

ProJet® 6000 and 7000

3D Printer



VisiJet® SL Materials

Part Building and Post-Processing Guide

Contents

Available Materials.....	3
Material Handling and Safety	3
System Care and Cleaning.....	3
VisiJet® SL Black.....	4
VisiJet® SL Clear.....	7
VisiJet® SL e-Stone™	10
VisiJet® SL Flex.....	12
VisiJet® SL HiTemp.....	14
VisiJet® SL Impact.....	16
VisiJet® SL Jewel.....	18
VisiJet® SL Tough	21

Available Materials

The ProJet 6000 and 7000 systems each have several materials available. Not all materials are available for both systems. For optimum part building results, you should follow the instructions for the specific material you are using in your system. Contained in this guide and provided in alphabetical order are:

- VisiJet® SL Black
- VisiJet® SL Clear
- VisiJet® SL e-Stone™
- VisiJet® SL Flex
- VisiJet® SL HiTemp
- VisiJet® SL Impact
- VisiJet® SL Jewel
- VisiJet® SL Tough

Each material starts on a new page, to make it easier for you to find the material you're going to be using.

Material Handling and Safety

To protect your own safety and the safety of others, always make sure to read and follow the information provided on the MSDS/SDS for your material. Dispose of unused material properly, verifying that you follow applicable regional and local regulations. Local hazardous waste disposal companies can provide appropriate services for this disposal.

System Care and Cleaning

You will want to keep your ProJet 6000 or 7000 clean of any material drips and spills. Do not use any strong acids or base cleaners (for example, no ammonia-based cleaners, no bleach). Only a small amount of these kinds of products can affect the material to the point that acceptable parts can no longer be built. Instead, use a small amount of isopropyl alcohol on a paper towel or soft cloth to clean your window and any drips or spills. Dispose of used towels/cloths appropriately according to your local waste handling requirements.

VisiJet® SL Black

- System Type:** VisiJet® SL Black is used on ProJet 6000 and 7000 SD, HD, and MP systems.
- Basic system configuration values:** Materials may require different settings for optimum performance. The settings for this material are:

Attribute	Value
Chamber heater	28 °C
Cart reservoir heater	28 °C
Recommended print tray material heater	28 °C

- Configuring files for accuracy:** You will enter specific starting values for your build files in 3DManage™ and on your system to influence part accuracy. Some of these values will also depend upon the build mode you are using. You will make changes that are specific to your system, but appropriate starting values are shown below.

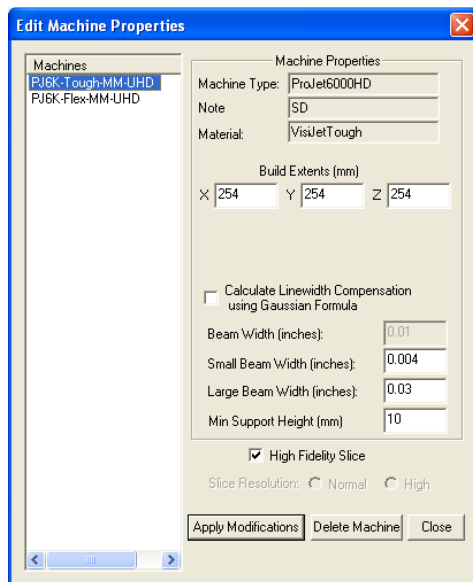
ProJet 6000:

Attribute	Entered where	HD mode	UHD mode	XHD mode
Baseline Scale Factors (x, y, z)	ProJet 6000 printer setup	1.0007, 1.0007, 1.0000	1.0020, 1.0020, 1.0000	1.0005, 1.0005, 1.0000
Baseline Small Beamwidth Value*	3DManage machine setup	0.002 inch	0.002 inch	0.0015 inch

ProJet 7000:

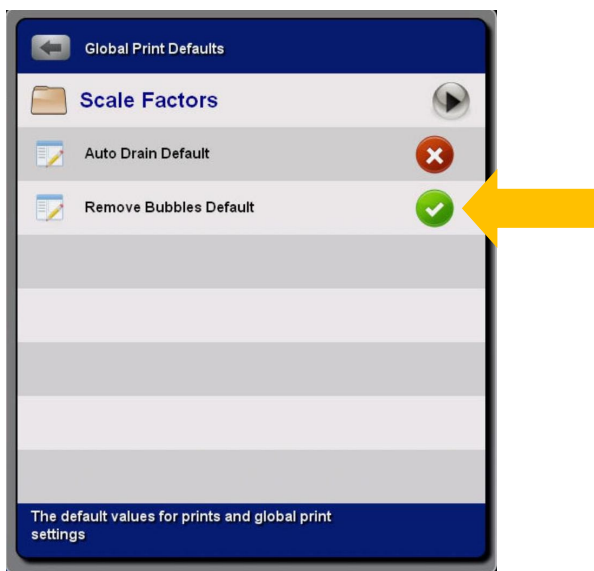
Attribute	Entered where	HD mode	UHD mode	XHD mode
Baseline Scale Factors (x, y, z)	ProJet 7000 printer setup	1.0020, 1.0020, 1.0000	1.0025, 1.0025, 1.000	1.0021, 1.0021, 1.0000
Baseline Small Beamwidth Value*	3DManage machine setup	0.004 inch	0.002 inch	0.0015 inch

* for line width compensation



- Hatch Overcure:** Hatch overcure has been optimized for both accuracy and mechanical properties. It is highly recommended that the hatch overcure values not be reduced from default. If build speed is key, reduce HOC by 0.001 inch. Dependent upon part geometry, this can increase build speed by up to 30%. However, expect that the increased build speed will come at the cost of accuracy and mechanical properties of both green and post cured parts. Negative effects will be higher shrinkage, and part deformation during and after post-curing.

5. **XHD build mode:** The 0.002" (0.050 mm) XHD mode is in a cyclical format. This means that though a border is drawn every layer, the hatch is not drawn every layer – rather, a more deeply-cured hatch is drawn every so many layers. The recoating parameters have been developed in conjunction with this drawing method, in order to achieve the best part results using such a thin layer. As a result, not all layers during the build will have the same recoat parameters, and the recoat parameters for layers which are not hatched cannot be changed. Therefore, users are strongly encouraged not to stray from the defaults.
6. **Upfacing surfaces:** Occasionally, some random small dimples or de-wetting spots have been observed on up-facing surfaces. This is the nature of the material, and cannot be eliminated completely.
7. **Downfacing surfaces:** The down fill cure depth has been optimized to reduce quilting and curl on the downfacing layer. Modifying down fill cure depth may reduce part quality.
8. **Supports for down facing large flat areas:** Users can take advantage of the provided style VisiJetBlack_FLAT.frg to generate the supports. This style has wider support spacing, and will save build time during supports.
9. **Bubbles:** The provided build style minimizes bubbles. Part orientation can also help avoid bubbles – orient thin wall features perpendicular to the print tray applicator. Verify that the resin surface is bubble free before you start building. We recommend turning the “remove bubbles” option on, as shown in the screen shot below.



10. **Liquid material color notes:**
 - In the bottle, VisiJet SL Black material color may vary from white to light gray. This can be true of materials even within the same batch.
 - In the print tray, the material may also appear any shade from white to light gray.
 - Some black residue will be visible on the surface of the material in the print tray, after parts are removed. After a month or two of use, the material in the print tray will turn slightly grayish. However, the final parts are always black.
11. **Part cleaning:** Parts must have excess VisiJet material removed prior to post-curing, as follows:
 - Drain excess VisiJet material from the parts for 10-15 minutes to remove most of the uncured material.
 - Immerse parts in TPM tank and agitate for a minimum of 20 minutes (maximum 90 minutes). Time required will depend on geometry. It's important to make sure the parts are thoroughly clean, or excess material will get cured into crevices or onto surfaces, affecting part resolution and/or accuracy. Parts may be cleaned on the platform, or after being removed from the platform.
 - Remove parts and drain excess TPM back into your tank.
 - Rinse parts with water, using pressure spray to fully remove TPM and excess diluted VisiJet material.
 - Air dry parts. You may use compressed air (low pressure) to dry the parts and remove liquid from crevices.
12. **Support removal:** Supports should be removed after the part is initially cleaned, but before the parts are post-cured. Support removal is quite simple and fast. FinePoint™ supports are very delicate, they remove easily by snapping them by hand at the base of the built part. Care must be taken, especially with very small or finely featured part geometry, to remove the supports without damage to finely featured models.

13. **Final part cleaning:** You may perform a final rinse using isopropyl alcohol (IPA) to achieve the most complete cleaning. Care should be taken to ensure that the parts are not left in IPA for more than 5 minutes total time. Some white residue may be observed after cleaning. If observed, the black color will come back with a quick wipe or spray with acetone and air dry.
14. **Post-curing:**
 - Most geometries are self-supporting, but use good judgment based on your specific parts to determine if additional support is required during the post-curing operation. Take care when orienting parts in the post-curing apparatus to avoid sagging or other deformation.
 - Take care to avoid excess post-during time, as this can adversely affect mechanical properties. Post-curing for 45 minutes each side (90 minutes total) is recommended.
15. **Post-finishing:** If you perform sanding operations on VisiJet SL Black parts, a white residue and/or white part surface may be visible after sanding the part. If that happens, brush off any loose material, and use a spray-on clear coat (Krylon[®] clear coat or similar) to wet the surface, then air dry. This will restore the black color to the surface of the part.

VisiJet® SL Clear

- System Type:** VisiJet SL Clear is used on ProJet 6000 and 7000 SD, HD, and MP systems.
- Basic system configuration values:** Materials may require different settings for optimum performance. The settings for this material are:

Attribute	Value
Chamber heater	28 °C
Cart reservoir heater	28 °C
Recommended print tray material heater	28 °C

- Configuring files for accuracy:** You will enter specific starting values for your build files in 3DManage and on your system to influence part accuracy. Some of these values will also depend upon the build mode you are using. You will make changes that are specific to your system, but appropriate starting values are shown below.

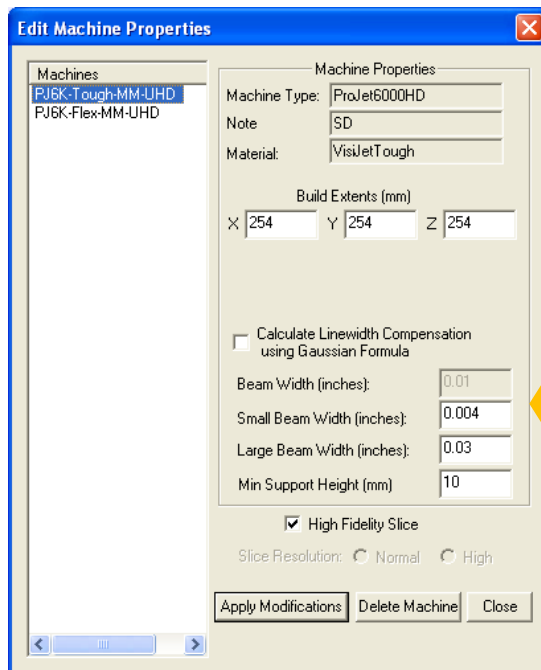
ProJet 6000:

Attribute	Entered where	UHD mode	XHD mode
Baseline Scale Factors (x, y, z)	ProJet 6000 printer setup	1.002, 1.002, 1.000	1.0005, 1.0005, 1.0000
Baseline Small Beamwidth Value*	3DManage machine setup	0.004 inch	0.001 inch

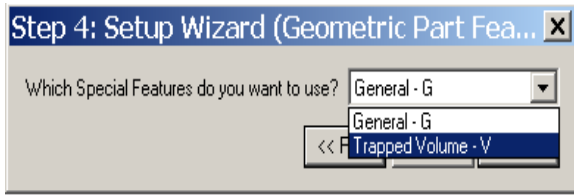
ProJet 7000:

Attribute	Entered where	UHD mode	XHD mode
Baseline Scale Factors (x, y, z)	ProJet 7000 printer setup	1.0017, 1.0017, 1.000	1.0010, 1.0010, 1.0000
Baseline Small Beamwidth Value*	3DManage machine setup	0.002 inch	0.001 inch

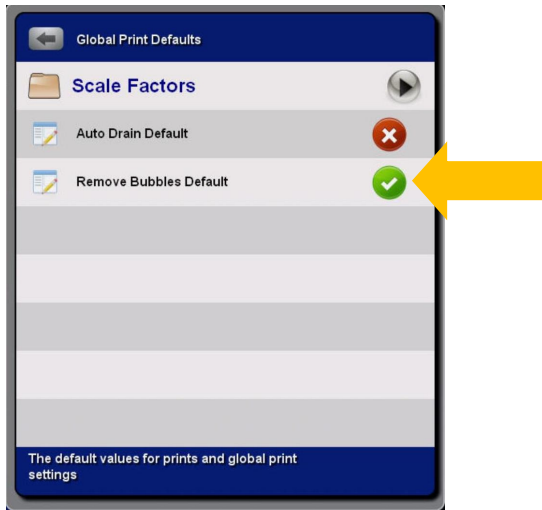
* for linewidth compensation



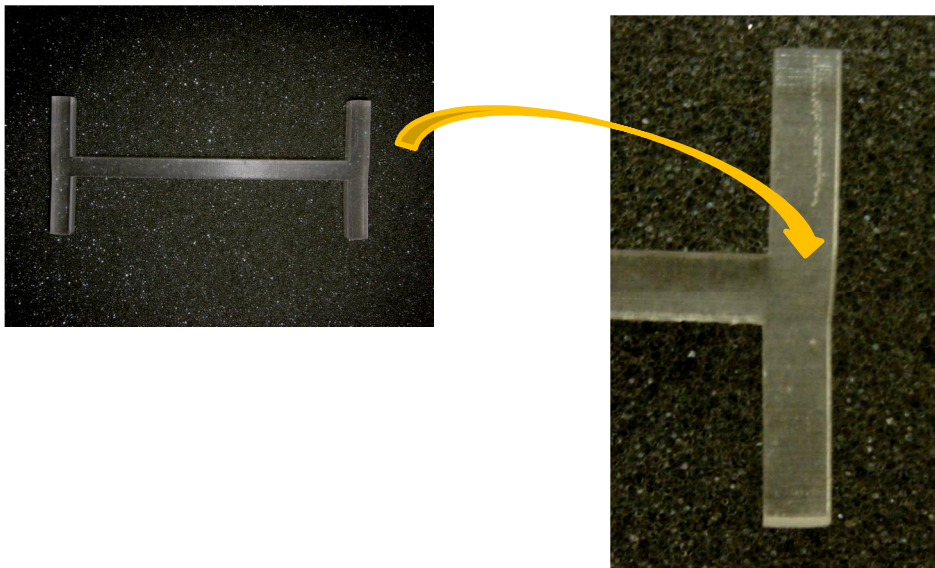
4. **Trapped volumes:** If your geometry has trapped volumes (a right-side up coffee cup is an example of a trapped volume), you should use the trapped volume recoating in the machine setup, as shown below.



5. **Bubbles:** The provided build style minimizes bubbles. Part orientation can also help avoid bubbles – orient thin wall features perpendicular to the print tray applicator. Verify that the resin surface is bubble free before you start building. We recommend turning the “remove bubbles” option on, as shown in the screen shot below.



6. **Differential Shrinkage:** Some geometries may show geometry dependent shrinkage (differential shrinkage). Differential shrinkage typically occurs where long or bulky sections shrink more than short or delicate sections, since shrinkage is linear. Shown below is a test coupon showing differential shrink. If the differential shrink must be reduced to the absolute minimum, increase post hatch delay (PHD) from default of 15 seconds to 30 seconds or more. The provided styles allow PHD to be set from zero to 60 seconds.



7. **UHD Mode:** This is the mode we expect will be the style primarily used for these systems.
8. **XHD Mode:** The XHD mode will produce finer detail on parts. Note that build speed is slower, in exchange for greater part detail.
9. **UHD QuickCast® style:** For both the ProJet 6000 and 7000 systems using VisiJet SL Clear, there is a special feature which allows you to build parts using the QuickCast style. Select this option as follows:
 - System type: select ProJet 6000 or ProJet 7000
 - Material: select VisiJet SL Clear
 - Mode: select UHD
 - Special Features: select “QuickCast” as shown below the table
 - For your starting parameters, use the following:

Attribute	Entered where	ProJet 6000 UHD QuickCast®	ProJet 7000 UHD QuickCast®
Baseline Scale Factors (x, y, z)	ProJet 6000 printer setup	1.0005, 1.0005, 1.0000	1.0010, 1.0010, 1.0000
Baseline Small Beamwidth Value*	3DManage machine setup	0.002 inch	0.0015 inch



10. **Software version:** Unless otherwise directed, always use the latest software version. Enhancements are often added which allow the system to build in a fully optimized way.
11. **Preferred part cleaning:** For best results, parts should be cleaned ONLY with isopropyl alcohol (IPA). Use of other solvents is not recommended, as they may cause surface gumminess or tackiness. Follow this procedure:
 - a. Carefully remove parts and supports from the platform.
 - b. Agitate parts in the IPA bath for 5 minutes.
 - c. If needed, brush downfacing surfaces/features with a soft toothbrush to remove residual resin.
 - d. Rinse again with fresh clean IPA
 - e. Air dry to complete cleaning.

Note: Care should be taken to ensure that the parts are not left in IPA for more than 15 minutes total time.
Note: Use of TPM is not recommended for this material. Opacity, cracking and other adverse effects can result.
12. **Support removal:** We recommend that supports be removed prior to post-curing the part. This results in the best part clarity.
13. **Post-curing:**
 - Most geometries are self-supporting, but use good judgment based on your specific parts to determine if additional support is required during the post-curing operation. Take care when orienting parts in the post-curing apparatus to avoid sagging or other deformation.
 - Take care to avoid excess post-during time, as this can adversely affect part clarity and color. Post-curing for 10-30 minutes is recommended.

VisiJet® SL e-Stone™

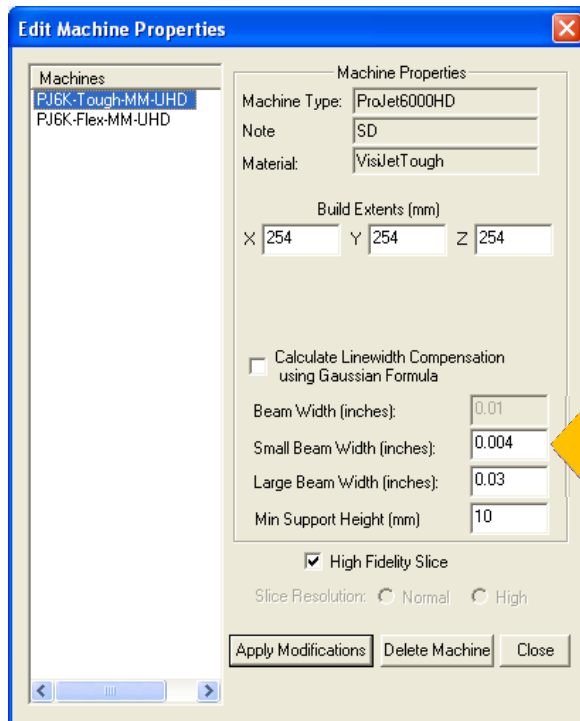
1. **System type:** VisiJet SL e-Stone material can be used only on the ProJet™ 6000 MP system.
2. **Basic system configuration values:** Materials may require different settings for optimum performance. The settings for this material are:

Attribute	Value
Chamber heater	28 °C
Cart reservoir heater	28 °C
Recommended print tray material heater	28 °C

3. **Configuring files for accuracy:** You will enter specific starting values for your build files in 3DManage and on your system to influence part accuracy. Some of these values will also depend upon the build mode you are using. You will make changes that are specific to your system, but appropriate starting values are shown below.

Attribute	Entered where	50 µm UHD mode	100 µm UHD mode
Baseline Scale Factors (x, y, z)	ProJet 6000 printer setup	1.003, 1.003, 1.000	1.0016, 1.0016, 1.000
Baseline Small Beamwidth Value*	3DManage machine setup	0.005 inch	0.004 inch

* for linewidth compensation



4. **UHD Mode:** This mode has two layer thicknesses available, both 100 micron (0.004 inch) and 50 micron (0.002 inch) as recommended baseline styles. We anticipate that the 50 micron style will be used for the MP application, and the 100 micron is made available as a more general use style. These are provided for you as initial starting points for your own final style development. They will build correctly for a broad spectrum of parts, but may require you to adjust parameters for certain specific geometries.
5. **Software version:** Unless otherwise directed, always use the latest software version. Enhancements are often added which allow the system to build in a fully optimized way.

6. **Part cleaning:** Parts must have excess VisiJet material removed prior to post-curing.
 - a. Drain excess VisiJet material from the parts for 10-15 minutes to remove most of the uncured material.
 - b. Immerse parts in TPM and agitate for a minimum of 20 minutes (maximum 90 minutes). Time required will depend on geometry. It's important to make sure the parts are thoroughly clean, or excess material will get cured into crevices or onto surfaces, affecting part resolution and/or accuracy. Parts may be cleaned on the platform, or off the platform.
 - c. Remove parts and drain excess TPM back into your tank.
 - d. Rinse parts with water, using water spray to fully remove TPM and excess diluted VisiJet material.
 - e. Air dry parts. You may use compressed air (low pressure) to dry the part and remove liquid from crevices.
7. **Post-curing:** Most geometries are self-supporting, but use good judgment based on your specific parts to determine if additional support is required during the post-curing operation. Take care when orienting parts in the post-curing apparatus to avoid sagging or other deformation. Supporting the part with loose sand is suitable. Post-curing for 45 minutes each side (90 minutes total) is recommended.

VisiJet® SL Flex

1. **System type:** VisiJet SL Flex is used on ProJet 6000 and 7000 SD, HD, and MP systems.
2. **Basic system configuration values:** Materials may require different settings for optimum performance. The settings for this material are:

Attribute	Value
Chamber heater	28 °C
Cart reservoir heater	28 °C
Recommended print tray material heater	28 °C

2. **Configuring files for accuracy:** You will enter specific starting values in your build files and on your system to influence part accuracy. Some of these values will also depend upon the build mode you are using. You will make changes that are specific to your system, but appropriate starting values are shown below.

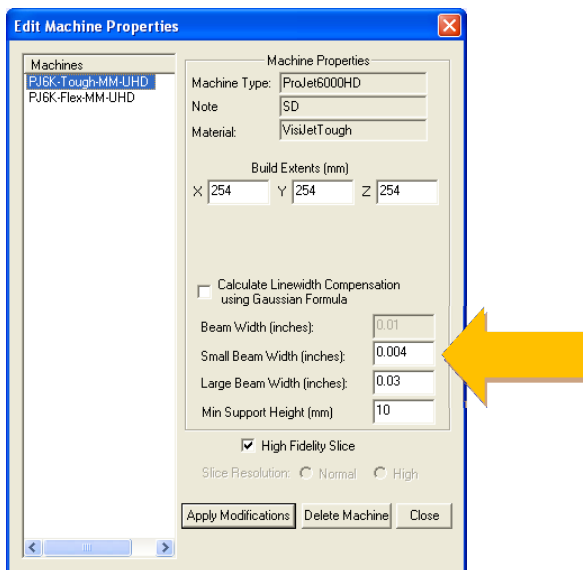
ProJet 6000

Attribute	Entered where	HD mode	UHD mode	XHD mode
Baseline Scale Factors (x, y, z)	ProJet 6000 printer setup	1.0023, 1.0023, 1.000	1.0016, 1.0016, 1.000	1.0023, 1.0023, 1.000
Baseline Small Beamwidth Value*	3DManage machine setup	0.005 inch	0.004 inch	0.002 inch

ProJet 7000

Attribute	Entered where	HD mode	UHD mode	XHD mode
Baseline Scale Factors (x, y, z)	ProJet 7000 printer setup	1.0020, 1.0020, 1.000	1.0024, 1.0024, 1.000	1.0021, 1.0021, 1.000
Baseline Small Beamwidth Value*	3DManage machine setup	0.002 inch	0.002 inch	0.002 inch

*For line width compensation



3. **HD Mode:** In general, HD mode will be about 25% faster than UHD mode. The actual difference in throughput is dependent on part geometry, available laser power, and other factors. Note that this increased throughput comes at the cost of accuracy and mechanical properties.

4. **UHD Mode:** This is the mode we expect will be primarily used for these systems.
5. **50 micron (0.002 inch) UHD recommended baseline (RB) style:** This style is provided for you as an initial starting point to build thinner layers. It will build correctly for a broad spectrum of parts, but may require you to adjust parameters for certain specific geometries.
6. **XHD Mode:** The XHD mode will produce finer detail on parts. Note that build speed is slower, in exchange for greater part detail.
7. **Software version:** Unless otherwise directed, always use the latest software version. Enhancements are often added which allow the system to build in a fully optimized way.
8. **Part cleaning:** Parts must have excess VisiJet material removed prior to post-curing.
 - a. Drain excess VisiJet material from the parts for 10-15 minutes to remove most of the uncured material.
 - b. Immerse parts in TPM and agitate for a minimum of 20 minutes (maximum 90 minutes). Time required will depend on geometry. It's important to make sure the parts are thoroughly clean, or excess material will get cured into crevices or onto surfaces, affecting part resolution and/or accuracy. Parts may be cleaned on the platform, or off the platform.
 - c. Remove parts and drain excess TPM back into your tank.
 - d. Rinse parts with water, using water spray to fully remove TPM and excess diluted VisiJet material.
 - e. Air dry parts. You may use compressed air (low pressure) to dry the part and remove liquid from crevices.
9. **Support removal:** We recommend that supports be removed prior to post-curing the part.
10. **Post-curing:** Most geometries are self-supporting, but use good judgment based on your specific parts to determine if additional support is required during the post-curing operation. Take care when orienting parts in the post-curing apparatus to avoid sagging or other deformation. Supporting the part with loose sand is suitable. Post-curing for 45 minutes each side (90 minutes total) is recommended.

VisiJet® SL HiTemp

1. **System type:** VisiJet SL HiTemp is used on ProJet 6000 and 7000 SD, HD, and MP systems.
2. **Basic system configuration values:** Materials may require different settings for optimum performance. The settings for this material are:

Attribute	Value
Chamber heater	28 °C
Cart reservoir heater	28 °C
Recommended print tray material heater	28 °C

3. **Configuring files for accuracy:** You will enter specific starting values for your build files in 3DManage and on your system to influence part accuracy. Some of these values will also depend upon the build mode you are using. You will make changes that are specific to your system, but appropriate starting values are shown below.

ProJet 6000

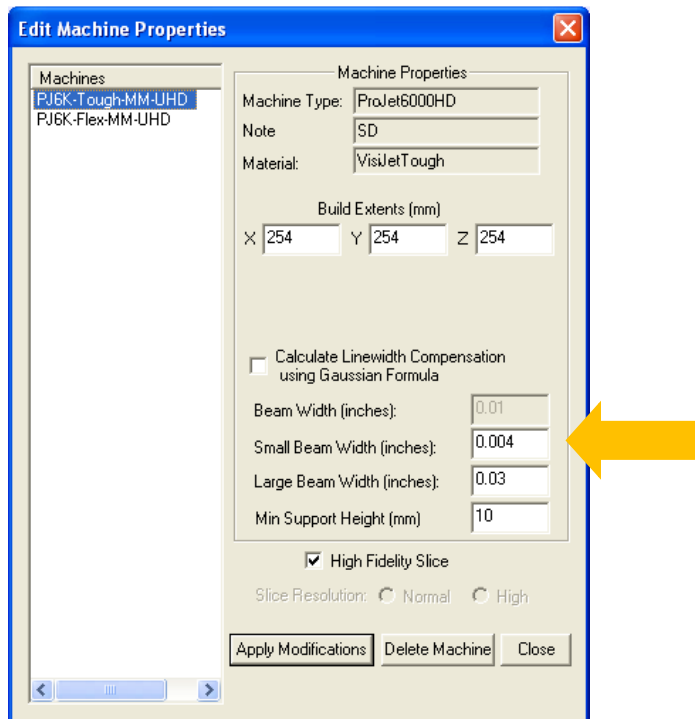
Attribute	Entered where	UHD mode
Baseline Scale Factors (x, y, z)	ProJet 6000 printer setup	1.002, 1.002, 1.000
Baseline Small Beamwidth Value*	3DManage machine setup	0.005 inch

* for linewidth compensation

ProJet 7000

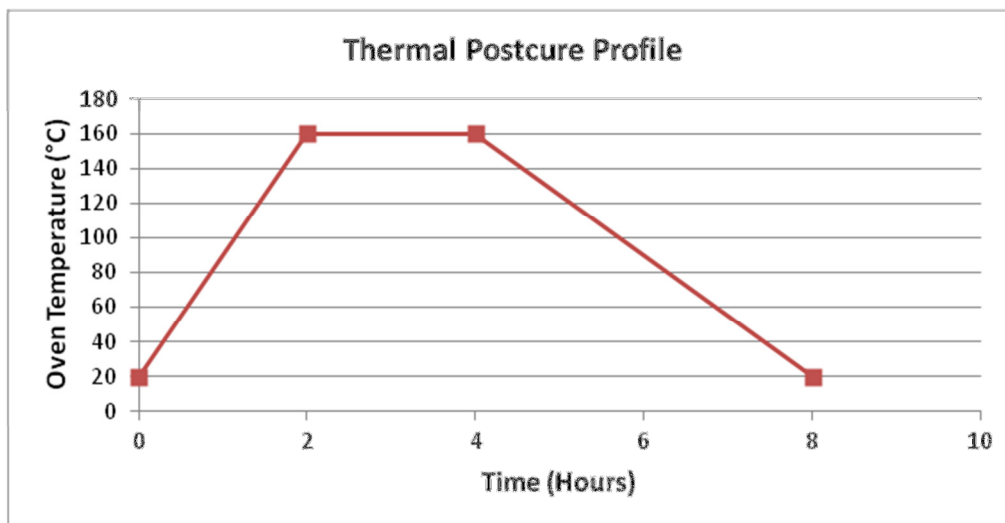
Attribute	Entered where	UHD mode
Baseline Scale Factors (x, y, z)	ProJet 7000 printer setup	1.003, 1.003, 1.000
Baseline Small Beamwidth Value*	3DManage machine setup	0.0015 inch

* for linewidth compensation



3. **Differential Shrinkage:** Some geometries may show geometry dependent shrinkage (differential shrinkage). If the differential shrink must be reduced to the absolute minimum, increase post hatch delay (PHD) from default of 15 seconds to 30 seconds or more. The provided styles allow PHD to be set from zero to 60 seconds.

4. **Software version:** Unless otherwise directed, always use the latest software version. Enhancements are often added which allow the system to build in a fully optimized way.
5. **Part cleaning:** Parts must have excess VisiJet material removed prior to post-curing.
 - a. Drain excess VisiJet material from the parts for 10-15 minutes to remove most of the uncured material.
 - b. Immerse parts in TPM and agitate for a minimum of 20 minutes (maximum 90 minutes). Time required will depend on geometry. It's important to make sure the parts are thoroughly clean, or excess material will get cured into crevices or onto surfaces, affecting part resolution and/or accuracy. Parts may be cleaned on the platform, or off the platform.
 - c. Remove parts and drain excess TPM back into your tank.
 - d. Rinse parts with water, using water spray to fully remove TPM and excess diluted VisiJet material.
 - e. Air dry parts. You may use compressed air (low pressure) to dry the part and remove liquid from crevices.
5. **Support removal:** We recommend that supports be removed prior to post-curing the part.
6. **Post-curing:**
 - Most geometries are self-supporting, but use good judgment based on your specific parts to determine if additional support is required during the post-curing operation. Take care when orienting parts in the post-curing apparatus to avoid sagging or other deformation. Supporting the part with loose sand is suitable.
 - Post-curing for 45 minutes each side (90 minutes total) is recommended.
7. **Thermal Post curing:** Parts built in VisiJet SL HiTemp material may be thermally post cured to achieve enhanced thermal resistance. This is particularly beneficial for higher temperature applications. In order to thermally post cure a part, treat as follows:
 - a. Clean and UV post cure as normal.
 - b. Place the part in a programmable thermal oven with sufficient support material (typically vermiculite or sand) to prevent sagging.
 - c. Slowly raise the oven temperature to 160° C (320° F) over a period of approximately 2 hours.
 - d. Hold the temperature for at least 2 hours, depending on the thickness of the part. Thin parts, those around 3mm (~0.125"), require only 2 hours at elevated temperature. Thicker parts will require more time. Your goal is to have the entire part mass reach equilibrium.
 - e. Shut off the oven, and slowly return the temperature to room temperature, over approximately 4-8 hours. It is important not to cool parts rapidly as thermal shocking may occur and result in cracks in the part.



VisiJet® SL Impact

- System type:** VisiJet SL Impact is used on ProJet 6000 and 7000 SD, HD, and MP systems.
- Basic system configuration values:** Materials may require different settings for optimum performance. The settings for this material are:

Attribute	Value
Chamber heater	28 °C
Cart reservoir heater	28 °C
Recommended print tray material heater	28 °C

- Configuring files for accuracy:** You will enter specific starting values in your build files and on your system to influence part accuracy. Some of these values will also depend upon the build mode you are using. You will make changes that are specific to your system, but appropriate starting values are shown below.

ProJet 6000

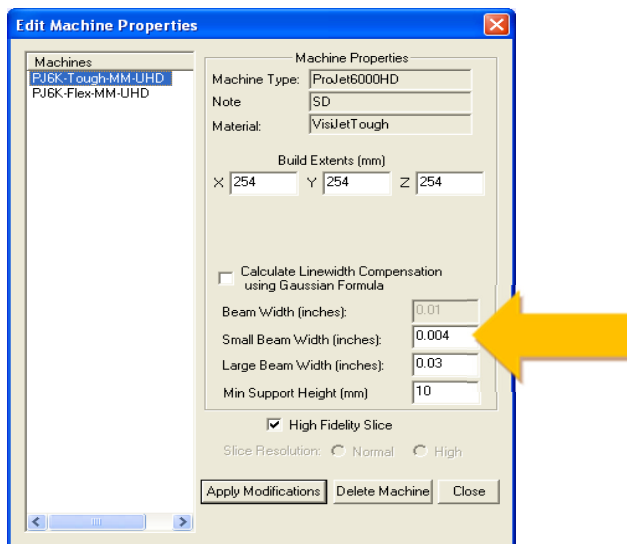
Attribute	Entered where	HD mode	UHD mode	XHD mode
Baseline Scale Factors (x, y, z)	ProJet 6000 printer setup	1.0015, 1.0015, 1.0000	1.0003, 1.0003, 1.0000	1.0010, 1.0010, 1.0000
Baseline Small Beamwidth Value*	3DManage machine setup	0.003 Inch	0.003 inch	0.002 inch

*For line width compensation

ProJet 7000

Attribute	Entered where	HD mode	UHD mode	XHD mode
Baseline Scale Factors (x, y, z)	ProJet 7000 printer setup	1.0025, 1.0025, 1.000	1.0010, 1.0010, 1.0000	1.0018, 1.0018, 1.0000
Baseline Small Beamwidth Value*	3DManage machine setup	0.003 Inch	0.003 inch	0.002 inch

*For line width compensation



- UHD Mode:** This is the mode we expect will be primarily used for these systems.
- XHD Mode:** The XHD mode will produce finer detail on parts. Note that build speed is slower, in exchange for greater part detail.

6. **Build start position and build area:**

Build start position and build area are critical factors for successful part building using VisiJet SL Impact material. It was observed that in the “green” state, the material exhibits low adhesion. Users should be careful when preparing parts, using the following instructions:

- a) At build start position, the top surface of the build tray should be 4 layers (0.016” or 0.400mm) above the resin level. That means the build tray should not be completely submerged into the resin until after the first 4 layers are complete.
 - b) Parts should not be built on the solid metal sections at the edges of the build tray because after deep-dip recoating, the material settles very slowly. Supports around the extreme edges of the build tray could float, resulting in build failure.
7. **Supports:** The default parameters are optimum for successful part building. Modifying supports may cause the build to crash, so proceed with caution if you change support parameters. In some cases, the supports may be crowded on some parts and may require editing.
 8. **Hatch Overcure:** Hatch overcure has been optimized to maximize build speed. It is highly recommended that the hatch overcure values not be reduced from default. However, you can increase hatch overcure to increase part hardness, or decrease the hatch overcure to increase build speed. Hatch overcure should not be increased or decreased more than 0.001” (0.025mm).
 9. **Down facing surfaces:** The default build style has been developed and optimized for the best down facing surfaces. The support spacing was also reduced from more standard 0.300 to 0.250 inches to prevent the “quilting” effect (down facing surfaces sagging between support lines). Also note that quilting can be more pronounced when relative humidity (RH) is above 50%. If you see this effect with high ambient RH, tighten support spacing to 0.2 inches. You may also need to stir the material in the print tray, using a drill motor and blade (e.g., paint stirrer). If you have questions about this process, please contact your local applications engineer.
 10. **Sweep speed:** The default sweep speed for the print tray applicator is set to 1 ips. It was observed that sweeping at 2 inches/second causes uneven top surfaces due to dewetting. Sweeping at 2 ips can be successful, however if the solidified cross section of parts are greater than 2 square inches, 1 ips is the recommended sweep speed.
 11. **Software version:** Unless otherwise directed, always use the latest software version. Enhancements are often added which allow the system to build in a fully optimized way. For Visijet SL Impact, software version should be:
 - 3D Manage: version 1.34 (or newer)
 - Control code: version 1.3.2068.0 (or newer)
 12. **Part cleaning:** Parts must have excess VisiJet material removed prior to post-curing.
 - a. Drain excess VisiJet material from the parts for 10-15 minutes to remove most of the uncured material.
 - b. Immerse parts in TPM and agitate for a minimum of 20 minutes (maximum 90 minutes). Time required will depend on geometry. It’s important to make sure the parts are thoroughly clean, or excess material will get cured into crevices or onto surfaces, affecting part resolution and/or accuracy. Parts may be cleaned on the platform, or off the platform.
 - c. Remove parts and drain excess TPM back into your tank.
 - d. Rinse parts with water, using water spray to fully remove TPM and excess diluted VisiJet material.
 - e. Air dry parts. You may use compressed air (low pressure) to dry the part and remove liquid from crevices.
 13. **Support removal:** We recommend that supports be removed prior to post-curing the part.
 14. **Post-curing:** Most geometries are self-supporting, but use good judgment based on your specific parts to determine if additional support is required during the post-curing operation. Take care when orienting parts in the post-curing apparatus to avoid sagging or other deformation. Supporting the part with loose sand is suitable. Post-curing for 30 minutes each side (60 minutes total) is recommended.

VisiJet® SL Jewel

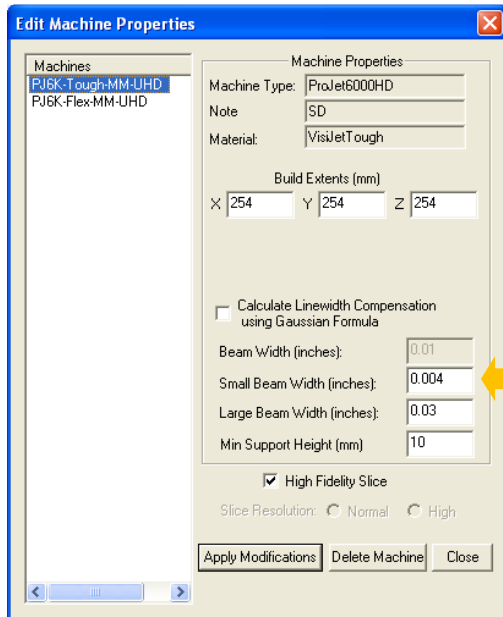
1. **System Type:** VisiJet SL Jewel is used on ProJet 6000 HD and MP systems.
2. **Basic system configuration values:** Materials may require different settings for optimum performance. The settings for this material are:

Attribute	Value
Chamber heater	28 °C
Cart reservoir heater	28 °C
Recommended print tray material heater	28 °C

3. **Configuring files for accuracy:** You will enter specific starting values for your build files in 3DManage and on your system to influence part accuracy. Some of these values will also depend upon the build mode you are using. You will make changes that are specific to your system, but appropriate starting values are shown below.

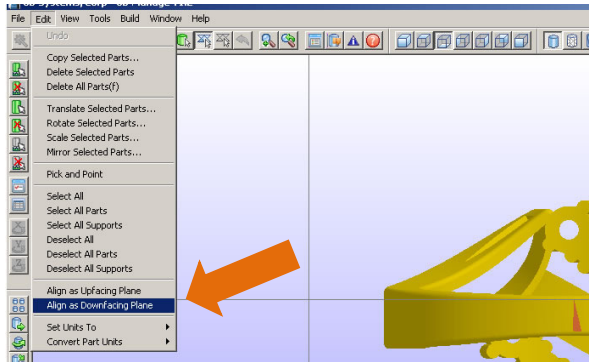
Attribute	Entered where	XHD mode
Baseline Scale Factors (x, y, z)	ProJet 6000 printer setup	1.0004, 1.0004, 1.0000
Baseline Small Beamwidth Value*	3DManage machine setup	0.001 inch

* for line width compensation

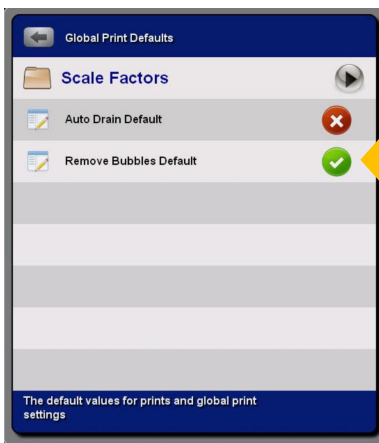


4. **Software version:** Unless otherwise directed, always use the latest software version. Enhancements are often added which allow the system to build in a fully optimized way
5. **XHD build mode:** The 0.001" (0.0250 mm) XHD mode is in a cyclical format. This means that though a border is drawn every layer, the hatch is not drawn every layer – rather, a more deeply-cured hatch is drawn every so many layers. The recoating parameters also have been developed in conjunction with this drawing method, in order to achieve the best part results using such a thin layer. As a result, not all layers during the build will have the same recoat parameters, and the recoat parameters for layers which are not hatched cannot be changed. Therefore, users are strongly encouraged not to stray from the defaults. The general (GNRL) option is specifically for jewelry parts which have mostly small features, however, when building parts with large drawing surfaces, users should select large flat (LFLT) option.
6. **Hatch Overcure:** Hatch overcure has been optimized for both accuracy and mechanical properties. It is highly recommended that the hatch overcure values not be reduced from default.

7. **Supports:** Supports are critical to build success. Unlike many other materials, support editing is required as a normal course of part preparation. Follow the guidelines below to ensure build success:
 - Support parameters are especially designed to support tiny features of jewelry parts. However, all jewelry parts may not be adequately supported using the default parameters and manual editing is likely required.
 - It is important that the resin be allowed to settle sufficiently between supports before the next layer is drawn. This may require that braces and extra supports are removed manually in the software.
 - When parts are built that have supports closely spaced or bunched together, the Zwait time (accessed in part recoating parameters) should be increased to allow the resin to settle before drawing the next layer.
 - This material has lower initial strength than some other materials. When removing supports, remove them with care to prevent damage to delicate part features.
8. **Part Orientation:** Correct positioning of the models is essential to successfully build parts having high detail. Upfacing surfaces will exhibit a mirror-like finish. Part orientation in which the small lowest support regions are near flat down facing surfaces are not usually sufficiently supported. In order to avoid this situation, jewelry parts should be prepared by selecting the down facing triangles option, “Align as down facing plane” or built at an angle greater than 20 degrees. To orient your parts flat in 3DManage software, on each relevant STL file, select one triangle, which you would like to turn into a down facing surface that is parallel with the build platform.



9. **Part positioning in Z:** The start layer of all STL files in the build must all have the same Z coordinate. Since the build style is cyclic, and hatching does not occur on every layer, the starting position of parts in a multiple part build is essential for successful part building.
10. **Bubbles:** The provided build style minimizes bubbles. Part orientation can also help avoid bubbles – orient thin wall features perpendicular to the print tray applicator. Verify that the resin surface is bubble free before you start building. We recommend turning the “remove bubbles” option on, as shown in the screen shot below.



11. **Liquid material color note:**
 - In the bottle, VisiJet SL Jewel material color may vary slightly, some material a bit darker or lighter blue.
 - In the print tray, the material may lighten in color over time. However, printed parts are always dark blue.

12. **Support removal:** It is recommended that most supports are removed before cleaning the part. Supports should be completely removed before post curing. Support removal is quite simple and fast. Finepoint supports are very delicate; they are removed easily by snapping them by hand at the base of the built part. Care must be taken, especially with very small or finely featured part geometry, to remove the supports without damage to fine features.

13. **Part cleaning:** Parts must have excess VisiJet material removed prior to post-curing. VisiJet SL Jewel green parts should be cleaned using an ultra-sonic cleaner and 99% isopropanol (IPA). In this part cleaning process, the parts are submerged in alcohol in which is contained in a glass container (do not use a plastic container). It is important that the net volume of green parts is less than 50% of the volume of the glass container at the alcohol level. The container is then put in an ultrasonic water bath in which the level of alcohol in the container is lower than the water level in the ultrasonic unit. The procedure is as follows:

- Remove parts from platform.
- Remove as many supports as possible. Supports can be removed using a pair of tweezers.
- Put parts into a glass container that will fit into the ultrasonic cleaner. A 500 ml glass beaker is generally appropriate.
- Add IPA to the container until all parts are submerged in IPA.
- Put the container in to the ultrasonic bath. Make sure the ultrasonic has water in it – the water level in the ultrasonic cleaner must be above the IPA level in the glass container.
- Turn on ultrasonic for 3 to 4 minutes.
Note: parts might be deformed if they are subjected to ultrasonic more than 4 minutes, and will usually not be clean in less than 3 minutes.
- Remove the IPA container with the parts, from the ultrasonic cleaner.
- Remove parts from the glass container, and put them into a fresh glass container.
- Add fresh IPA to second glass container until all parts are submerged.
- Put the second container into the ultrasonic bath. Verify water level in the ultrasonic cleaner is above the level of IPA in the glass container.
- Turn on ultrasonic for 1 minute.
- Remove glass container from the ultrasonic cleaner, and remove parts.
- Air dry parts. You may use compressed air (low pressure, about 10 PSI) to dry the parts and remove liquid from crevices.

Note: IPA in the first container will rapidly become dark blue. Once the IPA in the second container has visible bluish color, you should properly dispose of all the IPA used for cleaning. Alternately, you can swap the 2nd container to be used as the first wash, and completely replace the IPA for the “new” second container.

14. **Post-curing:**

- Most geometries are self-supporting, but use good judgment based on your specific parts to determine if additional support is required during the post-curing operation. Take care when orienting parts in the post-curing apparatus to avoid sagging or other deformation. Supporting the part with loose sand is suitable.
- Post-curing for 30 minutes each side (60 minutes total) is recommended.

VisiJet® SL Tough

1. **System type:** VisiJet SL Tough is used on ProJet 6000 and ProJet 7000 SD, HD, and MP systems.
2. **Basic system configuration values:** Materials may require different settings for optimum performance. The settings for this material are:

Attribute	Value
Chamber heater	28 °C
Cart reservoir heater	28 °C
Recommended print tray material heater	28 °C

3. **Configuring files for accuracy:** You will enter specific starting values for your build files in 3DManage and on your system to influence part accuracy. Some of these values will also depend upon the build mode you are using. You will make changes that are specific to your system, but appropriate starting values are shown below.

ProJet 6000

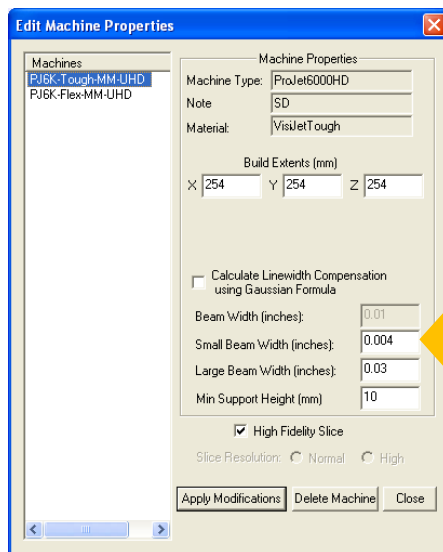
Attribute	Entered where	HD mode	UHD mode
Baseline Scale Factors (x, y, z)	ProJet 6000 printer setup	1.0019, 1.0019, 1.000	1.0014, 1.0014, 1.000
Baseline Small Beamwidth Value*	3DManage machine setup	0.005 inch	0.004 inch

* for linewidth compensation

ProJet 7000

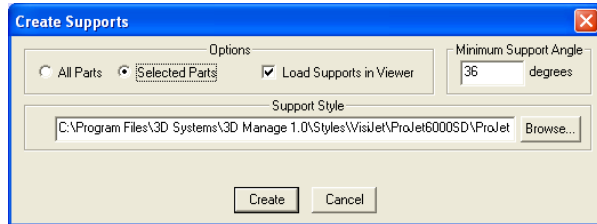
Attribute	Entered where	UHD mode
Baseline Scale Factors (x, y, z)	ProJet 7000 printer setup	1.0012, 1.0012, 1.000
Baseline Small Beamwidth Value*	3DManage machine setup	0.004 inch

* for linewidth compensation



4. **HD Mode:** In general, HD mode (when available) will be about 20% faster than UHD mode. The actual difference in throughput is dependent on part geometry, available laser power, and other factors. Note that this increased throughput comes at the cost of accuracy and mechanical properties.
5. **UHD Mode:** This is the build mode we would expect for use in general applications.
6. **Z-Wait value:** The use of Z-wait is very important to reliable part building. We recommend against reducing the default value in the style.

7. **Support generation:** In 3DManage, the 36-degree minimum support angle is used for best build reliability. Advanced users may be able to reduce that value, but care should be exercised when making that choice.



8. **Software version:** Unless otherwise directed, always use the latest software version. Enhancements are often added which allow the system to build in a fully optimized way.
9. **Part cleaning:** Parts must have excess VisiJet material removed prior to post-curing.
- Drain excess VisiJet material from the parts for 10-15 minutes to remove most of the uncured material.
 - Immerse parts in TPM and agitate for a minimum of 20 minutes (maximum 90 minutes). Time required will depend on geometry. It's important to make sure the parts are thoroughly clean, or excess material will get cured into crevices or onto surfaces, affecting part resolution and/or accuracy. Parts may be cleaned on the platform, or off the platform.
 - Remove parts and drain excess TPM back into your tank.
 - Rinse parts with water, using water spray to fully remove TPM and excess diluted VisiJet material.
 - Air dry parts. You may use compressed air (low pressure) to dry the part and remove liquid from crevices.
10. **Support removal:** We recommend that supports be removed prior to post-curing the parts.
11. **Post-curing:** Most geometries are self-supporting, but use good judgment based on your specific parts to determine if additional support is required during the post-curing operation. Take care when orienting parts in the post-curing apparatus to avoid sagging or other deformation. Supporting the part with loose sand is suitable. Post-curing for 45 minutes each side (90 minutes total) is recommended.

DISCLAIMER OF LIABILITY: The following supersedes any provision in your company's forms, letters, and papers. 3D Systems, Inc. makes no warranty whether expressed or implied, including warranties of merchantability or of fitness for a particular purpose for this product. No statements or recommendations contained in the product literature are to be construed as inducements to infringe any relevant patent now or hereafter in existence. Under no circumstances shall 3D Systems, Inc. be liable for incidental, consequential, or other damages from alleged negligence, breach of warranty, strict liability or any other theory, arising out of the use or handling of this product. The sole liability of 3D Systems, Inc. for any claims arising out of the manufacture, use or sale of its products shall be for the buyer's purchase price.

© Copyright 2011-2014 by 3D Systems, Inc. All rights reserved. Subject to change without notice. The 3D logo, ProJet, VisiJet and QuickCast are registered trademarks, and e-Stone, 3DManage and FinePoint are trademarks of 3D Systems, Inc. Krylon is a registered trademark of Krylon Products Group.



3D Systems Inc.
333 Three D Systems Circle | Rock Hill, SC | 29730
www.3dsystems.com

©2014 3D Systems, Inc. All rights reserved.