

Custom-designed aluminum casting patterns

by
Jon P. McGraw
Alloy Casting Co. Inc.
Mesquite, Texas

There are times when a fabricator may be faced with a custom job using ornamental castings, but because of lack of expertise in the pattern making area, he may have to forego the opportunity. This article can be the foundation for taking advantage of that next custom job.

This discussion will describe how to make a custom pattern and what happens when that pattern is used by the foundry.

If you are going to make a pattern, here are some technical considerations to remember:

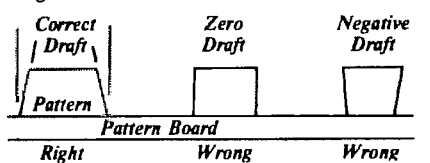
1. Shrinkage
2. Draft and parting lines
3. Material
4. Smoothness

1. A casting made from a pattern will always be 1-2% smaller than the pattern itself. This is because the cavity made by the pattern being pressed into the sand is filled with molten aluminum. When that aluminum solidifies and cools to room temperature, shrinkage occurs.

2. The draft of a pattern is important to insure the sand will easily part from the pattern with no torn sand. Draft should be in the range of four to seven degrees with more draft needed if the pattern is very thick.

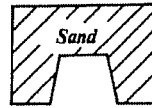
A pattern with negative draft will yield a casting with damaged edges when the sand is pulled from the pattern.

Figure 1

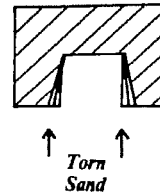


Patterns that are doubled faced must have draft from both sides of the center parting line. The parting line is nothing more than the line that divides the top face from the bottom face.

Figure 2 Right



Wrong



3. Almost any material can be used for a pattern. The choice will depend on the number of castings to be made from the pattern and how long you want to use it. Some materials used are wood, plaster of paris, bondo, wax, epoxy, plastic, aluminum or steel.

Each material has its benefits and drawbacks. Our company has patterns made from aluminum that are over 40 years old. They have had many years of repetitive use, have been added to with bondo or epoxy, and subtracted from by machining or filing. Plaster of paris chips easily and has no impact strength. Wax softens in the heat. A pattern material for five castings should be different than a pattern for two hundred castings or a pattern to be used once a year for ten years.

4. The smoother the pattern — the smoother the final casting. The edges of a wood pattern are especially prone to tearing sand because of loose wood fibers and indentions in the wood grain.

Patterns used by the foundries in our industry cover a wide range of sizes, shapes and complexities.

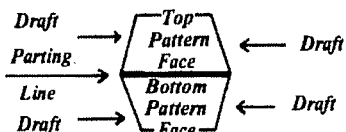
The simplest pattern is one with a flat back. This may be represented by a cast letter or number with the back face being completely flat.

The next level of patterns would be double-faced patterns with design on both sides, but with a parting line in a single plane. This may be represented by an orange sliced into halves. There is design on each half of orange, but it does have a straight single plane parting line where it has been sliced.

The most complicated case would be a double-faced pattern with a three-dimensional complex parting line. This may be represented by a curved loaf. Many oak and rose patterns have complex parting lines because leaves and acorns are scattered throughout the casting.

A flat-back pattern is the easiest to make. Pick your material, cut, slice, machine or file it to shape. Keep one side flat and remember your draft and shrinkage. A common cross section could be shown as in Figure 4.

Figure 3



A double-faced pattern with a complex parting line is the most difficult to make. You can still pick your material and cut, slice, machine or file it to shape. But you must remember to put a draft on each side of the parting line at each location throughout the pattern.

When this pattern arrives at the foundry it can be either molded "loose," i.e., without a pattern board, or given to a match plate maker. A match plate for a double-faced pattern has a long life and produces quality castings. Match plates are cast aluminum plates where the pattern board and design are integrally cast together.

Figure 4

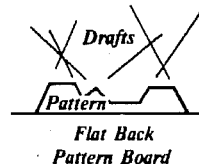
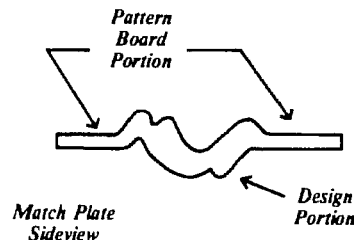


Figure 5



A double-faced pattern with a straight parting line is one of medium difficulty. The following is a sequence of steps (Figures 6-13) that would occur in making this type of double-faced custom casting. All figures are of the side view.

An example of a newly-created custom design can be seen in the Alloy Casting advertisement in this issue of the *FABRICATOR*. The pattern for the Bird of Paradise picket (#31) was put together with epoxy and parts from other bird designs. After sanding the epoxy for smoothness, the pattern was given to an aluminum matchplate maker. This decision was based on (1) the sections are thin and would be difficult to machine into two matching double face sections, (2) the parting line is complex, and (3) the pattern will be used many years and needs to be of durable material.

Conclusion: This article has been a brief overview of some of the ideas and steps necessary to make a custom pattern. It is not difficult, and it is not complicated. The next time you are faced with a custom job think about some of the possibilities we have discussed, and give it a try.

Figures 6 - 13 — Continues on page 34

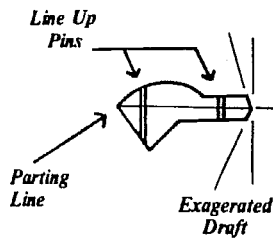
Figure 6.



Custom Casting
Desired

Figure 7.

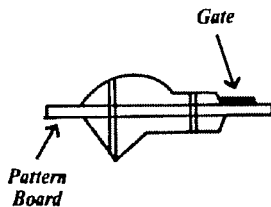
At The Fabricator



Make A Wood Pattern
In Two Parts With
Minimum Tolerance.
Line Them Up And Pin
Together. Remember
Smoothness, Shrinkage,
Parting Line, And Draft.

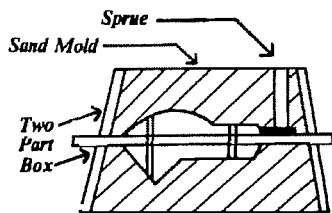
Figure 8.

At The Foundry



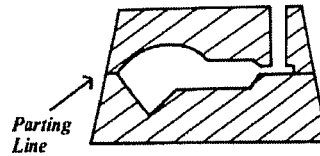
The Pattern Is Attached
To A Pattern Board And
Repinned. The Gate Is
Added. The Gate Is The
Inlet For The Molten
Aluminum.

Figure 9 Making The
Mold



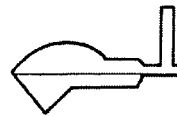
The Sand Is Pressed On
To Both Sides Of The
Pattern And The Sprue
Is Cut. The Sprue Is The
Hole Through Which
The Aluminum Is
Poured.

Figure 10.



After The Box And Pat-
tern Board Have Been
Removed, The Finished
Sand Mold Is Ready For
Pouring Of Metal.

Figure 11.



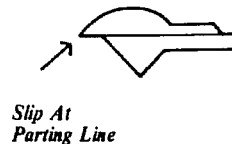
Rough Casting After The
Metal Has Been Poured,
Cooled, And The Sand
Has Been Removed.

Figure 12.



Finished Casting After
The Gate And Sprue
Have Been Cut Off.

Figure 13.



If The Two Pattern Parts
Have Not Been Pinned
And Mated Properly,
The Casting Will Have
Slipped At The Parting
Line.

EDITOR'S NOTE: Alloy Casting Co. is a Nationwide Supplier member of the National Ornamental & Miscellaneous Metals Association (NOMMA).

If you need to produce a custom casting for a customer, contact your casting supplier. Many of them will do custom-run projects for you at very reasonable prices.

In some cases you may want to produce unique castings for highly-specialized applications yourself. A good example of this is a custom monogram or coat-of-arms for a driveway gate. It is certainly possible to produce simple castings in your own shop using foundry molding sand and pouring the mold in lead or other low-temperature metal alloys.