

Formaldehyde, Formalin, Paraformaldehyde Safe Work Practices

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I. INTRODUCTION

In its purest form, **formaldehyde** is a colorless, highly toxic and flammable gas with a strong pungent odor. However, it is most commonly used as an aqueous solution called **formalin**, which typically also contains some methanol as a stabilizer. **Paraformaldehyde** is a white crystalline powder of polymerized formaldehyde, a flammable solid that can emit formaldehyde gas when heated or mixed with water. Many laboratories at UW use formalin solutions and paraformaldehyde solutions or solids as part of their research and clinical activities. It is commonly used in tissue fixing and preservation, and as an organic chemical reagent. The most widely used formaldehyde-containing chemical at UW is 10% neutral buffered (NB) formalin, which contains 4% formaldehyde.

In 2011, the US Department of Health and Human Services named formaldehyde a known human carcinogen. Prolonged exposure to formaldehyde has been associated with cancers of the lung, nasopharynx, oropharynx and nasal passages (nose and throat) and some studies suggest formaldehyde may cause leukemia, particularly myeloid leukemia, in humans. It has also been associated with decreased fertility and adverse reproductive effects. Formaldehyde is a sensitizing agent that can cause an immune system response upon initial exposure.

Subsequent exposure may cause severe allergic reactions of the skin, eyes and respiratory tract. Long-term or repeated exposure to low levels in the air or on the skin can cause asthma-like respiratory problems and skin irritation such as dermatitis and itching. Acute exposure can be highly irritating to the eyes, nose and throat. Because of the serious potential hazards for researchers and workers who may be exposed to formaldehyde as part of their work with formaldehyde-containing chemicals, precautions must be taken to eliminate or reduce the potential for exposure as much as possible.

In a laboratory setting, researchers and workers may be exposed to formaldehyde vapor emitted from formalin and paraformaldehyde solutions or from contaminated surfaces or materials. Inhalation of paraformaldehyde powder or aerosol produced during preparation of solutions may occur. Individuals may also be exposed when handling preserved specimens.

Exposure risks can be greatly reduced by (1) making sure that engineering controls such as chemical fume hoods, exhausted cabinets or containments are used, and (2) using proper procedures and personal protective equipment for handling formaldehyde-containing chemicals.

Principal investigators (PIs)/supervisors are required to assess the hazards of their work with formaldehyde-containing chemicals to determine the appropriate precautions and controls. The assessment includes, at a minimum, the types, forms, concentrations and volumes of chemical used, the procedures performed, engineering controls, personal protective equipment (PPE), decontamination and cleaning, spill response, waste handling and emergency procedures in case of possible exposure or other emergency. Environmental Health & Safety (EH&S) will assist PIs and supervisors as needed in their hazard assessment.

PIs/supervisors must provide personnel working with formaldehyde-containing chemicals laboratory-specific chemical training. The hazardous chemical training must include but is not limited to the health and physical hazards of the chemicals, signs and symptoms associated with exposure, appropriate work practices, PPE, and emergency procedures in case of spill or possible

exposure. Basic online [formaldehyde training](#) is available on the EH&S website.

Training on the safety data sheet (SDS) is required. [Section 7 of the EH&S Laboratory Safety Manual](#) on the EH&S website has additional information about safety training.

II. FORMALDEHYDE REGULATIONS, EXPOSURE LIMITS AND AIR MONITORING

Formaldehyde is one of the few chemicals with a specific regulatory standard written to protect workers. Washington State Administrative Code (WAC) permissible exposure limits for formaldehyde are very low and violation of the standard can result in heavy fines. It is the responsibility of the PI/supervisor to ensure that all legally required protections are in place and understood by their workers. EH&S routinely conducts formaldehyde air monitoring and evaluates potential formaldehyde exposures for campus labs. The regulated exposure limits are defined and summarized below including the specific WAC requirements given in [WAC 296-856](#). EH&S works with University units and departments to keep airborne formaldehyde levels in the workplace as low as possible even when measured levels are found to be below regulatory limits.

Definitions

Permissible Exposure Limit (PEL) – Airborne concentration of 0.75 part formaldehyde per million parts of air (0.75 ppm) calculated as an 8-hour time weighted average (8-hr TWA). The PEL is a concentration that nearly all workers may be exposed to daily during a 40-hour workweek for a working lifetime without adverse effect.

Short Term Exposure Limit (STEL) – Airborne concentration of 2 ppm calculated as a 15-minute TWA. The STEL should not be exceeded at any time during the workday.

Action Level (AL) – Airborne concentration of 0.5 ppm calculated as an 8-hr TWA.

Regulated Area – Any area where the airborne concentration of formaldehyde exceeds either the PEL or STEL. Access is restricted to trained authorized personnel.

Exposure Limits and Requirements Summary

Formaldehyde Airborne Concentration	Type of Limit	Exposure Duration	WAC Requirements
At or above 0.1 ppm	Exposure Threshold	Any period of time	<ul style="list-style-type: none"> Annual formaldehyde training
At or above 0.5 ppm	“Action” Level (AL)	8-hour TWA	Same as above <u>plus</u> : <ul style="list-style-type: none"> Employee medical surveillance Periodic exposure monitoring
At or above 0.75 ppm	Permissible Exposure Limit (PEL)	8-hour TWA	Same as above <u>plus</u> : <ul style="list-style-type: none"> Establish and post regulated areas Use respiratory protection Implement work practice and engineering controls to lower exposure below the PEL and STEL as feasible
At or above 2.0 ppm	Short-Term Exposure Limit (STEL)	15-minute TWA	

Air monitoring conducted by EH&S in various laboratories and work areas where formaldehyde-containing chemicals are used has shown that exposures were consistently below the WAC 8-hr TWA PEL and the 15-min TWA STEL when work with the chemicals was performed in a chemical fume hood or exhausted enclosure. However, in many labs exposure levels above the exposure threshold limit of 0.1 ppm were found, especially where work is done outside of a fume hood. When this occurs, annual basic [formaldehyde training](#) must be provided for all workers. This includes training to be completed before starting work with formaldehyde-containing chemicals, whenever there is a new use or new exposure potential to formaldehyde in a work area and annually thereafter. Lab specific formaldehyde training must also be provided. Routine use of formaldehyde-containing solutions and samples is acceptable only when airborne formaldehyde levels have been monitored and found to be below the action level of 0.5 ppm.

Refer to section [VI. FORMALDEHYDE SAFE USE PRACTICES](#), for table titled “Minimum Ventilation and PPE Requirements for Common Procedures using Formaldehyde” for a summary of procedures that have been monitored. Contact an EH&S Occupational Health and Safety Specialist at 206-543-7388 for guidance or to request that air monitoring be conducted during specific procedures in laboratories not listed in the table.

III. LABORATORY PLANNING AND PREPARATION FOR USE

1. Develop a written laboratory-specific SOP specific to the formaldehyde-containing chemical being used. A [Formaldehyde Template SOP](#) is available on the EH&S website to help in preparation of a customized SOP.
2. Contact an EH&S Occupational Health and Safety Specialist at 206-543-7388 to request that formaldehyde air monitoring be performed for procedures not listed in the table in section VI, or uncommon procedures conducted outside of a fume hood or equivalent ventilation.
3. Provide and document formaldehyde training and specific chemical SOP training to personnel working with formaldehyde-containing chemicals and any others authorized or required to be in the laboratory during work with formaldehyde-containing chemicals. A sample training documentation form is attached to the template SOP.
4. Ensure the chemical SDS is available to staff at all times and that the chemical appears in the online UW MyChem inventory system.
5. Designate a laboratory, workspace and certified chemical fume hood, exhausted biological safety cabinet (BSC), glove box or other approved containment for work with formaldehyde-containing chemicals. The laboratory facilities required may vary based on the level of hazard posed by the procedures being performed and the concentration of the formaldehyde-containing chemical.
6. Designate an area for storage of formaldehyde-containing chemicals that is properly labeled, away from incompatible chemicals (such as oxidizers, strong acids and strong bases), adverse conditions (such as heat or ignition sources), and has secondary containment.
7. Post the [EH&S Exposure Response Poster](#) in the laboratory.

8. If possible, do not work with paraformaldehyde in solid form. If it is necessary to purchase it in solid form, purchase pre-diluted or pre-weighed chemical (preferably in granular or flake, rather than powder form) in the least quantity needed to perform work.
9. If large volumes of formalin solutions must be used, such as 5-gal or larger quantities in containers, determine the best location, setup, and procedures to prevent exposures and spills. Evaluate all handling operations, training, and procedures for use, change-out and refilling of containers and pump dispensing where needed.
10. Determine if waste formaldehyde-containing chemical can be treated in the laboratory and disposed of in the sink. Details of treatment procedures are given in Section [IX. FORMALDEHYDE WASTE COLLECTION, DISPOSAL AND TREATMENT](#) below.
11. Ensure supplies are available for waste handling, treatment (if done) and disposal, and for routine cleaning of surfaces.
12. Ensure appropriate supplies, such as absorbent pads, for spill cleanup are readily available in a clearly marked spill cleanup kit.
13. Document spill cleanup procedures that staff are expected to follow, and list required PPE. Specify when a spill cleanup contractor will be needed.

IV. ENGINEERING CONTROLS

1. Work with concentrated (greater than 4% formaldehyde/paraformaldehyde) solutions only in a properly operating and certified chemical fume hood, exhausted BSC, glove box or other approved containment that does not exhaust into the room. Do not use laminar flow hoods or cabinets. Consider the procedures being performed when selecting a containment device.
2. Safety shower and emergency eyewash must be easily accessible within the immediate work environment in areas where formaldehyde is used.
3. Laboratory rooms must be at negative pressure with respect to the corridors and external environment. Doors to the room must be kept closed at all times.

V. PERSONAL PROTECTIVE EQUIPMENT (PPE)

1. Wear two pairs of disposable nitrile exam gloves or one pair of non-disposable nitrile or butyl gloves (minimum 10 mil thickness) when there is a significant risk of contact:
 - Handling 37% or greater concentration of formaldehyde alone or mixed with phenol
 - Preparing chemical
 - Handling specimens fixed in formaldehyde
 - Extended handling periods
 - Cleaning up spills
 - Immersion of the hands is anticipated
2. Wear at least one pair of disposable nitrile exam gloves when handling paraformaldehyde or formalin solutions containing less than 37% formaldehyde.

3. Change gloves after each use, or when torn, punctured, or contaminated.
4. Wear safety glasses with side shields or goggles.
5. Wear a lab coat or equivalent.
6. If splash/spatter possible, wear face protection, such as a face shield, and a chemical resistant apron with sleeves.
7. If ventilation and other control methods are not effective or feasible, respiratory protection (requires enrollment in UW's respirator program) may be required. Airborne formaldehyde may be present when work is done outside of approved containment. Surgical masks or dust masks do not provide protection. Contact the EH&S Respiratory Program Administrator at uwresp@uw.edu for information or visit the [Respiratory Protection page](#) on the EH&S website.

VI. FORMALDEHYDE SAFE USE PRACTICES

1. Preparation of formaldehyde solutions must be performed in a chemical fume hood, exhausted BSC, glove box or other approved containment.
2. Perform preparations over plastic backed absorbent pads. Dispose of pads after completion of tasks.
3. Handle paraformaldehyde powder (and, preferably, granules or flakes) only in a chemical fume hood or other approved containment.
4. If weighing paraformaldehyde solid and the balance cannot be located in a fume hood or BSC, use the following method: Weigh an empty container and lid, take to the hood and add solid to the container and cover with the lid, return to the balance to weigh the solid added to the covered container.
5. Work within a fume hood whenever possible, especially when:
 - Mixing or transferring solutions
 - Working with high concentrations or large volumes in open containers
 - Aerosolizing solutions
 - Heating solutions
 - Working with solutions under pressure
 - Spreading solutions over a large surface area
6. Dilute solutions (1 - 4% formaldehyde) in small quantities may be used outside of a fume hood as long as the process has been monitored by EH&S and airborne formaldehyde levels are determined to be below the action level of 0.5 ppm.
7. Transport formaldehyde-containing chemicals only in labeled, leak/spill-proof, non-breakable secondary containers.
8. Utilize safe sharps procedures. Dispose of sharps in a sharps container. The sharps container must be in the immediate vicinity of work. Needle locking syringes or disposable

syringe needle units are recommended and should be disposed of promptly after use. Remove blades from scalpels with a scalpel blade remover.

9. Dispose of unused excess chemical as a hazardous waste in an appropriate waste container.
10. Double bag all used or contaminated (not grossly contaminated) disposable items, such as gloves, paper towels and absorbent pads, in plastic bags. Label as non-hazardous waste before disposing in the trash. Place grossly contaminated items in double bags for hazardous waste pickup.
11. After work is complete, wipe down area with detergent and water solution.
12. Wash hands with soap and water upon completion of tasks.

The table below summarizes some common procedures using formaldehyde-containing chemicals in research and other laboratories and the associated minimum requirements for ventilation and PPE to minimize the potential for exposures. The minimum requirements have been determined based on air monitoring data collected during these common procedures in various laboratories. Use of formaldehyde-containing solutions and samples outside of a fume hood or ventilated enclosure is acceptable *only* when airborne formaldehyde levels have been monitored and found to be below the action level of 0.5 ppm. When a fume hood or ventilated enclosure is not available or feasible, laboratories, with assistance from EH&S, have developed specific procedures and work practices to minimize exposures. Contact an EH&S Occupational Health and Safety Specialist at 206-543-7388 for more information and guidance or to request that air monitoring be conducted during specific procedures in laboratories.

Minimum Ventilation and PPE Requirements for Common Procedures Using Formaldehyde

Procedure	Formaldehyde-containing chemical	Ventilation	PPE
Preparation of solutions	Paraformaldehyde weighing and soln. prep	Fume hood or equivalent	Safety glasses/goggles, nitrile gloves, lab coat
	Solution prep from 37% formaldehyde	Fume hood or equivalent	Safety glasses/goggles, nitrile gloves, lab coat
Using pressurized systems	all	Fume hood or equivalent	Safety glasses/goggles, nitrile gloves, lab coat; if splash possible, add face shield, impervious apron with sleeves
Fixing tissues or cells	1-4% formaldehyde (3-10% NB formalin or paraformaldehyde soln.)	Fume hood or equivalent; or well ventilated area if small amounts and short task time*	Safety glasses/goggles, nitrile gloves, lab coat
	Placing sample in 4% formaldehyde in prefilled screw cap containers	Well ventilated area if small amounts and short task time	Safety glasses/goggles, nitrile gloves, lab coat
Gross examination of fixed tissues	4% formaldehyde (10% NB formalin)	Fume hood or equivalent, down draft table, well ventilated area if small amounts and short task time	Safety glasses/goggles, nitrile gloves, lab coat
Microscopic examination of fixed tissues or cells	4% formaldehyde (10% NB formalin)	Well ventilated area if small amounts and short task time	Safety glasses/goggles, nitrile gloves, lab coat
Blot assays	37% formaldehyde and diluted solutions	Fume hood or equivalent	Safety glasses/goggles, nitrile gloves, lab coat
Animal perfusions	1-4% formaldehyde (3-10% NB formalin or paraformaldehyde soln.)	Fume hood or equivalent	Safety glasses/goggles, nitrile gloves, lab coat
Specimen discard, waste chemical handling & treatment	all	Fume hood or equivalent	Safety glasses/goggles, nitrile gloves, lab coat; if splash possible, add face shield, impervious apron with sleeves
Spill cleanup**	all	Fume hood, equivalent or well ventilated area	Goggles, double nitrile exam gloves (or Silver Shield or non-disposable nitrile gloves), lab coat; if splash possible, add face shield, impervious apron with sleeves

NB = neutral buffered

*small amounts = up to 50 mL; short task time = less than 5 min.

**refer to Section [VII. FORMALDEHYDE SPILL CLEANUP](#)

VII. FORMALDEHYDE SPILL CLEANUP

Formaldehyde spills must be cleaned up immediately by properly protected and trained personnel who are not sensitive to formaldehyde. All other persons should leave the area. Spill response procedures must be developed based on the chemical present and potential spill or release conditions. Clean up spills using contents of the spill kit.

Do not attempt to clean up any spill if not trained or comfortable. For large spills, evacuate the area and call 9-1-1 on campus phone for help. If spill is out of control, call 9-1-1. If person injured, exposed, or suspected of being exposed to formaldehyde, follow procedures below in [Section VIII. ACUTE EXPOSURE](#).

Instructions for small or contained spills

- Spills inside a fume hood, BSC, glove box or approved containment
- Small spills (250 ml or less) outside of fume hood or containment
 1. Spills, regardless of size, inside a fume hood can typically be cleaned up by trained people who are not sensitive to formaldehyde.
 2. Small spills outside a fume hood (250 ml or less) can also be managed by trained people who are not sensitive to formaldehyde.
 3. Personnel must wear a lab coat or smock, safety goggles, two pairs of disposable nitrile exam gloves or one pair of thicker nitrile or butyl gloves (minimum 10 mil thickness) or Silver Shield gloves, and shoe covers as needed when cleaning up spills.
 4. **Liquids:** Wipe up spilled liquids with absorbent pads. If using a formaldehyde neutralizing absorbent, cover the spill with the absorbent and allow to sit for the prescribed contact time (usually 15 min.), and then scoop up and dispose of properly.
 5. **Solids:** Gently cover paraformaldehyde solid spills with wetted paper towels or absorbent pads to avoid raising dust and then wipe up.
 6. Clean the spill area thoroughly with detergent solution followed by clean water.
 7. If spill is extensive within the containment, clean all interior surfaces after completion of the spill cleanup.
 8. Double bag all waste in plastic bags labeled with a hazardous waste label that reads "formaldehyde spill debris." Submit an [Online Chemical Waste Collection Request](#) on the EH&S website.

Instructions for large spills (greater than 250 ml) outside of fume hood or containment

1. Large formaldehyde spills (greater than 250 ml) outside a fume hood or containment may generate vapors above formaldehyde exposure limits; therefore, these spills require the use of respiratory protection.
2. Cover spill if possible to keep vapors down.
3. Evacuate area and restrict access. Attend to injured or exposed persons using emergency shower or eyewash. Follow procedures below in [Section VIII.ACUTE EXPOSURE](#).

4. As soon as possible report the spill in a safe area by notifying EH&S (during business hours (M-F/8-5) 206-543-0467, outside business hours 9-1-1 on campus phone. Tell them that a spill has occurred, and that you need help managing the spill. EH&S can arrange for a spill cleanup contractor. Notify a supervisor.
5. Be prepared to provide the following information:
 - Name and phone number of knowledgeable person that can be contacted
 - Name of chemical spilled, concentration and amount spilled, liquid or solid type spill
 - Number of injured, if any (refer below to Section [VIII. ACUTE EXPOSURE](#))
 - Location of spill

This information can also be used in reporting to the Emergency Department (ED) after a potential exposure.

6. **Only if staff are trained, have the proper PPE including respiratory protection and are comfortable with cleaning up the spill, they may proceed to clean it up.** Personnel must wear a lab coat or smock, safety goggles, two pairs of disposable nitrile exam gloves or one pair of thicker nitrile or butyl gloves (minimum 10 mil thickness) or Silver Shield gloves, shoe covers and a respirator specifically for protection against formaldehyde. Respirator use requires enrollment in UW's respirator program. Contact EH&S at uwresp@uw.edu for information or visit the [Respiratory Protection page](#) on the EH&S website.
7. **Liquids:** Wipe up spilled liquids with absorbent pads. If using a formaldehyde neutralizing absorbent, cover the spill with the absorbent and allow to sit for the prescribed contact time (usually 15 min.), and then scoop up and dispose of properly.
8. **Solids:** Gently cover paraformaldehyde solid spills with wetted paper towels or absorbent pads to avoid raising dust and then wipe up.
9. Clean the spill area thoroughly with detergent solution followed by clean water.
10. Double bag all waste in plastic bags labeled with a hazardous waste label that reads "formaldehyde spill debris." Submit an [Online Chemical Waste Collection Request](#) on the EH&S website.

Any spill incident requires the involved person or supervisor to complete and submit the UW [Online Accident Reporting System \(OARS\)](#) form to EH&S.

For questions on spill cleanup, contact EH&S spill consultants at 206-543-0467.

VIII. ACUTE EXPOSURE

Follow the steps below for any exposures to formaldehyde or refer to the [EH&S Exposure Response Poster](#) that is posted in the laboratory.

1. **Provide first aid immediately**
 - **Inhalation exposure**

Move out of contaminated area. Get medical help.

- **Sharps injury** (needlestick and subcutaneous exposure)
Scrub exposed area thoroughly for 15 minutes using warm water and sudsing soap.
- **Skin exposure**
Use the nearest safety shower for 15 minutes. Stay under the shower and remove clothing. Use a clean lab coat or spare clothing for cover-up.
- **Eye exposure**
Use the eyewash for 15 minutes while holding eyelids open.

2. Get help

- **Call 9-1-1 on campus phone or go to nearest Emergency Department (ED). Give details of exposure:**
 - Chemical
 - Dose
 - Route of exposure
 - Time since exposure
- **Bring to the ED the SDS and SOP for the specific chemical.**
- **Notify your supervisor** as soon as possible for assistance.
- **Secure area before leaving.** Lock doors and indicate spill if needed.

3. Report the incident to Environmental Health & Safety (EH&S)

- During business hours (M-F/8-5) call 206-543-7262.
- Outside business hours call 206-685-UWPD (8973) or 9-1-1 on campus phone to be routed to the EH&S staff on call.
- **If serious accident, hospitalization or fatality, notify EH&S immediately after providing first aid and/or getting help.**
- **For all incidents and near misses, the involved person or supervisor completes and submits the UW [Online Accident Reporting System \(OARS\)](#) form to EH&S.**

IX. FORMALDEHYDE WASTE COLLECTION, DISPOSAL AND TREATMENT

Once formaldehyde-containing waste solutions are properly collected there are two options for disposal. A request may be submitted to EH&S for pickup of the waste. Alternatively, a laboratory may work with EH&S to develop a formaldehyde treatment procedure where the lab treats their formaldehyde waste for disposal in the sink.

Formaldehyde waste collection

1. Formaldehyde-containing chemical waste is considered a hazardous chemical waste. Visit

the [Chemical Waste Disposal page](#) on the EH&S website to submit a Chemical Waste Collection Request. For guidance and questions contact EH&S Environmental Programs at chmwaste@uw.edu or 206-616-5835.

2. Accumulate waste in a sturdy, chemically compatible container with a secure closure. For contaminated debris, a bag may be used, but it must be strong enough to prevent the contents from puncturing through.
3. Double bag all used and contaminated (not grossly contaminated) disposable items, such as gloves, paper towels and absorbent pads, in plastic bags. Label as non-hazardous waste before disposing in the trash.
4. Place grossly contaminated disposable items in double plastic bags for hazardous waste pickup.
5. All waste containers must be properly labeled with all of the contents.
6. All waste containers must be properly closed or sealed.
7. **Waste formaldehyde-containing solutions with specimens or tissue samples must be separated before disposal.** The specimens may be considered biohazardous waste, which would need to be handled according to procedures on the [Biohazardous Waste page](#) on the EH&S website.

Option 1: EH&S pickup of formaldehyde waste for disposal

For waste pickup: Submit an [Online Chemical Waste Collection Request](#) on the EH&S website.

Option 2: Treatment of formaldehyde waste

Untreated formaldehyde-containing solutions cannot be poured down the drain! Some laboratories may be able to treat their own formaldehyde waste, which helps UW avoid the risks and costs of hazardous waste transport and disposal. A formaldehyde treatment protocol has been approved by the King County Wastewater Treatment Division and WA Department of Ecology. Only formaldehyde solutions at concentrations less than 0.1% (1000 ppm) are acceptable for sewer discharge. To participate in the treatment program the following must be done:

- a) Submit a [Waste Evaluation Request form](#) for EH&S to review the waste generated and confirm appropriateness of treatment.
- b) Enroll in the "Treatment by Generator" EH&S program.
- c) Create an SOP for the treatment process.
- d) Train employees and others who may be doing treatments.
- e) Maintain a formaldehyde treatment log and report activities to EH&S annually.

Contact EH&S Environmental Programs at 206-616-5835 or email chmwaste@uw.edu with any questions. More information is also available on the [Chemical Treatment and Recycling page](#) on the EH&S website.

The sample protocol below is intended for treating 10% NB formalin solutions (4% formaldehyde) with the recommended product Neutralex.

Equipment needed:

- Neutralization container
- Neutralex packet
- pH test strips
- Aldehyde test reagent and indicator strips
- Chemical treatment log

Procedure

1. Work in a chemical fume hood or other approved ventilated containment.
2. Wear nitrile gloves, apron or lab coat and goggles. Wear a face shield if splash possible.
3. Designate and label a “formaldehyde waste neutralization container” such as a 2.5 gallon wide mouth polypropylene carboy with a handle. If using larger containers, ensure a safe way to dispense the contents without lifting, either pumping or siphoning. Maintain closed in chemical fume hood or ventilated enclosure with secondary containment.
4. Fill the waste container allowing space for mixing.
5. Add $\frac{1}{2}$ of one packet of Neutralex powder to 2.5 gallons of waste formaldehyde solution. Add a full packet to 5 gallons of waste solution. A full packet contains 750 g (26 oz.); a $\frac{1}{2}$ packet would be 375 g (13 oz.).
6. Mix the solution by stirring or by sealing the container and tipping or swirling the container from side to side.
7. Let the solution sit for 15 minutes. Swirl once again just before testing.
8. Check the pH.
 - Pipette 5 mL of the treated waste solution to a test tube
 - Insert end of the pH test strip into the solution. Compare the color produced on the pH test strip to the color chart provided.
 - The pH of the solution must be between 6 and 9 to be suitable for discharge.
9. Test for residual aldehydes.
 - Add 20 drops of the aldehyde test reagent to waste solution in test tube
 - Mix thoroughly
 - Immerse reaction zone of the aldehyde indicator strip into the waste solution for at least one second
 - Shake off excess liquid from the strip and wait 60 seconds
 - Compare the reaction zone color of the strip to the color scale provided. The matching color indicates the residual aldehyde content in ppm of the treated waste solution. The reading must be below 100 ppm.

10. If the result is below 100 ppm, the treated formaldehyde solution may be discharged to the sewer. Record the quantity, pH and residual aldehyde concentration on the [Chemical Treatment Log](#).
11. If the result is above 100 ppm, stir or swirl the solution and let sit for another 15 minutes. Test again. If the residual aldehyde content remains at or above 100 ppm, the waste solution cannot be poured down the sink and must be disposed of as hazardous chemical waste.

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