accept the shipment. Have it returned to point of origin.

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CAUTION: DO NOT ALLOW BOTH SETS OF AIRLOCK DOORS TO BE OPEN AT THE SAME TIME!

- (d) Move the hoist into the airlock.
- (e) Close the inner airlock doors.
- (f) Open the outer airlock doors and retrieve the cask into the airlock.
- (f) Close the outer airlock doors, open the inner doors allowing access to Room 200.

### 4.4 Personnel Requirements

Usually one person can handle this task with the service of OHP. If a difficult or hazardous situation develops, other operating personnel must be called for assistance or assistance must be sought from someone familiar with a particular shipment and shipping container.

### 4.5 Equipment and Materials

- (a) 3-Ton Ingersol Rand air drive hoist.
- (b) Laboratory carts and dolly for pigs.
- (c) Absorbent wipes for taking smears.
- (d) Radiation detection instrumentation.

### 4.6 Protective Equipment

- (a) Gloves; surgeon, canvas, cotton.
- (b) Lab Coats or Coveralls (white).
- (c) Safety Glasses.
- (d) Safety Shoes (recommended).
- (e) Shoe Covers (preferred) or rubbers.
- (f) Survey Instruments.

### 4.7 Job Hazards

- (a) Use of crane.

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(b) General hazards of handling heavy items, mechanical equipment and radioactive material.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-ALO-710, (Replaces 5-30.11), LARGE CASK LOADING/UNLOADING

### 1.0 APPLICABILITY

This procedure provides instruction and requirements for the loading/unloading of the following five types of large casks via plug ports located on the rear face: 1) the intermediate level transfer cask, 2) the sodium sample transfer cask, 3) the PRTR graphite cask 4) the 1 ton lab and dry storage cask and 5) the 325B waste cask.

### 2.0 DEFINITIONS

None

### 3.0 RESPONSIBLE STAFF

Analyst

### 4.0 PROCEDURE

#### 4.1 General Requirements

- (a) Use crane, mechanical aids or other assistance when lifting or moving heavy transfer containers.
- (b) The exterior surfaces of all casks must be free of smearable contamination at all times.
- (c) If incoming fissile materials are involved, don't unload the cask without first checking to see whether the new material will pose a criticality safety problem. The upper limit of all six cells collectively is 230 grams (element weight).

#### 4.2 Preparation

- (a) Paper the wall and floor area below the wall plug port.
- (b) When unloading cask, always check the Radioactive Shipment Report and any packaging information accompanying the

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shipment for conditions and warnings. If unusual packaging conditions are indicated, seek help with someone familiar with the shipment.

- (c) Collect the required materials and equipment and have them ready for use.
- (d) Put on the indicated protective clothing.
- (e) Contact Occupational Health Physics (OHP) for assistance.

### 4.3 Loading/Unloading of Casks

- (a) With the exceptions of the sodium sample transfer cask and the 325B waste cask, all casks are normally loaded/unloaded through the 3-1/2" port on the rear face of cell three. The other two must be loaded/unloaded through the 7 in. port of on the rear face of cell one.
- (b) Cask loading and unloading procedures are one in the same.
- (c) Relocate any radioactive material in the cell such that it is as far from the entry port as possible without being in direct line of the cell opening.
- (d) Set the 4000-lb capacity hoist table to its lowest elevation, and with the 3-ton air hoist place the cask on the table. Center the cask laterally with the gate-end of the cask facing the side of the table nearest the fixed wheels and with the gate-end projecting about 2-3 in. over the edge of the table. Be sure the cask will not roll or move when the table is moved. The waste cask has a special cradle which must be secured to the table before placing the cask on it.
- (e) Move the 3-ton hoist on the trolley so that it is parallel with the wall port.
- (f) Using methanol wetted absorbent swabs, pull the 3-1/2" plug from the wall slowly wiping it down as it is withdrawn. Stand it upright, bagged, on end on a clean paper towel in an out of the way position. In the case of the sodium cask, pull the 7 in. plug behind cell one in accordance with procedure PNL-ALO-707.
- (g) If present, removed any plastic covering on the cask end gate.

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- (h) With the table near the cell and the cask facing the open port, elevate the table until the cask is slightly below the port. Attach a bag between the cell wall and cask face. Using the 3 ton hoist align the end gate with the port and push the table as close to the cell wall as possible.
- (i) Attach the T-handle to the cask scoop, open the cask end gate, release the scoop retainer and push the scoop into the cell until its position permits the removal of or loading of samples. If samples are removed, move them away from the port opening.
- (j) Withdraw the scoop into the cask, close the end gate, fasten the scoop retainer, remove the T-handle and lower the cask back onto the table.
- (k) Back the table away from the cell wall about 1 ft and decontaminate the cell wall and cask face.
- (l) Using long tongs and methanol wetted swabs, swab out the port and dispose of the swabs in cell.
- (m) Replace the plug in the cell port and again check for contamination by smears of the cell wall, the floor and the cask. Remove any contamination found.
- (n) Return the hoist table to its lowest elevation. Replastic the end gate after surveying. Using the hoist, set the cask on the floor of Room 200.
- (o) Return the hoist to its storage position.

### 4.4 Personnel Requirements

Usually one person can handle this task with the service of OHP. If a difficult or hazardous situation develops, other operating personnel must be called for assistance, or assistance must be sought from someone familiar with a particular shipment or shipping container.

### 4.5 Equipment and Materials

- (a) 3-ton air driven hoist.
- (b) 4000-lb capacity hoist table.
- (c) Absorbent wipes, brown Kraft or "butcher" paper.
- (d) Scissors.

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- (e) Tape masking and cloth back.
- (f) Methanol.
- (g) Plastic bags, 12 in. x 16 in.
- (h) Plastic Sheet.

### 4.5 Protective Equipment

- (a) Gloves; surgeon, canvas, cotton.
- (b) Lab Coats or Coveralls (white).
- (c) Safety Glasses.
- (d) Safety Shoes (recommended).
- (e) Shoe Covers (preferred) or rubbers.
- (f) Survey Instruments.

### 4.6 Job Hazards

- (a) Use of crane.
- (b) Use of hoist table and/or hydraulic scissor lift table.
- (c) General hazards of handling heavy items, mechanical equipment, and radioactive materials.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-ALO-711, (Replaces 5-30.12), OPERATION OF THE RADIOACTIVE LIQUID WASTE SYSTEM (RLWS)

### 1.0 APPLICABILITY

This procedure provides instructions and requirements for introducing radioactive liquid wastes into the RLWS. The liquid effluent from the six hot cells drain into Tank #1 in Room 32. Room 32 is located in the basement directly below the hot cell facility and houses both Tank #1 and the six filter banks, one for each cell. The cells are equipped with a continuous drain trough that traverses all six cells. There are three exit points in the trough, between cells 1 and 2, cells 3 and 4 and cells 5 and 6. All three exit lines converge into a common line that drains into the tank. In addition to the cell drain, there are two other drains that empty into Tank #1. They are the sink in Room 200 and the cup sink in Hood #1 Room 201.

### 2.0 DEFINITIONS

WM&EC            Waste Management and Environmental Compliance  
PM                Preventative Maintenance  
WHC              Westinghouse Hanford Company

### 3.0 RESPONSIBLE STAFF

All staff assigned to the 325B Hot Cell Facility

### 4.0 PROCEDURE

#### 4.1 General Requirements for the Usage of the RLWS

Consult the latest revision to WM&EC's Procedure R1-6 GENERAL RADIOACTIVE LIQUID WASTE SYSTEM PROCEDURES. This document is subject to change frequently.

#### 4.2 PROCEDURE FOR WASTE DISPOSAL THROUGH RLWS SINKS AND HOT CELLS LOCATED IN THE SHIELDED ANALYTICAL LABORATORY

\* Insure that the chemical composition of the waste is known either by analytical results or process knowledge.

Author	Date	Project Mgr.	Date	QAD Representative	Date
RT Steele	8/28/90	N/A		GK Gerke	8/28/90
Technical Reviewer	Date	Line Mgr.	Date	Other	Date
WC Weimer	8/29/90	HH Van Tuyl	8/28/90	All original signatures on file	
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- \* If no approval number is in place for this waste type then obtain one through PNL WM&EC before starting the waste processing.
- \* Adjust the pH of the waste to within the acceptable range as defined by the Approval Document issued by WHC.
- \* Filter the waste to remove all precipitate or solid matter and dispose of the solids in the appropriate container for dry solid waste.
- \* Dispose of the waste and record in the Laboratory Record Book per instructions given in WM&EC's R1-6.

### 4.3 OPERATION OF TANK #1 ROOM 32

#### 4.31 TANK CONTROLS

The control panel for Tank #1 in Room 32 is located in the operating gallery for the hot cells, i.e., Room 201. The panel is under the large window on the east wall. The panel consists of a single three-position control knob, two light indicators, a small speaker, and a push button control to disable the audible alarm. The knob positions are:

- 1) **HAND** In this position the tank is jettison manually.
- 2) **OFF** In this position the jet is disabled. The conductivity probes will not jettison the tank at the proper time. However, the high level alarm (activated by the uppermost conductivity probe) is still functional.
- 3) **AUTO** In this position the tank will automatically jettison when the middle conductivity probe is contacted by the liquid in the tank. The jettison action will stop when the lower conductivity probe is above the liquid level in the tank. This occurs when there is 4 inches of liquid left in the tank.

The two indicator lights are as follows:

- 1) **GREEN LIGHT** This signifies that the jet is operating.
- 2) **RED LIGHT** Signifies that the liquid in the tank is above the conductivity probe that would automatically jettison the tank if it were working (i.e., the middle probe). There are two probable causes for this condition:

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- 1) The control knob is in the off position, and
- 2) The relays associated with the conductivity probes are malfunctioning. There is an audible alarm associated with this light. The black push button located beside the light disables it.

### 4.32 PROCEDURE TO AUTOMATICALLY OR MANUALLY JET THE TANK

The tank is always operated in the automatic mode thereby reducing the risk of an overflow condition. There are times, however, when requests are made to manually jettison the tank because the contents fall under a 90-day holding clock. If the control panel green indicator light comes on, or to manually jet the tank, do the following:

- \* If the green indicator light is on turn the control knob to the OFF position.
- \* Notify the building Health Physics personnel and request their assistance. They are to monitor the RLWS line in the basement when the tank is jettisoned.
- \* Notify the Building Manager. There is a potential that the building Retention Process Sewer stream may be diverted into the RLWS when the tank jettisons. The Building Manager may need to disable the divert station while the tank is emptying. The Victoreen monitor located in Room 201 displays the dose rate 1 foot from tank in Room 32. This is a good indicator of whether a divert may occur or not. A reading of 1 R/hr or more may cause a divert.
- \* Notify the Building Power Operator.
- \* Notify the building occupants in the basement whose labs and offices the RLWS line travels through. If you cannot find them, leave a note on their door informing them of the potential for high dose rates while the tank is emptied.
- \* Notify the 340 Building personnel (WHC) and obtain permission to dump the tank.
- \* Jettison the tank by turning the control knob in Room 201 to the HAND position and note the time. Forty-five minutes of jetting time should be sufficient to empty the tank regardless of the level inside.
- \* After jettisoning, return the control knob to the AUTO position and notify all interested parties.

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- \* Document the event in the RLWS Laboratory Record Book.

### 4.33 PROCEDURE FOR PREVENTIVE MAINTENANCE CHECKS OF CONDUCTIVITY PROBES

This test will require the assistance of a Radiation Protection Technologist, an electrician, a pipefitter, and a staff member from Operations. The PM will fall under the jurisdiction of the electricians and the frequency of the test shall be determined by them for reliable operation of the probes.

- \* Acquire the services of a Radiation Protection Technologist.
- \* Notify the Building Manager of the test.
- \* Notify the Building Power Operator.
- \* Notify the building occupants whose labs and offices the RLWS line passes.
- \* Coordinate the test with the 340 Building personnel.
- \* Station a pipefitter at the inlet valve for the jet water. Make sure that it is understood that at the first sign of an overflow the jet water is to be valved out. The pipefitter shall be in radio contact with personnel in the hot cell operations gallery during the test.
- \* Deliberately introduce water into the tank via the hot cell drain system or the tank flush line.
- \* When the tank jet light comes on disable the jetting action by turning the control knob to the OFF position. Continue to fill the tank until the high level alarm actuates.
- \* Immediately turn the control knob back to the AUTO position and stop all inlet water to the tank. (DO NOT CONFUSE THE TANK INLET WATER WITH THE JET INLET WATER)
- \* Make certain that the tank empties and that the GREEN jettison light goes out on the control panel in Room 201.
- \* Notify all interested parties of the completion of this test.
- \* Document the test in the RLWS Laboratory Record Book, including the time required for jetting.

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## PNL TECHNICAL PROCEDURE

### 4.34 EMERGENCY PROCEDURES

There are two potential problem areas to be addressed here. A high-level alarm condition and a tank overflow.

- \* There are two high-level alarm indicators (i.e., red lights) associated with Tank #1 in Room 32:
  - 1) on the control panel in Room 201 and
  - 2) on the Power Operators indicator board located in his office.

If either of these conditions occur then take the following actions:

- \* Check the control knob position in Room 201 to see if it has been inadvertently left in the OFF setting. If so, turn to the AUTO position allowing the tank to empty. Be sure to make the proper notifications when time allows.
- \* Locate the source of the effluent filling the tank and eliminate it.
- \* If the control knob is in the AUTO position and/or the source of the effluent filling the tank is unknown, then have the Power Operator immediately valve out all water services to the hot cells including the inlet water to the jet on the tank.
- \* The tank in Room 32 should be checked for overflow on an hourly basis until the problem is resolved.
- \* In the event of an overflow condition during off shift hours the following steps by the Building Power Operator will minimize the spill:
  - (1) Notify 375-2400 "Emergency number for reporting purposes" of the spill.
  - (2) Obtain Radiation Protection Technologist coverage.
  - (3) Check the pressure drop across the filter housing in the inlet water line to the jet. (This is located outside of Room 32.) If the pressure drop is outside the allowable range then turn off the inlet water to the jet immediately. If the pressure drop is within the acceptable range THEN

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## PNL TECHNICAL PROCEDURE

(4) Turn the control knob in Room 201 to the HAND position.

The emergency procedure for an overflow condition happening during normal work hours is the same as above except that the appropriate contacts shall be made to jet the water out of the building, i.e., when time allows.

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## PNL TECHNICAL PROCEDURE

TITLE: PNL-ALO-713, (Replaces 7-40.9), LABORATORY PROCEDURE FOR THE PHYSICAL CHARACTERIZATION OF FLUIDS

### 1.0 APPLICABILITY

This procedure will be used to measure the following fluid properties:

- Density.
- Weight percent total solids.
- Weight percent dissolved solids.
- Weight percent suspended solids.

It is assumed that all samples are representative and homogeneous.

### 2.0 DEFINITIONS

None.

### 3.0 RESPONSIBLE STAFF

Cognizant Scientist.

Analyst.

### 4.0 PROCEDURE

#### 4.1 Equipment and Materials

- Balance, analytical  $\pm 2$  mg accuracy.
- Beakers, polypropylene; 30 ml.
- Crucible, ceramic; 30 ml.
- Desiccator.
- Filter paper, 0.45 micron.
- Flask, filtration 250 ml.

Author	Date	Project Mgr.	Date	QAD Representative	Date
RT Steele	6/15/89	N/A		LJ Ethridge	6/15/89
Technical Reviewer	Date	Line Mgr.	Date	Other	Date
N/A		WC Weimer	6/15/89	All original signatures on file	
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- Funnel, Buchner or similar.
- Graduated cylinder, plastic, 50, 100 or 250 ml  $\pm$  1 ml capacity.
- Oven, capable of 1000°C.

### 4.2 Procedure for Density

Density is determined using a plastic cylinder. Plastic is favored because surface interaction between the sample and the cylinder is minimized; slurry adheres less to plastic than it does to glass, and the meniscus is considerably reduced. The cylinder size shall be 50, 100 or 250 ml in size. The cylinder shall be the largest of the previously mentioned sizes that is appropriate for use with the available sample volume.

- Step 1) Place the graduated cylinder on a calibrated scale and adjust the tare to zero.
- Step 2) Carefully pour the sample into the cylinder so as to minimize air entrainment in the sample. Air bubbles in the sample will affect the accuracy of the density measurement.
- Step 3) Return the cylinder to the scale and record the weight and volume of the sample and identify the balance used. The density is a simple ratio of mass over volume (grams/milliliter).

The accuracy of the scale used in this determination must be  $\pm 0.2$  gram. The accuracy of the graduated cylinder used in this determination must be  $\pm 1$  ml. The accuracy of the reported data will normally be  $\pm 0.2$  g/ml.

### 4.3 Procedure for Weight Percent Total Solids Determination

Total solids content is determined by oven drying an aliquot of slurry at  $105 \pm 5^\circ\text{C}$  for a period of 48 hours. Knowing the weight of the container, the initial weight of the slurry and the combined weight of the dry slurry and container, the weight percent total solids can be calculated. To obtain total solids data on slurries or solutions do the following:

- Step 1) Weigh a 30 ml polypropylene beaker or ceramic crucible and record this value as "Crucible Weight" or "CW".

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Step 2) Pour approximately 25 ml of sample fluid into the container and weigh it. Record this combined weight as "Initial Weight" or "IW".

Step 3) Dry the container of fluid for 48 hours or to constant weight, whichever is longer, at a temperature of  $105 \pm 5^{\circ}\text{C}$ . After it has been dried, place the hot sample in a desiccator until it reaches room temperature. Weigh the sample and container and record the value as "Gross Dry Weight" or "DW".

Step 4) The weight percent total solids value is calculated by inserting the above values into the following equation:

$$\text{wt\% total solids or "TS"} = [(DW-CW)/(IW-CW)]100$$

Balances used in this determination must have an accuracy of  $\pm 2$  mg. Data will normally be reported with an accuracy of  $\pm 0.01$  wt%.

### 4.4 Weight Percent Dissolved Solids Determination

Dissolved solids content is determined by a filtration method. The final calculation for dissolved solids content cannot be carried out until total solids content data is available. Therefore, do the total solids determination first. For the dissolved solids data and suspended solids data to be valid, it is essential that the material used for the total solids and dissolved solids determinations are representative subsamples of the same sample. To obtain dissolved solids data, the following steps must be carried out:

Step 1) Weigh a small volume (15-30 ml) polypropylene beaker and record the weight as "Beaker Tare" or "BT".

Step 2) Vacuum filter, using a Buchner funnel or similar, 15-20 ml of fluid through a membrane filter of 0.45 micron pore size and collect the filtrate in the tared beaker. Weigh the filtrate and beaker and record this as "Filtrate Weight" or "FW".

Step 3) Dry the filtrate in the beaker at  $105 \pm 5^{\circ}\text{C}$  for >24 hours or until the sample reaches a constant weight, whichever is longer. Place the hot sample in a desiccator until it reaches room temperature. Weigh the dry filtrate and beaker and record this as "Filtrate Dry Weight" or "FD".

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Step 4) From the above data, calculate the weight of dissolved solids in the filtrate using the following equation:

$$\text{dissolved-filtrate solids or "FS" = (FD-BT)}$$

Step 5) Using the above value and the total solids data, the weight percent dissolved solids can be calculated using the following equation:

$$\text{wt% dissolved solids content or "DS" = } \frac{[(FD-BT)(100-TS)]}{(FW-FD)}$$

The balances used in this determination must have an accuracy of  $\pm 2$  mg. The data is normally reported with an accuracy of  $\pm 0.01$  wt%.

### 4.5 Weight Percent Suspended Solids Determination

The suspended solids content determination is a simple subtraction that is carried out using the dissolved solids data and the total solids data in the following equation:

$$\% \text{ suspended solids content or "SS" = TS-DS.}$$

The data usually reported with an accuracy of  $\pm 0.01$  wt%.

### 4.6 Records

Records will be maintained and controlled so as to conform with the requirements of MCS-033. Laboratory Record Books and Analytical Report forms provide a mechanism for control of most records. ~~Laboratory Report Book will be used in accordance with the Act Now Directive #89-1 of Management Guide 4.3.~~

### 4.7 Procedure Qualification

This procedure is based on standard, well understood laboratory methods. It is considered qualified through the Independent Technical Review of the Technical Procedure.

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