# Customer Information Bulletin

CIB

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Status: Non-confidential

Subject: Tips & Information for part building with Accura® Phoenix material

1) **Software version:** It is best to use the most current software version. To ensure compatibility with newly created build styles, use these versions or newer:
   - **Part preparation software:** 3D Sprint™ 2.5, 3DManage™ 1.5, Lightyear™ 1.4
   - **Part building systems:** The software must be updated for the registration of Accura Phoenix.
     - iPro™/ViperPro: 3DPrint™ 1.2.4169
     - ProX™800/950: Print 3D Pro V1.1.5443
     - SLA-7000 and Viper: WINSLA 5.1

2) **Part building system software entries:** Each material on a SLA system uses a specific material entry in the 3DPrint software. The entries contain the values for Dp and Ec used for each material. See the 3DPrint Users' Guides for details. The values for Dp and Ec are shown below.

Recommended Starting Parameters:

| | **Viper** | **SLA-7000** | **ViperPro/iPro/ProX** |
|---|---|---|---|
| Dp | 6.4 | 6.4 | 6.4 |
| Ec (mJ/cm2) | 11.7 | 11.7 | 11.7 |
| Baseline Scale Factors (x/y/z) | 1.0000/1.0000/1.0000 | 1.0005/1.0005/1.0000 | 1.0009/1.0009/1.0000 |
| Baseline Linewidth Compensation Value | 0.0500mm (0.0020 in) | 0.0500mm (0.0020 in) | 0.0250mm (0.0010 in) |
| Recommended vat temperature | 28°C | 28°C | 28°C |

3) **Hatch Overcure:** Hatch overcure has been optimized for best part quality. It is highly recommended that the hatch overcure values not be increased from default due to the heat generated during part building, resulting in part defects.

4) **Upfacing surfaces**: Occasionally, some random small dimples or de-wetting spots have been observed on up-facing surfaces. This is the nature of this material, and cannot be eliminated completely.

5) **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.

6) **Use of post-hatch delay (PHD):** The styles for this resin are set up using PHD in most cases. Reducing PHD should be done with caution, as this may affect surface finish. Reducing PHD may result in "fuzzy" sidewalls. Sidewall anomalies may appear with bulky parts (individual part cross section greater than 4 square inches). When building bulky parts on these systems, you may need to increase PHD from 20 seconds to 30 or more seconds to achieve the best surface finish. The styles allow PHD to be set from zero to 60 seconds.

7) **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 20 seconds to 30 seconds or more. The provided styles allow PHD to be set from zero to 60 seconds.

8) **Part Supports:** Accura Phoenix supports have been described as "thin and crisp." 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.

9) **Near-flat downfacing features**: For the Viper, a special EXACT build style was developed to minimize downfacing border and surface delamination for near-flat inclined downfacing surfaces. This style should be used when surfaces are sloped at an angle of less than 20 degrees from horizontal. You may use this style for the whole part if you wish, or just for the region with the very shallow angle. This file is named Part_Phoenix_EXACT_0040in_NFLT.sty.

10) **Part cleaning:** Parts must have excess material removed prior to post-curing.
    a. Drain excess 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.
    e. Perform a final rinse with clean IPA to remove excess diluted material.
    f. Air dry parts. You may use compressed air (low pressure) to dry the part and remove liquid from crevices.
    g. Parts cleaned as described above may exhibit cloudy downfacing surfaces and sometimes a white residue from the solvent evaporation. Clarity can be restored by sanding the down facing surfaces with fine sandpaper or Scotch-Brite™, or by vapor honing for hard to reach organic shapes. Clear coating will further enhance the clarity.

11) **Support removal:** We recommend that supports be removed prior to post-curing the part.

12) **UV Post-curing**:
    a. 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.
    b. Post-curing for 45 minutes each side (90 minutes total) is recommended.

13) **Liquid material color:** This material includes components which, over time, can agglomerate/clump together and become visible as colored "specks" in the resin, typically bluish specks. This is due to liquid material age or storage conditions. If this is observed, simply mix the material as described below:
    - For material in bottles: Shake or stir the material in the bottle for 10 minutes, shaking by hand or using a drill motor and blade (e.g., paint stirrer).
    - If this is observed in the vat or MDM: Using the elevator stir function for a minimum of 1 hour.

    If you have questions about this process, contact your regional customer support center. The regional contact information can be found on the 3D Systems website, www.3DSystems.com.

13) **Heat Deflection Temperatures (HDT) with Thermal Post Cure (TPC):** Higher HDT can be achieved using 80 C thermal post cure, values can be found on the printer/material data sheet. TPC temperature will result in part color change; the higher the temperature, the more the color will darken.

14) **Thermal Post curing:** Parts built in Accura Phoenix 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. From room temperature, slowly raise the oven temperature to 80° C (176° 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. For large/bulky parts, cooling should be even longer, 12 hours or even longer. It is important not to cool parts rapidly as thermal shocking may occur and result in part cracking.