SANDIA NATIONAL LABORATORIES
NEW MEXICO

WASTE MANAGEMENT AND POLLUTION PREVENTION DEPARTMENT

RADIOACTIVE WASTE/MATERIAL FACILITIES

OPERATION OF MACROENCAPSULATION UNIT

Replaces: LOP 02-02, Rev 03, dated 05/20/08, archived on 05/03/2010

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RF 2042-DPJ Pre-Job Briefing Remarks
RF 2042-PSR Pre-Start Work Review
RF 2042-RTF RMWMF Treatment Form

1.0 PURPOSE, SCOPE AND OWNERSHIP

1.1 Purpose

This SNL/NM Laboratory Operating Procedure (LOP) describes the operation of Ultratech macroencapsulation units used to macroencapsulate mixed waste at the Radioactive and Mixed Waste Management Facility (RMWMF) at SNL/NM.

1.2 Scope

Most of the waste to be macroencapsulated is expected to be mixed waste hazardous debris assigned EPA hazardous waste codes for toxicity characteristic metals (D004 through D011), radioactive elemental lead solids, and mixed waste non-debris items such as spark gap tubes and radiological sources that are included in a treatment variance granted by the New Mexico Environment Department (NMED) on June 3, 2004. Radioactive cadmium-, mercury-, and silver-containing batteries may also be macroencapsulated in accordance with this procedure.

This LOP applies to all personnel who use or supervise others who use the macro units.

This procedure will be implemented only in Buildings 6920 and 6921 where macroencapsulation can be done at the RMWMF.

Documents that must be used in conjunction with this LOP include:

- FOP 09-11, *Open Container Operations*
- Preliminary Hazard Screening (PHS) for open container operations
- Attachment 1, *Macro Sealing Procedure To be used with MSE Brand Encapsulation Control Units, August 18, 2008*
- A task-specific work plan addressing the macroencapsulation of the waste stream

1.3 Ownership

The Department Manager and the author are responsible for the structure and content of this procedure. Recommendations for improvement and comments regarding the modification of this procedure should be forwarded to the Department Manager or the author.

1.4 Review Frequency

This procedure shall be reviewed at least every two years and revised in accordance with AOP 94-12, *Technical Work Document Processing System*.

2.0 RESPONSIBILITIES

2.1 Open Container Project Leader

The Open Container Project Leader shall ensure that:

- A PHS, RWP, and HA are approved for open container operations.
- Only qualified personnel, as defined in Section of this LOP, implement these procedures.
- Safety precautions specified in this LOP; FOP 09-11, *Open Container Operations;* task-specific work plans; equipment manuals; and permits are followed.
- The steps outlined in this LOP are carried out according to this LOP.
- Necessary staff are available to perform the activities described in this LOP safely and effectively.

2.2 Processing Specialist

The Processing Specialist shall:

- Review the analytical and/or DR data supplied with the waste prior to treatment and ensure that there are no compatibility issues between components in the waste and between waste and container materials.
- Verify that the DR and radiological waste information are complete. Waste without DRs may be macroencapsulated with prior approval from the Waste Characterization Project Leader.
- Prepare a task-specific work plan, obtain reviews and approvals described in FOP 09-11, *Open Container Operations,* and ensure that personnel have read, understood and agree to follow the task-specific work plan and have signed the associated authorized user list (AUL).
- Ensure that there is Radiological Control Technician (RCT) coverage as necessary.
- Ensure that macro operations are on the Plan-of-the-Day, per FOP 95-32, *Formality of Operations*.

- Hold a pre-job briefing to discuss existing analytical data and the hazards inherent to the waste and the task. Review the task, procedures and responsibilities as necessary. Document the briefing on forms RF 2042-PSR, *Pre-Start Work Review*, and RF 2042-DPJ, *Pre-Job Briefing Remarks.*
- Ensure that all necessary safety equipment is present prior to beginning the procedure.
- Ensure that all containers are labeled as required by the Resource Conservation and Recovery Act (RCRA).
- Inform the Open Container Project Leader when:

  Incidents not covered by this procedure occur.

  Modifications to this procedure are necessary.

2.3 Waste Handlers

Waste Handlers performing work in this procedure shall:

Read, understand and comply with the requirements of this LOP and task-specific work plans, and sign the associated AULs or sign-in/sign-out sheets as required by FOP 09-11 and Radiological Protection Procedures Manual (RPPM), *Chapter 1*, Radiological Work Planning and Controls.

- Participate in daily pre-job briefings.
- Consult the Processing Specialist when there are questions about safe handling or treatment according to the prescribed procedure.
- Perform the tasks as specified in this LOP and the task-specific work plan.

2.4 Radiological Control Technician (RCT)

RCTs comply with the requirements of FOP 09-11, *Open Container Operations*, and perform the duties assigned in the task-specific work plan.

RCTs attend the pre-job briefing and are aware of the activity schedule. RCTs provide job coverage and radiological instruments to support the activity.

RCTs complete daily radiological surveys of the work area when the macro unit is operated.

3.0 HAZARDS IDENTIFICATION AND SAFETY PRECAUTIONS

The major hazards are described in this section.

Hot Surfaces Work: Macro unit sealing will result in the macro waste unit becoming very hot (>400°F) in the area of the seal when the lid and the macro unit base are fused together. Although no personnel are expected to be near the waste unit during the sealing step, the waste unit will be posted, "Thermally Hot," or equivalent during the sealing step.

Electrical Hazards: During the sealing step, an electrical charge of 208 V, 30 A is carried to the macro waste unit and must not be contacted by personnel. During other times, the equipment is de-energized and must be handled as normal electrical equipment. No unauthorized personnel are likely to be near the macro unit during the sealing step, and open container operations personnel will be present during sealing step to ensure no unauthorized personnel approach the electrical connections.

Eye and Skin Contact: Safety precautions include, at a minimum, the wearing of safety glasses with side-shields or goggles, and protective gloves and clothing. Long sleeves (either shirt or lab coat) must be worn when hot surfaces are present in the work area.

Heavy containers and items: Moving heavy containers is accomplished using wheeled carts, pallet jacks, forklifts, hoists, and gantry cranes, as specified in task-specific work plans. All container movements are performed in accordance with Base Operations procedures. Only trained personnel move waste at the RMWMF. Lifts outside the work area may be performed using forklifts equipped for lifting drums. Personnel involved with waste movement are trained in waste handling, forklift operation, and hoisting/rigging.

Hand tools and electrical power tools: Macro unit sealing operations may require use of hand and power tools (router, for example to patch the waste unit lids). The tools are standard, unmodified, commercial items. Precautions include use of cut resistant gloves, safety glasses, and safety shoes, equipment inspection before use, general maintenance of equipment, and pre-planning/discussing such operations with the open container operations team and RCT.

Radioactivity: Internal or external personal contamination could occur in an accident scenario or if the waste is not properly handled. Safety precautions include:

- Radiological Worker II training.
- Wearing TLDs (thermoluminescent dosimeters) in accordance with the requirements stated in the task-specific work plan.
- Wearing personal protective equipment (PPE) specified in the task-specific work plan.
- Reviewing the DR for dose rates.
- Handling only waste parcels that are properly packaged and identified.

4.0 TRAINING

Only the Open Container Project Leader and personnel who are qualified as Processing Specialists, or Waste Handlers, as described in the *Weston Qualification and Training Program*, shall implement this LOP.

5.0 PROCEDURE

All activities in this procedure shall be performed by qualified personnel and supervised by a Processing Specialist. This process will be conducted in designated area(s) only in Buildings 6920 and 6921.

5.1 Equipment

The macro unit equipment consists of the following:

- Macroencapsulation Waste Units [Ultratech 55-gallon MacroPacks and Ultra-MacroPack boxes
- Encapsulation Control Unit (ECU) with electrodes
- Weight Distribution Device

- Specific weight amounts placed on the weight distribution device for the macro waste unit being used:

  UltraTech 55-gal. MacroPacks - ~300 lbs.

  UltraTech Boxes - 1200 lbs.(specific weight device provided by UltraTech)

5.2 Waste Package Preparation

Waste parcels to be macroencapsulated must be in a primary container (e.g., plastic bag, bucket, or drum with void space completely filled). Primary containers must have a movement radiological survey that is less than two years old. The parcels are macroencapsulated in the primary container.

Hold Point: Parcels that are not in an adequate primary container or that do not have a current radiological survey (as described above) constitute a hold point that will be noted in the macroencapsulation task-specific work plan. Resurveying a parcel may be performed as an Open Container Type 1 activity. If overpacking or repackaging is necessary, it is performed as invasive processing operations activities under a separate task-specific work plan as described in FOP 09-11, *Open Container Operations*.

Parcels will be placed compactly in the macro waste unit. The macro waste unit may be filled to capacity but may not be over-filled such that it exceeds the rim of the sealing surface. There will be no size reduction as part of this LOP. A separate work-plan must be generated for that task as described in FOP 09-11, *Open Container Operations*.

5.3 Tracking

The Processing Specialist will ensure that all waste is tracked using a barcode reader and RadTrack using standard tracking procedures.

5.4 Limitations

The waste must not contain free liquid, and particulate/non-debris (<60mm in all dimensions) must not exceed 50 percent of the waste by volume present in each primary container. The only exceptions are: less-than-debris-size radioactive cadmium-, mercury-, and silver-containing batteries; and waste covered by a treatment variance granted to SNL/NM by the NMED on June 3, 2004 that permits spark gap tubes and mixed waste radiological sources to be treated by macroencapsulation.

Contamination exceeding the RPPM, Attachment 6-1 – *Radioactive Contamination Limits*, cannot be present on the outside of waste parcels for macroencapsulation unless being performed in a Contamination Area. Macroencapsulation must not be performed when parcel dose rates exceed postings.

5.5 General Instructions

Clean up any waste spills that might result from a broken bag immediately. Minimize the spread of contamination from a waste spill. If a waste spill occurs, contact the RCT in a timely manner. No liquid waste is treated under this LOP.

Frisk gloves if contamination is suspected and change contaminated gloves.

Check ("frisk") hands and feet for contamination prior to leaving a contamination area for the PCM-II for the final personnel surveillance. It is recommended that the RCT perform the frisk. If contamination appears to be present, pause or move to a lower background area and perform one minute static counts of the affected areas.

The ECU / power supply should not be placed in any CA. The ECU / power supply may remain in a radiological buffer area while plugged into the 220V outlet and the electrical leads run into the CA.

Waste repackaging, direct handling of waste and preparation of waste parcels will not be performed under this procedure.

5.6 Macro Unit Detailed Sealing Instructions

UltraTech 55-gallon MacroPack units:

1. Prepare all pre-job forms for the day.
2. For this task, ensure a Waste Certification Official (WCO) is contacted. A WCO may want to be present near the work area to observe backfilling and sealing the 'macro.'
3. Place the macro unit to be backfilled and sealed on a steel (1000 lb. cap.) drum cart. Move the macro unit into the designated work area.
4. Open loaded macro units under the drum ventilator/elephant trunk in Building 6920, Room 120, or in the drum hood in Building 6921, Room 102, and allow it to vent a few minutes. Inspect contents to insure macro unit is loaded properly and all waste is below the sealing edge of the macro unit.
5. Complete backfilling the interstitial space inside the base unit(s) of the macro unit with an approved inert backfill material.

6. Apply vibration to the drum by manually tapping on the outside of the drum and/or using the pneumatic drum vibrator. The drum vibrator is hung over the lip of the drum being careful not to damage the seal zone inside the macro. Place a small piece of leather between the drum vibrator and the drum and cinch the vibrator securely to the drum. Apply compressed air from the building air. Run the vibrator to compact the backfill material whenever adding or periodically between additions of backfill, whichever appears to be most effective. Run the vibrator until the level of the backfill stops falling (i.e., backfill stops filling interstitial spaces among parcels) and is filled to the edge of the sealing surface.
7. Establish that the macro unit contains less than 10% void space in accordance with the WCO, if present in the work area.
8. Remove the drum vibrator, if used. Wipe the sealing area of the base unit clean with a damp (water without Simple Green® or solvents) cloth to remove any dust or dirt. Allow to air-dry, or dry using a clean dry cloth.
9. On the underside of the HDPE lid, wipe the sealing surface of the sealing wires clean with a damp (water only) cloth. Wipe down the entire macro unit lid.
10. Place the cleaned lid on the cleaned base unit and center the lid carefully.
11. Place the weight distribution plate, with the spacer blocks down, onto the lid to be sealed and screw the electrodes into the lid connectors.
12. Place weights at the center of the lid at a rate of about 50 pounds per linear foot of circumference (approximately 300 lbs. for a 55-gallon macro unit). Connect the output leads from the Encapsulation Control Unit (ECU) to the electrodes and secure the electrodes' wire leads to minimize stress on the electrodes during the sealing event.
13. Safety watch/processing specialist will ensure personnel and materials are clear from the macro unit to be sealed and announce that power will be applied.
14. Safety watch/processing specialist will plug the ECU into the power source and follow all switching procedures and requirements. Don cotton outer wear, leather gloves, safety glasses, hearing protection and look away when switching power on at the wall panel.
15. Safety watch/processing specialist will switch on the ECU on the front panel of the ECU. PLC screen will light up and show the current settings for the ECU.

16. Push the button on the ECU labeled "Start". Record the voltage and current displayed on the ECU readout in the open container log book. The lid is now being sealed to the base unit. Sealing will take 20 minutes. When sealing is complete, the PLC screen will return to "ready" mode. NOTE: If the ECU quits sealing and indicates a fault, pause the operation. Consult the ECU Fault Recovery Table in Attachment 1. If the table indicates the lid should be replaced, turn off the ECU at the switch and switch off the 220 VAC switch. Disconnect the electrodes from the macro. If the ECU malfunctions consistently, call qualified SNL/NM electrical personnel to open and inspect the ECU for repairs.
17. Safety watch/processing specialist will switch off the ECU, switch off power at the wall panel, and unplug the ECU.
18. The Processing Specialist will disconnect the ECU leads from the electrodes. Remove the electrodes from the lid.
19. After a minimum of one hour cooling time, remove the weights and weight plate from the sealed macro.
20. Wipe down the macro. Transfer the macro unit into the radiation buffer area (RBA) under the direction of the RCT. Collect large area swipe of the macro unit if requested by the RCT.
21. Request the RCT to perform a movement radiological survey of the sealed macro unit. Include the top of the macro unit (the sealed, HDPE lid) in the survey and identify with a separate survey sticker.
22. When survey results indicate the macro unit is cleared for release, apply spin welds or heat an LDPE patch using a heat gun to the areas on the macro unit lid where the terminal connections are. (See Spin Welding Procedure in Attachment 1). The patch is effective and complete when there is a small bead of molten plastic completely around the edge of the patch and plastic fills the depression in the lid.
23. Secure the (drum) lid on the macro unit (see, for example FOP 00-02, *Waste Handling*), apply mixed waste label, other labels and tamper indicating device (TID), as appropriate.
24. At the end of each work day, request the RCT perform a work area radiological survey (post-job survey) of the room.

UltraTech Ultra-MacroPack Box units:

1. Prepare all pre-job forms for the day.
2. For this task, ensure the WCO is contacted. The WCO may want to be present near the work area to observe backfilling and sealing the 'macro.'
3. As necessary, stretch plastic wrap or place vinyl tape over the sealing area (ridged edge) of the base unit of the macro unit box to keep it free of dust or dirt.
4. Prepare to backfill void space in the macro unit with urethane foam. Only the personnel backfilling the macro unit with foam will be allowed in the work area until the foam has cured (i.e., no observers in the work area).
5. If foaming is taking place in the SE airlock notify the RMWMF operator and open the exterior roll-up door (approximately 10 feet) for ventilation. Along the west side of the airlock, place the large floor fan on a table to ventilate the work area outwards. Post the area immediately east of the SE Airlock (approximately 20 feet from the doors) using 'Caution' tape to prevent personnel from entering the Airlock and adjacent areas. Post the area around the personnel door between the Airlock and the South Bay using "Keep Out" signs and/or 'Caution' tape to prevent entry to the Airlock. (The South Bay remains accessible by other doors.)
6. If foaming is taking place in room 120, no additional boundaries are necessary.
7. Don PAPR respirators with organic vapor cartridges (bubble hoods or tight fitting face pieces) or more restrictive respiratory protection specified in Section C of the task-specific workplan. Slowly add polyurethane foam to the macro unit covering the waste and between items. Allow the foam to expand and proceed to add foam in lifts, each about one foot thick, allowing the foam to expand.
8. Stop addition of foam when all the foam added has expanded to about 2-6" below the rim of the macro. Ensure foam, after expansion, is not higher than the seal zone on the top of the macro.
9. Pause to allow the foam to cure about one hour. If the work area will not be attended during this time, the macro unit lid may be placed on the macro, but only if the foam will not reach (touch) the lid.
10. At the end of the cure time close the roll-up door, turn off the fan, and remove postings if foamed in the SE airlock.

11. Open the macro, if appropriate. If the foam has expanded up to about the height of the seal zone on the macro, it must be chipped/cut down to a level that will allow the lid to be securely set on the seal zone without gaps.
12. Completely backfill the remaining headspace in the macro unit with an approved inert backfill material (typically oil absorbent or polyethylene beads). Dust masks are required for pouring oil absorbent unless dust is controlled by local ventilation. If possible, mound the fill slightly in the center of the macro unit but do not prevent the lid from closing firmly and completely onto the sealing zone. The backfill should be added to less than 1" below the sealing zone at the rim of the macro.
13. Verify that the macro unit contains <10% void volume, in consultation with the WCO, if present in the work area.
14. If necessary, remove plastic wrap or vinyl tape from the sealing area and wipe the sealing area of the base unit clean with a damp (water only) cloth to remove any dust or dirt. Dispose wrap and wipes as trash.
15. On the underside of the HDPE lid, wipe the sealing surface of the sealing wires clean with a damp (water) cloth. Dispose wipes as trash.
16. Place the cleaned lid on the cleaned base unit and center the lid.
17. Place the UltraTech weight distribution device on the lid being careful not to knock the lid off center. Place the UltraTech weight device (1200 lbs.) on top of the distribution device by gantry.
18. Thread the black and white electrodes into the lid of the macro. Connect the output leads from the Encapsulation Control Unit (ECU or "controller") into the clips on the free end of the electrodes. Be careful to route the ECU leads so that they will not "hang" from the electrodes.
19. Safety watch/processing specialist will plug the ECU into the power source and follow all switching procedures and requirements. Don cotton outer wear, leather gloves, safety glasses, and hearing protection and look away when switching power on at the wall panel.
20. Safety watch/processing specialist will switch on the ECU on the front panel of the ECU. PLC screen will light up and show the current settings for the ECU.

21. Push the button on the ECU labeled "Start." Record the voltage and current displayed on the ECU readout in the open container log book. The lid is now being sealed to the base unit. Sealing will take 20 minutes. When sealing is complete, the PLC screen will return to "ready" mode. NOTE: If the ECU quits sealing and indicates a fault, pause the operation. Consult the ECU Fault Recovery Table in Attachment 1. If the table indicates the lid should be replaced, turn off the ECU at the switch and switch off the 220 VAC switch. Disconnect the electrodes from the macro. If the ECU malfunctions consistently, call qualified SNL/NM electrical personnel to open and inspect the ECU for repairs.
22. Safety watch/processing specialist will switch off the ECU, switch off power at the wall panel, and unplug the ECU. See safe switching instructions in Step 19.
23. Processing specialist will disconnect the ECU output leads from the lid. Remove the electrodes from the lid.
24. After a minimum of 2.5-hours cooling time, the weight may be removed from the sealed macro.
25. Wipe down the macro unit and request the RCT to perform a movement radiological survey of the sealed macro. Include the top of the macro unit (the sealed, HDPE lid) in the survey and identify with a separate survey sticker.
26. When survey results indicate the macro unit may be closed, apply a spin weld or heat an LDPE patch using a heat gun to the small wells on the macro unit lid where the terminal connections are. (See Spin Welding Procedure in Attachment 1). The patch is effective and complete when there is a small bead of molten plastic completely around the edge of the patch and plastic fills the depression in the lid.
27. Install the box lid following the manufacturer's instructions.
28. Secure the box lid on the macro unit (see, for example FOP 00-02, *Waste Handling*), apply mixed waste label, other labels and tamper indicating device (TID), as appropriate.
29. At the completion of macroencapsulation, request movement survey of the macro unit waste form from the RCT.

5.7 Project-Generated Waste (PGW)

All radiologically-contaminated and suspect-contaminated waste resulting from macroencapsulation treatment, including decontamination materials, should be managed as low-level radioactive waste. Labeled container(s) for accumulation of PGW will be available in the work area. All additions to the containers will be logged on a Waste Addition Log.

In the unlikely event that PGW is mixed waste or suspect mixed waste, this waste must be segregated from low-level radioactive waste and stored separately and labeled as mixed waste, pending sampling and analysis or other determination of its hazardous constituents.

5.8 Final Waste Form Inspection and Storage

Following completion of all treatment operations, the Processing Specialist and the WCO will thoroughly inspect the completed macro unit waste unit. The WCO will request from the Processing Specialist the records required to certify the inspection of the waste form.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE for personnel involved in this process will be specified in the task-specific work plan.

Minimum PPE to be worn by personnel in the designated work area includes:

- Safety glasses.
- Steel-toed safety shoes.
- Long-sleeved lab coat or equivalent and long pants when hot surfaces are present.
- Cut resistant gloves when handling equipment and waste forms. Inner cotton liners may be added if handling hot objects or LDPE.

PPE should be chosen and used with the effects of heat and heat stress in mind.

7.0 RECORDS

The Processing Specialist or the Open Container Project Leader shall ensure that a RMWMF Treatment Form (RF 2042-RTF) is filled out for each DR treated. Information to be available on the RMWMF Treatment Form and/or the treatment logbook must include:

- Waste codes.
- Parcel and Container numbers of each waste parcel added to the Macro waste unit.
- Volume of each parcel added to the Macro waste unit.
- Weight of each parcel added to the Macro waste unit.
- Parcel and Container numbers of the Macro waste unit.
- Volume of the Macro waste unit.
- Weight of the Macro waste unit.

The Processing Specialist will maintain daily logs and inspection logs that are completed during operations.

In accordance with AOP 94-19, *Records Requirements*, RMWMF Treatment Forms (RF 2042-RTF), DRs, forms required by RPPM, Chapter 1, *Radiological Work Planning and Controls,* and other treatment forms are QA records.

8.0 REFERENCES

AOP 94-12, *Technical Work Document Processing System*

AOP 94-19, *Records Requirements*

FOP 95-26, *Non-Routine Conditions*

FOP 95-31, *Responding to Emergencies*

FOP 95-32, *Formality of Operations*

FOP 09-11, *Open Container Operations*

MN471016, Radiological Protection Procedures Manual, RPPM

PLA 96-15, *Quality Assurance Plan (QAP)*

Weston Qualification and Training Program

ATTACHMENT 1

MACRO SEALING PROCEDURE
TO BE USED WITH
MSE BRAND ENCAPSULATION CONTROL UNITS

August 18, 2008

1. Obtain a power source for the Encapsulation Control Unit (ECU). 120-volt alternating current, 60 hertz, I phase; 50-amp circuit, (or 240Vac, 60Hz, I Phase, 25 Amp).
2. CAUTION: Do not fill the unit past the bottom edge of the flange. After filling the unit, wipe the sealing area of the base unit clean with a damp (water) cloth to remove any dust or dirt. Allow to air-dry, or dry using a dean dry cloth.
3. Wipe the sealing surface of the sealing wires clean with a damp (water) cloth. Allow to air-dry, or dry using a clean dry cloth.
4. Place the cleaned lid on the cleaned base unit and center the lid as well as possible.
5. Plug the ECU into the power source. The PLC screen will light up and show the current settings for the ECU.
6. Place the weight distribution device, with the spacer blocks down, onto the lid to be sealed.
7. Screw the aluminum connector blocks into the lid connections and connect the ECU clips to them. Be careful to route the ECU clips so that they will not short out on steel of the container or "hang" from the connector blocks.
8. Place weights, centered on the weight distribution device, at a rate of about 50 pounds or more per linear foot (*not more than 75 pounds per foot*).
9. Push the button on the ECU labeled "Start". The lid is now being sealed to the base unit.
   Sealing will take 20 minutes. When sealing is complete, the PLC screen will return to “ready" mode.
10. Record the voltage reading displayed on the ECU at the beginning of the 20 minute seal cycle.

11. When the PLC screen returns to "ready" mode, proceed to step 12.
NOTE: If the ECU quits sealing and indicates a fault, skip the rest of this procedure and follow the ECU Fault Recovery Table below.

ECU FAULT RECOVERY TABLE

TIME IN PROCESS	TYPE OF FAULT	RESPONSE TO FAULT
450 seconds or less	ANY Fault other than utility power failure	Remove and replace the lid with a good lid. Report the bad lid to Sate QA and to UltraTech.
	Utility Power Failure	Allow lid to cool 20 minutes then reset ECU and START a full length sealing process.
More than 450 but less than 840 seconds	Voltage increase of up to 25% above the initial reading (step 10)	Continue process to a minimum of 900 seconds. Report process time of voltage increase to Site QA and to UltraTech.
	Voltage increase of over 26% above the initial reading (step 10)	Shut off the sealing process. Report the problem to Site QA and contact UltraTech for special handling instructions based on size, type and form of container.
	Utility Power Failure of less than 20 minutes	Reset ECU. Restart process for balance of 20 minutes.
	Utility Power Failure of more than 20 minutes.	Allow lid to cool for 1.5 hours. Reset ECU. Restart process for full 20 minutes.
840 seconds or more	Any FAULT	Seal is acceptable. Continue normal disposition of sealed MacroPak.

12. Disconnect the ECU from the lid.

13. After a minimum of 1 hour cooling time, the weights and weight distribution device may be removed from the sealed macroencapsulated container.

Spin Welding Procedure

Spin welding is used to apply polyethylene patches over the areas where the Encapsulation Control Unit connects to the macrocncapsulation lid so there will not be a potential corrosion path into the seal area of the macroencapsulation lid.

1) Install the spin patch holder/drive bit on the router.
2) Extend the bit face 1/2 to 2 inches beyond the base plate so that the router can be comfortably supported, yet held firmly, by both hands and guided gently onto the area to be patched.
3) Install one of the supplied spin patches to the patch holder/drive bit.
4) While supporting the weight of the router with both hands guide the spin patch down onto the area to be patched so that the patch is just lightly touching the surface of the area to be patched. **Use care to ensure that the router is held perpendicular to the lid in both the side-to-side direction and in the front-to-back direction.**

   NOTE: Steps 5-7 will only take between 2 and 10 seconds

5) Holding the router firmly, switch it on. If the router does not have a finger operated switch, have an assistant operate the switch.
6) Apply very light pressure on the patch while the surfaces heat and melt. (Some smoking may or may not occur).
7) When a small bead of molten material forms completely around the spin patch switch off the router and apply light downward pressure.
8) Hold the router without allowing it to tip sideways, forward and back with this downward pressure for about 10 seconds.
9) Remove the router by lifting it straight upward and inspect the patch. There should be a bead of molten material completely around the patch:
   - If there is not a bead completely around the patch, remove the patch immediately by prying it off with a screwdriver. Repeat steps 4 through 9.
   - If there is a bead completely around the patch, a good patch has been accomplished.

14. After removing the weights and weight distribution device, remove the connectors from lid.

15. Using a plunge type router apply the polyethylene spin patches supplied with the unit over the area where the screw connections were. (See the Spin Welding Procedure on page 4). The spin patch is effective and complete when there is a small bead of molten plastic completely around the edge of the patch.

16. Remove the router and allow the patch to cool for 5 minutes.

17. Apply the steel lid to the steel encased "macro" and fasten it as directed on the Closure Instructions supplied with each unit.

ATTACHMENT 2
Change History – Revision 03 to Revision 04

Throughout	Revision 03 of this document was archived. Revision 04 - This document was updated and revised extensively and must be read in its entirety.