

# DIELESS DEPOSITION MANUFACTURING INSTRUCTIONS

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# INTRODUCTION/SUMMARY



1. Print finger frames via 3D printer
2. Seal/tape finger frames
3. Prepare rubber urethane mixtures
4. Pour joint flexure urethanes
5. Pour finger pad urethanes
6. Wait for urethanes to cure (24-48 hours)
7. Cut away sacrificial walls

Step-by-step video also available at:

[www.youtube.com/watch?v=dEJJMax7hs0](http://www.youtube.com/watch?v=dEJJMax7hs0)





# SEALING



- Remove all support material prior to pouring
- DO NOT pour on top of support material
  - Urethanes will leak through support material
- Use tape to seal bottom of finger molds
  - Most adhesives will suffice
  - Some leakage is expected, not critical
  - Heating duct tape (and more rigid tapes) are preferred



# SELECTED URETHANES



## Finger Joints:

- PMC-780 Urethane [\[link\]](#)
  - Two-part rubber compound
  - PMC-790 too stiff for general use cases
  - Demold time: 48 hours



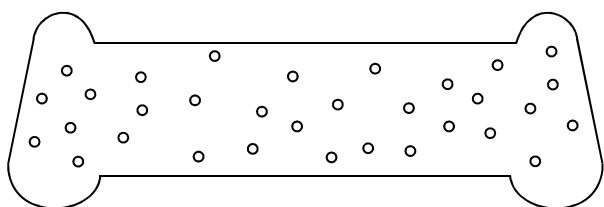
## Finger Pads:

- Vytaflex-20/30 Urethane [\[link\]](#)
  - Two part urethane rubber
  - PMC-780 and other Vytaflex options can act as suitable replacements
  - Demold time: 16 hours

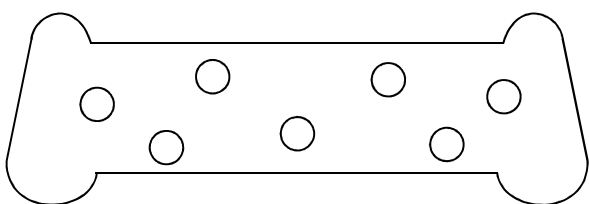
- Commercial rubber urethanes are mixed just like two-part epoxy
- Mix according to ratios in instructions, either by volume or mass
  - Mass scale will need 0.1g precision due to small quantity that is mixed



# DEGASSING (OPTIONAL)



Degas



No Degassing

## Why Degas?

- More evenly distributed bubble/imperfection formation
- Higher density
- Higher stiffness
- Higher degree of manufacturing repeatability



## Solutions:

- Low vacuum in dessicator (see figure to the left)
  - Leave mixed urethane in vacuum for < 2 min
  - Urethane will quickly rise and fall
- Consider alternative urethanes that set more quickly
  - Alternative urethanes from those listed in this guide have not been tested in OpenHand projects





# POURING

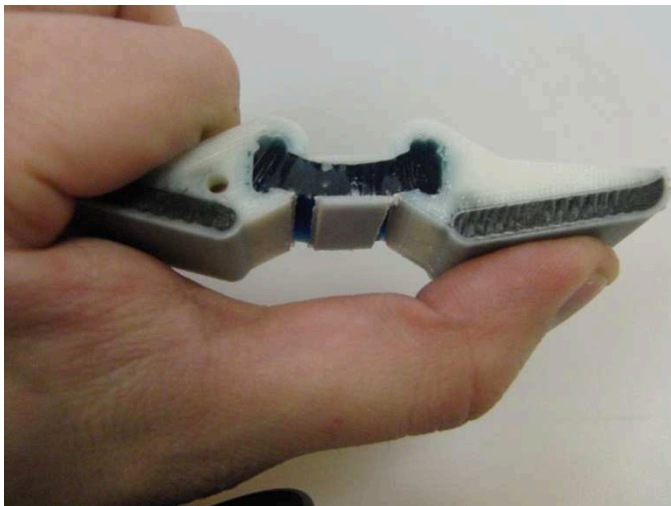
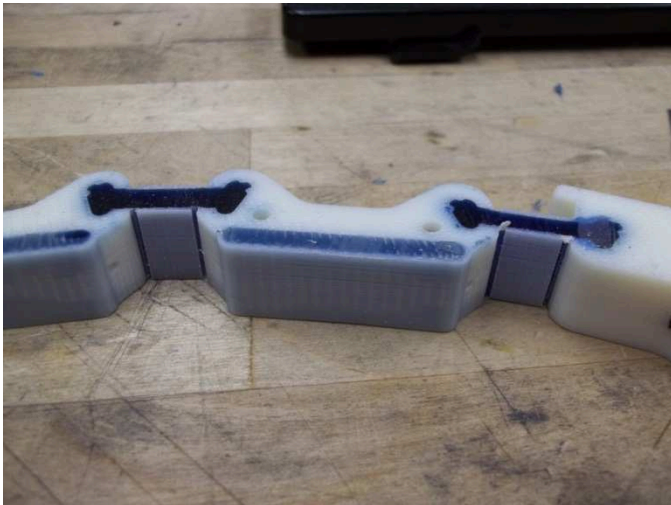


- Pour from as high and with as thin a stream as possible
- Pour more than necessary
  - Excess material can be cut off and removed later
- Less viscous urethanes have higher chances of leakage
  - Can wait ~15 min for urethanes to become more viscous and easier to pour if desired

Tips/suggestions for pouring also available via the urethane distributor at [www.smooth-on.com](http://www.smooth-on.com)



# WALL REMOVAL



- ABS frame ~0.7-1.0 mm thick
  - Bandsaw or file used to cut out frame elements
  - Compliance of joints/pads minimizes damage if cut is excessive
  - Can partially cut and then “snap” frame elements apart
- File, blade, or belt sander can be used to smooth, file-down excess ABS or urethane material