

# Prototype Rails 2015

## On Choosing a Casting Resin

by Tom Madden

There are many urethane casting resins available, and choosing one that is right for you isn't easy or obvious. There are high-performance castable urethanes with cured properties approaching those of the better engineering plastics, but they tend to be fast-curing, higher viscosity resins which require special heated processing equipment and/or extensive heated post-curing to achieve their specified properties. If you're coming at this from a hobby background, stick with a general purpose room temperature curing urethane with a gel time long enough to let you mix, de-air and fill your molds without being rushed. BJB Enterprises, Hapco Inc. and Smooth-On are three such suppliers, but there are a multitude of others. Shipping costs are significant, so finding a nearby supplier may be more of a consideration than what resin you choose to use - at least as you get started.

Two factors to consider as you make your choices: the faster the cure time, the greater the shrinkage; and the slower the cure time, the shorter the mold life. The curing reaction is exothermic, generating heat. A fast cure material releases heat very quickly, as anyone who has worked with Alumilite knows. Shrinkage is really just a coefficient of expansion effect, so an Alumilite casting that gels in a minute and reaches 250°F (to pick a somewhat arbitrary figure) will have much more shrinkage as it cools to room temperature than a casting that gels at 180°F in ten minutes. However, you may well get 50 or more Alumilite castings from a mold, and only 20 from the slower resin, as mold life is inversely related to the length of time resin stays liquid in the mold.

My principle casting resin is Hapco Inc.'s Ultralloy 109, which cures at room temperature but benefits from a heated post-cure. (I do not do any post-curing.) It may not be the right one for you because it's a fairly expensive industrial product, but its cured properties may be of interest when comparing alternative resins:

Mix ratio:	1:1 by weight
Gel time:	8.5 minutes
Hardness:	80 Shore D (injection molded styrene is ~79 Shore D)
Mixed viscosity:	300 cps
Demold time:	45-90 minutes*
Shrinkage (inch/inch)	.001 - .004*
Heat distortion temp:	70°C (158°F)**
Flexural strength:	11,900 psi

\*: Shortest demold time and largest shrinkage based on 1/8" minimum thickness. Model parts seldom meet that minimum, and I allow at least four hours before demolding.

\*\* : Based on an 80°C (176°F) post-cure for 8 hours minimum. Without post-curing, the HDT ranges from 135° to 145°F, certainly acceptable unless your layout is in an uninsulated tin building in Las Cruces, NM. (A tip of the hat to the late Fred Dabney, one of the stalwarts of the old rec.models.railroad Usenet newsgroup of internet times gone by.)

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To me, the most important property is heat distortion temperature. Some of the urethanes sold for hobby use have an HDT as low as 105°F. That's warm water, and you don't want your model softening while you wash and scrub it prior to painting. I've also seen some of Martin Lofton's display models become distorted while sitting in the sun at his sales booth at the Orange Empire RR Museum's March swap meet in Perris, CA, so even higher HDT resins can be damaged.