3D Printing Custom Trays with Formlabs SLA 3D Printers

Custom Tray Resin is a Class I biocompatible, fast printing biocompatible material for the direct printing of custom impression trays that can be used for crowns and bridges, implants, dentures, and other comprehensive cases. The use of digitally created custom impression trays provides consistent, accurate, impressions, and improved patient outcomes. This material can be used to print impression trays in under one hour, reducing labor time and enabling higher throughput.

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Contents

Essentials

Needed From the Dentist

A physical or digital impression of the patient's dentition

Required Hardware and Materials

Made by Formlabs

- Form 2 or Form 3B 3D printer
- Form 2 Resin Tank LT or Form 3 Resin Tank v2 or higher
- Build Platform
- Custom Tray Resin
- Form Wash
- Form Cure
- Finishing kit or secondary wash station

Made by Third Parties

- Desktop scanner (if physical impression or model)
- Dental design software
- Low-speed dental handpiece with cutting and finishing wheels
- Polishing equipment and materials (optional)
- Isopropyl alcohol (IPA) ≥ 99%

Required Software

PreForm 3.6.1 or higher

Firmware 1.7.3 or higher

Dental design software or outsourcing to a dental design provider

1. Scan

Dental design software requires a digital impression of the patient's anatomy in order to design a custom tray. To acquire this data, scan the patient directly with a 3D intraoral scanner or scan a physical impression or a poured model with a desktop 3D scanner.
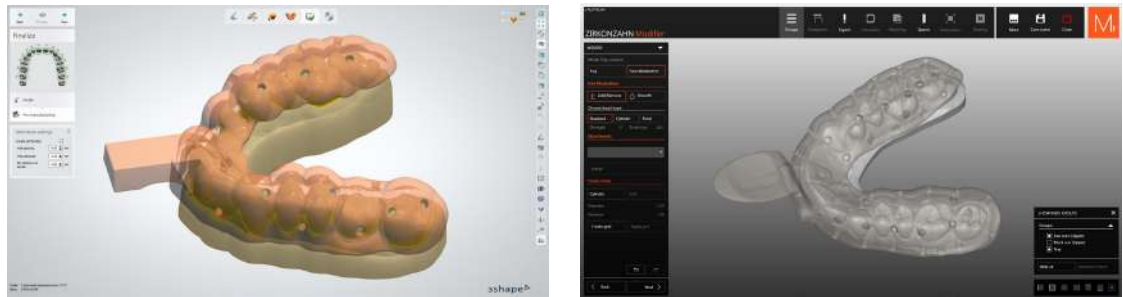
2. Design

2.1 Design the Custom Impression Tray

There are several dental software options for digitally designing custom impression trays. In this application guide, we will be outlining parameters for 3Shape Dental System and ZirkonZahn.Tray.

ZirkonZahn.Tray is a free dental CAD software for designing custom trays that integrates with Formlabs' PreForm. Download it here for free.

There are also outsourced dental CAD providers where you can send a digitized impression for creating the design.

GENERAL CAD CONSTRUCTION REQUIREMENTS

|	
Minimum wall thickness	2 mm
Minimum handle thickness	3 mm (3Shape and Zirkon Zahn Tray Designer handles meet these requirements)
For heavy body impression materials we recommend retention holes 3 mm in diameter	

2.2 Export the STL File

Once the case has been designed to specification manufacturing can begin. The majority of dental design software generates a manufacturing file in .stl format. Locate the file and move it into the print preparation software, PreForm.

3. Print

Note: Use PreForm version 3.6.1 or higher and firmware 1.7.3 or higher
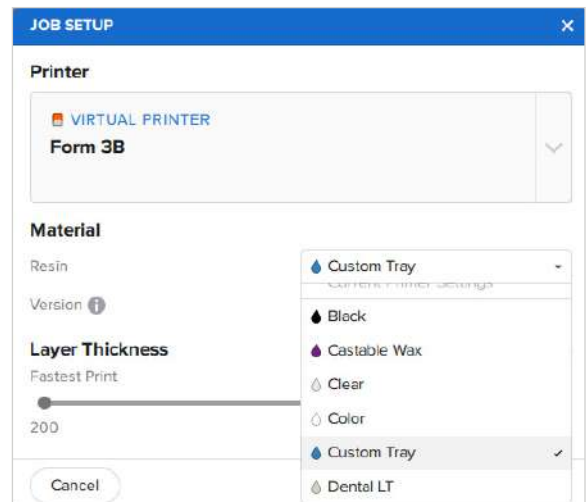
3.1 Import File(s)

Import or open the design file(s) by dragging them into PreForm or opening them using the "File" menu and locating them on your computer or network.
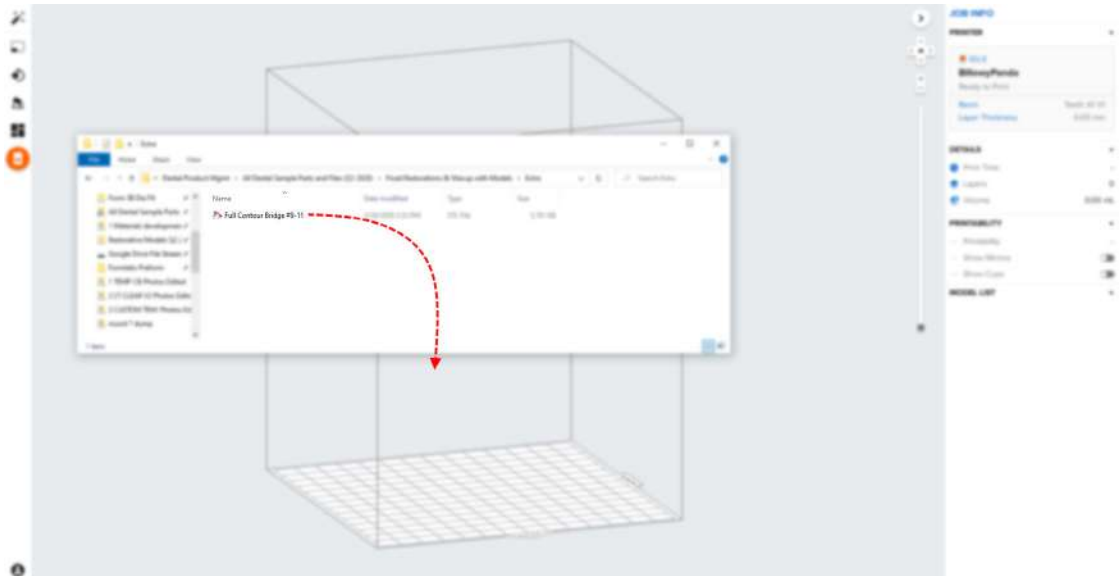
3.2 Material Selection

Select the material for printing by clicking the printer box in the "Job Info" menu on the right-hand side.

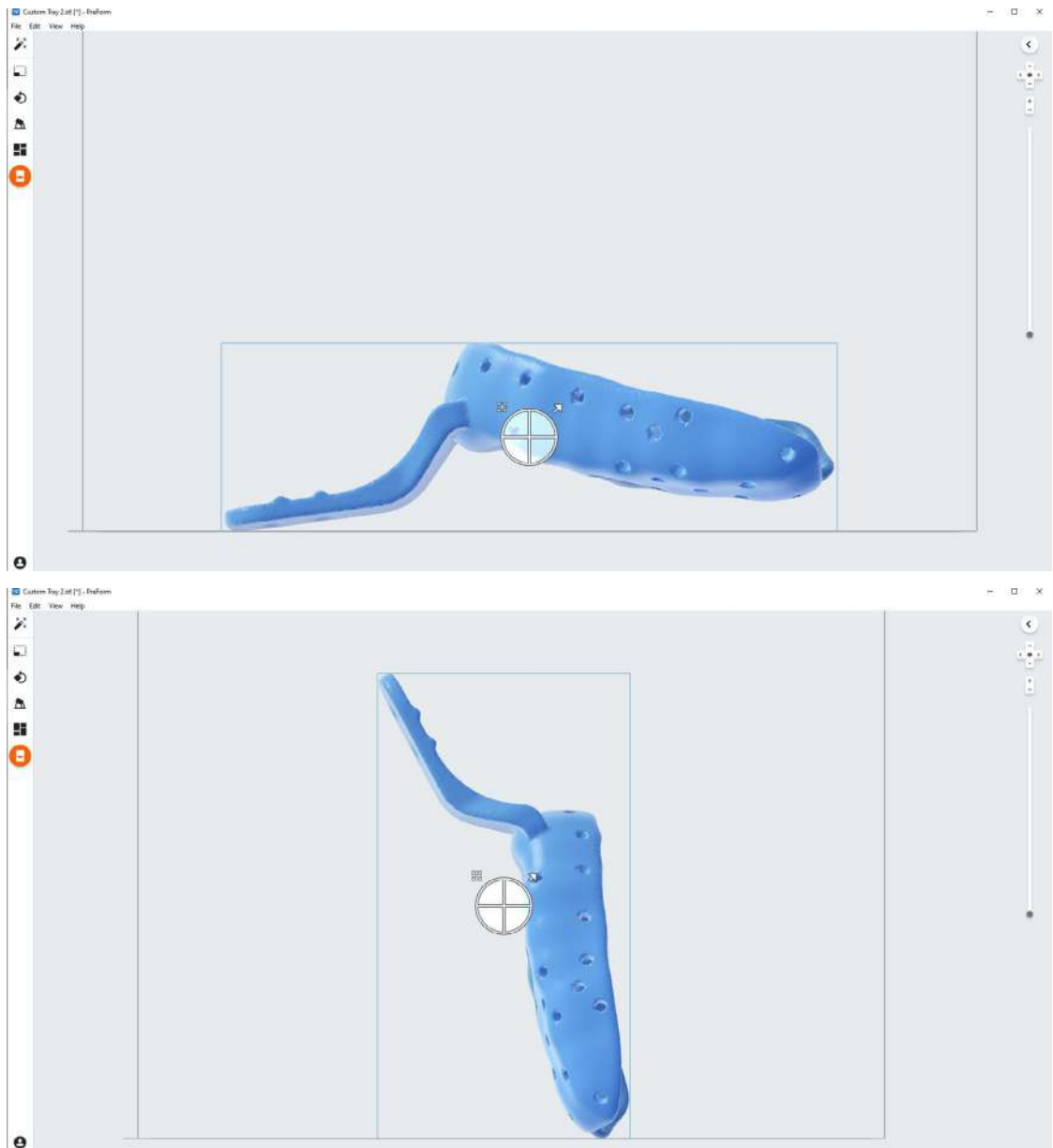Select "Custom Tray" in the material pull down.

3.3 Orientation

Always position the intaglio surface away from the build plate.

To rotate a tray click on the part and "click and drag" the sphere.

Trays can be made horizontal or nearly vertical to the build plate, depending on the amount of parts needed to be printed.
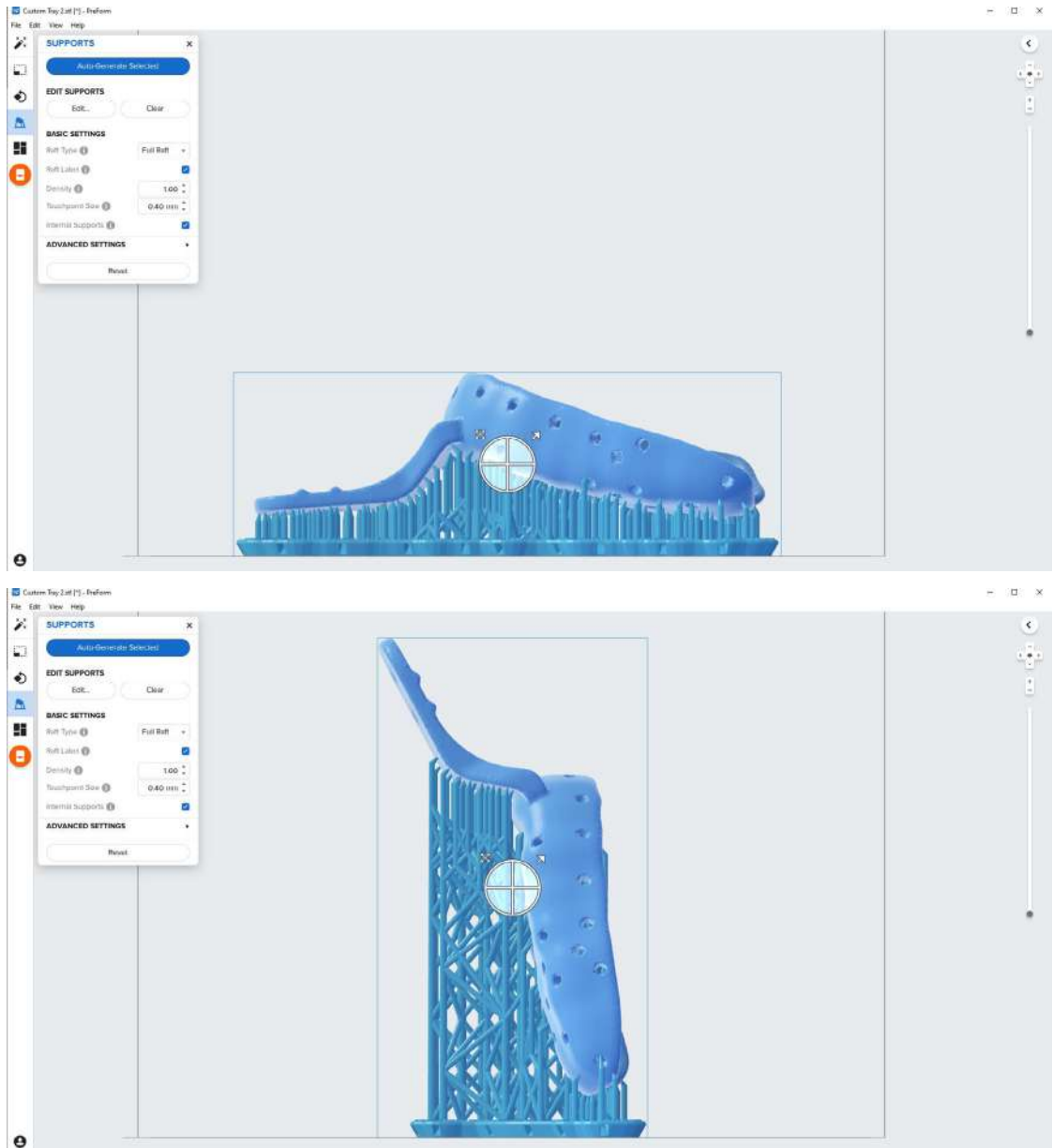

> **Tip:** Orientate parts so that the intaglio surface needs as little support structures as possible.

3.4 Generate Supports

3.4.1 Automatic Support Generation

Click the "Supports" button on the left side of PreForm and click the "Auto Generate Selected" or "Auto Generate All" button.

3.4.2 Manual Support Editing

If a support point is not in an ideal location, it can be moved after automatic generation by clicking the "Edit…" button in the Supports menu.
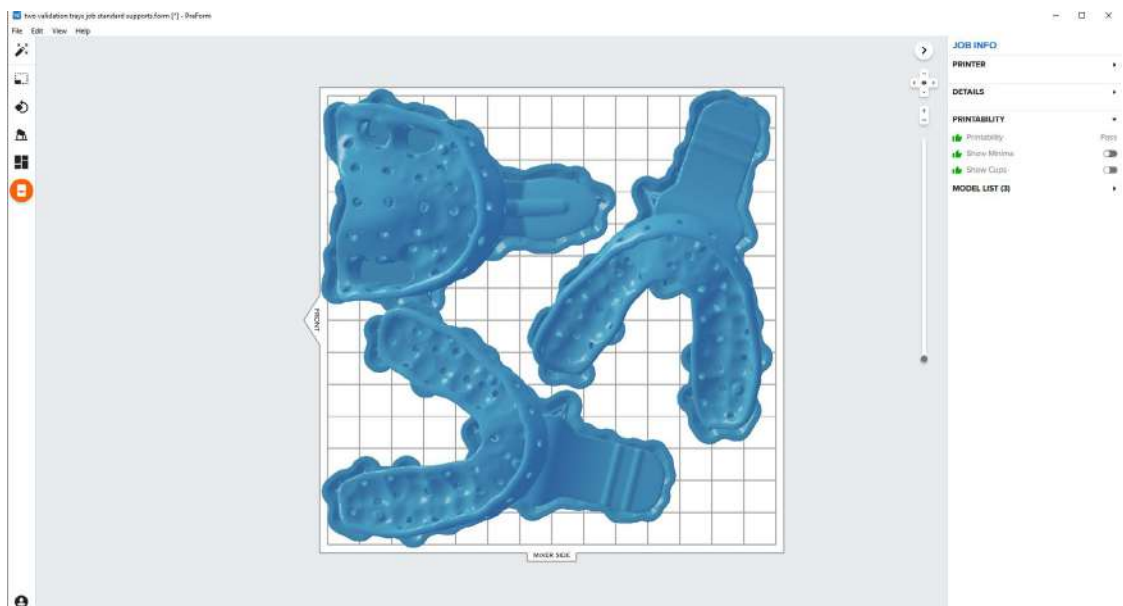
PreForm will indicate in red what areas might require additional support.

Confirm under the "Job Info" menu bar on the right side of the program that "Printability" has green thumbs-up.
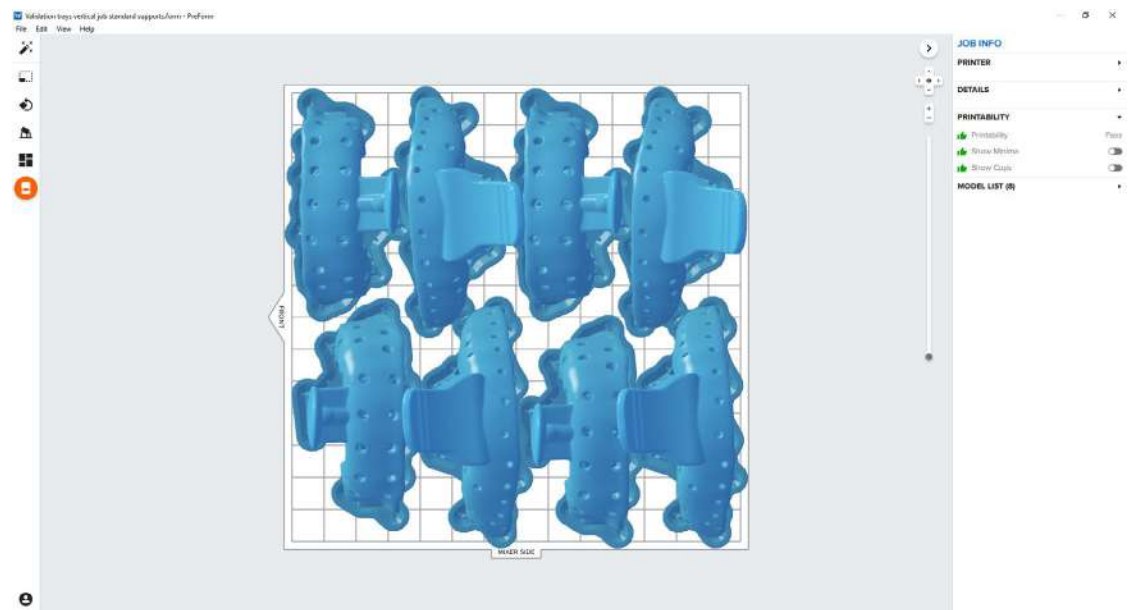

3.5 Printing Layout

Example of a job with horizontal orientation.

> **Tip:** When printing multiple cases, overlapping rafts can optimize the use of the build volume and save material.

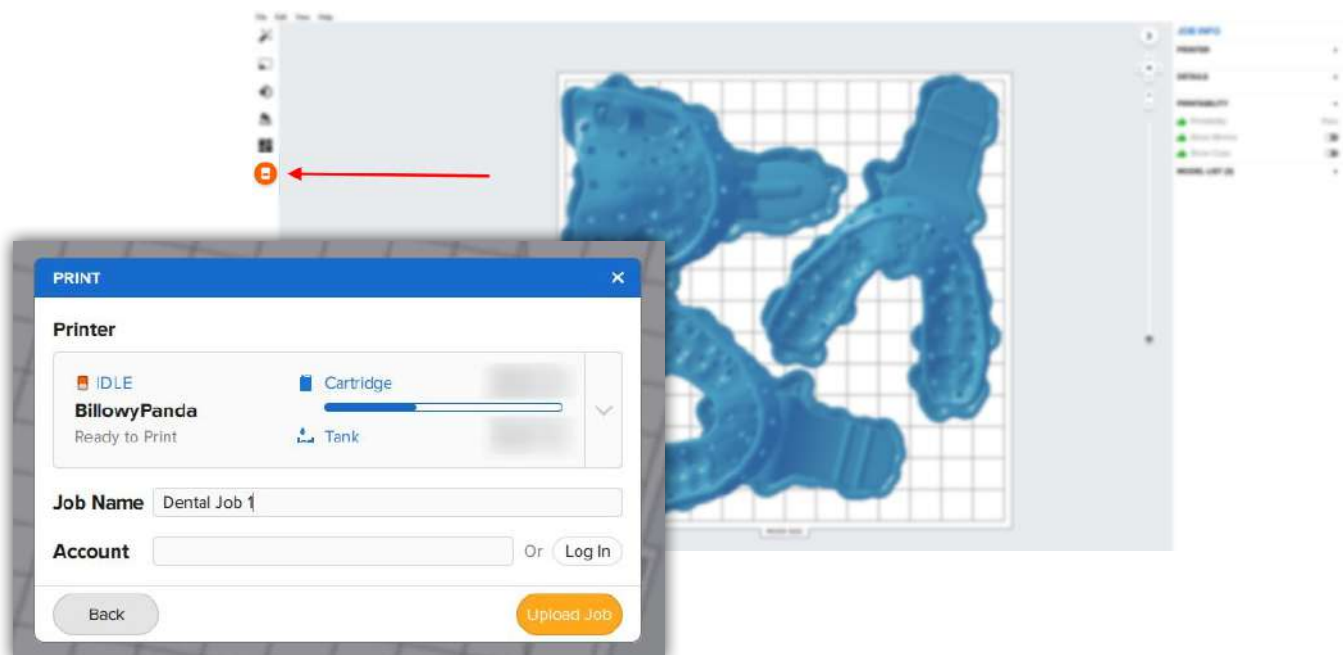Example of a job with near vertical orientation.

3.6 Transferring Job to the Printer

Send the job to the printer by clicking the orange printer icon on the left.

The "Print" dialog box will open to select the printer.

Click the orange "Upload Job" button to begin the transfer of the job to the printer.

3.7 Set up the Printer

Shake the Custom Tray Resin cartridge and then insert the cartridge, a build platform, and a compatible resin tank into the Form 2 or Form 3B printer.

- Begin printing by selecting the print job from the printer's touch screen
- Follow any prompts or dialogs shown on the printer screen
- The printer will automatically complete the print

Attention: For full compliance and biocompatibility, Custom Tray Resin requires a dedicated resin tank and build platform. Only use the Form Wash with other Formlabs biocompatible resins, such as Surgical Guide Resin.

4. Post Processing

Always use gloves when handling uncured resins and parts.

4.1 Part Removal

Remove printed parts from the build platform by wedging the part removal or scraping tool under the part raft and rotating the tool.

4.2 Washing

Precautions

1. When washing the printed part with solvent, it should be in a properly ventilated environment with proper protective masks and gloves.
2. Expired or unused Custom Tray Resin shall be disposed in accordance with local regulations.
3. IPA shall be disposed of in accordance with local regulations.
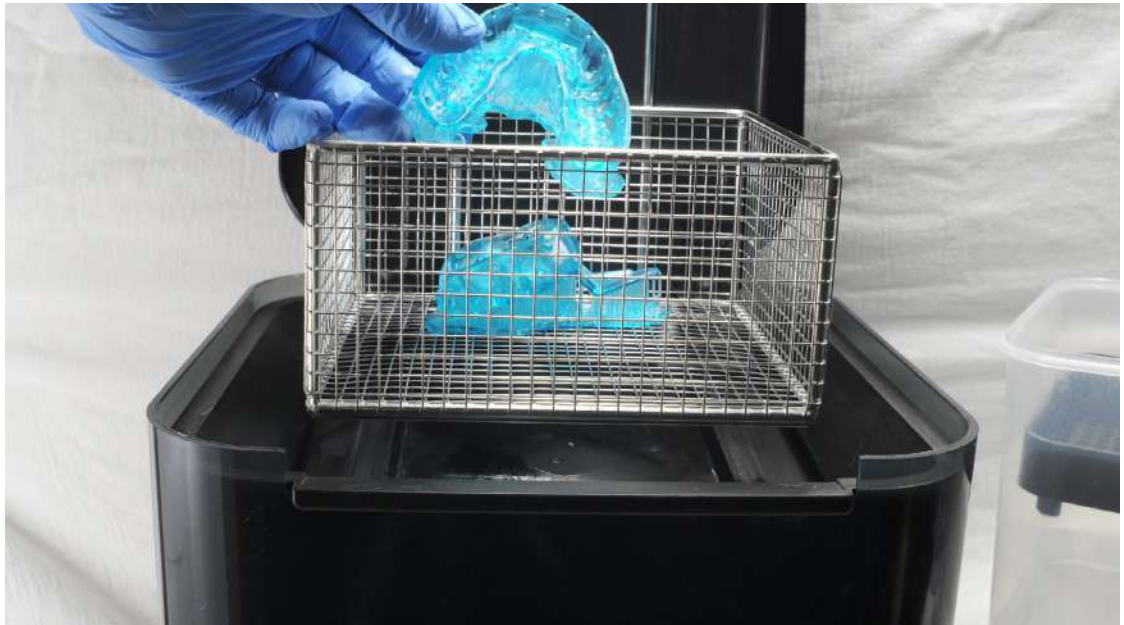
Place the printed parts in a Form Wash filled with isopropyl alcohol (IPA, ≥99%) and wash them for 10 minutes.

Make sure the parts are fully submerged in IPA when washing.

Exceeding wash duration may affect dimensional accuracy and performance of printed parts over time.

4.3 Drying

Remove the parts from the IPA and leave them to air dry at room temperature for at least 30 minutes.

Compressed air can also be used to dry parts after 10 minutes of bench drying.

Inspect printed parts to ensure that parts are clean and dry.

No residual alcohol, excess liquid resin or residue particles must remain on surface before proceeding to subsequent steps.

If any wet, uncured resin is still present after drying, use a squeeze bottle with fresh IPA to remove uncured resin and then air dry the parts again.
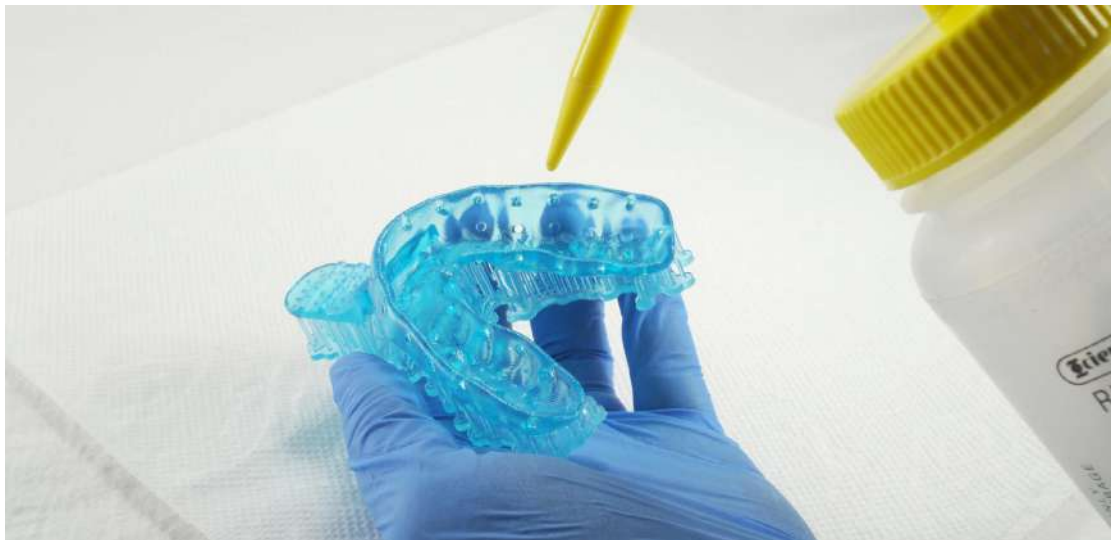
4.4 Post Curing

Place the dried printed parts in a Form Cure and post cure them at 60°C for 30 minutes.

4.5 Support Removal

Remove supports using a cutting disk and handpiece, or other part removal tool.

> **Note:** While ripping the supports from the part might be quicker, it can leave divots in the part. We recommend cutting the supports off individually.

As sections of the supports are removed the raft can be cut to give more room for the next area of the part to be cut.

Removing supports should leave a small positive feature.

Inspect the custom tray. Discard and reprint the part if any cracks are detected.

4.6 Finishing and Polishing

If any rough marks are left on the surface of the 3D printed tray after support removal, smooth down the support surfaces with a wheel or carbide rotary and handpiece to improve patient comfort.

Example of a finished part.

Optional: Once the surface is finished to satisfaction, you can polish and smooth the outside of the tray.

A high gloss shine can be achieved with traditional polishing tools and materials commonly used for dental acrylics.

Note: Lathes with rag or felt wheels, pumice, and high shine compound make the process quick and easy.

5. Cleaning and Disinfection

5.1 Cleaning Parts

Fully post processed parts can be cleaned using a dedicated soft toothbrush with neutral soap and room temperature water.

After cleaning, always inspect parts for any cracks.

Discard the part if any damage or cracks are detected.

5.2 Disinfection

The finished custom tray may be cleaned and disinfected according to facility protocols.

A tested method of disinfection includes soaking the finished part in fresh 70% IPA for 5 minutes.

After disinfection, inspect the part for cracks to ensure the integrity of the impression tray.

> **Note:** Do not leave the part in the alcohol solution for longer than 5 minutes.

⚠️ **CAUTION**

Caution: IPA disinfection is not compatible with impregum polyether impression materials. Secondary disinfection methods must be verified for use by the manufacturer.