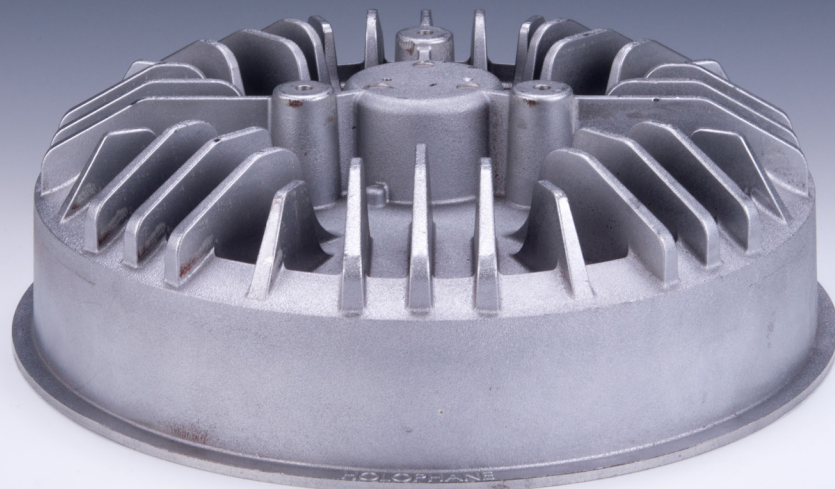


7 Important Specs when **Designing** for Permanent Mold Casting



#1 Wall Thickness

To make your design permanent-mold friendly, we recommend a wall thickness of **at least 0.180 inches**.

Since the permanent mold process is gravity-fed and castings solidify quickly, a minimum

wall thickness allows adequate metal flow.

Try to **avoid isolated thin or thick sections**. These can impact the flow and solidification of metal, cause shrinkage, and lead to other defects.

Alternatives

If your design's wall thickness is non-negotiable and on the borderline of permanent mold requirements, molds can be equipped with **vents** and **chills** to help alleviate issues during casting. However, inadequate wall thickness increases your potential for higher scrap rates.

Another alternative is to cast your part with thicker walls, then use secondaries, like **machining** and **polishing**, to shave off some excess metal.

Yet overall, if you wish to permanent mold cast your product, it is best to design the part with **adequate wall thickness from the start**. This minimizes opportunities for error. Otherwise, consider choosing a manufacturing method that specializes in isolated thin or thick walls.

#2 Fillets & Radii

Slightly rounded corners make your part stronger!

We recommend **at least 0.030 inches**.

Sharp corners cause...

- High Stresses
- Cracking
- Tearing

Need a 90-Degree Corner?

We suggest casting your part with the recommended fillets and radii, then **machining** and **polishing** your desired corners. This is a common operation in the permanent mold industry.

#3 Machine Stock Allowance

Greatest Dimension (inches)	Tolerance
0 – 6	0.045
6 – 12	0.060
12 – 18	0.075
18 – 24	0.090

per surface, not per dimension

If machining is required, your design must account for a machine stock allowance.

Casting stock can be allowed on surfaces requiring tighter tolerances or smoother surface finishes than the cast surfaces can provide.

#4 Standard Draft

Length of Draw (inches)	Draft (degrees)
0.000 - 0.125	10
0.126 - 0.500	7
0.501 - 1.000	5
1.001 - 5.000	3
5.001 - 12.000	2

Draft is important in permanent mold casting.

Draft...

- Aids in part ejection
- Extends mold tooling life
- Creates cleaner castings

Minimum draft requirements are **dependent on depth**.

Cored Hole Draft

Diameter (inches)	Maximum Depth (inches)	Draft (degrees)
0.250	0.125	15
0.250 - 0.500	0.250	8
0.501 - 1.000	1.000	5
1.001 - 2.000	3.000	3
2.001 - 4.000	6.000	2

Cored holes can save time in machining.

Similarly, minimum cored hole draft requirements are **dependent on depth and diameter**.

#5 Concentricity (T.I.R.)

FEATURES IN ONE SIDE OF MOLD	
Concentricity (inches)	Tolerance
0 - 5	0.025
6	0.028
7	0.031
<i>Each additional inch</i>	<i>Add 0.003</i>

FEATURES ACROSS PARTING LINE	
Concentricity (inches)	Tolerance
0 - 5	0.050
6	0.054
7	0.058
<i>Each additional inch</i>	<i>Add 0.004</i>

#6 Linear Tolerance

Permanent mold process capabilities for linear tolerance are as follows.

Linear Tolerance (inches)	One Side of Parting Line	Across the Parting Line
First Inch	+/- 0.015	+/- 0.025
Each Additional Inch	Add 0.002	Add 0.003
3 (example)	+/- 0.021	+/- 0.034
10 (example)	+/- 0.035	+/- 0.055
Additional Tolerance for Sand Core Position	0.015 + 0.002 x largest dimension of core cross	
Additional Tolerance for Metal Core Position	0.010 + 0.001 x largest dimension of core cross	

#7 Flatness

Permanent mold process capabilities for flatness are as follows.

Greatest Dimension (inches)	Tolerance
0 - 6	0.020
Each Additional Inch	Add 0.002
7 (example)	0.022
8 (example)	0.024
9 (example)	0.026

Bonus Design Opportunities

While designing, consider bonus capabilities of the permanent mold process. For example, you can cast your product around **metal inserts**, directly embedding them into your part.

cavities inside the casting. After casting, these cores are baked or shaken out, leaving an empty space inside the part.

You can also use **sand cores** to create hollow