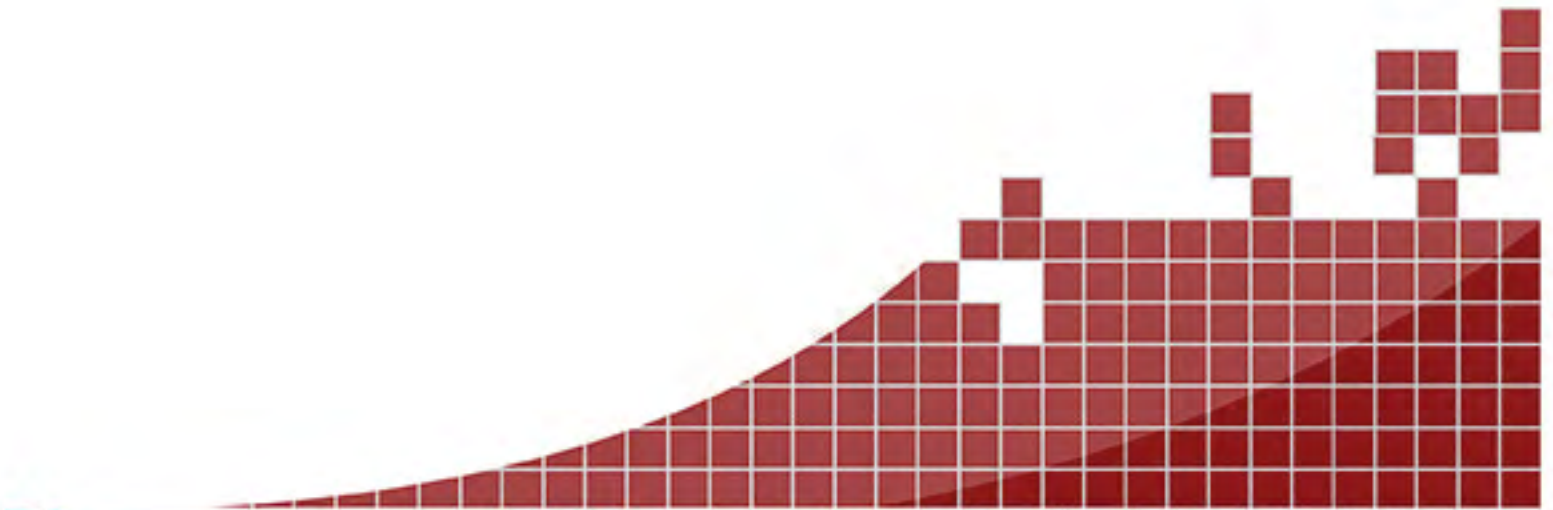




Heavy Gauge Plastic

*Pressure and Vacuum Thermoforming Process &
Design Guide*



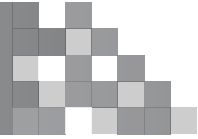
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Heavy Gauge Plastic Pressure and Vacuum Thermoforming Process and Design Guide



WHAT TO USE THIS GUIDE FOR

- A BASIC DEFINITION OF HEAVY GAUGE PLASTIC THERMOFORMING
- DETERMINING IF HEAVY GAUGE PLASTIC THERMOFORMING IS THE RIGHT PROCESS FOR YOUR APPLICATION
- ADVANTAGES AND LIMITATIONS OF HEAVY GAUGE PLASTIC THERMOFORMED COMPONENTS AND PARTS
- DESIGN AND TECHNICAL CONSIDERATIONS
- BASICS OF MATERIAL SELECTION
- CONSIDERATIONS CHOOSING THE RIGHT THERMOFORMING COMPANY FOR YOUR PROJECT



This guide was created by [Productive Plastics Inc.](#), drawing from over 55 years of heavy gauge thermoforming, manufacturing, and industry experience to provide you with general knowledge and design considerations for the design and manufacturing of custom heavy gauge thermoformed applications. The material within is tailored to be helpful and informative to not only an engineer, but to any member of a project's team.

Manufacturing processes, material options, and thermoforming technologies are constantly evolving. Therefore, this guide is not intended to be completely comprehensive, but instead used as a reference to assist your project's team in working with Productive Plastics or another manufacturer in the design and manufacturing process of your project.

-
- ✓ **NOTE** *This guide is for Heavy Gauge Thermoforming Applications (ex. industrial vehicles, enclosures, medical device components, transportation (Mass and Aerospace) interior components, etc). Although the processes are similar, this guide is not intended for thin gauge thermoforming applications (ex. disposable cups, lids, blister packaging). See below for additional info on Heavy vs. Thin Thermoforming*

What is Heavy Gauge Plastic Thermoforming?



FIG. 1
Example of finished
Vacuum-Formed piece

[Heavy Gauge Plastic Thermoforming](#) is a manufacturing process used to create formed plastic parts. The process is accomplished by applying heat and pressure (positive or negative) to stretch and conform a two dimensional thermoplastic sheet material onto temperature controlled molds to create custom three dimensional shaped structures and parts.

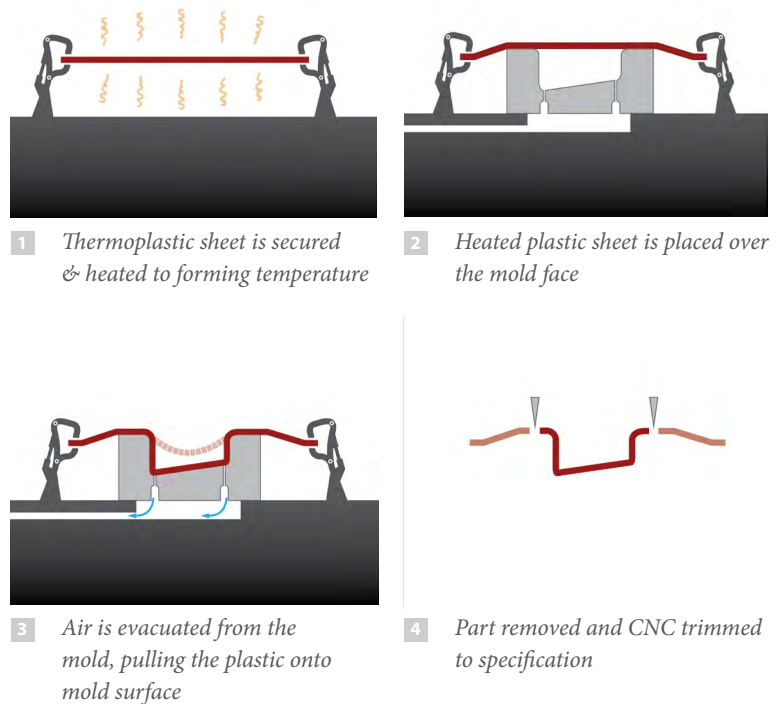
PRIMARY FORMING TECHNIQUES

Since its inception in the 1940s, various Thermoforming techniques have been created. Approximately ten variations of the process are currently in use. Today's primary thermoforming processes are:

VACUUM FORMING A plastic production process in which all air is removed between the mold and the plastic sheet, creating negative pressure, which draws the plastic down onto the tool. Expelled air is vented through vacuum holes in the mold.

KEY ADVANTAGES OF VACUUM FORMING

- COST EFFECTIVE
- TIGHT TOLERANCES
- UNDERCUT FEATURES
- ABILITY TO FORM LARGE PARTS
- MOLDED SURFACE TEXTURE CAPABILITY
- SHARP DETAILS



[Click Here](#)

For more info, including a short Vacuum Forming video





FIG. 2
Example of finished
Pressure-Formed piece

KEY ADVANTAGES OF PRESSURE FORMING

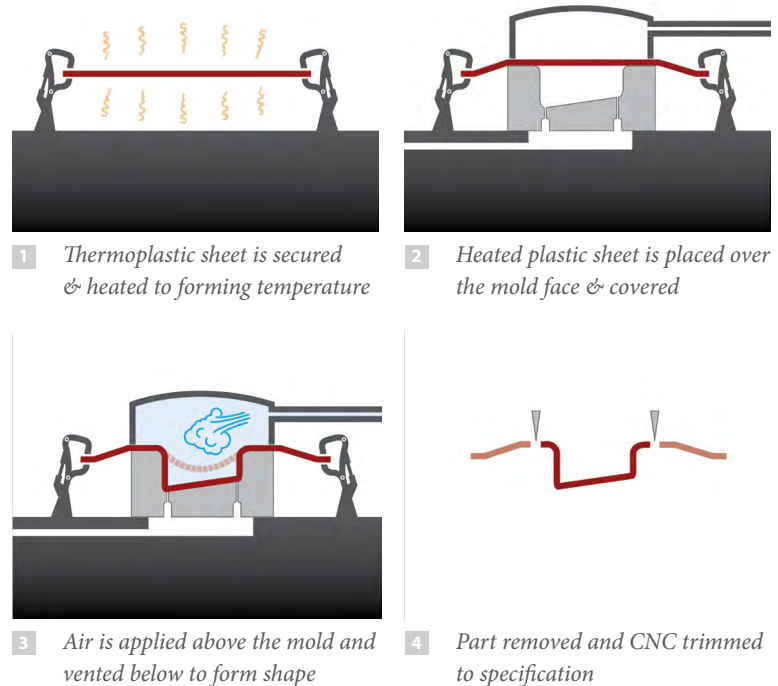
- COST EFFECTIVE
- TIGHT TOLERANCES
- ABILITY TO FORM LARGE PARTS
- VENTS AND LOUVERS
CAPABILITY
- QUICK TOOLING
- COMPLEX SHAPE CAPABILITY

✓ **NOTE** *Productive Plastics*
is a custom heavy gauge
thermoforming manufacturer,
therefore this guide is geared
towards heavy gauge applications



FIG. 3
Example of Heavy Gauge Trim and
Paneling on All Terrain Vehicle

PRESSURE FORMING is a plastic production process in which compressed air is used to push the back of the plastic sheet up against the mold. Creating component aesthetics that rival injection and structural foam molding.



[Click Here](#)

For more info, including a short Pressure Forming video

HEAVY GAUGE VS. THIN GAUGE

There are two distinct thermoforming categories, heavy gauge and thin gauge, that share thermoforming similarities, but vary greatly in material thickness, material characteristics, industry applications, average project volumes, tooling, and many other details.

HEAVY GAUGE (ALSO REFERRED TO AS SHEET FEED OR THICK GAUGE) Utilizes plastic sheet material thickness between 1.5mm (.060 inches) and 12.7mm (.50 inches)

MOST COMMON APPLICATIONS

- Enclosures (electronic, kiosk, medical device, fitness equip, etc)
- Transportation (mass transit and aerospace) interior components (window masks, seating, panels, etc)
- Industrial equipment and material handling components
- Heavy truck and recreational vehicle Interior/ Exterior components



FIG. 4
Example of Thin Gauge

THIN GAUGE (ALSO REFERRED TO AS ROLL FED)

Utilizes plastic sheet material thickness less than 1.5mm (.060 inches)

MOST COMMON APPLICATIONS

- Blister or clamshell packaging
- Disposable plastic cups

OTHER PLASTIC PRODUCTION PROCESSES

In addition to Thermoforming, there are numerous other plastic production processes available:

- Blow Molding
- Injection Molding
- Rotational Molding
- Structural Foam Molding
- Reaction Injection Molding
- Fiberglass Reinforced Plastic (FRP/GRP)

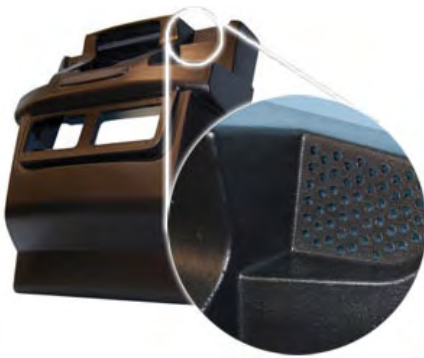


FIG. 5
Front fascia, self-service kiosk,
20" x 24" - Injection molded detail
achieved via pressure forming process

Is Heavy Gauge Thermoforming the Right Process for my Application?

While heavy gauge thermoforming might not be the ideal process for every project, it has some distinct advantages over alternative manufacturing processes that should be considered.

A few industries that have found heavy gauge plastic thermoformed parts superior to the alternatives:

INDUSTRY APPLICATIONS FOR HEAVY GAUGE THERMOFORMING

- | | |
|--|---|
| ✓ Kiosk/Gaming Enclosures | ✓ Industrial Equipment and Vehicle Int/Ext Components |
| ✓ Medical Device Enclosures | |
| ✓ Fitness Equipment Enclosures | ✓ Heavy Truck / Recreational Vehicle Int/Ext Components |
| ✓ Mass Transportation Interiors Components | |



[Click Here](#)

Want to explore more information on heavy gauge thermoforming industry examples and case studies?



PLASTIC PROCESS SELECTION CHART

Use the following chart to assist in determining which plastic process, [Custom Heavy Gauge Thermoforming](#) or otherwise, is the right process for your application: (Keep in mind that this information is just a very general guideline on process selection and the chart below only shows a process that is most commonly chosen and generally best suited for the associated project characteristic – There are, of course, exceptions to every rule and a multitude of variables to consider that are not accounted for in this chart. Please [contact](#) Productive Plastics for a more detailed assessment of your project’s thermoforming process selection that takes into account all of the variables unique to your project)

PROJECT ATTRIBUTES	HEAVY GAUGE THERMOFORMING	THIN GAUGE THERMOFORMING	INJECTION MOLDING	STRUCTURAL FOAM MOLDING	ROTATIONAL MOLDING
Part thickness between .060 -.375”	✓				
Part thickness < .060		✓			
Small quantities - EAU (< 250)	✓				
Mod. quantities - EAU (250 - 2500)	✓			✓	✓
Large quantities - EAU (> 2500)		✓	✓	✓	✓
Very specific wall thickness			✓	✓	✓
Structural Components			✓	✓	✓

THERMOFORMING AND THERMOPLASTIC ADVANTAGES

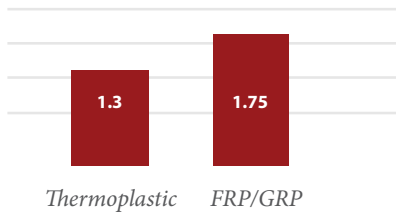
LIGHTWEIGHT MATERIAL

The plastic material used in thermoforming produces parts that are, in most cases, significantly lighter than other industry materials such as sheet metal and reinforced plastic (FRP/GRP). This can lead to large cost savings when utilized in the mass transportation industry and other weight sensitive industries.

COST EFFECTIVE AND LOWER TOOLING EXPENSE

The thermoforming process is highly automated, relatively simple, and typically requires a low amount of labor. Most applications utilize only a single tool per part. Consequently, lead times tend to be shorter, and the tooling and labor costs reduced when compared to other processes. These benefits are maximized for projects with a tight tooling budget and moderate production volumes of 250-3000 annually.

SPECIFIC GRAVITY (AVG.)

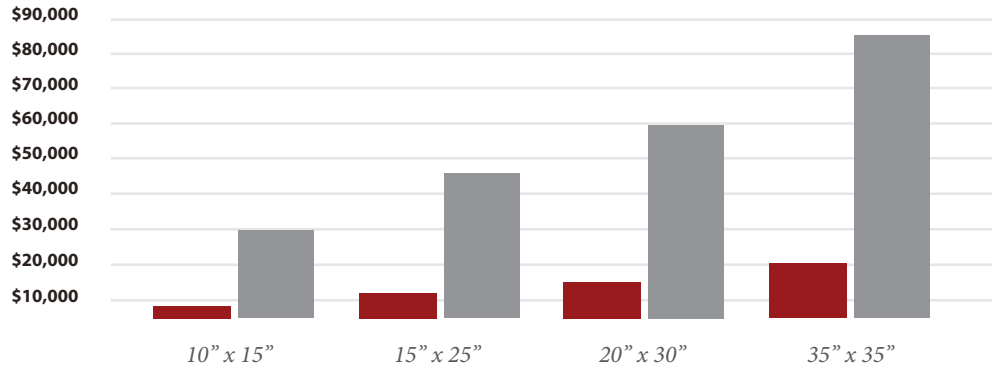


✓ **NOTE** Thermoplastic is, on average 30% lighter than fiberglass (FRP/GRP)

TOOLING COMPARISON CHART

■ Heavy Gauge Thermoforming ■ Injection Molding

TOOLING COST COMPARISON BY PART SIZE (AVG.)

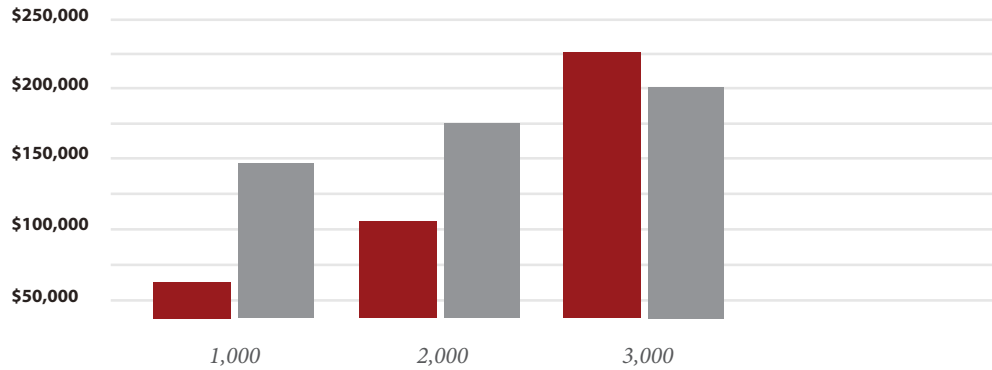


✓ **NOTE** Tool cost may vary depending upon part complexity

TOTAL PART COST COMPARISON CHART

■ Heavy Gauge Thermoforming ■ Injection Molding

TOTAL PART COST BY VOLUME (AVG.)



✓ **NOTE** Heavy gauge thermoforming is most cost effective in moderate production volumes of approximately 250-3000 parts



ENVIRONMENTALLY FRIENDLY AND INDUSTRY COMPLIANT

Most material options for thermoforming, and there are many, are recyclable and VOC free. Material providers also have formulations of thermoplastic that are designed to meet industry and government standards in characteristics such as flammability, toxicity, and others.



FIG. 6
Example of Design Flexibility

**RAPID PRODUCT DEVELOPMENT
CYCLE AND REDUCED TIME
TO MARKET**

- PRODUCTION SAMPLES IN 6 - 10 WEEKS



FIG. 7
Medical Scanner - Actual size 6' x 7'

GREATER DESIGN FREEDOM AND AESTHETIC FLEXIBILITY

One of the unique characteristics of the thermoforming process and material is its ability to produce extremely detailed and complex parts. Diverse surface texturing options, precise tolerances for mated parts, and complex geometry design are just a few of the capabilities of thermoformed plastic.

- Plastic raw material with coloration can remove the additional cost and time associated with the secondary process of part painting
- Capability to produce three-dimensional parts with a single wall (results similar to Injection, Structural Foam or Reaction Injectional Molding processes) or with twin walls bonded together to form a hollow bodied part (results similar to Blow Molding processes).

EXTREMELY DURABLE

The flexible and durable nature of thermoformed plastic material allows impact forces to be deflected over the materials surface, allowing the material to recover from impacts that would otherwise crack or damage a more rigid and unyielding material. The benefits are an increase in part life and a reduction in part replacement and maintenance costs.

- Most thermoplastic is also highly resistant to chemicals and graffiti.
- Ability to utilize insert molding techniques. Typical strengthening features such as under-cuts and ribs can be molded into parts.

LARGE PART PRODUCTION CAPABILITY

- The thermoforming process has the capability to produce parts with extremely large dimensions. The size of a part is mainly restricted only by the size of the manufacturers machinery.
- Manufacturers can make very large products with excellent dimensional control.

THERMOFORMING CONVERSIONS

Thermoforming can be an ideal candidate for industries looking to take advantage of modernizing their products with thermoformed plastic parts or enclosures that are often more light weight, cost effective to manufacture, design flexible, durable, and recyclable than materials such as:

- Reinforced fiberglass (GRP/FRP)
- Sheet metal
- Wood



[Click Here](#)

For more details and advantages on converting fiberglass to thermoformed parts



Heavy Gauge Thermoforming Design Considerations



[Click Here](#)

Want to learn more about how a proven design and development cycle can take you from concept to completion, avoiding the common time consuming and costly pitfalls?

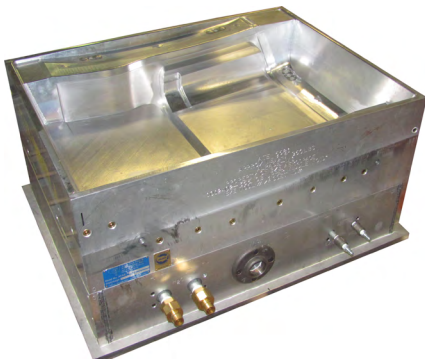


FIG. 8
Example of Aluminum Tooling Practices



[Click Here](#)

Looking for more information on tooling?

THE MOST IMPORTANT DESIGN CONSIDERATION The thermoforming process stretches a two dimensional flat sheet of plastic into a three dimensional geometric shape (think blowing up a latex balloon into a child’s small toy sandcastle mold) . Subsequently, the wall thickness of the finished part will be less than the original starting plastic sheet thickness, varying throughout the part based upon the stretch and draw ratios (see item 3 and 4 below). Therefore it is essential that when dimensioning component parts for the thermoforming process, all dimensions be taken from the tool surface side of the parts as thermo-forming is a single sided process utilizing either a core or cavity mold versus a core and cavity which delivers a specific wall thickness. Productive Plastics highly recommends working with your thermoformer during the design stage of your project so that thermoforming considerations can be accounted for at the start of your project’s development cycle.

FABRICATED OR MACHINED ALUMINUM TOOLS

- *Relatively expensive*
- *Require longer lead times*
- *Require a cooling plate temperature control system*
- *Provide a high degree of detail*

CAST ALUMINUM TOOLS

- *Less expensive*
- *Shorter lead times*
- *Easier and more effective temperature control*

DIMENSIONING

Should be generated from the mold surface. It is important to remember that only the mold side of the part can be controlled in thermoforming.

- | | |
|--|---|
| <ul style="list-style-type: none"> • PARTS REQUIRING MALE TOOLS
<i>Should be dimensioned to the inside of the part</i> | <ul style="list-style-type: none"> • PARTS REQUIRING FEMALE TOOLS
<i>Should be dimensioned to the outside of the part</i> |
|--|---|

STRETCH RATIO FORMULA

Surface Area of Formed Part

Net Starting Area of Original Sheet

*Net Starting Area of Original Sheet =
(Part Length x Part Width)*

STRETCH RATIO *Ratio of the surface area of the formed part to the net starting area of the original sheet. The draw ratio expresses the relationship between the beginning surface area of the unformed plastic sheet material which covers the opening of the mold, and the ending surface area of the part once the material is formed over the interior of the mold surface.*

✓ **NOTE** *An average stretch ratio of 3:1 is considered maximum for thermoforming*



DRAW RATIO FORMULA

Maximum Depth of Part

Minimum Distance Across Open Face

✓ **NOTE** *Less than 1:1 depth of draw ratio is considered best for the thermoforming process*

✓ **NOTE** *Tighter tolerances can in most cases be accommodated if required. Consult with [Productive Plastics](#) or your heavy gauge thermoforming company.*

DRAW RATIO

Ratio of the maximum depth of the mold and the minimum distance across the open face of the mold at any given location on the mold.

TOLERANCES

The tolerances listed below are commensurate with industry standards and the capabilities of the thermoforming processes. Tighter tolerances can, in most cases, be accommodated using specialized fixtures and techniques. These should be identified at the project onset so that the proper methods can be developed.

Thermoforming tolerance variables are primarily driven by the relationship between part complexity and size of the mold. As mold dimensions increase in size, additional tolerance is required.

Unless specifically called out to a datum or identified edge, standard practice is to centrally locate the CNC pattern on the formed part. If other requirements are needed, they can be accommodated once identified.

Measurement accuracy requires that parts be held in abatement, due to the nature of plastics, parts may deform under their own weight. All dimensions should be referenced from a formed (tool side) feature, to minimize variation.

In cases where deflection is likely a part must be adequately supported to minimize this deflection.

Pin gauges are used for verifying HOLE dimensions up to .500", holes larger than .500", any size slots or other hole-like features (single D or DD key holes) are measured using alternate calibrated equipment, of suitable accuracy for the measurement being taken.

FORMING TOLERANCE	MOLD SIZE (INITIAL 12")	APPLICATION
Formed Measurements	± .020"	Additional .001 per inch beyond 12"
Bowing/Warpage	± .030" per foot	

TRIM / MACHINING TOLERANCE	TOLERANCE	APPLICATION
Drilled Hole Diameters	± .005"	Holes ≤ 1"
Drilled Hole Diameters	± .010"	Holes > 1" and < 3"
Slots	± .010"	Slots ≤ 1" in any direction
Slots	± .020"	Slots > 1"
CNC Trimming	± .020"	Includes hole diam. >3"

DEPTH OF DRAW	RADII (IN.)
0 – 3"	.060 minimum
3 – 6"	.060 - .125
6 – 12"	.125 - .250
12' or greater	.250 minimum

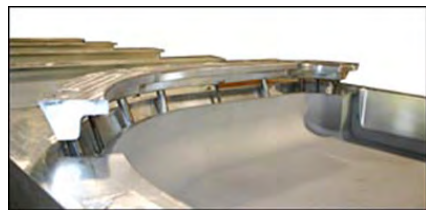


FIG. 9
Articulating tool feature to assist in mold separation for formed parts with undercuts



FIG. 10
Core pull tooling feature to assist in mold separation for formed parts with undercuts

RADII

From a material distribution perspective, the greater the radii the better the wall thickness uniformity.

- Where three radii meet, at least one of the radii should be larger
- Radii smaller than those recommended in the following chart may cause excessive thinning of material, resulting in a weak corner
- The deeper the part, the larger the radii required

RIBS AND LOUVERS (AIR VENTS)

From a material distribution perspective, the greater the radii the better the wall thickness uniformity.

- When designing ribs and louvers, the distance between each rib should be \geq the height of the rib
- When the starting gauge of the material is greater than the distance between the rib, use the larger dimension

UNDERCUTS AND BACK DRAFTS

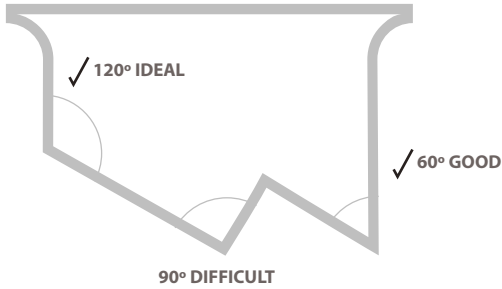
A feature in which the designer attaches or matches parts without showing the trimmed edge.

- Effective for hidden fastening devices and mating surfaces
- Both should be designed to have minimal effect on wall thickness
- The width of the undercut flange should not exceed 0.375"

Undercuts can be achieved in thermoforming with similar results to injection molded parts. **THE THERMOFORMING ADVANTAGE, WITH RESPECT TO UNDERCUTS, IS THAT THEY CAN BE ACCOMPLISHED AT A FRACTION OF THE TOOLING COST WHEN COMPARED TO INJECTION MOLDED PARTS.**

TOOLING TECHNIQUES WHEN THERMOFORMING UNDERCUTS

Undercuts can present a challenge for mold separation during the thermoforming process. Core pull or other articulating tooling features can be employed in a tool's design to assist in mold separation.



DRAFT Degree of taper of a vertical sidewall. Required to facilitate the removal of the part from the mold. Surface texturing and part complexity can increase the required draft angle

- **PARTS MADE FROM MALE TOOLS**

The required draft angle is greater on a male tool due to the tendency for the plastic material to grip the mold as it cools and shrinks.

Male tooled parts should have a minimum of 3 degrees of draft.

- **PARTS MADE FROM FEMALE TOOLS**

The required draft angle is less than that of a male tool due to the cavity nature of a female tool.

When the plastic material cools and shrinks, it will pull away from the surface of the mold, facilitating in separation.

Molds with a smooth surface (no texturing) should have a minimum of 1 degree of draft (This can be reduced to 0 degrees in areas with sharp corners)

QUALITY AND DEFECT INSPECTION

DEFECT CLASSES

Defects are broken into classes based upon their intended use and the requirements of the customer. If the specifics are not known, the part is to be treated as a class "A".

"A" CLASS EXAMPLES

- Refers to an etched finish, pressure formed part
- A highly visible part made from a male mold
- Parts that are routinely in the operators reach when in the installed position.

"B" CLASS EXAMPLES

- A highly visible part that will go through a prepping operation
- Parts that are normally viewed from a distance of 6 feet or more when in the installed position.

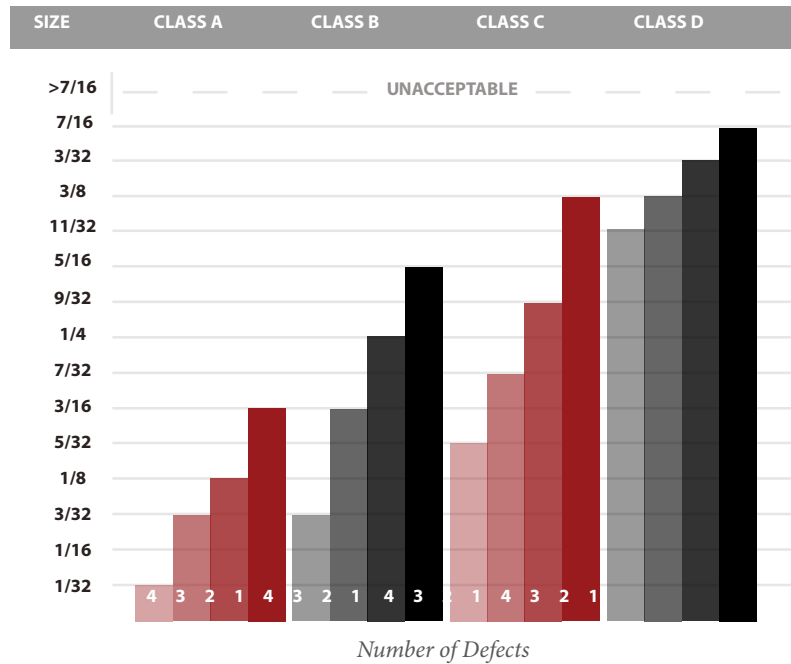
"C" CLASS EXAMPLES

- Refers to an internal part that is generally not seen after it is placed into service. Contactor covers, internal ducting and guarding would be examples.

“D” CLASS EXAMPLES

- Refers to an internal part that is assembled to another part by PPI. An example would be ducting or reinforcements installed as part of any Assembly operation.

DEFECT CHART



✓ **NOTE** *The material selection process can be complex and is critical to creating a successful part. The information below only scratches the surface of material selection.*

[Contact Productive Plastics](#) early in the design stage of your project for assistance in determining the ideal material for your application.

MATERIAL SELECTION

WHAT PLASTIC MATERIAL IS RIGHT FOR MY APPLICATION?

There is a multitude of different types of plastic materials available to thermoforming, each with their own specific characteristics, properties, strengths, and weaknesses.

Many thermoplastic providers also produce blended thermoplastic material products specifically designed to meet industry standards and specifications in key markets, such as aerospace, mass transit, military, etc.

Proper selection of the appropriate plastic material for a specific application is an essential component in creating a successful thermoformed plastic part and is directly related to your project’s market needs, intended use, and operational environment.

PLASTIC MATERIAL CHARACTERISTICS

Here are some general advantages, disadvantages, and industry examples of some commonly used thermoplastic materials. This should only be used as a very basic reference and as a starting point when consulting with Productive Plastics or your thermoforming manufacturer on selecting the right material for your project.

PLASTIC MATERIALS

PLASTIC MATERIAL	ADVANTAGES	DISADVANTAGES	INDUSTRY EXAMPLES
Polystyrene	Clear plastic, very moldable, inexpensive, recyclable, high chemical resistance, high electrical resistance, heat distortion ~200°F	Cracks and breaks easily	Disposable cups, disposable applications, decorative applications, electrical applications
HIPS (High Impact Polystyrene)	Very moldable, relatively inexpensive	Marginal crack and break resistance	Picture frames, shower walls, Food containers
Polyethylene (PE)	Chemically resistant, high impact resistant, high electrical resistance, fairly economical, can be UV protected with additive	High mold shrinkage, not suited for tight dimensional tolerances, cosmetic deficiencies	Pallets, tanks, truck bed liners, tote bins, self-lubricating tendency makes it ideal for non-stick/low friction applications
Polypropylene (PP)	High level of stiffness, light weight, high heat deflection, chemical resistance at room temperature	Difficult to process, high mold shrinkage	Tool cases, applications with living hinge, food containers, acid tanks
ABS (Acrylonitrile Butadiene Styrene)	Engineered plastic that can be customized to desired levels of stiffness, hardness, heat deflection, and many other characteristics	UV Sensitive - Requires a UV protective cap layer for extended exposure	Cases of all types, bath tubs, fenders, instrument panels, automotive vehicles, and more
PVC (Polyvinyl Chloride)	Very high chemical resistance, stain resistant, stiffer than ABS, high room temp. impact strength, natural flame retardant qualities	Difficult to process	Shower surrounds, moldings, panels, display cases
PVC/ABS (alloy)	Easy to process, very cosmetic, dimensional stability, impressions well off a textured tool, maintains tight dimensional tolerances, retains some of PVC's natural flame retardant qualities	Not as stiff as pure PVC, heat distortion point lower than ABS	Decorative fascia, equipment covers, mass transportation applications, outdoor applications with UV protective cap, many others
PVC/Acrylic	Easy to process, highly customizable alloy, high impact resistance, very high chemical and stain resistance	Low heat distortion point ~160°F	Aircraft interiors, medical equipment covers, transportation applications, electronic enclosures, outdoor applications with UV protective cap

PLASTIC MATERIALS CONT'D.

PLASTIC MATERIAL	ADVANTAGES	DISADVANTAGES	INDUSTRY EXAMPLES
Polycarbonate	Extremely high impact resistance, high clarity - good for transparent parts, precision molding, good insulator, high heat distortion point ~270°F	Low chemical resistance to certain substances (oil, gasoline, harsh chemicals), can be difficult to process, higher material and processing cost	Visors, plastic guards, transportation components (headlights, taillights, instrument panels), appliance drawers, skylights
Polycarbonate/ABS	When compared to true polycarbonate - less expensive, lower heat distortion ~240°F, much easier to process, higher chemical resistance	When compared to true polycarbonate - reduced clarity, lower heat distortion ~240°F	Computer and machine enclosures, electrical applications, cellular phones, automotive applications
TPO (thermoplastic olefin)	High impact strength (even at cold temperatures), high dimensional stability (low mold shrinkage), stiffness, high chemical resistance	Can be difficult to process due to material sag during heating	Car bumpers and other automotive applications, chemical shields, gear covers
PETG (polyethylene-terephthalate)	Very easy to process, high clarity – good for transparent parts	Not UV stable – unsuitable for extended exposure	Structural automotive parts, hand tools, industrial components

✓ **NOTE** Please note that this material list is not completely comprehensive. There are many blended variations of thermoplastic available that are designed to meet specific niche market demands and standards that are not listed here but may be ideal for your application.



FIG. 11
Example of painting

PART FINISHING

PAINTING AND SILK SCREENING

- Most thermoplastic can accommodate silk screening and surface painting. Plastic material with coloration is available for many applications and can, in some cases, remove the need for surface painting.

TEXTURING

- Can be accomplished in the mold or painted on as a secondary operation
- Mold texturing must be open celled pattern in order to facilitate proper air evacuation of the mold
- Multi-level texturing can be accommodated
- Embossing, logos, and, hot stamping



FIG. 12
Example of Distortion Printing applied to Thermoformed Plastic

DISTORTION PRINTING Process in which a precisely distorted version of a desired image is printed onto a flat sheet of thermoplastic material so that when the material is thermoformed and stretched into a three-dimensional part, the image appears on the final product in its desired and proper dimensions.

WHY USE DISTORTION PRINTING FOR LARGE THREE-DIMENSIONAL PLASTIC PARTS?

Distortion printing provides numerous advantages in the quality and detail expected in a completed plastic part.

- Improved branding and consumer awareness
- Design innovation
- Increased speed-to-market product development
- Automated and accurate distortion process eliminates cost and risks related to previous trial-and-error processes
- Large part distortion printing is cutting-edge for the thermoforming industry
- Elimination of material and assembly costs for secondary parts used for decoration purposes
- Pre-decorating capabilities of distortion printing vastly increases design envelope for design engineers



[Click Here](#)

Want more information on Distortion Printing? Click here for additional facts, including a short video.



FIG. 13
Example of Assembly

SECONDARY OPERATIONS AND VALUE ADDED ASSEMBLY

Most finished products require assembly. Many thermoforming companies, including Productive Plastics, have on site secondary assembly capabilities and are able to perform value added functions that can often shorten product lead times and reduce overall project cost.

- Painting or finishing
- Bonding anchors
- Attaching fasteners
- Sheet metal assemblies
- Attaching electrical components



[Click Here](#)

Want to learn more about how value added options can reduce your manufacturing chain, logistics, time to market, and overall project cost?



How do I Choose the Right Heavy Gauge Thermoforming Manufacturer?

Custom thermoforming plastic part manufacturers are plentiful and often specialize in specific thermoforming techniques and industries. They also encompass varying degrees of manufacturing and design expertise, production capabilities, and quality control. Therefore, it is extremely important to choose a company that has expertise and experience in categories that coincide with your project's needs.

Here are some questions Productive Plastics recommends asking a potential heavy gauge thermoforming company:

1. DOES YOUR COMPANY HAVE EXPERIENCE IN MY INDUSTRY AND WITH PLASTIC MATERIAL THAT MEETS MY INDUSTRY STANDARDS?

Partnering with a company that is familiar with the demands and nature of your industry, has experience in forming with raw materials that meet your industry's standards (toxicity, flammability, tensile strength, etc), and has appropriate affiliations within your field can ultimately save you time and money by avoiding the early learning curve pitfalls that can sometimes derail the development of a new project.

2. DO YOU HAVE IN HOUSE DESIGN AND REVERSE ENGINEERING CAPABILITIES?

Whether you are starting from scratch, an existing design, or converting from another material, working with a company that has design capabilities can reduce cost, lead time, and logistics by eliminating the need for and problems that can arise from utilizing a third party design firm.

3. DOES YOUR COMPANY UTILIZE LEAN MANUFACTURING DISCIPLINES?

A company that utilizes techniques to actively manage and increase the efficiency and quality of their manufacturing process is one that will likely be able to provide you with the highest quality part at the most competitive rate.

4. DOES YOUR COMPANY HAVE A QUALITY CONTROL PROGRAM THAT IS ISO 9001:2008 CERTIFIED?

If quality is important to your project, then choose a company that is committed to producing high quality parts and has an established quality control program.



FIG. 14
In-House design capabilities can reduce cost, lead time, and logistics

5. WHERE IS YOUR COMPANY LOCATED?

Shipping and logistical costs, especially for large parts, can add a substantial amount to the cost of your project. When possible, select a manufacturer within your geographic region to reduce shipping cost as much as practical.

6. DOES YOUR COMPANY OFFER SECONDARY ASSEMBLY OR VALUE ADDED OPTIONS?

Another benefit that can save you time and money by shortening the supply and assembly chain of vendors required to complete your project. Consider the potential time and cost savings if, for example, your kiosk enclosure part arrived from your thermoforming company in turn-key condition, complete with fasteners, bonded anchor points, attached sheet metal structure, and electrical components already installed.



Let's Get Started

On Providing Solutions for Your Project

We hope that you have found the information in this guide on Heavy Gauge Vacuum and Pressure Thermoforming helpful and useful in addressing your project's plastic manufacturing needs. We invite you to contact us at Productive Plastics for any additional information or to discuss solutions for your project's design, development, and production challenges.

Our team of experienced engineers and manufacturing professionals are ready to assist in taking your project from concept to completion. We are focused on providing you with design expertise, lean manufacturing processes, and excellent customer service to deliver you high quality parts that meet your time to market schedules and bottom line requirements.

Over 55 years of thermoforming, design, and manufacturing expertise

ISO 9001:2008 certified

On site painting facility

Secondary assembly capabilities

Lean manufacturing enterprise

READY TO GET STARTED? *Submit a Request for Quotation and we will contact you ASAP and start providing solutions for your next project.*

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