

CAPABILITIES SHEET: PLASTIC DIVISION
THERMOFORMING DESIGN GUIDELINE



Plastic Component Parts & Assemblies



Plastic Packaging

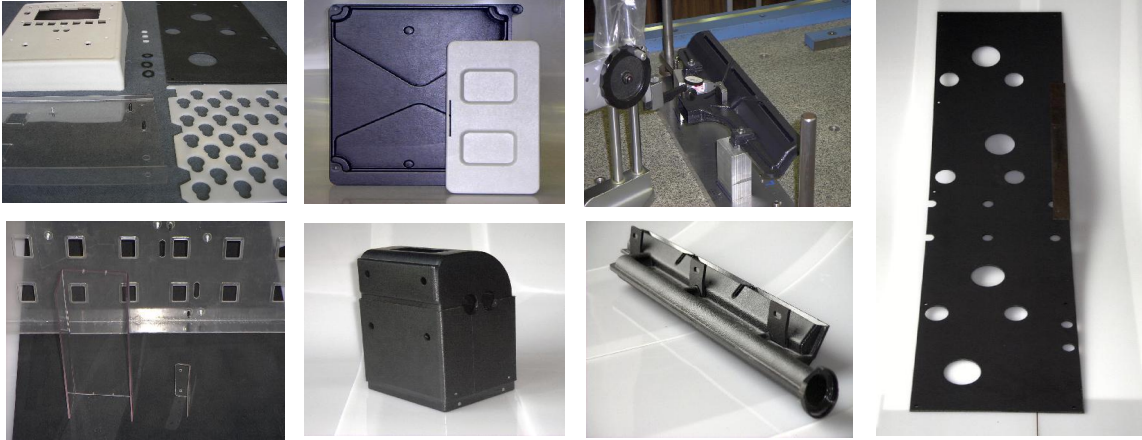
General / Government / Prime Contractor Information

- Material traceability maintained under UL file E11805.
- **RoHs** Certification available
- **Business Certifications:** Pullman Manufacturing is a veteran-owned small business; see SBA profile at [SBA Dynamic Small Business Search](#).
- **CAGE Code** is 74194. We are a listed vendor at Central Contractor Registration.
- **Product Service Code: L081** – Tech Rep Svcs/containers-Packaging

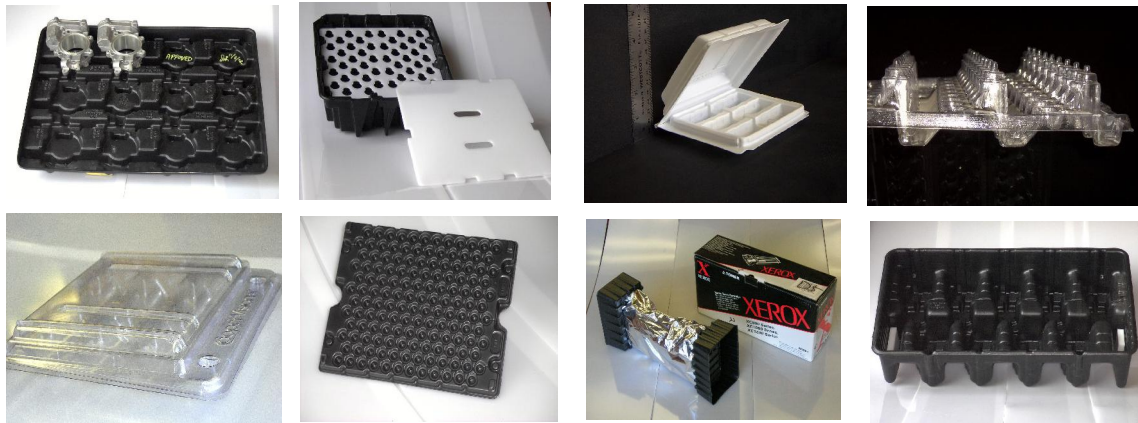
APPLICATIONS:

- Plastic Component Parts:** Pressure Forming, & Twin Sheet Forming is commonly used for low to mid volume component parts. It is an alternate process to injection molding for many applications. A vacuum form mold is typically 20% of the cost of an injection mold.
- Industrial Plastic Packaging:** disposable & returnable, including clamshells, trays, endcaps, blisters, inserts, and covers.
- Medical Packaging:** Materials include polypropylene, Delrin, HIPS, materials for use in autoclave cleaning, Testing options include compression and vibration testing.
- Anti-Static Packaging** for electronics including static dissipative, and conductive materials.
- Plastic Trimming: 5-Axis Routing,** Die Cutting, & Plastic Stamping of flat sheet with in material thickness from .010” to 1/2” thick.
- Machining of plastic** components in all types of plastic material including Delrin, Nylon, UHMW, and Vespel.

Plastic Component Parts



Industrial Plastic Packaging



THERMOFORMING DESIGN GUIDELINE

Materials:

***Specific data pages upon request / RoHs Certification available when applicable.**

Component Part Materials:

ABS	Good Formability and Impact Strength.
R59 Royalite	Formability and Fire Rating UL 94 V0(.085”THK).
ABS/Polycarbonate	Higher Heat Deflection Temperature, Impact Strength
Acrylic PVC	Excellent Formability, Fire Rating 94 V-0 (Kydex T, Kydex 100, DKE 400)
HDPE	Chemical Resistance.
Polypropylene	Chemical Resistance
Polycarbonate	Impact Strength, Higher Heat Deflection Temperature

Decorative / Specialty Materials:

TPO: Thermoplastic Olefin
Clear ABS
UV Stabilized / Capped Materials (Korad, Solarkote)
Decorative Patterns including Metallic Finishes

Packaging Materials:

Polypropylene Medical applications, reusable applications
HDPE Good chemical resistance; durable, opaque, low cost.
HIPS Low cost, opaque material generally for disposable applications
PETG/RPET Clear, durable, for thin gage applications
PVC Clear, good forming characteristics

Selection Considerations:

- a) Color
- b) Texture/Haircell
- c) Chemical Exposure
- d) Temperature
- e) UL Requirements
- f) Impact Resistance
- g) Anti static / Conductive Requirements
- h) UV Exterior Exposure

Material Starting Thickness vs. Part Thickness:

As sheet material is formed, it is stretched, and finished part thickness can vary significantly from starting thickness. Material thickness also varies within the same part depending on feature characteristics. This thinning of material effects dimensions and tolerances of features opposite mold size. For this reason, mold type(female vs. male) is often dictated by the critical dimensions.

Trimming Options:



CNC 5-Axis Router: Accurate & consistent, one set up for multiple planes, good for high tolerance applications.

Die Cutting & High Speed Die Cutting: Low cost tooling

Standard Routing: Can be done in cycle for simpler applications.

Stamping of Plastics: Fast cycle times and accuracy on traditional punch presses.

CNC Turret Punch Press: Low cost, minimal tooling, short lead times.

CNC Machining: Accurate & consistent

Molds:

Mold Cost is substantially less than injection molds (generally in the range of 10-20% of an injection mold). This makes it advantageous to use on production parts as well as for prototyping for injection molding. Mold options include wood or epoxy for prototypes (50 pcs. Max.) and Water-cooled aluminum molds for production.

Male Molds

- a) Better Detail on inside of part
- b) Slightly less expensive than a female mold
- c) Requires greater draft angles (1 - 4 degrees)
- d) Thickest at top, thin sidewalls, thinnest at rim.

Female Molds

- a) Better Detail on outside of part
- b) Thickest at rim, thinnest at corners.
- c) Draft angle between 0 -2 degrees.

Design Considerations(Component Parts):

Draft:

The larger the draft, the better the wall thickness and the easier the part is to form. An easier part requires a thinner material thickness which results in lower part cost. Refer to Mold information above for guidelines.

Radii:

The larger the radii, the better the wall thickness and the easier the part is to form. An easier part requires a thinner material thickness which results in lower part cost. General rules: a) Minimum recommended radius is equal to material thickness. b) 4X the material thickness creates an easy forming condition.

Ribs:

- 1) Rib (or any detail) on one side shows on opposite side.
- 2) Ribs generally used to strengthen parts (concentric ribs, radial ribs).
- 3) Samples available

Tolerances: (General Rules)

- 1) Formed details on mold side: +/- .38mm
- 2) Formed details on opposite side: (to review by specific application)
- 3) Hole-to-hole on the same plane: +/- .38mm.
- 4) Trim Dimensions: +/- .75mm.

