

# **Professional Resin Casting Tips That Are Actually Useful To The Hobbyist**



Tom Madden  
Hindsight 2020  
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# **Professional Resin Casting Tips That Are Actually Useful To The Hobbyist**

**Inspired by Lester Breuer's August  
Hindsight 2020 resin casting presentation**

## Topics

- **Selecting a resin**
- **Mold frames – Legos and beyond**
- **Three types of open molds**

But first.....

**I differ with Lester in one area – curing resin in vacuum.**

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**Vacuum lets trapped air bubbles in liquid resin expand and burst.**

But first.....

I differ with Lester in one area – curing resin in vacuum.

Vacuum lets trapped air bubbles in liquid resin expand and burst.

**Once the trapped air is gone, vacuum is no longer needed.**

But first.....

**For a treatise on causes and prevention  
of bubbles in resin casting see:**

[www.pullmanproject.com/Bubbles.pdf](http://www.pullmanproject.com/Bubbles.pdf)

## Resin Properties

- **Hobby vs. commercial**



## Resin Properties

- **Hobby vs. commercial**  
**Part “A” (Activator), Part “B” (Base)**



## Resin Properties

- **Hobby vs. commercial**  
**Sold in kits (pints, quarts, gallons)**



## Resin Properties

- **Hobby vs. commercial**  
**A gallon kit contains a gallon of Base...**



## Resin Properties

- **Hobby vs. commercial**  
**...and a matching volume of Activator**



## Resin Properties

- **Properties that matter**

## Resin Properties

- **Properties that matter**

**Cost**

**Mixed viscosity**

**Pot life or gel time**

**Cure time**

**Hardness**

**Shrinkage**

**Heat deflection temperature**

**Tensile strength**

**Pressure curing required?**

## Resin Properties

- **Cost**

Smooth-On 321 - **\$90/gallon**

Hapco 109 - **\$190/gallon**

## Resin Properties

- **Mixed viscosity**

Smooth-On 321 – **70 cps**

Hapco 109 – **300 cps**

Olive oil – 50 to 60 cps

SAE 40 motor oil – 250 to 400 cps



## Resin Properties

- **Pot life**

Smooth-On 321 – **9 minutes**

Hapco 109 – **8.5 minutes**

## Resin Properties

- **Cure time**

Smooth-On 321 – **3 hours**

Hapco 109 – **4 hours**

**These are much longer than the demold times specified by the manufacturers. Those are based on parts at least 1/8" thick. Our parts tend to be thinner, don't get as hot and take longer to cure.**

## Resin Properties

- **Hardness**

Smooth-On 321 – **70 Shore D**

Hapco 109 – **80 Shore D**

Styrene – 75 to 80 Shore D

## Resin Properties

- **Shrinkage (room temperature cure)**

Smooth-On 321 – **0.004" per inch**

Hapco 109 – **0.001" per inch**

These are lower than those specified by the manufacturers because our parts don't get as hot while curing.

## Resin Properties

- **Heat deflection temperature**

Smooth-On 321 – **140 F**

Hapco 109 – **158 F**

## Resin Properties

- **Tensile strength**

Smooth-On 321 – **3000 psi**

Hapco 109 – **7700 psi**

## Resin Properties

- **Pressure curing required?**

Smooth-On 321 – **No**

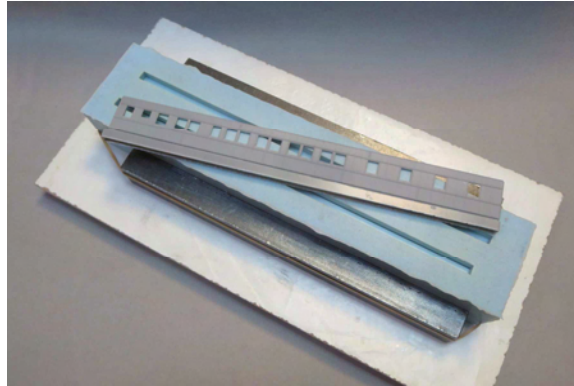
Hapco 109 – **Yes**

## Resin Properties

**I only use Smooth-cast 321 in applications where low viscosity or cost considerations outweigh the poorer physical properties.**

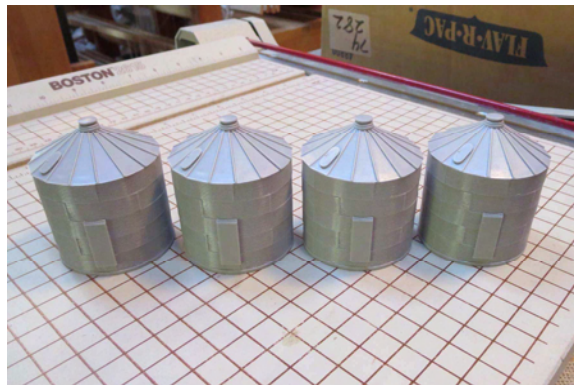
## Resin Properties

**Low viscosity – for molds with deep and narrow cavities (passenger car sides)**



## Resin Properties

**Cost – for thick walled objects that won't get handled (Resin Car Works grain bins)**



## Resin Properties

- **Precaution #1**

**Smooth-on 321 causes molds to swell and “grow” with use. Long parts become longer and thin parts or regions become thinner.**

**Not a problem with small parts or short runs, but something to account for in production.**

## Resin Properties

- **Precaution #2**

**Mold life is related to how long the resin stays liquid in the mold. The longer the pot life or gel time, the shorter the mold life.**

**Not a problem for most hobby uses but also something to keep in mind if you get into production.**

## Resin Properties

- **Precaution #3**

Urethane resin activator is an excellent desiccant and will absorb moisture from humid air. Prepare only the amount you need – for me, a week's worth of base, a day's worth of activator.

## Resin Properties

- **Precaution #2**



## Resin Properties

- **Mixing cups for resin**



**Plastic picnic cups**

## Resin Properties

- **Mixing cups for resin**



**Solo picnic cups, PETE  
(polyethylene terephthalate)  
Good for everything**



## Resin Properties

- **Mixing cups for resin**



## Resin Properties

- **Mixing cups for resin**



## Legos for Mold Frames

## Legos for Mold Frames

- **Laminated shelving stock**



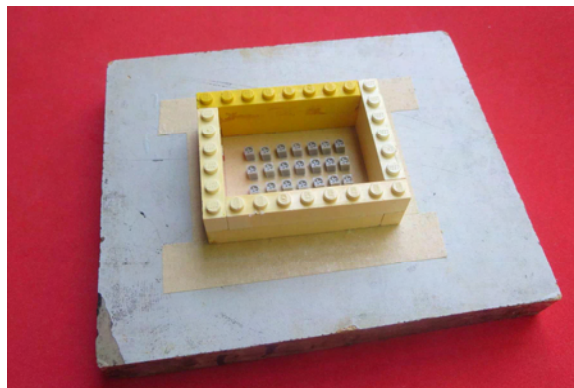
## Legos for Mold Frames

- **Bron BT-480 double-sided paper (carpet) tape, 3/4" & 2" widths**



## Legos for Mold Frames

- **Multiple parts and frame on base**



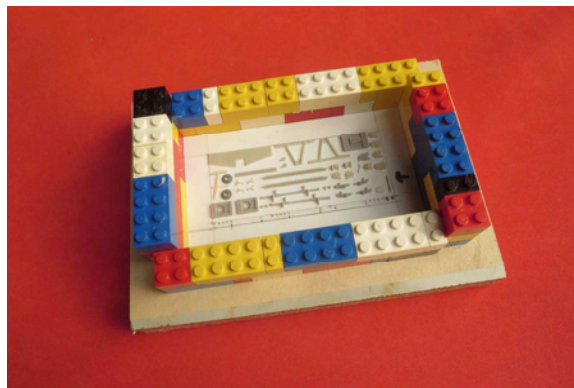
## Legos for Mold Frames

- **Multiple parts on plate taped to base**



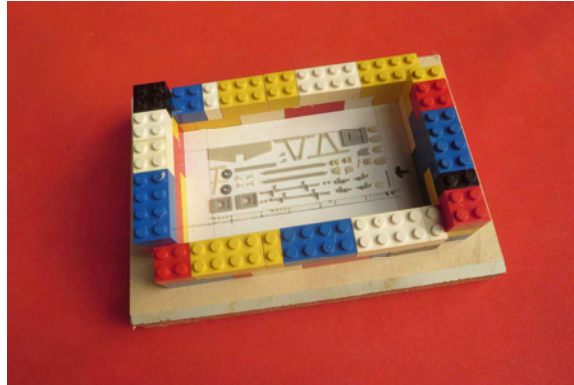
## Legos for Mold Frames

- **Plate framed by Legos**



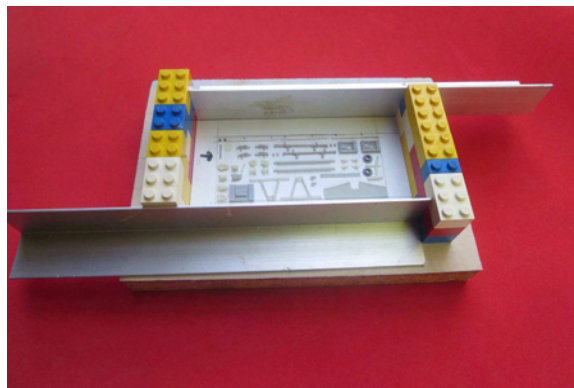
## Legos for Mold Frames

- **Corners don't need to interlock**



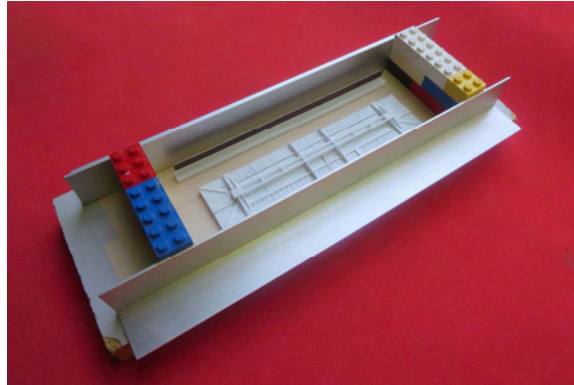
## Legos for Mold Frames

- **Plate framed by Legos and angles**



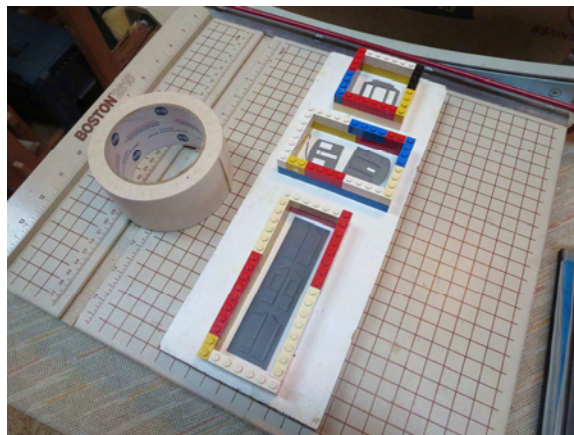
## Legos for Mold Frames

- **Parts framed by Legos and angles**



## Legos for Mold Frames

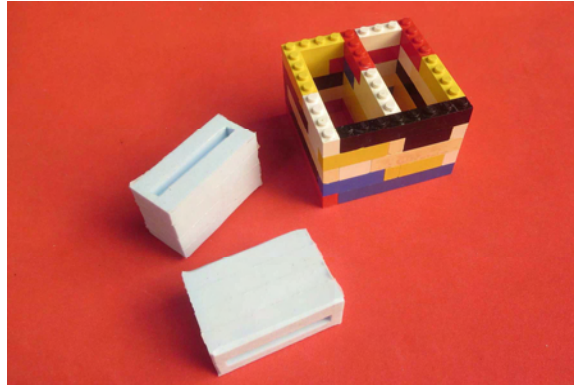
- **Multiple parts and frames, one base**





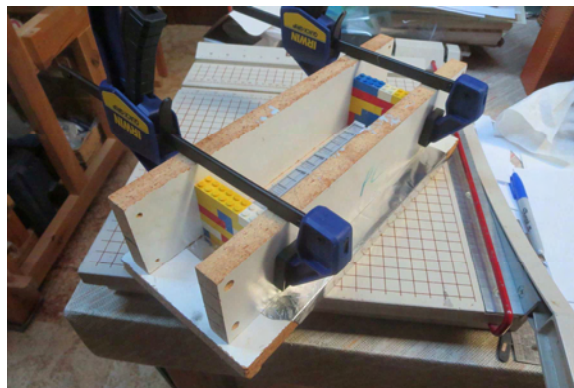
## Legos for Mold Frames

- **Two-cavity Lego mold frame**



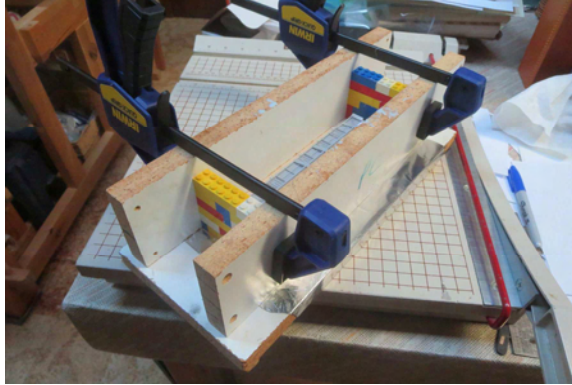
## Legos for Mold Frames

- **Big molds need tape plus clamps**



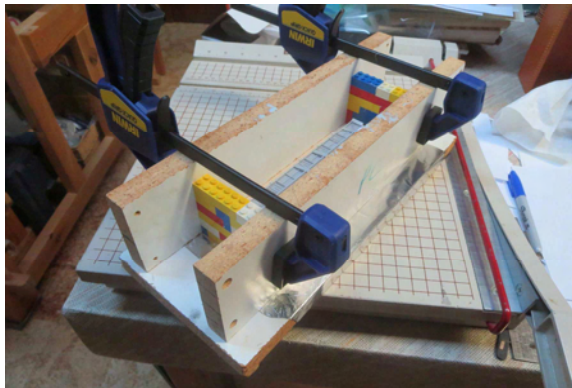
## Legos for Mold Frames

- **Corners don't need sealing for any of these applications**



## Legos for Mold Frames

- **Silicone rubber is viscous – it won't drain out of the corners**





## Molding Supplies

## Molding Supplies

- **Mold release – spray (from Alumilite)**



## Molding Supplies

- **Mold release – liquid (from Smooth-On)**



## Molding Supplies

- **Cap sheets (0.060" acrylic sheet)**



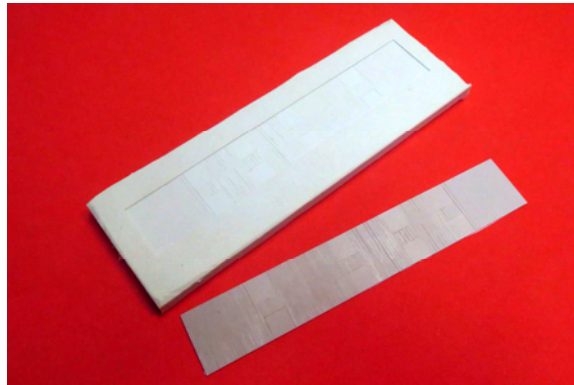
## Open Molds

- **Conventional open molds**

## Open Molds

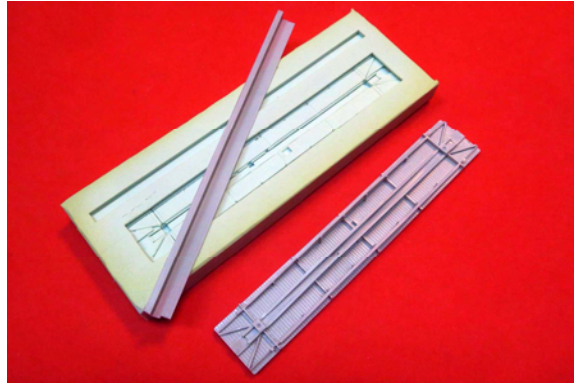
- **Conventional open molds**

Individual parts



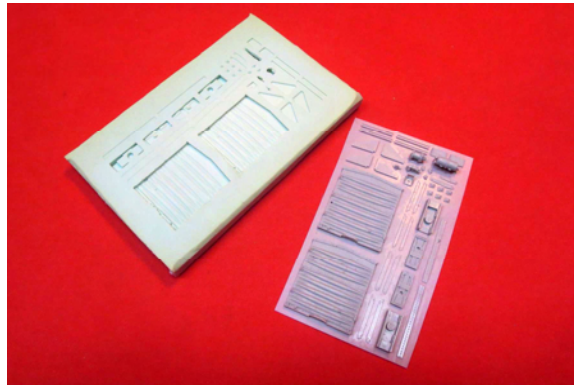
## Open Molds

- **Conventional open molds**  
**Multiple parts**



## Open Molds

- **Conventional open molds**  
**Multiple parts on sheets of flash**

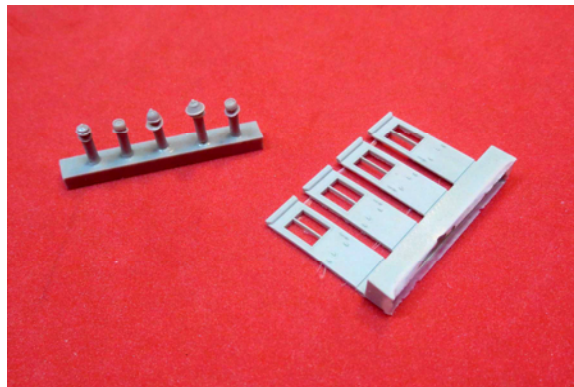


## Open Molds

- **Reservoir molds**

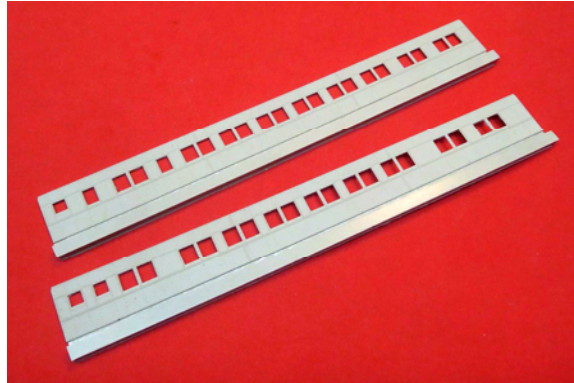
## Open Molds

- **Reservoir molds**  
**Parts produced on runners**



## Open Molds

- **Reservoir molds**  
Parts produced on runners



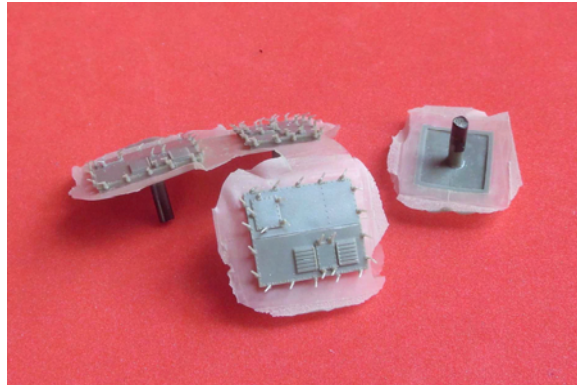
## Open Molds

- **Squash molds**

## Open Molds

- **Squash molds**

Parts made by squashing 2 molds together



## Casting in Open Molds

## Casting in Open Molds

- **Conventional open molds**  
Mold, base and cap sheet



## Casting in Open Molds

- **Conventional open molds**  
Flood fill, cap and hold with rubber bands





## Casting in Open Molds

- Rubber bands



## Casting in Open Molds

- Rubber bands  
Directly on mold? NO!!



## Casting in Open Molds

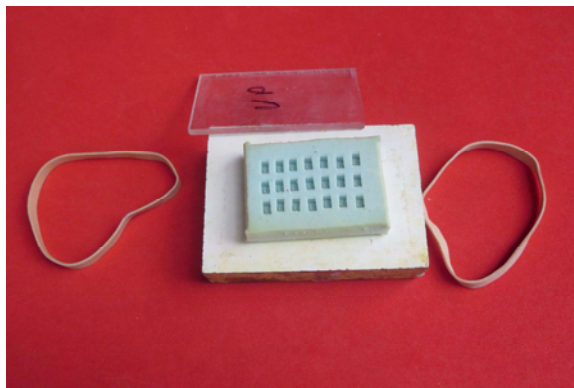
- **Rubber bands**

Non-uniform pressure can distort mold



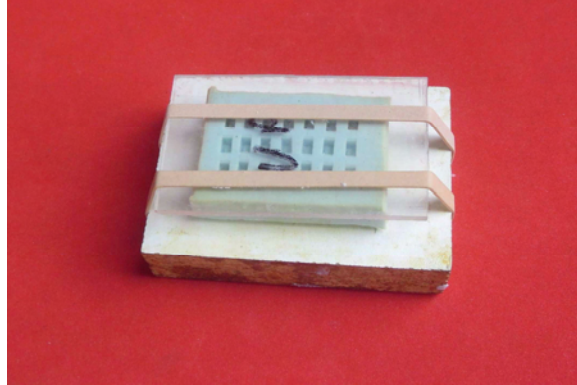
## Casting in Open Molds

- **Rubber bands – yes!**



## Casting in Open Molds

- **Rubber bands – yes!**  
But only for clamping molds between plates



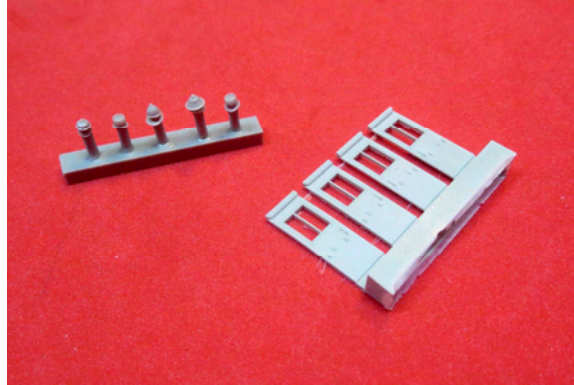
## Casting in Open Molds

- **Reservoir molds**  
A form of open mold for complex parts

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- **Reservoir molds**

A form of open mold for complex parts



## Casting in Open Molds

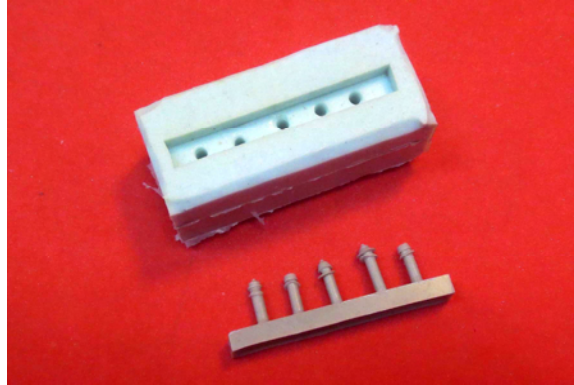
- **Reservoir molds**

**Mold includes large reservoir (cavity) at the opening which holds extra resin. When the filled mold is put under vacuum and trapped air is pulled from the mold cavity, resin from the reservoir is drawn into the mold to replace the air.**

## Casting in Open Molds

- **Reservoir molds**

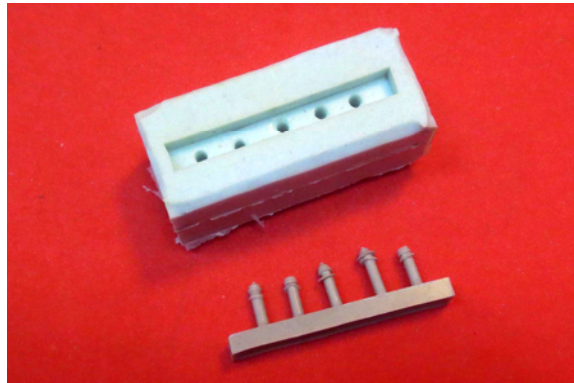
Fill cavity, pull vacuum, top off cavity



## Casting in Open Molds

- **Reservoir molds**

No cap needed



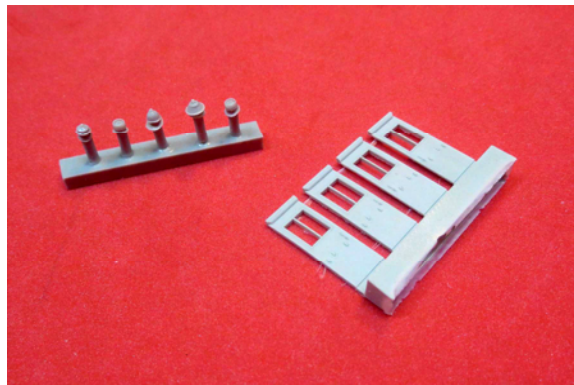
## Casting in Open Molds

- **Reservoir molds**

**When cured, the resin in the reservoir becomes a runner/sprue to which the parts are attached.**

## Casting in Open Molds

- **Reservoir molds**



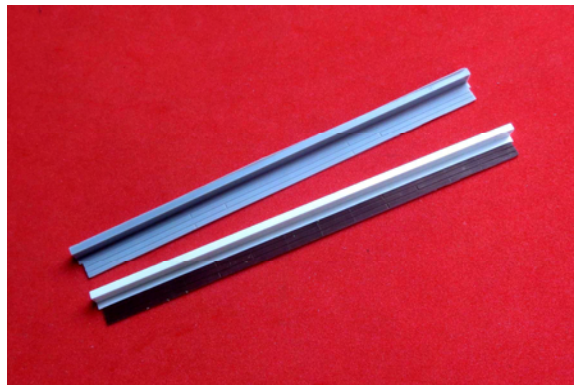
## Casting in Open Molds

- **Reservoir molds**

**Also useful for long, thin parts where you need to maintain uniform thickness.**

## Casting in Open Molds

- **Reservoir molds**





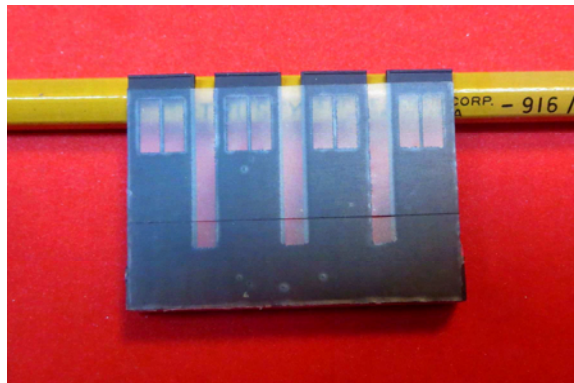
## Casting in Open Molds

- **Reservoir molds**  
Parts with gaps or openings



## Casting in Open Molds

- **Reservoir molds**  
Tape off apertures with Scotch Magic tape





## Casting in Open Molds

- **Reservoir molds**

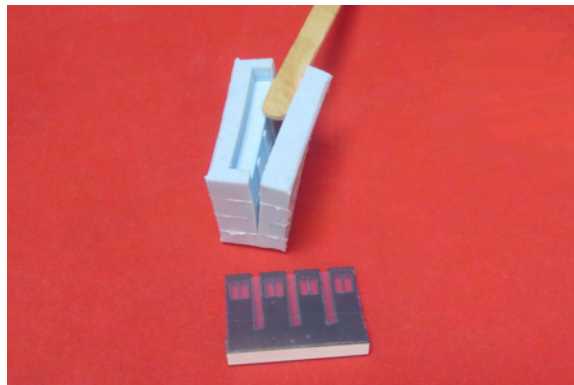
Long parts, difficult to remove from mold



## Casting in Open Molds

- **Reservoir molds**

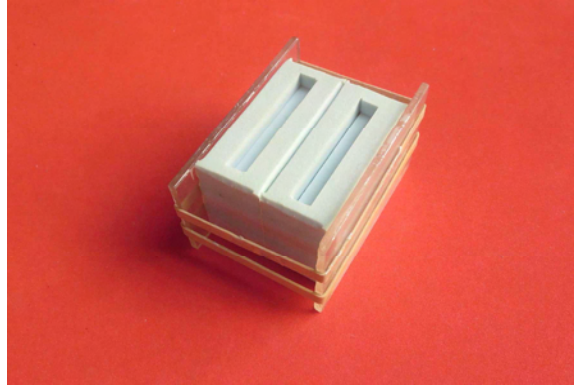
Partially cut the mold with a #11 blade



## Casting in Open Molds

- **Reservoir molds**

Cut molds need to be constrained.....



## Casting in Open Molds

- **Reservoir molds**

...but the results are good!



## Casting in Open Molds

- **Squash molds**

Two-part molds that you use like open molds

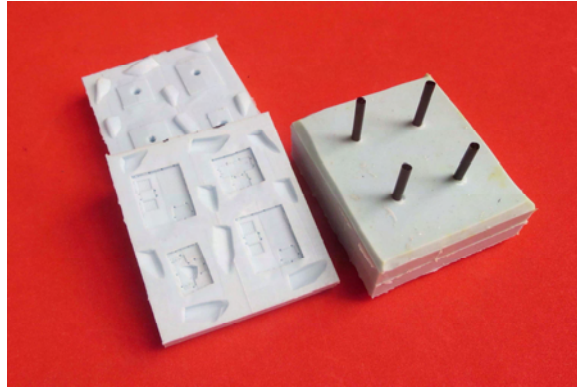
## Casting in Open Molds

- **Squash molds**

Put resin in one half of the mold, pull vacuum if needed, squash the other mold half to it like a cap sheet.

## Casting in Open Molds

- **Squash molds**



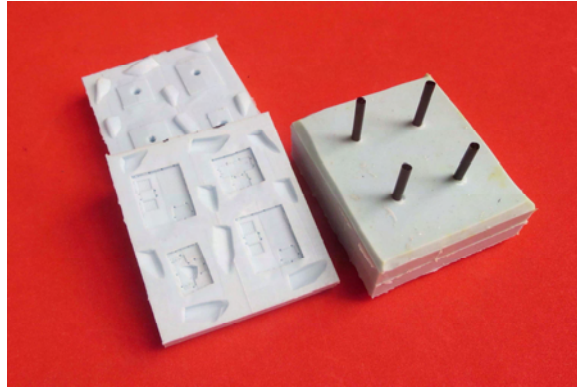
## Casting in Open Molds

- **Squash molds**

In this case the gate openings in the upper mold section aren't to get resin into the mold - they give the resin a place to go when you squash the halves together.

## Casting in Open Molds

- **Squash molds**



## Casting in Open Molds

- **Squash molds**

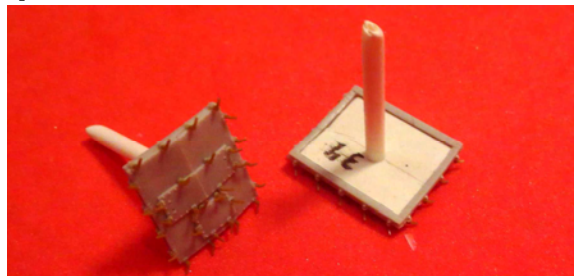
The black plastic “standpipes” keep the resin from oozing out of the hole in the mold.

After the resin cures the standpipe can be clipped off and the mold opened without having to cut into the mold surface.

## Casting in Open Molds

- **Squash molds**

Standpipes are 1" sections of Walmart coffee stirrers. They are 1/16" diameter, matching the size of the styrene rods on the patterns.



## Casting in Open Molds

- **Squash molds**

Lifetime supply.....



## Casting in Open Molds

- **Squash molds**

I use squash molds for one very high viscosity flexible and tough resin for parts that couldn't be demolded successfully, let alone survive normal handling, without damage.

But the technique can certainly be used with any resin.

## Casting in Open Molds

- **Squash molds**



## Final thoughts

**Roll up your sleeves and dive in. Like many things in our hobby, you will learn more from your mistakes than you will when everything goes as planned.**

The End!

