POP FOAM'S DESIGN GUIDE
20 Things to Know About Designing with PopFoam:

PO Box 91475
Portland, OR 97229

www.popfoam.com

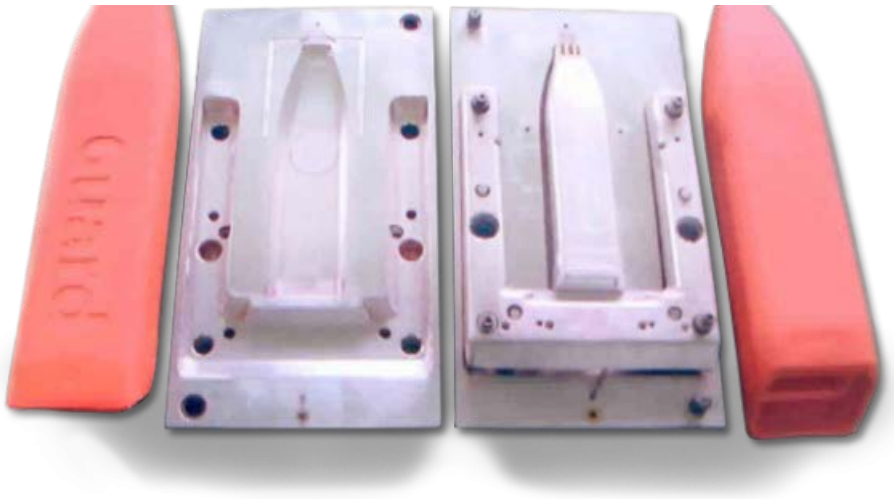
1. Why and when to use PopFoam

PopFoam is a proprietary closed cell & cross linked material. PopFoam is waterproof and can be designed to float while resisting mold and mildew. It is an excellent choice for a water environment. It is also chemically resistant and has an excellent tensile and tear strength. PopFoam is both durable and strong, unlike most other foams. It can be compounded to cover a wide range of hardness's and can also be matched to meet almost any color. If you require a product that requires softness but also requires toughness, PopFoam is your best choice.

2. The PopFoam injected foam molded process

In the injection foam molded process, the machines are vertical multi-station and use multiple molds. The molds are heated which is required for the cross-linking process. The heating/cycle time is dependent on the size and thickness of the part. When the cycle time is finished the molds open and the part rapidly ejects from the mold. The part literally “pops” out of the mold, hence our name PopFoam. Because the part expands the actual mold cavity is smaller than the finished part, unlike thermoplastic injection molding.

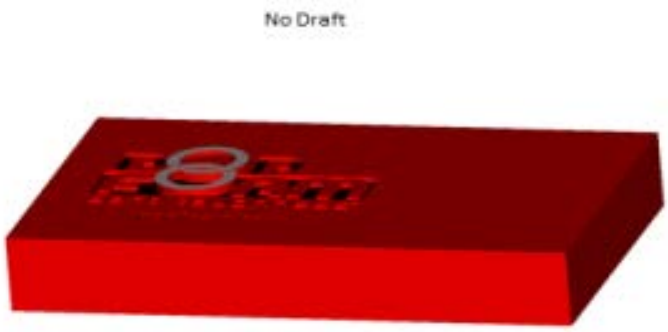
The parts usually require a cooling fixture to assure the part meets the correct size and dimensions. The gate is trimmed before packaging and shipping.



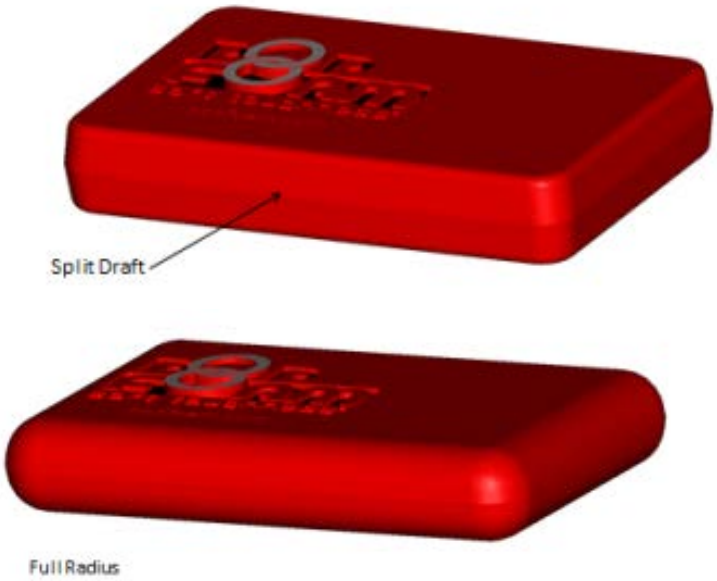
3. Guidelines for Draft

Because the injection molded foam process utilizes self-ejection instead of the mechanical injection of thermoplastic injection molding, one of the most critical design principles is using the correct draft.

Most part designs will require a minimum of 5 degrees of draft or radius to self-eject the part.



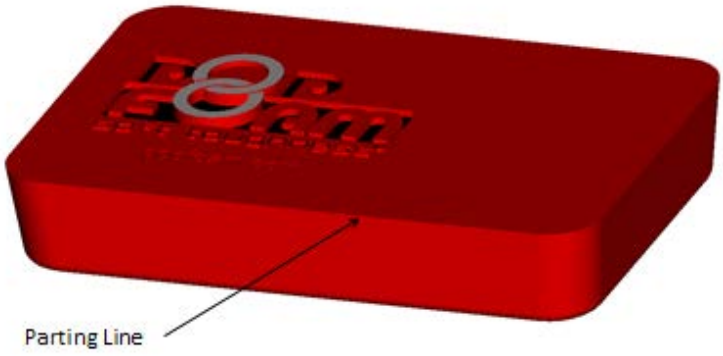
Parts without draft cannot eject from the mold



Part designs with a simple draft, split draft design or a full radius design will allow parts to eject from the mold.

4. Location of Parting Line

It is an important to determine where the parting line gate location and potential flashing in the part design process. Consider both cosmetic and function each part requires when deciding on location.



5. Part length to width ratios explained

Generally in the injection molding foam process the length to width ratio of 4:1 is acceptable. If the part exceeds this ratio, the part may not eject out of the mold without some wrinkling or surface defect.

Part geometry of a ratio of 4:1 or less is acceptable

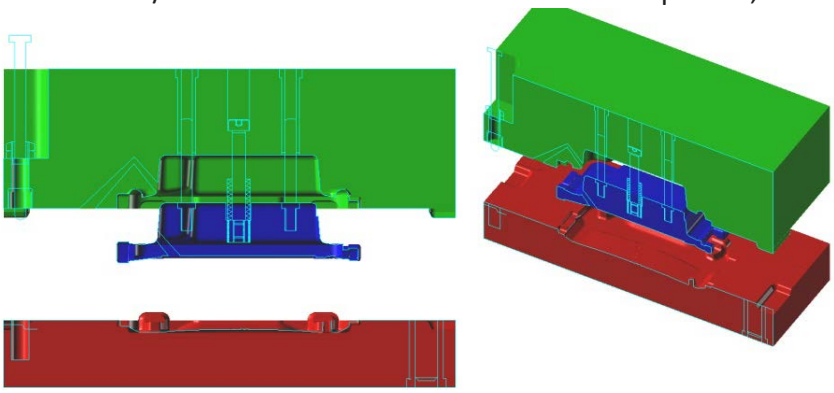
Part geometry over 4:1 ratio is not acceptable

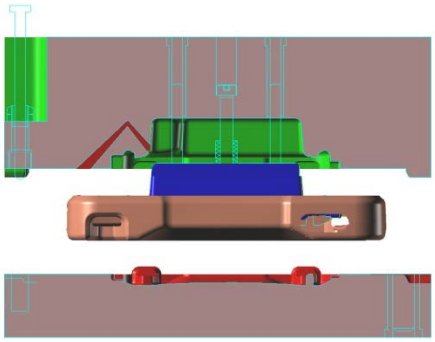
6. Undercuts Explained

In the injection molding foam process, undercuts can be designed into the part design. There are several types of undercut designs as follows.

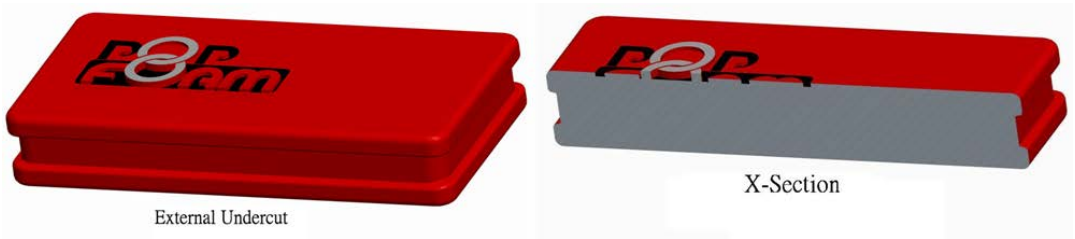
Internal/female undercuts are acceptable

Complete internal/female undercuts are achievable in PopFoam, examples below



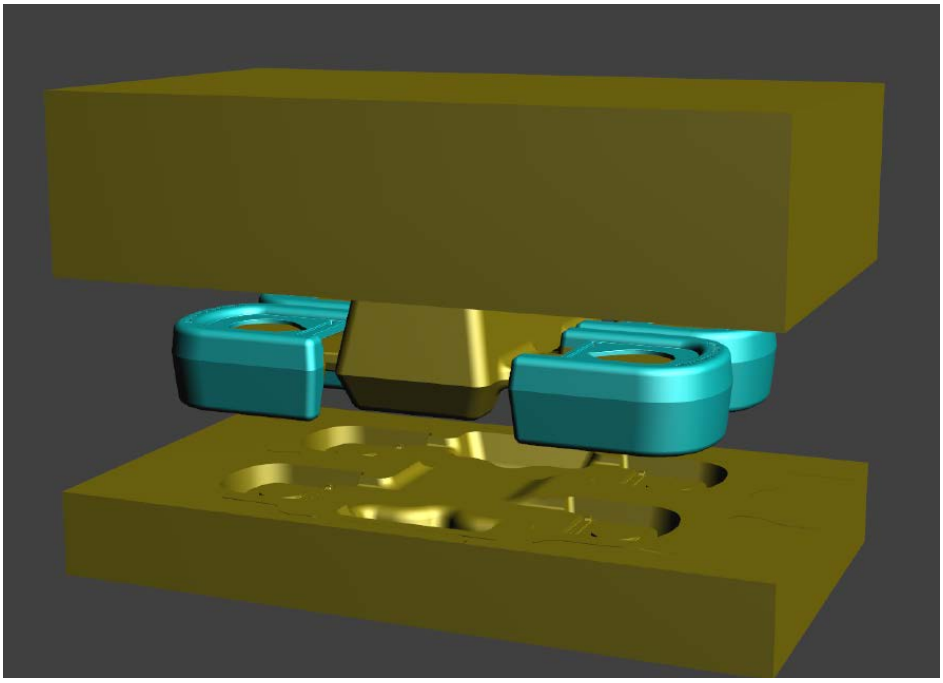


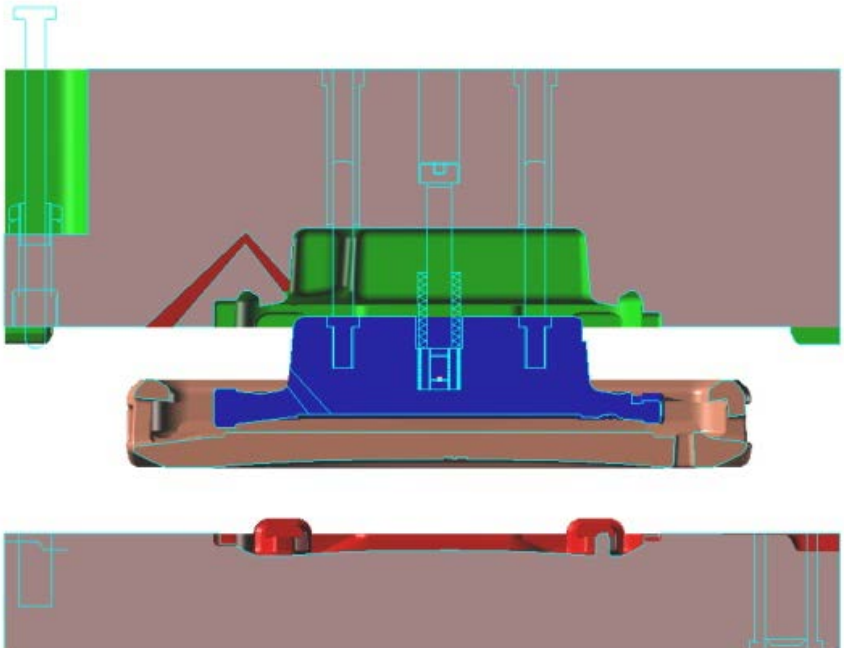
External/male undercuts are not possible due to the expansion process; the self-ejecting forces create tooling release issues.



7. Use of Floating Cores

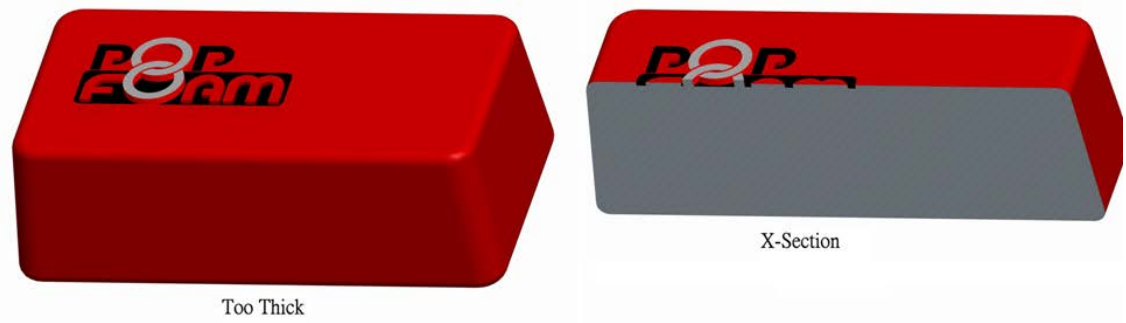
When the designing for a part that has a hole or hollow area the mandrel needs to float in order to core out the part.



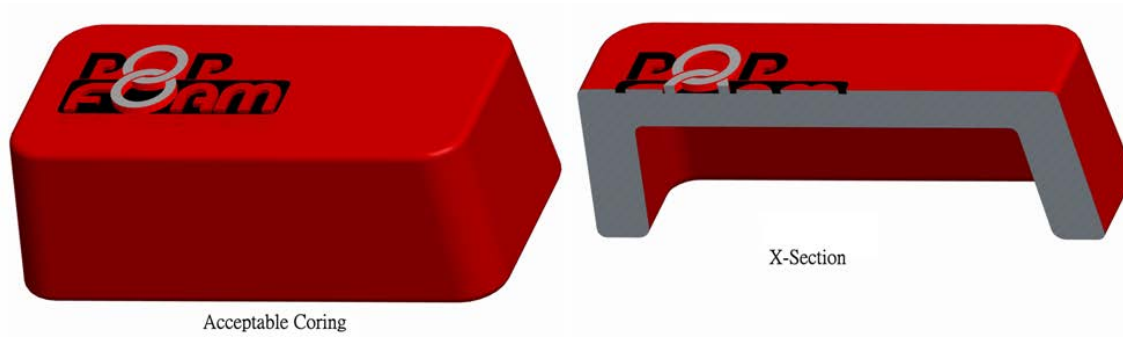


8. Wall thickness and coring explained

Overall the part design should have a uniform wall thickness. Uneven wall thickness can result in sink marks or distortions on the finished part. The minimum wall thickness if in limited areas can be 0.06” and the maximum wall thickness is 2”, common wall sections range for 0.250” to .600”

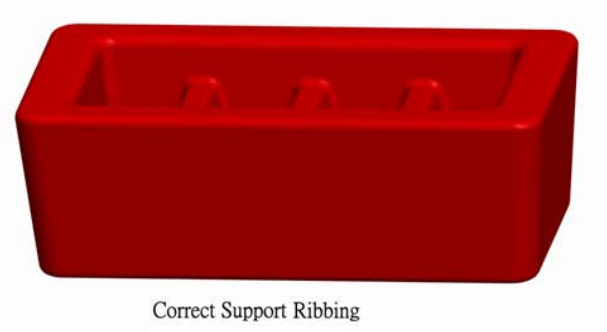


Coring removes material from the part which can allow for faster cycle times which reduces the overall cost of the part.

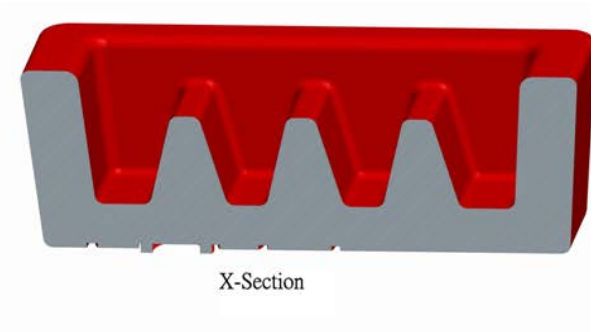


9. Ribbing and cross sections explained

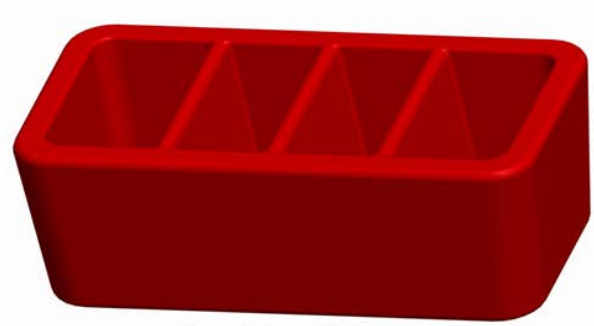
Internal ribbing or supports design is much different in injection foam molding than conventional thermoplastic injection molding. With injection foam molding using long draw ribbing creates tooling release issues and can trap pockets of gas equating to process and cosmetic issues. Designing the correct coring will allow the finished part to resist collapsing when pressure is applied.



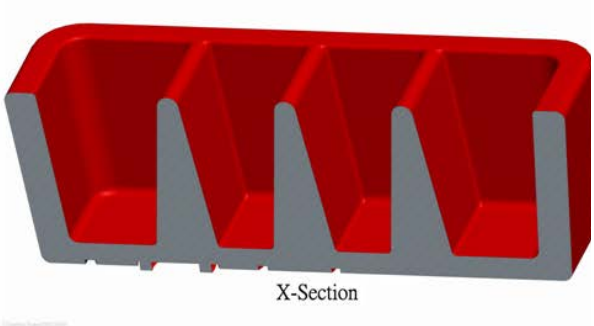
Correct Support Ribbing



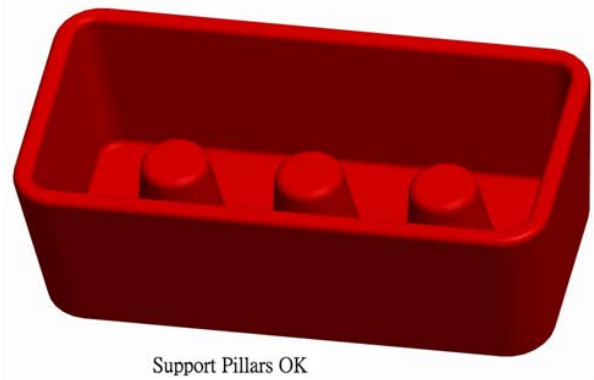
X-Section



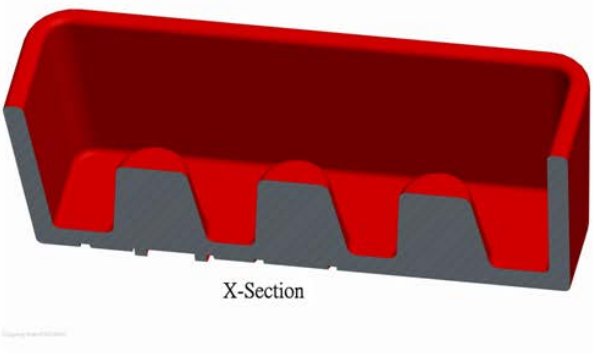
Incorrect Support Ribbing



X-Section



Support Pillars OK



X-Section

10. Adding text or logos

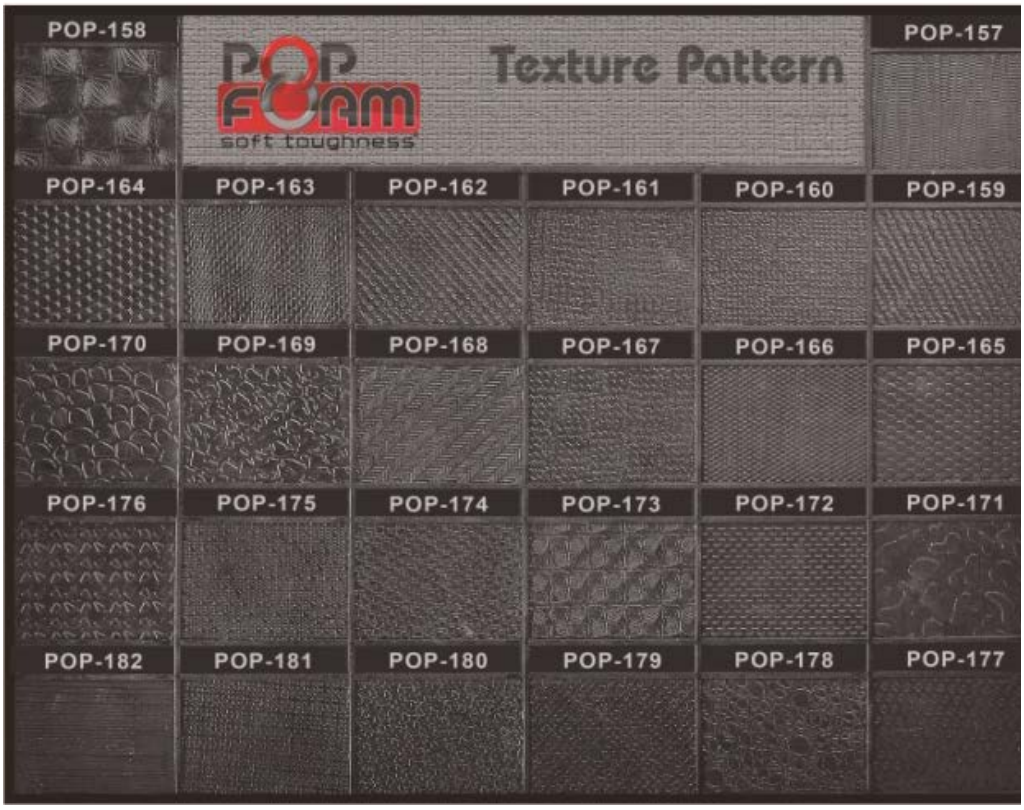
With PopFoam it is possible to enhance your design by adding text and or logos. These can be either raised or recessed on the part.

For smaller text it is better to use raised details. Due to ejection issues, text and logos cannot be placed on sidewalls.

11. Texture

Texture is a great way to upgrade the quality of the finished product. PopFoam can be enhanced with a multitude of different textured surfaces and the following link shows our stock textures.

Texture can be applied at various depths and many patterns on a single part, our design group will assist you with any final details or questions.



12. General Tolerances

During the development phase our engineers will provide guidance on tolerances to optimize your products.

Many factors have a direct relation to the amount of tolerance required as PopFoam is a soft compound that expands from tooling much smaller than the finished part and often will require post molding fixturing.

Generally speaking tolerances can be held to +/- 3% however it is design and compound dependent, please consult with us and we will help develop a process control plan. Basically, the harder the material selected the lower the expansion so it will produce a tighter tolerance than a softer material

13. Rules of thumb for part size

With PopFoam the maximum part size is 30 ¾” L x 12 ½” W x 14 ¼” H (780 L x 320 W X 360 H mm) or 30 ¾” L x 25 ¼” W X 14 ¼” if 2 sets of molds are in one station.

The minimum size for production is 2”x2” given that smaller products are not feasible from both a manufacturing and cost per standpoint.

The maximum Shot Volume is 1400g for part size in the 30 ¾” L x 12 ½” W x 14 ¼” H range or 2800g for part size in 30 ¾” L x 25 ¼” W X 14 ¼” range.

14. The PopFoam injected foam molded process

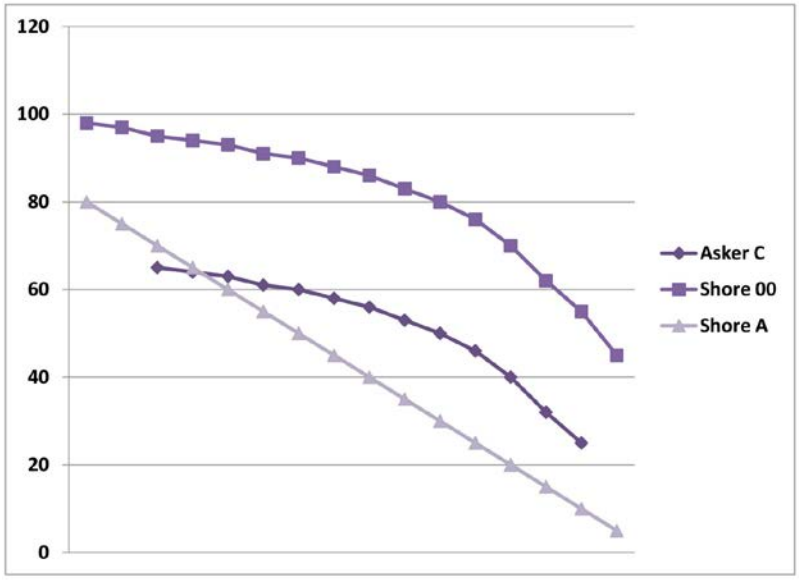
PopFoam softness can be measured in the following three scales.

PopFoam is usually measured in the Asker “C” scale:

- “C” Scale: 30-65
- “A” Scale: 15-70
- “OO” 60-95

The following chart compares these three scales.

No.	Durometer Result		
	Asker C	Shore 00	Shore A
1		98	80
2		97	75
3	65	95	70
4	64	94	65
5	63	93	60
6	61	91	55
7	60	90	50
8	58	88	45
9	56	86	40
10	53	83	35
11	50	80	30
12	46	76	25
13	40	70	20
14	32	62	15
15	25	55	10
16		45	5



15. Color

Although PopFoam typically works from the standard Pantone color matching system, we can match colors from paper, paint chips, fabric or even a sample part.

We can also offer those “fun swirl” colors by mixing several colors into the final melt process providing further exciting enhancement to your products.

PopFoam also has two shot technology available to introduce either two colors or different densities in a single molded product.

16. Decoration and Finishing

PopFoam offers years of experience when it comes to decorating and enhancing the aesthetics of your product. Following are some of the processes and treatments we offer:

- Pad Printing – From company logos to custom illustrations, our pad printing facilities can apply most any image to your product in single to multiple colors.

- Cubic Print - From a wood grain to camouflage we can apply virtually any pattern or array of colors to your product.

- Painting – can offer your product to have that extra enhancer. Painting will allow the latest fashions to complement your product from multi-color logos to fluorescents it will offer that one of a kind custom appearance.

- Laser Engraving, one of the latest technological enhancements used on PopFoam products. It offers a clean and crisp finished logo or design.

17. Assembly

Whether your requirements are for a simple added value process or a complete retail ready package we have the experience to meet your requirements. Our customers are in various markets which include, automotive, consumer products, medical, recreational goods, aerospace and electronics.

PopFoam has experience with many added value processes which include gluing/adhesion, sewing, decorative pad printing, decorative painting and laser engraving.

18. Packaging

Make the right first impression with the right packaging. From thermoformed clamshells to reusable fabric bags to recyclable cardboard containers, get solutions to your specific packaging challenge. PopFoam can supply custom thermoformed trays, plastic bags or almost any cardboard packaging requirement. We offer a rigorous quality control from planning right through final inspection.

19. Cost Impact Factors

There are several key impact factors that will affect the overall cost of the finished product.

- **Molds**
  Molds can be the largest impact on the overall cost for Injection Foam Molding. The key factors for molds are number of molds required and mold complexity.

- **Volume**
  Injection Foam molding utilizes multi-station machines and requires multiple molds for production. The annual volume production will be a key impact factor for part cost.

- **Part Size and Number of Cavities**
  The size of the part will determine how many cavities can be put into one mold. The more cavities will offer a lower part cost.

- **Part Thickness**
  The part thickness will determine the heating and overall cycle time which is a key factor for part cost.

- **Overall Cubic Volume**
  The cubic volume determines the amount of material being used which is a key to part cost.

20. Preferred CAD Data

PopFoam works with CAD files of the following formats:

- **Pro/E / Cero**
- **Solid Works**
- **Step**
- **XT**
- **IGS**