



NICKEL SHELL MOLDS

USING EC-440
CASTING SYSTEM

APPLICATION GUIDE



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STRUCTURAL GUIDE FOR CASTING PRODUCTION MOLDS USED FOR THE MANUFACTURING PROCESSES OF NICKEL SHELL TOOLING AS COMMONLY PRACTICED BY TOOLING ENGINEERS

BENEFITS OF NICKEL SHELL TOOLING

Low CTE: 12.28×10^{-6} in/°F and 4% tensile elongation of the resin matrix combine to alleviate bond line stress.

Strength Plus Heat Resistance: Constant mold temperature performance up to 250°F and compressive strengths exceeding 16,000 psi.

High Specific Heat Properties: Whether running hot or cold, molds will maintain optimum and uniform surface temperatures for faster part production cycles.

Cost Efficiency: Less than \$310 per cubic foot.

NICKEL SHELL

Prepare nickel shell surface for optimum adhesion of back casting system by sand blasting until surface has a uniform silvery appearance. If allowable, do not grind away surface irregularities created during the electroforming process. These surface irregularities will minimize overall adhesion stresses due to their mechanical locking properties.

FRAME

A steel perimeter reinforcement frame is welded together. Common frame materials are steel C-BEAM or $\frac{3}{4}$ " to 1" steel plate. Plan frame dimensions to allow for a 4" to 6" mold flange and a 4" to 6" cast thickness between highest point on the pattern and top of the frame. The 4" formula is generally used when forming shallow depth parts.

Concrete rebar ($\frac{3}{8}$ " or $\frac{1}{2}$ ") is welded into the frame on 10" to 16" spacing, running the length and width of the mold. Spacing of rebar from the mold surface is a minimum of 1". It is important to note that any male detail protruding more than 2" from the general contour needs a rebar structure.

TEMPERATURE CONTROL

Maintaining mold surface temperature is generally accomplished by using $\frac{1}{4}$ " i.d. soft copper tubing spaced on 3" centers across the mold length and manifolded outside the mold into square steel tubing. Spacing of copper lines from mold surface is generally 2" or greater. It is important to note there should be no contact between the copper lines and re-bar. A $\frac{1}{2}$ " gap is recommended between the two. Also, copper lines should have a light coat of Adtech Mold Release MR #1 applied before casting.

CASTING THE MOLD

1. Catalyze ES-225 and brush coat a 0.015" to 0.020" inch thickness over pattern surface and allow to tack.
2. Repeat step 1 and allow to tack.
3. Thoroughly mix 20 pounds of EC-440 resin with 6 pounds of EC-440 hardener. Blend this mixture with one pail of N-61 Powder Filler (41.6#). Make sure all of the powder is resin coated.

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4. Use a portion of this mixture to brush on a generous coating over the ES-225. It is critical to apply this mixture during the tack stage of the ES-225.
5. Lower and align steel perimeter frame on pattern flange and clamp firmly in place. You may need to seal the outside joint with a polyester product such as ADTECH P-26, or a 5 minute epoxy paste adhesive such as ADTECH EA-624 to prevent any leaks of the casting system between the frame/flange joints.
6. With the remaining contents of the catalyzed EC-440 / N-61 mixture (from step 3), blend with 50 to 100 pounds of N-6 Coarse Bulk Filler and begin pouring your mold. Do not wait for the coating mixture applied in step #4 to tack.
7. Continue to cast your mold using the following batch mixture. Fill the mold to within 1/8" of the frame top. This mixture yields 1.34 cubic feet:

20# EC-440 resin + 6# EC-440 hardener + 1 pail N-61 Powder (41.6#) + 3 bags/pails (150#) N-6 Bulk Filler.

Pail batches can be mixed with a heavy duty industrial drill and a pail size Jiffy Mixer. After you have mixed resin + hardener + powder in one pail, divide that mixture equally into 3 empty pails before adding the coarse bulk filler. The easiest way to mix when making large pours is to use a portable concrete mixer.

8. When the cast begins to gel you can top off the remaining 1/8" using the EC-440 Resin/Hardener blended with a machineable aluminum grain filler such as ADTECH N-20 Aluminum Grain.
9. Post-cure and demold schedules are listed on the EC-440 Product Bulletin.

NOTE: Use your temperature control unit to heat condition the mold internally. Do not oven cure.

ESTIMATING MATERIAL USAGE

Using 5-Gallon Pails:

1 EC-440 pail resin/hardener kit
 2 pails N-61 powder filler
 6 bags/pails N-6 coarse bulk filler
(Total yield = 2.68 cubic feet)

Using 55-Gallon Drums:

1 EC-440 drum resin/hardener kit
 22 pails N-61 powder filler
 66 bags/pails N-6 coarse bulk filler
(Total yield = 29.5 cubic feet)

NOTE: When casting with EC-439 System and N-60 Powder Filler please refer to EC-439 Product Bulletin for mixing and estimating guide.

PLEASE REFERENCE THE FOLLOWING PRODUCT DATA BULLETINS

EC-440 Epoxy Mast Cast System (or optional EC-439 Epoxy Mast Cast System)
 N-61 Ceramic Powder Mixture (use N-60 package when casting with EC-439 System)
 N-6 Ceramic Bulk Filler
 ES-225 High-Temp Polishable Epoxy Surface Coat
 Mold Releases MR #1 and MR #2