2024 Tetramethylammonium Hydroxide (TMAH) SOP

*Highlighted instructions may be deleted*: At SJSU, the documentation for Standard Operating Procedures is managed through the RSS SOP App. Please contact your college/dept safety staff OR the SJSU Chemical Hygiene Officer if you need help navigating the app. We recommend directly editing the SOPs in the app itself instead of in the Word document.

All personnel required to perform these procedures or work with the hazards identified in this SOP must review all safety requirements and sign the training record. SOPs and training records must be annually updated according to the [SJSU Chemical Hygiene Plan](https://www.sjsu.edu/fdo/services/ehs/laboratory-safety/chemical-hygiene.php). Electronic or physical copies of SOPs must be readily accessible to personnel. This SOP must be accompanied by hands-on training or demonstration.

Lab/Shop Contact Information .

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| --- | --- | --- |
| Lab/Shop Supervisor Name(s) |  |  |
| Lab/Shop Supervisor Email/Phone |  |  |
| Department |  |  |
| Building & Rooms |  |  |
| Lab/Shop phone |  |  |
| Emergency | Emergency Contact | Emergency Phone |
| Contact for emergencies, injuries, or severe hazards | UPD Emergency Dispatchers | 911 (or 408-924-2222 from a non-campus phone) |
| Contacts for safety questions or help with minor hazards | SJSU Environmental Health & Safety ehs@sjsu.edu | 408-924-1969 |
| . | SJSU Chemical Hygiene Officer skye.kelty@sjsu.edu | 408-924-1978 |
| . | College/Dept Safety Contact EMAIL  REQUIRED | REQUIRED |

# HAZARD OVERVIEW

Tetramethylammonium hydroxide (TMAH) is a quaternary ammonium salt which is commonly encountered as concentrated solutions in water or methanol. It is used in micro- or nanofabrication as an etchant and developer. TMAH is typically one of several ingredients in commercial etching/stripping mixtures, although it may also be used pure. **TMAH presents significant health hazards, must be handled with extreme caution, and should only be used if there is no safer alternative.** **TMAH can be used safely with proper precautions.**

TMAH is **corrosive** as a strong base; the 25% solution in water has a pH of greater than 13. Corrosive materials cause immediate destruction of living tissue and other materials by chemical action at the site of contact and can be solids, liquids, or gases. Direct exposure to corrosives may cause ocular damage resulting in blindness and/or skin burns within seconds of exposure. Corrosive gases, dust from solids, or aerosolized/evaporated liquids can be inhaled and cause serious damage to mucous membranes and the airways. The severity of chemical burns depends on the type and concentration of the chemical, the body parts contacted, and the duration of exposure. Skin exposures to between 10% and 25% TMAH will cause 2nd and 3rd degree burns. These burns can be painful, but there are reports of pain not developing for 15 minutes or more. Do not rely on pain as a sign of exposure. TMAH can corrode certain metals.

In addition to causing chemical burns, skin contact with TMAH can cause **systemic toxicity,** which can lead to respiratory failure. Due to the severe toxicity, exposure to >1% TMAH solutions over a few percent of the body must be treated as a life-threatening event. Depending on the level and duration of exposure, symptoms may include blurred or double vision; pinpoint pupils; changes in heart rate and blood pressure; abdominal cramping, nausea and vomiting; diarrhea, excessive salivation sweating, or bronchial secretions; urinary incontinence; muscle twitching, tremors, or convulsions. When heated to decomposition, TMAH emits toxic fumes of NOx and ammonia. Since 2007, there have been several recorded fatalities from skin exposure to TMAH solutions. Three of the recorded fatalities occurred due to heart attacks despite immediate decontamination and prompt medical care. Life-threatening symptoms can develop within 20 minutes, unconsciousness within 30, and, in the worst cases, death can occur within an hour. **There is no known antidote for TMAH poisoning. Immediate removal of the material using a safety shower/eyewash for at least 15 minutes is critical.**

*(highlighted instructions may be deleted)* If the material is a Gas or is intentionally vaporized/aerosolized, the material should be handled according to Acutely Toxic Gas SOP. Acutely Toxic Gas is NOT covered by this SOP.

Refer to the [Compressed Gas SOP](https://www.sjsu.edu/fdo/services/ehs/laboratory-safety/chemical-sop.php) and directly contact the Chemical Hygiene Officer for help.

# ENGINEERING/VENTILATION CONTROLS

1. Use chemical fume hood approved by Environmental Health & Safety when using volatile and/or semi volatile substances, manipulating substances that may generate aerosols, and performing lab/shop procedures that may result in an uncontrolled release. In general, containers of toxic materials should not be opened or handled outside of containment that provides protection from fumes. **Identify TMAH work areas with a sign stating “Danger, Tetramethylammonium Hydroxide in this Area” until the fume hood is decontaminated.**
2. Weigh toxic materials using a scale within a chemical fume hood approved by Environmental Health & Safety for ventilation control. If weighing within containment is not feasible, use a taring method to reduce potential inhalation exposure. ***1)*** Pre-weigh container. ***2)*** Work inside containment device to add toxic material to container. ***3)*** Seal container in the containment device. ***4)*** Re-weigh using the scale outside of the containment device. ***5)*** Only open container in containment device to add or remove the toxic material.
3. IF APPLICABLE: Continue to describe any additional lab/shop-specific engineering or ventilation controls and equipment safety features that will be used to reduce the risk of chemical exposures. (*highlighted instructions may be deleted*)
4. *(highlighted instructions may be deleted)* If you must use TMAH without/outside of the engineering or ventilation controls listed above OR your process will create substantial vapor, you must contact ehs@sjsu.edu for an exposure assessment.

# ADMINISTRATIVE CONTROLS

1. Do not deviate from this SOP without prior approval from the lab/shop supervisor.
2. Notify the lab/shop supervisor of any accidents, incidents, near-misses, or unexpected outcomes involving the Hazardous Materials described in this SOP.
3. **Training Requirements:** 
   1. Complete lab/shop safety awareness training prior to working in the lab/shop.
   2. Complete lab/shop-specific safety training on procedures, techniques, and safety equipment (for example: emergency eyewash, safety shower, fire extinguisher, spill kits) prior to working in the lab/shop.
   3. Demonstrate competency to perform the SOP to the designated trainer, document training, and maintain records in case of inspection by regulating authorities.
4. **Inventory Requirements:** Know the location and content of Safety Data Sheets for all the chemicals used or in storage.
5. Inventory website: [ehs.ucop.edu/chemicals](http://ehs.ucop.edu/chemicals) => log in with SJSU email => search chemicals
6. Inventory app: RSS Chemicals App => log in with SJSU email => search chemicals
7. Safety Data Sheet Library: [ehs.ucop.edu/sds](http://ehs.ucop.edu/sds) => log in with SJSU email => search chemicals
8. *Make sure you select the correct inventory if your account is linked to multiple labs/shops.*
9. *(highlighted instructions may be deleted)* If you need help adding Safety Data Sheets to Chemicals app or using chemical inventory, you must request help from your college/dept safety staff or the Chemical Hygiene Officer.
10. **Procurement:** The amount of hazardous material in any room or floor is limited by CA Fire Code to protect occupants and first responders during emergencies. Do not store excess hazardous materials that are not critical for current operations. The Chemical Hygiene Officer can help you find existing campus supplies for small projects to help avoid the need to purchase excess supplies. The lab/shop supervisor must complete a New Chemical Procurement Form ([single](https://apps.docusign.com/send/templates/details/5230c720-8581-4c5e-9440-02042c04b460) or [multiple](https://apps.docusign.com/send/templates/details/1b14d021-997b-4454-8903-89abe5f8225c)) before adding a new chemical to the inventory.
    1. Order the lowest possible concentration required to complete the task.
    2. *(highlighted instructions may be deleted)* Note any procurement quantity limitations if any.
11. **NEVER WORK ALONE.** All work involving TMAH must be performed in the presence of at least one safety buddy in visible and audible range. The safety buddy must be a person who has been trained in this SOP and who is proficient with the emergency protocols set forth in this SOP. Risks may also be controlled by scheduling operations with the highest exposure risk at a time when fewer workers are present in the area, preferably within normal business hours when the most safety and technical staff are on-duty (9AM-4PM). *(highlighted instructions may be deleted)* Labs with extensive training and practice related to toxic materials can refine this rule to include/exclude specific toxics OR to develop special requirements to allow some individuals with proven training/experience records to work alone.
12. **Transport:** Use a bottle carrier or secondary containment when transporting hazardous materials between work areas.
    1. **Up to 2 containers of toxic liquids < 0.5 pint (250 mL) or toxic solids < 0.25 lb (250 g) can be hand carried in a bottle carrier or secondary container.**
    2. Use a cart to transport any larger containers of hazardous materials between rooms, in hallways, or in elevators.The cart must be well-maintained, must have a lip on the edge to prevent items from sliding off the cart, and must have secondary containment capacity to contain spills and separate incompatible materials. Do not obstruct routes of egress or leave a cart of hazardous materials unattended in public areas. **If an elevator is used, only one occupant is allowed to be in the elevator to transport the materials. Do not allow additional passengers to enter the elevator.** If your building has a hazardous materials elevator or service elevator, follow college/department guidance about access and use of these specialized elevators.
    3. **DO NOT transport hazardous materials by carrying them in stairwells.** Accidental spills in the staircase block emergency evacuation routes for the whole building and spills in staircases are extremely challenging to clean up.
    4. Safety staff must be called to assist with transportation of any individual chemical containers over 5 gallons (18.9 L). Special training is required to transport large chemical containers like drums.
13. **Storage:** Store chemicals in secondary containers that are segregated based on chemical compatibility (see [SJSU Chemical Hygiene Plan](https://www.sjsu.edu/fdo/services/ehs/laboratory-safety/chemical-hygiene.php) or contact college/department safety staff for additional guidance).
    1. The Acute Toxin storage location must only be accessible to authorized personnel that were trained using this SOP. Individual storage locations can be unlocked if all lab personnel are trained to work with Acute Toxins and the lab door is locked to limit access.
    2. Acute Toxins must be stored inside a separate storage area, clearly labeled with "TOXIC" or skull-and-crossbones. Clear identification of acute toxins also helps keep emergency responders and facilities workers safe.
    3. Containers should always be tightly-sealed, cleaned, and free of leftover chemicals before storage. Only handle toxic chemical containers while using gloves.
    4. TMAH containers must be stored in a tightly-closed secondary container within a designated storage cabinet. You can store TMAH in corrosive cabinet with other bases if they are compatible.
14. **Process Setup:** 
    1. Confirm the presence of required safety equipment (for example: appropriate spill kit and Class ABC fire extinguisher). Inspect all equipment and experimental setups. Safety shower/eyewash must be within 10 seconds of travel time.
    2. Identify **TMAH** work areas with a sign stating “Danger, Tetramethylammonium Hydroxide Used in this Area” until the fume hood is decontaminated.
    3. *(this section may be deleted if not applicable, highlighted instructions may be deleted)* Plate based assays:
       1. Each plate must be treated with the same caution and threshold limitations as the stock and working solution tubes. Most plates contain up to 20 mL of liquids.
       2. Use plate seals to prevent accidental splashes and spills. Only open one plate at a time. Carefully stabilize the plate anytime you must peel off the seal -- practice this with a nonhazardous liquid in a plate before attempting this technique with hazardous materials. Do not hold a plate in your hand while trying to remove the seal with another hand-- place the plate on the bench to stabilize when unsealing.
    4. Prepare proper working and waste containers with complete labels before initiating protocol. Empty chemical containers of TMAH must be disposed of as hazardous waste as part of the Environmental Protection Agency’s [“P-list”.](https://www.epa.gov/sites/production/files/2016-01/documents/hw_listref_sep2012.pdf)
    5. *(highlighted instructions may be deleted)* Note any handling quantity limitations if any. For example: **Quantity Limitations: PI approval must be obtained in advance if a higher scale is necessary.** For use as reagent: up to 20 g or 25 mL for carcinogens, up to 10 g or 15 mL for reproductive toxins, and up to 10 g or 15 mL for acute toxins. For use as a solvent in a reaction: up to 100 mL for reproductive toxins, up to 200 mL for carcinogens, and none for acute toxins. For use in extractions: up to 500 mL, except for acute toxins. For use in chromatography: up to 1000 mL, except for acute toxins.
15. IF APPLICABLE: Here or in the detailed protocol at the end of this document, describe any additional administrative controls. Examples include restrictions on working alone, specific procedures, equipment instructions, or locations. Include any chemical-specific administrative controls. You may attach documents and pictures to this SOP. You may provide links to relevant training videos but unfortunately can't directly attach videos or slideshows to the SOP *(highlighted instructions may be deleted).*

# PERSONAL PROTECTIVE EQUIPMENT

1. **Eye Protection:** At a minimum ANSI Z87.1-compliant safety glasses are necessary when handling the hazardous materials described in this SOP. Additionally, safety glasses are necessary for anyone within 15 ft (5 m) of processes involving the hazardous materials described in this SOP. If multiple operations with hazardous materials are present in a room, everyone in the room must wear safety glasses upon entering. Between uses, eye protection and face shields can be gently cleaned with soapy water or a compatible cleaning solution (like 70% v/v ethanol in water).
   1. Splash goggles are required for all processes that could potentially generate splashes or aerosols.
   2. Depending on the hazard assessment, a face shield may be required in addition to safety eyewear.
   3. Ordinary prescription glasses are NOT acceptable eye protection.
2. **Body Protection:** At a minimum, long pants (covered legs), closed toe/closed heel shoes (covered feet), and a chemically-compatible lab/shop coat that fully extends to the wrist are necessary. Long hair, jewelry, and head coverings must be restrained to prevent accidental contact with hazards.
   1. Where splashes or skin contact is foreseeable, additional protective clothing is required such as a face shield, chemically-resistant apron, or disposable sleeves.
   2. *(highlighted instructions may be deleted)* Define your lab/shop schedule for lab/shop coat laundering OR replacement of disposable lab coats, sleeves, or aprons. In general, coats should be laundered/replaced after about 40 hours of active work with hazards-- check manufacturer recommendations and consider the hazards of the actual workflow before following this general guidance. Contact the Chemical Hygiene Officer for assistance with risk assessments, product selection, or development of a laundering/replacement schedule. Contact your college/dept leadership if you have questions about costs for PPE.
3. **Hand Protection:** *(highlighted instructions may be deleted)* Define the type of glove to be used based on: all chemical(s) used; anticipated chemical contact (e.g. incidental or immersion); manufacturer permeation/compatibility data; and whether a combination of different gloves is needed. Thick (>10 mil total glove thickness) neoprene or nitrile gloves are recommended for concentrated TMAH. Nitrile exam gloves can be employed for brief use of dilute solutions. Consider double gloving. Consider double-glove if acid is highly concentrated, large volumes are used, or splash is likely. Using thick gloves can reduce dexterity, and may increase the possibility of spills, however they do provide superior protection when the risk of exposure is greater due to the quantity being used or handled. If wearing two layers of thinner neoprene or nitrile disposable gloves, change the outer pair frequently. Check gloves for holes before each use. Disposable gloves cannot be reused. Reusable gloves can be cleaned between uses according to manufacturer instructions.
4. IF APPLICABLE: Here or in the detailed protocol at the end of this document, insert lab/shop-specific descriptions of personal protective equipment and hygiene practices, including any specialized personal protective equipment needed for a procedural step or specific task. *(highlighted instructions may be deleted)*

# SPILL AND EMERGENCY PROCEDURES

**Environmental Health & Safety must be notified immediately** for any uncontrolled release of TMAH including, but not limited to, spills, equipment failure, rupture of containers, or failure of control equipment. If in doubt, call the College Safety Team or Environmental Health & Safety for help.

Emergency contact information for this SOP is included on the first page. DO NOT attempt to clean up a chemical spill unless you have been trained, have the appropriate spill response materials, and feel comfortable doing so. After completing immediate spill containment or injury responses, report the incident to the lab/shop supervisor. IF APPLICABLE: Add additional lab/shop-specific chain of command information for reporting and responding to spills or emergencies. *(highlighted instructions may be deleted)*

**Small chemical spills:** If you need help, contact the College Safety Team or Environmental Health & Safety. **Trained** personnel may clean up **spills inside a chemical fume hood and small spills [< 0.5 pint (250 mL) and solids < 0.25 lb (250 g)] outside of chemical fume hood or paint booth**. When cleaning up spills, personnel must wear a lab coat or smock, safety goggles, two pairs of disposable nitrile gloves or one pair of thicker nitrile or butyl gloves (minimum 10 mil thickness), and shoe covers as needed. If it can be done safely, put down universal absorbent pads and plug sink/floor drains to slow the spread of an ongoing spill. ***Remove all ignition sources from the vicinity of the spill.***

***Liquids*:** Wipe up spilled liquids with absorbent pads from the spill kit and then scoop up and dispose of hazardous waste. Proceed to final steps for all small spills below. Some spills may require the use of absorbent pads along the outside edge of the spill to prevent further spread followed by the administration of absorbent material. If this solid absorbent material is used, DO NOT dry sweep which can generate dust and instead follow instructions for solid spills below.

***Solids:*** Gently cover solid spills with wetted paper towels or absorbent pads to avoid raising dust. If broken glass or sharps are present, carefully collect using thick pieces of paper, tongs, tweezers, other tool to prevent injury. Place broken glass or sharps inside puncture-proof hazardous waste container - DO NOT include sharps in the hazardous waste debris bag. Wipe up spill cleanup materials and dispose of hazardous waste. Proceed to final steps for all small spills below.

***FINAL STEPS FOR ALL SMALL SPILLS:*** After cleaning up visible chemical contamination, clean the spill area thoroughly with detergent solution followed by clean water. If the spill is extensive, clean all worksurfaces, secondary containers, and interior surfaces after completion of the initial spill cleanup. Double bag all non-sharp waste in plastic bags with a hazardous waste label that reads "*TETRAMETHYLAMMONIUM HYDROXIDE* spill debris” and securely close the bag. If contaminated sharps or broken glass were collected, apply a similar hazardous waste label to the separate puncture-proof container.

**Large chemical spill:** con ne the spill within the containment device (chemical fume hood or paint booth), con ne the spill in the room, evacuate everyone from the room, and call 911 (use blue light phone or call 408-924-2222 from a non-campus phone). If it can be done safely, put down universal absorbent pads and plug sink/floor drains to slow the spread of an ongoing spill. Help remove any exposed people from the spill area to fresh air, but do not endanger yourself by entering a potentially toxic atmosphere or failing to wear appropriate personal protective equipment. Before exiting the room or area, inspect your clothing and shoes for signs of contamination, such as saturation or powder. Remove contaminated clothing, place in plastic bags, and label the bag if safe to do. Leave the clothing or bag of clothing near the spill area or inside the room where the spill occurred.

**First Aid for Chemical Skin or Eye Exposure:**  **1)** seek emergency medical attention by calling 911 (use blue light phone or call 408-924-2222 from a non-campus phone), **2)** remove potential sources of prolonged contact like contaminated personal protective equipment or clothes-- **immediately remove contact lenses** with a clean glove on if an eye exposure occurs, **3)** move away from any hazardous fumes or aerosols, and **4)** wash area of chemical contact for at least 15 minutes with water using eye wash, sink, or safety shower. You can request additional assistance navigating responses to specific toxins by calling Poison Control (1-800-222-1222) or the SJSU Chemical Hygiene Officer. Anyone assisting with first aid in case of exposure should wear personal protective equipment to prevent transfer from the exposed person to themselves. Always ask for a person’s consent before assisting them in an emergency. If the exposed person is unconscious or unable to provide consent due to the circumstances at hand, first aid under [implied consent](https://www.redcross.org/take-a-class/resources/learn-first-aid/unresponsive-and-breathing-person) should only proceed by trained responders to address immediate hazards that are likely to further harm the unconscious person. If you are unsure of the cause of unconsciousness, be aware that moving a person with a head or spinal injury can be dangerous and it is best to wait for first responders to move the unconscious individual if possible.

**First Aid for Chemical Inhalation or Ingestion:** Seek emergency medical attention immediately by calling 911 (use blue light phone or call 408-924-2222 from a non-campus phone). You can request additional assistance navigating responses to specific toxins by calling Poison Control (1-800-222-1222) or the SJSU Chemical Hygiene Officer. Anyone assisting with first aid in case of exposure should wear personal protective equipment to prevent transfer from the exposed person to themselves. Always ask for a person’s consent before assisting them in an emergency. Help remove any exposed people from the spill/leak area to fresh air but do not endanger yourself by entering a potentially toxic atmosphere or failing to wear appropriate personal protective equipment. **If the exposed person is conscious**, strongly discourage them from leaving alone, operating heavy equipment, or operating vehicles before receiving medical attention. The exposed person should sit up or lay on their side. The exposed person should not stand on their own since lightheadedness and related falls could cause head injuries. The exposed person should not lay facing up since this position can make breathing more difficult and can cause choking if vomiting occurs. Do not give them anything to eat or drink before receiving medical attention. **If the exposed person is unconscious**, closely monitor breathing and whether they gag or vomit. If the exposed person is unconscious or unable to provide consent due to the circumstances at hand, first aid under [implied consent](https://www.redcross.org/take-a-class/resources/learn-first-aid/unresponsive-and-breathing-person) should only proceed by trained responders to address immediate hazards that are likely to further harm the unconscious person. If you are unsure of the cause of unconsciousness, be aware that moving a person with a head or spinal injury can be dangerous and it is best to wait for first responders to move the unconscious individual if possible. Do not give them anything to eat or drink before receiving medical attention. **If an unconscious exposed person vomits**, roll them onto their side with a cushion behind their back and their upper leg pulled slightly forward (similar to the maneuver used in cases of alcohol poisoning or drug overdose). Wipe any vomit away from their mouth and keep their face pointing down to allow any vomit to escape without blocking airways. **If an unconscious exposed person is not breathing or their heart beat stops**, responders should administer cardiopulmonary resuscitation (CPR) or use an Automated External Defibrillator (AED) if they are trained and feel comfortable doing so. If you suspect that the unconscious person has inhaled or ingested a toxic chemical, do not perform mouth-to-mouth techniques associated with CPR and only use artificial respiration techniques.

IF APPLICABLE: Carefully review the Safety Data Sheets for the products you are using to update this emergency and spill information. Consult with college or SJSU safety staff if you need assistance updating this section. You may add first aid information here or in the detailed protocol at the end of this document. *(highlighted instructions may be deleted)*

# WASTE MANAGEMENT + DECONTAMINATION

Hazardous chemical waste must be managed as outlined in [SJSU Chemical Hygiene Plan.](https://www.sjsu.edu/fdo/services/ehs/laboratory-safety/chemical-hygiene.php) All waste accumulation [containers must be chemically compatible with the waste and properly labeled with the SJSU Hazardous Waste label. Hazardous chemical waste must be stored in a designated location within closed containers. Hazardous](https://www.sjsu.edu/fdo/services/ehs/hazmat/hazardous-waste-management.php) chemical waste containers must be within a secondary container that can hold 1.5 fold more volume than the waste container itself. In general, hazardous waste must be removed from your lab/shop within 9 months of the accumulation start date to ensure proper disposal within 1 year by Environmental Health & Safety. Unrinsed empty containers must be capped and disposed of as hazardous waste.

**Do not combine waste streams containing TMAH with other chemical waste.**

Ensure that all materials that have come in contact with toxic materials have been triple rinsed with a compatible solvent before removal from the fume hood. The solvent rinses must be disposed of as hazardous waste. Unrinsed, contaminated disposable materials such as pipette tips and centrifuge tubes should be disposed of as solid hazardous chemical waste.

*(this plate assay section may be deleted if not applicable, highlighted instructions may be deleted)* Dispose of the plate assay contents as hazardous waste at the end of the experiment. Most plates contain up to 20mL total volume of liquid. To collect the liquid waste into a pre-labeled hazardous waste container:

1. Move the hazardous chemical waste container, an appropriate solvent squirt bottle, and the plate into the chemical fume hood.
2. Lower the sash as low as you can to provide additional splash protection to your face.
3. Open the hazardous liquid waste container and insert a large funnel into the top.
4. Tilt the plate so that the whole plate is inside of the funnel and tap the bottom of the plate to encourage the liquid to pour out into the hazardous chemical waste container.
5. Use the squirt bottle to wash out the plate 3 times and use the funnel to collect the washes into the hazardous waste container. After the triple wash, the plate can be disposed by putting it into a regular trash can.
6. Use the squirt bottle to wash out the funnel 3 times and collect the washes into the hazardous waste container.

Clean contaminated work areas and equipment with an appropriate cleaning agent and dispose of cleaning materials properly to prevent accumulation of hazardous chemical residue. Extinguish and secure all ignition sources before beginning to clean up using flammable liquids. Decontaminate equipment before removing it from the designated work area.

Upon interruption or completion of work and/or decontamination of equipment, remove personal protective equipment to wash hands and arms with soap and water. Personal protective equipment should not be worn outside the lab/shop. Grossly contaminated equipment or clothing must be disposed of as hazardous waste. When in doubt, consider it grossly contaminated.

IF APPLICABLE - Insert description(s) of decontamination procedures for equipment, glassware, and/or controlled areas (e.g. gloveboxes, restricted access hoods, or designated portions of the lab/shop). *(highlighted instructions may be deleted)*

# DESIGNATED AREA

Designated area(s) for the use and storage of hazardous materials shall be established where limited access, [special procedures, knowledge, and work skills are required. Signage indicating the corresponding Globally Harmonized System pictogram(s) should be visible at the entrance of the designated area (e.g. postings on th](https://www.osha.gov/Publications/HazComm_QuickCard_Pictogram.html)e exterior of the lab/shop door).

REQUIRED: Insert description(s) of the designated area(s) for hazardous materials described in this SOP within your lab/shop. The entire lab/shop, a portion of the lab/shop, a fume hood, etc. can be designated. If you need to transport your hazardous materials to a field site or any other location outside of your SJSU lab/shop/classroom you MUST contact EHS or your safety staff for help with developing off-site emergency safety planning and complying with the Department of Transportation and other regulatory authorities. *highlighted instructions may be deleted*

# DETAILED PROTOCOL

Any deviation from this protocol requires approval by the lab/shop supervisor.

REQUIRED: Insert or attach the lab-specific protocol for the process, hazardous chemical(s), or hazard class described in this SOP. You may attach documents and pictures to this SOP. You may provide links to relevant training videos but unfortunately can't directly attach videos or slide shows to the SOP. Include any relevant resources like journal articles, patents, etc. as desired. Please find Chemical Overview Table Template and Templates for Detailed Protocols attached. Delete the templates if they do not apply to your lab/shop. If your lab/shop does not conduct specialized work and the scope of work is already addressed in the main SOP document, explain the situation to safety staff that review your SOPs in order to request to skip this Detailed Protocol section. Contact the Chemical Hygiene Officer or visit the EHS SOP website if you would like templates to get a head start.

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| --- | --- | --- | --- |
| TEMPLATE Version | Date Implemented | Author | Revision Notes: |
| 1.0 | 7/10/2024 | Skye Kelty | New template |
| LAB/SHOP-SPECIFIC Version | Date Approved | Author | Revision Notes |

# Documentation of Required Standard Operating Procedure Training

SOP is only valid if: 1) the first signature on the SOP is the lab/shop supervisor and 2) the second signature is completed by safety staff to indicate that they have reviewed the SOP and are prepared to provide required support for the hazards described.

* Prior to using Tetramethylammonium Hydroxide, lab/shop personnel must complete hands-on training or demonstration led by a designated trainer on the hazards, how to protect themselves from these hazards, and emergency procedures.
* SOP and a Safety Data Sheet for each hazardous material described in the SOP must be readily available.
* The lab/shop supervisor must ensure that their lab/shop personnel have attended appropriate safety awareness training or refresher training within the last three years of the current date.
* Training must be repeated following procedural revisions to this SOP. Training must be documented before initiating work with the hazards described in the SOP. Training must be refreshed annually and documentation must be updated.

The designated trainer(s) that the lab/shop supervisor approved for this protocol are: **REQUIRED list designated trainers for this SOP.**