

# Post Processing Guide



## ProJet® MJP 2500 & MJP 2500 Plus

### Post Processing Guide

p/n 33-D126 Rev B

Original Instructions

 Please refer back to <http://infocenter.3dsystems.com/projetmjp2500/post-processing-guide> for the most up-to-date post processing guide

## VisiJet® Materials

### About this Manual


This purpose of this document is to discuss the types of materials that will be available for use in the ProJet® MJP 2500 and ProJet® MJP 2500 Plus and to help you determine which material works best for your application. Also included in this manual is safety information, material handling, and post processing instructions.

The materials currently available for use in the ProJet® MJP 2500 and ProJet® MJP 2500 Plus are:

VisiJet® Materials for ProJet® MJP 2500/2500 Plus	
ProJet® MJP 2500	ProJet® MJP 2500 Plus
<b>*VisiJet® M2R-WT</b> (Rigid White, General Purpose)	<b>*VisiJet® M2R-WT</b> (Rigid White, General Purpose)
<b>*VisiJet® M2R-BK</b> (Rigid Black, General Purpose)	<b>*VisiJet® M2R-BK</b> (Rigid Black, General Purpose)
<b>VisiJet® M2G-DUR</b> (VisiJet ProFlex, EngGneering Clear, PP-like)	<b>VisiJet® M2G-DUR</b> (VisiJet ProFlex, EnGineering Clear, PP-like)
N/A	<b>VisiJet® M2R-GRY</b> (Rigid Gray, High Contrast)
N/A	<b>VisiJet® M2G-CL</b> (VisiJet Armor, EnGineering Clear, ABS-like)
N/A	<b>*VisiJet® M2R-CL</b> (Rigid Clear, General Purpose)
N/A	<b>VisiJet® M2-EBK</b> (Elastomeric Black, High Flex)

N/A	<b>VisiJet® M2-ENT</b> <b>(Elastomeric Natural, High Flex)</b>
<b>VisiJet® M2 SUP</b> <b>(Wax support material)</b>	<b>VisiJet® M2 SUP</b> <b>(Wax support material)</b>

\* Replaces former VisiJet® materials (RWT, RCL and RBK).

 **NOTE:** VisiJet® M2G-CL and VisiJet® M2G-DUR materials use advanced chemistry that produces a stronger odor that may not be suitable for all office environments. See the Facility Requirements Guide for further details.

## Important Safety Information

### Safety Symbols and Definitions



**HOT SURFACE HAZARD:** Parts may be hot when handling. Avoid contact. Allow surface to cool before touching.



**HARMFUL IRRITANT WARNING:** Indicates that skin or eye irritation could result while exposed to a chemical composition.



**WARNING: INDICATES THE POSSIBILITY OF INJURY PERSONNEL**



**WEAR GLOVES: WEAR THE APPROPRIATE GLOVES WHEN REQUIRED. FOR EXAMPLE, WHEN TOUCHING SURFACES THAT MAY CONTAIN OR HAVE BEEN EXPOSED TO MATERIALS, WEAR NITRILE GLOVES. HEAT GLOVES ARE NECESSARY WHEN TOUCHING SURFACES THAT MAY BE HOT TO ENSURE BURNS DON'T OCCUR.**



**NOTE:** A note signifies important information but not information of a critical content.



Eye protection: Indicated the need for eye protection.

### First Aid and Personal Protective Equipment

The following paragraphs provide general first aid procedures and recommendations for protective equipment to minimize the risks from material exposure. If professional medical attention is necessary, take the Global Harmonized Standards/Safety Data Sheet (GHS/SDS) for the exact material involved to the attending physician. SDS sheets can be found [here](#).

#### Skin Contact

Wear 100% nitrile gloves and lab coats to avoid skin contact. Should material come in contact with skin, wash thoroughly with soap and cold water and immediately remove contaminated clothing and shoes. If skin is irritated, seek medical attention. Dry-clean contaminated clothing. Discard contaminated shoes and leather products.

#### Eye Contact

Safety goggles should be worn to prevent accidental splashes into the eyes. If material comes in contact with the eye, flush immediately with large amounts of water for 15 minutes, avoid sunlight, fluorescent light, and other ultraviolet light, and obtain immediate medical attention. Eye wash facilities and a first aid kit should be readily available and close to the 3D printer system.

#### Contact Lenses

If material splashes into the eye when contact lenses are worn, flush the eye with water immediately. Verify that flushing has removed the contact lens from the eye. Protect eyes from light and obtain immediate medical attention. Discard contact lenses that come into contact with liquid material.

#### Fume Inhalation




Remove the person to fresh air. Give artificial respiration or cardiopulmonary resuscitation (CPR) if required. If breathing is difficult, give oxygen. Obtain immediate medical attention.

## Material Handling and Safety

For material handling and safety, please refer to the [SDS](#) sheets and [User Guide](#) for further details.

## General Printer Equipment Recommendations and Best Practices

### General Printer Equipment Recommendations and Best Practices

Printer	Materials	Part Removal From Plate	Bulk Wax Removal	Fine Wax Removal	Optimal Solvent
 <b>ProJet® MJP 2500 &amp; MJP 2500 Plus</b>	Rigid Family	Freezer (1)	EasyClean System - or - Convection Oven (2)	EasyClean System (3)	Mineral Oil - or - EZ Rinse - C
	Engineering Family		Convection Oven (4)	Ultrasonic Bath (4)	Mineral Oil
	Elastomeric Family		Convection Oven	Ultrasonic Bath	Mineral Oil
 <b>ProJet® MJP 3600</b>	All	Freezer (1)	Convection Oven	Ultrasonic Bath	EZ Rinse-C
 <b>ProJet® MJP 5600</b>	Rigid Family	Freezer (1)	Convection Oven	Ultrasonic Bath	Mineral Oil - or - EZ Rinse-C
	Elastomeric Family and Composite Mixtures				Mineral Oil

- (1) Size equipment based on largest expected part size and volume of parts generated per day.
- (2) Select an oven if you plan to batch high volume of parts.
- (3) Use mineral oil and an ultrasonic bath for complex entrapped cavities.
- (4) If using an EasyClean system process times should be held to a minimum necessary for wax removal.

## Post Processing a Part

After a part is printed, there are steps that must be followed before it can be considered ready for use or ready for other advanced processes like painting or dyeing. Following these steps will ensure a successful and usable part. This document is intended to provide general guidelines for post processing of UV curable acrylate parts for all 3D Systems MultiJet products including the ProJet® MJP 2500, ProJet® MJP 3600 and ProJet® MJP 5600 lines of printers.

## Supplies Needed

- Protective Clothing (lab coat, protective sleeves)
- Nitrile Gloves
- Insulating Gloves
- Safety Glasses
- Putty Knife
- Paper Towels / Absorbent Pads
- Mineral Oil or EZ Rinse-C
- Isopropyl Alcohol (IPA)
- Source for Warm Water (container or running water)
- Metal Basket(s) (optional)
- Plastic Bristle Brush - like a toothbrush (optional)

## Equipment and Tools Needed

- Freezer
- Melting oven capable of heating to 65°C (149°F) such as ProJet® Finisher or ProJet® XL Finisher

- MJP EasyClean System
- Ultrasonic Cleaner (optional)


## Steps for Post Processing a Part


### Remove Parts from the Build Plate

1. After job is finished printing, remove the build plate with the parts attached from the printer. Lift the entire platform out the printer.




*Build plate with completed parts ready for post processing*

 NOTE: Wear proper protective lab clothing.

 NOTE: Nitrile gloves are recommended when handling parts and/or when working with fluids.

2. Place the platform of parts in a freezer. This will cool the parts and enables the parts to separate easily from the build plate. This can take as little as a few minutes, but may take longer for some geometries.

 NOTE: Placing the print platform on a metal surface as shown here speeds up the cooling time.



*Build plate with parts attached placed on a metal plate in a freezer*

3. Once the plate is cooled sufficiently, the parts can be removed. Most parts should separate freely from the plate with the remainder easily removed with little force, leaving behind very little support residue.



*Parts typically fall free from the build plate after freezing*

4. For some geometries, it may be necessary to use a putty knife to loosen the parts. Use a plastic mallet, wood block, or small hammer to gently tap the base of each part using the putty knife until it comes free from the plate. Keep the angle of putty knife below about 30 degrees to avoid gouging or scraping the build plate.





Eye protection is required when performing this step.




*If needed, lightly tap the base of the part with a putty knife*

5. Allow parts to come to room temperature before adding to support removal heat source.

 NOTE: The putty knife can also be used to remove some parts quickly even without using the freezer.

 NOTE: Take extra care when removing very small parts or parts with fine features.

 NOTE: Take care not to scratch, groove, dent, or damage the parts or the platform in the removal process.

## **Bulk Support Removal from Part**

1. Once parts have been removed from the build plate, the support material needs to be removed from the parts. This can be done in a convection oven (like the ProJet® Finisher) or using the [MJP EasyClean System](#). These two heating systems serve similar purposes, but each has unique capabilities depending on customer needs.




ProJet® EasyClean Steamer System	ProJet® Finisher Oven
<ul style="list-style-type: none"> <li>• Fast</li> <li>• Optimized for ProJet® MJP 2500 part sizes</li> <li>• Compact and Economical, general-purpose solution</li> <li>• Combined bulk and fine support removal</li> </ul>	<ul style="list-style-type: none"> <li>• Large physical volume available</li> <li>• High part volume "batch processing" capability</li> <li>• Best for processing <b>Elastomeric and Engineering Families</b> of materials</li> </ul>


2. The bulk wax is easily removed with a hands-free process. Place the parts in the Oven or EasyClean Bulk Wax Chamber. It is often advantageous to use a metal basket (accompanies EasyClean System) when processing the parts.



*Metal baskets used to carry multiple MJP parts during post processing*

3. The parts must be placed over a drip tray that will collect the melted support as it comes off the parts. This setup is included as part of the ProJet® EasyClean System. Support collection trays must also be used with an oven setup. The actual melt time will depend on the size of the part and how much support wax is present. The ProJet® EasyClean System operates similar to a vegetable steamer and runs at 100°C. The oven should be set to 65°C (149°F). For best part quality, remove the parts as soon as the bulk wax material has melted off all the parts from either system. For some parts, this can take 30 minutes or longer. The ProJet® EasyClean System is much faster compared to the ProJet® Finisher Oven.

 **NOTE:** Do not let the parts soak in the molten support wax in the oven.

 **NOTE:** For best quality, avoid stacking parts on top of one another.



*ProJet® Finisher oven or larger convection oven*

4. Remove parts from oven and wipe off any remaining support material with a paper towel. Alternatively, one can place the parts for a few minutes on an absorbent paper towel while heated in the oven or ProJet® EasyClean System.



*Wipe off any remaining support material with a paper towel*



**Caution:** Be careful when handling hot parts and always wear gloves.

## Fine Wax Removal from Part

1. The remaining support wax on the part is easily dissolved away with a hands-free process. Either the EasyClean System or an ultrasonic bath can be used. These two systems serve similar purposes, but each have unique capabilities depending on customer needs.



ProJet® EasyClean Steamer System for fine wax removal	Ultrasonic Bath for fine wax removal
<ul style="list-style-type: none"> <li>• Fast</li> <li>• Economic, general purpose solution</li> <li>• Combined bulk and fine support removal solution</li> <li>• Optimized for ProJet® MJP 2500/3600 size</li> </ul>	<ul style="list-style-type: none"> <li>• Large physical size is available</li> <li>• Removes support better on the finest of features</li> <li>• Best for entrapped support removal which may require longer processing times</li> <li>• Best for processing <b>Elastomeric and Engineering Families</b> of materials</li> </ul>

2. The EasyClean System is an economic general-purpose solution for most customer needs. A heated ultrasonic bath is better for very small features. It is also synergistic with the removal of support that is entrapped in very fine features within a part (like internal flow visualization channels or when the support is present within the part to create a light composite structure). The action of the ultrasonic bath removes the support more quickly and is more effective. The EasyClean System is also fixed in physical size. Ultrasonic baths can be purchased for large part size needs. Both systems work for all materials.
3. Either EZ Rinse-C or light mineral oil can be used for the fine wax removal step in either the EasyClean System or the ultrasonic bath. These two fluids serve similar purposes, but each has unique capabilities depending on customer needs.



*Two convenient materials for MJP fine wax removal step to serve your part needs*

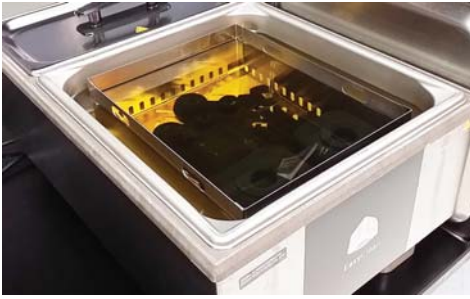
- |  |  |
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| <ul style="list-style-type: none"> <li>• Easily rinses away with water</li> <li>• Dissolves support wax quickly</li> </ul> | <ul style="list-style-type: none"> <li>• Requires liquid dishwashing soap (Dawn) to remove oil</li> <li>• Best for processing <b>Elastomeric and Engineering Families</b> of materials</li> <li>• Best long term part aesthetic (long term injection molded plastic look and feel)</li> <li>• Best for entrapped support removal which may require longer processing times.</li> </ul> |
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**CAUTION:** Use gloves to avoid contact with the solvents.

4. For both fine wax removal solvents, the parts are placed directly in the liquid that is held at approximately 65°C (149°F). Leave the parts in the liquid until the wax is removed. Keep the time in the EZ Rinse-C or Mineral Oil as short as possible (2-5 minutes). If using the EasyClean system (which has no agitation), a gentle swirling of the part in the chamber can aid in removing the residual wax. The ultrasonic action is very efficient in removing residual wax with no additional manual agitation required. For certain parts, like complex parts or parts with entrapped cavities, it may be necessary to leave the parts in the mineral oil bath for more time.





*Parts placed in either EasyClean fine wax removal system or into the ultrasonic bath*



**NOTE:** EZ Rinse can be purchased from your printer sales team

**NOTE:** White mineral oil – light viscosity should be sourced locally in your country of origin.

McMaster: <https://www.mcmaster.com/#mineral-oil/=19o67sv>

W.S Dodge Oil, 3710 Fruitland Ave., Maywood, Ca 90270, (323) 583-3478, [www.wsdodgeoil.com](http://www.wsdodgeoil.com)

Hardware stores or grocery stores typically carry mineral oil

5. Rinse parts with warm soapy water. The best practice is to use a fresh tub of hot soapy water. When using mineral oil use extra soap in the water. It is acceptable to apply the soap directly on the part and use a light brush (such as a toothbrush) to clean the part.



*Fresh tub of soapy hot water with light brushing of part if needed*

6. Wipe parts dry with a paper towel or absorbent pad or allow them to air dry. Clean, dry compressed air blown lightly over the parts can be used to speed the drying time.

## Cleaning the Build Plate for the Next Job

The build plate should be cleaned prior to re-inserting it into the printer.

1. Carefully use a sharp putty knife or single-edge, metal razor blade scraper (held at a 30 degree angle to the surface) to scrape any excess material from the build plate. When using a razor blade scraper, be sure the blade is new and still sharp; do not use a dull or nicked blade.



**NOTE:** A standard tray for a paint roller can be used to collect the scrapings from the build plate.



*Scrape any excess support off the platform*



**CAUTION: Use caution while scraping the plate and avoid damaging the plate with scratches or gouges.**

2. Spray the platform with Isopropyl alcohol (IPA) and wipe with paper towels. Alternatively, one can use the disposable IPA wipes to clean the plate. Do not reuse the wipes. Heating the plate briefly can aid in complete support removal.



Wipe the plate with IPA

3. Always clean both sides of the build plate.

## Material Characteristics

The photopolymers used in Multi-jet Printing may be hazardous if handled improperly. Repeated skin contact with materials may cause sensitization. Consult the manufacturer's Global Harmonized Standards/Safety Data Sheet (GHS/SDS) for information on specific materials. For further information on this and related topics, consult the 3D Systems – Materials website at <http://www.3dsystems.com/support/materials/msds>.

Material Property	VisiJet® M2R-CL	VisiJet® M2R-WT	VisiJet® M2R-BK	VisiJet® M2R-TN	VisiJet® M2R-GRY	VisiJet® M2 ENT	VisiJet® M2 EBK	VisiJet® M2G-CL	VisiJet® M2G-DUR
Accuracy	****	****	****	****	****	****	****	****	****
High Temperature (HDT @ 66psi)	51°C	51°C	61°C	71°C	51°C	N/A	N/A	47°C	N/A
Moisture Resistance (absorption)	0.50%	0.50%	0.50%	0.50%	0.50%	0.90%	0.60%	0.5%	0.6%
High Clarity	****	N/A	N/A	N/A	N/A	***	N/A	*****	*****
High Stiffness (Shore D Hardness)	77	77	81	81	77	N/A	N/A	70	60
High Elongation	20-30 %	20-30 %	6-12%	N/A	20-30 %	160-230%	160-230%	55-65%	65-75%
High Impact Strength	20-25 J/m	20-25 J/m	15-18 J/m	N/A	20-25 J/m	N/A	N/A	40-50 J/m	70-80 J/m
Opacity	N/A	*****	*****	*****	*****	***	*****	N/A	N/A
Color	Transparent Clear	Opaque White	Opaque Black	Opaque Tan	Opaque Gray	Amber Translucent	Black	Transparent Clear	Transparent Clear
<b>"Simulant" Characteristics</b>	<b>VisiJet® M2R-CL</b>	<b>VisiJet® M2R-WT</b>	<b>VisiJet® M2R-BK</b>	<b>VisiJet® M2R-TN</b>	<b>VisiJet® M2R-GRY</b>	<b>VisiJet® M2 ENT</b>	<b>VisiJet® M2 EBK</b>	<b>VisiJet® M2G-CL</b>	<b>VisiJet® M2G-DUR</b>
Polypropylene	***	***	N/A	N/A	***	N/A	N/A	****	*****

ABS	****	****	****	****	****	N/A	N/A	*****	***
Polycarbonate	***	N/A	N/A	N/A	N/A	N/A	N/A	****	N/A
Elastomeric (rubber-like)	N/A	N/A	N/A	N/A	N/A	*****	*****	N/A	***
<b>Recommended Applications</b>	<b>VisiJet® M2R-CL</b>	<b>VisiJet® M2R-WT</b>	<b>VisiJet® M2R-BK</b>	<b>VisiJet® M2R-TN</b>	<b>VisiJet® M2R-GRY</b>	<b>VisiJet® M2 ENT</b>	<b>VisiJet® M2 EBK</b>	<b>VisiJet® M2G-CL</b>	<b>VisiJet® M2G-DUR</b>
Investment Casting (Flask Method)	****	***	***	***	***	N/A	N/A	***	N/A
Jigs/Fixtures/Tools	****	****	***	N/A	****	N/A	N/A	*****	***
Master Patterns for RTV	****	****	****	N/A	****	N/A	N/A	****	***
General Purpose Models	*****	*****	*****	N/A	*****	N/A	N/A	*****	****
Functional Prototyping (snap fits)	****	****	***	N/A	****	N/A	N/A	*****	*****
Injection Molding/Direct AIM	***	***	***	N/A	***	N/A	N/A	****	N/A
Dental Models	N/A	N/A	N/A	*****	N/A	N/A	N/A	N/A	N/A

<b>RATING SYSTEM</b>	
*****	= BEST
****	= BETTER
***	= GOOD