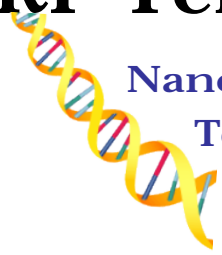


# RP Tempering™ Technology News



**Nano-Composite  
Technology**

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Solid Freeform Additive Technology &  
Patent Pending Engineering Technique

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## Inquires Increase Dramatically

End Users and Service Bureaus alike are taking advantage of the value adding benefits of applying the RP Tempering Technologies. Most inquires received are about potentially using RP Tempering Technologies to achieve specific results in actual Rapid Manufacture (RM) applications. PAR3 Technology and TCST are yielding multiple calls daily about tempering SFF/RP parts made from multiple materials and systems including FDM (Dimension), LS, SL and Objet.

We are happy to report that we have been successful addressing these applications for our customers. RP Tempering applications are creating increased sales opportunities for our network of Distributors, Services Bureaus and OEM End Users.

Below are just some of the applications that we have successfully addressed over the last 60 days:

### UL94 Flammability:

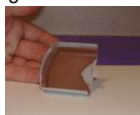
- o Vertical Burn V-0 (SLS & FDM)
- o Horizontal Burn H-B
- o Surface Burn 5V-A

### EMI Shielding:

- o Static Decay Properties
- o Conductivity

### RFI Shielding for:

- o Cell phone signals
- o CB, TV, FM & AM signals
- o Radio frequency radiation
- o Microwaves



Specialty micron powder shielding products for magnetic, electro magnetic, block radiation light, conductivity, lead replacement/RoHS and other uses:

- o Stainless Steel particles

- o Copper particles
- o Aluminum particles
- o Tungsten particles
- o Nickel particles
- o Ceramic particles
- o Carbon particles
- o Combinations of the above to achieve application specifications.

### Thermal Applications:

- o Hi-temperature applications
- o Increased Heat Deformation
- o Increased Heat Resistance
- o Thermally Insulate properties
- o Fire Retardant applications
- o Shield for UV Light to slow down the aging process in SLA & Objet parts.



### Sealing Microscopic Porosity:

- o Water tight without leaking in FDM, SLA, SLS & Objet parts.

### Chemical Resistance & Sealing for:

- o #2 Fuel
- o Oil & Sludge
- o UV Light
- o Chlorinated water
- o Ethanol & Methanol
- o Water & Moisture



### Mechanical Property Enhancements:

- o Impact Strength
- o Torsion Strength
- o Flex Strength
- o Tensile & Flex Modulus stay the same
- o Vibration Damping
- o Holds Vacuum Pressures
- o Living Hinges will work without breaking multiple times.
- o 3 Axis Durability

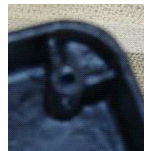
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**The Newly Revised  
Application Instructions  
are Available  
on the RP Tempering  
website. See Page 4.**

### Misc. Enhancements:

- o Enhanced Preparation for CNC Machining Stability
- o Living Hinges
- o Screw Bosses
- o Snap Features
- o Thin wall Parts



# UL94 Burn Test Update

The second round of 30 piece DOE's are completed for the UL94 Burn Test Criteria. This second round of testing confirms what was seen in the initial round. The results show that FDM materials (PPS & PC) & SLS materials (Duraform PA) with RP Tempering applied passed all the UL94 Burn Test Criteria.

PAR3 Technology also included two other FDM materials in their test at Porter Engineering. The FDM process PC/ABS materials with RP Tempering applied will pass some of the lower UL94 classifications. The FDM process, ABS material with RP Tempering applied will not pass the UL94 Burn Test Criteria.

## Summary for PC Materials From FDM Process

The PC material performed very well from the FDM process. Two separate DOE's of 30 pieces each were completed. The second DOE confirmed the first round of testing that PC material will pass the UL94 criteria when RP Tempering Fire Retardant materials are applied. Pictured below are PC material FDM parts before and after RP Tempering.



Plain FDM UL94 Burn Test - Failed



RP Tempered FDM 5VA - Passed



RP Tempered FDM V-0 - Passed



RP Tempered FDM H-B - Passed

## Summary for LS Duraform Materials

The SLS material performed very well during the FR test. Two separate DOE's of 30 pieces each were completed. Again the second DOE confirmed the first round of testing that the SLS materials will pass the UL94 criteria when RP Tempering Fire Retardant materials are applied. Pictured below are the SLS material parts before and after testing.



Plain SLS UL94 Burn Test - Failed



RP Tempered SLS V-0 - Passed



RP Tempered SLS 5VA - Passed



RP Tempered SLS H-B - Passed

## UL94 5VA & 5VB Surface Burn Test

This is the toughest UL94 burn test criteria. A larger 1200\* F degree flame is applied to the surface of test bar in a widespread area. Burning should stop within 60 seconds after five applications of five seconds each of a flame to test the bar. The test specimens may not have a burn-through/no hole.

### PC Material/Plain (Not Tempered) - FDM Process 15 Specimens - Failed

- ☒ All 5 applications have to put out at 70 seconds and failed test
- Would not self extinguished
- ☒ Average length of burn at 70 seconds is 87.20mm.

### RP Tempered PC Material - FDM Process

	Average Burn Time (seconds)	Average Burn Length (mm)
1st 5 seconds	0.80	1.73
2nd 5 seconds	1.06	11.60
3rd 5 seconds	1.73	19.47
4th 5 seconds	1.80	25.80
5th 5 seconds	2.40	31.54

There were 15 test specimen and in each case the flames self extinguished.

### Duraform PA Material/Plain (Not Tempered) - SLS Process 15 Specimens - Failed

- ☒ All 5 applications have to put out at 70 seconds and failed test
- Would not self extinguished
- ☒ Average length of burn at 70 seconds is 78.60mm

### RP Tempered Duraform PA Material - SLS Process

	Average Burn Time (seconds)	Average Burn Length (mm)
1st 5 seconds	1.00	7.33
2nd 5 seconds	1.67	10.40
3rd 5 seconds	1.94	25.20
4th 5 seconds	2.80	29.60
5th 5 seconds	4.60	45.11

There were 15 test specimen and in each case the flames self extinguished.

## UL94 V-0, V-1 & V-2 Vertical Burn Test

These are the most common UL94 Burn test criteria to pass and fit most real world applications. This is the second toughest UL94 V-0 burn test criteria. Burning should stop within 10 seconds after two applications of ten seconds each of a 1200\* F degree flame to test the bar. The test specimens may not have a burn-through/no hole and no drips.

### PC Material/Plain (Not Tempered) - FDM Process 15 Specimens - Failed

- ☒ Both applications have to put out at 70 seconds and failed test
- Would not self extinguished
- ☒ Average length of burn at 70 seconds - 55mm

### PC Material/RP Tempered - FDM Process - 15 Test Specimens - Passed

- ☒ 1st five seconds
    - o Average burn time- 3.94 seconds
  - ☒ 2nd five seconds average burn time
    - o Average burn time is 6.94 seconds
- In all cases the flame self extinguished.

### Duraform PA Material/Plain (Not Tempered) - SLS Process 15 Specimens - Failed

- ☒ Both applications have to put out at 70 seconds and failed test
- Would not self extinguished
- ☒ Average length of burn at 70 seconds is 70.90mm

### Duraform PA Material/RP Tempered - LS Process - 15 Test Specimens - Passed

- ☒ 1st five seconds
    - o Average burn time- 1.87 seconds
  - ☒ 2nd five seconds average burn time
    - o Average burn time is 6.60 seconds
- In all cases the flame self extinguished

## UL94 H-B Horizontal Burn Test

This test incorporates a slow horizontal burn on a 3mm thick specimen with a burning rate which is less than 30/min. or stops burning before the 50 mark. Apply flame for 2

Continued on Page 3



