




Standard Operating Procedure for Photoreactive Resins

Formlabs Resin V4 (Clear, Black, White, Grey, etc), Flexible Resins, Heat-Resistance Resins:

Section 1 – Lab-Specific Information

Building/Room(s) covered by this SOP:	Paul G. Allen Center for CSE, CSE 615 Bill & Melinda Gates Center for CSE, CSE2 G15
Unit or department:	Paul G. Allen School of CSE
Chemical Hygiene Officer Name:	Alexander Lefort
Chemical Hygiene Officer Signature/Date:	 2024/05/07
This SOP was created by (if not PI): Name/Title	Alexander Lefort Fabrication Research Lab Manager

Section 2 – Hazards

Components:

Urethane Dimethacrylate (CAS N/A)

Methacrylate Monomer(s) (CAS N/A)

Photoinitiator(s) (CAS N/A)

Hazards:

Eye irritation, category 2A

Skin sensitization, category 1

Hazard Statements:

H319 Causes serious eye irritation.

H317 May cause an allergic skin reaction.

Precautionary Statements:

P264 Wash skin thoroughly after handling

P280 Wear protective gloves, protective clothing and eye protection.

P261 Avoid breathing dust/fume/gas/mist/vapors/spray



P272 Contaminated work clothing must not be allowed out of the workplace

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P337+P313 If eye irritation persists: Get medical advice/attention.

P302+P352 IF ON SKIN: Wash with plenty of soap and water

P333+P313 If skin irritation or rash occurs: Get medical advice/attention

P363 Wash contaminated clothing before reuse

P501 Dispose of contents/container in accordance with local/regional/national regulations



Section 3 – Engineering Controls and Personal Protective Equipment (PPE)

Engineering controls

Form 3 resin printers come with a containing lid that remains closed and should only be opened when inserting or removing build plates or resin tanks. This is likewise present on the post-processing stations.

Hygiene measures

Avoid contact with skin, eyes, and clothing. Wash hands after removing PPE, before breaks, and immediately after handling the chemical. Any potentially exposed body parts should be washed immediately.

PPE required during any usage of the Form 3 resin printer and/or its post-processing stations:

Skin and body protection

Chemically compatible laboratory coats that fully extend to the wrist must be worn and be appropriately sized for the individual and buttoned to their full length. Personnel must also wear full-length pants, or equivalent, and close-toe shoes. The area of skin between the shoe and ankle must not be exposed.

Tyvek disposable lab coats are required during all steps when printing with the Form 3 printer. Lab coats may be reused so long as no resin or other chemical spots are present and they are not torn or otherwise worn out. Store these lab coats only on the provided hooks near the entrance of the room and ensure that your name is written on the left breast pocket.

Hand protection

Hand protection is required for the activities described in this SOP.

Disposable nitrile gloves are required during all steps when working with the Form 3 printer. If the gloves do not fit properly, contact the lab manager to purchase the appropriate size for you.

Gloves must be inspected prior to use, including a check for pinholes.



Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands immediately after glove removal.

Eye protection

ANSI Z87.1-compliant eye protection is required for all work with Formlabs resins. Ordinary prescription glasses will NOT provide adequate protection unless they also meet the Z87.1 standard and have compliant side shields. Chemical splash goggles are required during all steps in printing with the Form 3 printer.

Respiratory protection

Respiratory protection is not required for the activities described in this SOP.

Section 4 – Special handling and storage requirements

Only tools specific to the Form 3 resin printer and post-processing station should be used with the Formlabs resins. Do NOT use other 3D printer tools, as this will cause contamination of those tools.

If changing out a resin tank, it is required to put the resin tank that is not in use into a designated Formlabs resin tank case and to label the case with the appropriate resin inside. This both prevents spills as well as the resin curing prematurely.

Uncured resin should not be transported outside of the lab unless in sealed, unopened resin cartridges.

- Clean all contaminated surfaces with isopropanol and dry.
- Place all contaminated disposable items in appropriate laboratory waste for disposal.
- Non-disposable/re-usable utensils, glassware, and other surfaces contaminated with Formlabs resins must be decontaminated at the end of the laboratory work session.
- When work is completed, remove gloves and wash hands with soap and water.

Formlabs resins should not be transferred to secondary containers unless the lab manager is made aware of this. If transferred, an appropriate label must be affixed to the secondary container, as per the EH&S guidance found here: [Chemical Container Labels | EHS \(washington.edu\)](#). Please contact the lab manager for appropriate labels.

Section 5 – Spill and accident procedures

Chemical spills must be cleaned up as soon as possible by properly protected and trained personnel. You must be trained on the Form 3 resin printer and Formlabs resins in order to clean up a spill of these chemicals. Keep others from coming in contact with the spill.

If resin is spilled, stop the procedure at hand and ensure that no further resin spills. Follow the procedures below to clean up the spill:

1. Ensure that you have the proper PPE on to deal with the spill: lab coat, splash goggles, nitrile gloves, and that none of these are contaminated from the spill. If they are, replace them if disposable or wipe them off with an isopropanol-wetted paper towel. KEEP ALL WASTE TOGETHER IN A PLASTIC BAG FOR PROPER DISPOSAL. Bags may be found below the sink.
2. Using paper towels, wipe up the spilled area of wet resin and collect the contaminated paper towels in your disposal bag.



3. Once excess resin is removed, spray the area with isopropanol from one of the squeeze bottles next to the print post-processing station.
4. Use fresh towels to wipe up the isopropanol and dry the area. Add these to the disposal bag.
5. Once everything is cleaned, tie the bag shut, double bag it with another bag, and label it with a chemical waste label. See the lab manager for labels.
6. Place the bag in the chemicals cabinet to the right of the sink and alert the lab manager if you have not already done so.

For questions on spill cleanup, contact EH&S spill consultants at 206-543-0467 during normal business hours (Monday-Friday, 8 a.m. to 5 p.m.).

Any spill, exposure or near miss incident requires the involved person or supervisor to complete and submit the [UW Online Accident Reporting System](#) (OARS) form on the EH&S website within 24 hours (certain [types of incidents require immediate notification](#)).

Exposures: If a person is injured, exposed, or suspected of being exposed to Formlabs resins, follow procedures listed here:

Perform first aid immediately.

- **Inhalation exposure:** Although these resins do not have particularly hazardous fumes, they can smell quite strong. If you become light-headed, move out of contaminated area, ideally to an area with good airflow, such as outside; get medical help if symptoms persist.
- **Sharps injury** (needle stick or subcutaneous exposure): Scrub exposed area thoroughly for 15 minutes using warm water and sudsing soap.
- **Skin exposure:** Remove contaminated clothing. If exposed to a small amount and on an easily accessible part, rinse the location at the sink for 15 minutes. If exposed to a large amount, 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 eye wash for 15 minutes while holding eyelids open.

Get help if exposed to a large amount, or the exposure triggers an allergic reaction.

- **Call 9-1-1** or go to nearest Emergency Department (ED); provide details of exposure:
 - Agent
 - Dose
 - Route of exposure
 - Time since exposure
- **Bring the SDS and this SOP** to the Emergency Department
- **Notify your supervisor** as soon as possible for assistance
- **Secure the area** before leaving; lock doors and indicate spill if needed

Report the incident to Environmental Health & Safety.

- **Notify EH&S immediately** after providing first aid and/or getting help.
 - During business hours (M-F/8-5), call 206-543-7262.
 - Outside of business hours, call 206-685-UWPD (8973) to be routed to EH&S Staff On Call.
- Any spill, exposure or near miss incident requires the involved person or supervisor to complete and submit the [UW Online Accident Reporting System](#) (OARS) form on the EH&S website within 24 hours (certain [types of incidents require immediate notification](#)).

Section 6 – Waste accumulation and disposal procedures

The Fabrication Research Lab has two separate waste streams: flammable and non-flammable materials.

- Flammable waste materials must always be stored in the flammables cabinet.
- Non-flammables waste must always be stored in the non-flammable cabinet.
- Acids are not allowed in the space; Contact the lab manager if you run across these.

To dispose of empty cartridges and tanks, ensure that the cartridge or tank is as empty as possible of uncured resin. Place the cartridge or tank into its original box and seal the box. Label it with a properly filled out waste collection tag. Contact the lab manager for these.

When more than three cartridges or tanks are ready for disposal, or a spill has occurred, contact the lab manager and they will submit a chemical waste collection request.

All chemical waste containers must be labeled with a [UW Hazardous Waste Label](#). Refer to [How to Label Chemical Waste Containers](#).

To request a collection of chemical waste, submit a form on the [Chemical Waste Disposal](#) webpage on the EH&S website or directly in [MyChem](#) inventory. Contact EH&S at 206.616.5835 or chmwaste@uw.edu with questions.

Work area decontamination procedures as appropriate for the chemical in use should be followed.

Generally, there should be no need to use glassware or other containers for Formlabs resins, but the removal of cured resin pancakes on the tank may require the usage of such containers. In these events, empty the containers of as much resin as possible back into a cartridge or tank, then add isopropanol to the container and swirl gently to dissolve the remaining resin. Drain this isopropanol into a designated isopropanol and resin waste carboy, found in the flammables cabinet. Repeat this step as many times as necessary to remove all visible resin. Then, repeat the step once more to remove any leftover traces. Set the container to the side of the sink to air dry.

Section 7 – Protocol

Formlabs photoreactive resins must only be used with the Form 3 resin printers and their post-processing stations. See the Form 3 resin printer SOP for detailed usage of these machines.

NOTE: Any deviation from this SOP requires approval from the lab manager.

Section 8 – Special Precautions for animal use (Yes No)

N/A

Section 9 – Approvals required

All staff working with Formlabs photoreactive resins must be trained on this SOP prior to starting work. They must also review the particular SDS for their resin, and it must be readily available in the laboratory either physically or digitally. All training must be documented and maintained by the PI or their designee.

Users must complete the Formlabs Form 3 Resin Printer Training and pass the quiz in addition to reading this chemical SOP in order to work with the Form 3 resin printer and Formlabs resins.



Section 10 – Decontamination

Decontamination should not be required during regular usage of these chemicals. The form 3 resin printer and its post-processing station should not come in contact with or be used with other chemicals outside of Formlabs resins and isopropanol.

Section 11 – Designated area

Formlabs resins should only be used in the Form 3 resin printer and its post-processing station.

Section 12 – Documentation of training

- Prior to using substances included in this SOP, laboratory personnel must be trained on the hazards described in this SOP, how to protect themselves from the hazards, and emergency procedures.
- Ready access to this SOP and to a Safety Data Sheet for each hazardous material described in the SOP must be made available in the lab space(s) where these substances are used.
- The Principal Investigator (PI), or Responsible Party, if the activity does not involve a PI, must ensure that their laboratory personnel have attended appropriate laboratory safety training (and refresher training where applicable).
- Training must be repeated following **any** revision to the content of this SOP.
- Training must be documented. Trainings are documented via a Fabrication Research Lab Training Records spreadsheet. Please contact the lab manager for access: Aalefort@cs.washington.edu.