



Standard Operating Procedure for Objet Resins

Vero Series (VeroBlue, VeroClear, etc), Support materials, Model cleaning fluid

Section 1 – Lab-Specific Information

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

Section 2 – Hazards

Components:

Proprietary materials

Titanium dioxide

Camphene

Ethoxylated Trimethylolpropane Triacrylate

Acrylic acid

Glycerol, propoxylated, esters with acrylic acid

1,7,7-Trimethyltricyclo[2.2.1.0^{2,6}]heptain

Hazards:

Skin corrosion/irritation category 2

Serious eye damage/eye irritation category 1

Skin sensitization category 1B

Carcinogenicity category 2

Specific target organ toxicity (single exposure) category 3

Specific target organ toxicity (repeated exposure) category 2

Hazard Statements:



Causes skin irritation.

Causes serious eye damage.

May cause an allergic skin reaction.

Suspected of causing cancer.

May cause respiratory irritation.

May cause damage to organs through prolonged or repeated exposure.

Precautionary Statements:

Obtain special instructions before use

Do not handle until all safety precautions have been read and understood

Wear protective gloves/protective clothing/eye protection/face protection

Wash face, hands and any exposed skin thoroughly after handling

Contaminated work clothing must not be allowed out of the workplace

Do not breathe dust/fume/gas/mist/vapors/spray

Use only in a well-ventilated area

IF exposed or concerned: Get medical advice/attention

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

Immediately call a POISON CENTER or doctor

IF ON SKIN: Wash with plenty of water and soap

Take off contaminated clothing and wash it before reuse

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

IF INHALED: Remove person to fresh air and keep comfortable for breathing



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

Engineering controls



Objet resins are all contained within a sealed cartridge with a 'self-healing' rubber gasket requiring puncture by the Objet 30's material loading system to access.

This method generally provides a great deal of protection and separation between the chemical and the user. Likewise, the printer will only dispense the material within its enclosed build envelope during a print job. The build envelope has an interlock that will immediately pause the printer if the lid is opened.

Once fully cured (i.e. the print has completed), the materials are innocuous and able to be handled readily without gloves.

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 is not required when starting up the printer or initializing a print, so long as the resin cartridge drawer remains closed.

PPE in the form of hand protection (see below) is required when removing a print from the printer and before placing it in the post-processing spray booth to avoid contact with any potential residual uncured resin. Once removed from the post-processing spray booth, you may remove PPE.

PPE is required whenever print cartridges are added, removed, or changed, or otherwise handled to prevent accidental exposure to any residual resin on the outside of the cartridges:

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 the adding, removal, or changing of the Objet resin cartridges or when the resin cartridge drawer is open. 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 the adding, removal, or changing of the Objet resin cartridges or when the resin cartridge drawer is open. 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 Objet 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 the adding, removal, or changing of the Objet resin cartridges or when the resin cartridge drawer is open.

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 Objet 30 resin printer and post-processing spray station should be used with fully cured Objet resin from between first removal from the printer and post-processing at the spray station. Do NOT use other 3D printer tools, as this may cause contamination of those tools.

NO tools should be used on or near the Objet resin cartridges to avoid the potential of puncturing or otherwise damaging them.

Resin cartridges should only be changed by the lab manager. It is required to put the resin cartridge that is not in use into the designated Objet resin drawer below the machine.

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 Objet 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 \(washington.edu\)](https://ehs.washington.edu/chemical-container-labels). 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 Objet 30 printer and Objet resins in order to clean up a spill of these chemicals. All other persons should leave the area.

Contact the lab manager immediately to inform them of the spill and for additional guidance. Follow the steps below:

1. Retrieve the lab spill kit from under the sink area.



2. Open the bucket and empty it onto an unused, uncontaminated surface. Utilize the splash goggles and nitrile gloves inside, as well as grabbing a disposable lab coat to wear.
3. Once fully suited with PPE (nitrile gloves, splash goggles, lab coat), use the multi-absorbent pads from the kit to absorb the resins from the spill. As they become saturated, place them into the bucket of the spill kit.
4. Once the area is dry, douse the area in water and dry with any remaining pads or paper towels. Place any paper towels used into the bucket as well.
5. Remove gloves and disposable lab coat and place into the waste container and seal the container with the lid.
6. Label the container with a properly filled out waste disposal label (see lab manager) and place the bucket into the non-flammable waste cabinet.
7. Promptly wash your hands with soap and warm water. Done.

Do **not** attempt to clean up any spill if **not** trained or comfortable. Evacuate the area and call 9-1-1 on campus phone for help. If the spill is out of control, call 9-1-1. If a person is injured, exposed or suspected of being exposed, call 9-1-1 and follow the EXPOSURE PROCEDURES (below).

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](#)).

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

Perform first aid immediately.

- **Inhalation exposure:** Move out of contaminated area; get medical help immediately if symptoms occur. IF exposed or concerned: Get medical advice/attention.
- **Ingestion:** Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Call a physician.
- **Sharps injury** (needle stick or 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. May cause an allergic reaction. In the case of skin irritation or allergic reactions, see a physician.
- **Eye exposure:** Use the eye wash for 15 minutes while holding eyelids open. Remove contact lenses if present and easy to do so. Continue rinsing. Do not rub affected area. Get immediate medical attention.

Get Help.



- **Immediate medical attention is required. Show the safety data sheet to the doctor in attendance.**
- **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

Self-protection of the first aider: Avoid contact with skin, eyes, or clothing. Wear personal protective equipment listed in this SOP.

Note to physicians: May cause sensitization in susceptible persons. Treat symptomatically.

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-flammable waste must always be stored in the non-flammable cabinet.
- Free-standing acids are not allowed in the space; Contact the lab manager if you run across these.

To dispose of empty cartridges, wear appropriate PPE. Place the cartridge into its original box and seal the box. Label it with a properly filled out waste collection tag and place into the non-flammable chemical storage cabinet. Contact the lab manager for labels.

When more than three cartridges 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.

There should be no need to use glassware or other containers for Objet resins; If contact with Objet resins occurs on another object, follow the spill cleaning guidelines.



Section 7 – Protocol

Objet resins must only be used with the Objet 30 polyjet printer. See the Objet 30 polyjet printer SOP for detailed usage of this machine.

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 Objet 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 Objet 30 Polyjet Printer Training in addition to reading this chemical SOP in order to work with the Objet 30 Polyjet Printer and Objet resins.

Section 10 – Decontamination

Decontamination should not be required during regular usage of these chemicals. The Objet 30 printer and its post-processing spray station should not come in contact with or be used with other chemicals outside of Objet resins and support materials.

Section 11 – Designated area

Objet resins should only be used in the Objet 30 printer.

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.