GENERAL DESIGN CONSIDERATIONS:

- Radius all corners where possible. Resistance to metal flow is decreased through radii as is the tendency to drag and bend at sharp corners. The outer skin is the hardest (strongest) casting area, and by radiusing, the skin remains intact.

- Allow maximum draft where practical. This assists casting release from the mold, and as with radiusing, bending and tearing are minimized.

- Keep wall thicknesses as uniform as possible. This enhances metal flow by avoiding pressure drops – going from thick to thin to thick surfaces – during the injection cycle. Pressure drops inhibit metal flow, promote backfilling, and result in cold shut and porosity.

- Casting design must be kept practical with the casting process. Dimensions across the parting line and dimensions across moving die members (cam actions, hydraulic pulls, etc.) must be specified given that such areas are the most difficult to maintain in die casting. Proper engineering and die construction minimizes problems associated with moving die members.

- Keep tolerances practical and essential as is necessary.

- Keep machining stock to a minimum in order to avoid porosity openings.

- Cored Holes
  - Aluminum: min. .080
  - Zinc: .040

- Cast Threads
  - Keep in class A
  - Allow flats at parting line if possible

PRESSURE TIGHT CASTINGS

To cast pressure tight components, give special considerations to all details of the molding process. Depending on pressure tight requirements, the cost of impregnation can be avoided by following the basic design guidelines of radii, draft, uniform sections, etc. Take particular care not to break the casting skin. The following are also recommended:

- Incorporate a vacuum system into the die design. This need not to be complicated, and will assist in removing gasses from the die surface that could “trap” during injection.
- Pay close attention to fillets and metal savers.
- Avoid heavy sections. Heavy sections promote porosity due to heat concentration.
- Core holes as opposed to machining. Machining aggravates porosity.
- Similarly, avoid the removal of large amounts of stock when machining.
- It is recommended that the die caster pressure test a percentage of the castings. Imperfections not visible by physical inspection do exist. The cost associated with pressure testing is minimal compared to impregnation.

INSERT CASTINGS

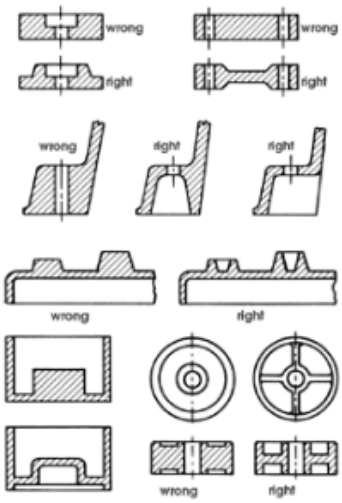
In certain applications, it is desirable to place an insert into the die and cast the molten metal around it. Inserts are used where demands on the component go beyond the capabilities of the zinc and aluminum alloys.

Where a steel thread is required for strength, for example, an insert can be placed in the appropriate area of the mold and metal diecast around it. The casting now conforms to the requisite engineering needs.

The same applies to heater elements. These can also be inserted, with the casting providing the housing for the element as well as the housing for the liquid to be heated.

WALL THICKNESS

Overly thick walls slow production, invite porosity, and are expensive. Recommended maximum wall thickness for zinc die castings is .380", and for aluminum die castings .250". Nonuniform wall thickness and unnecessary material bulk should also be avoided because of differential contraction in cooling, often causing cracks.

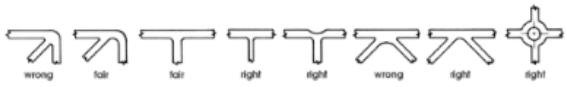


GUSSET TYPE RIBS

Part strength should be increased by adding gusset-type ribs rather than by increasing wall thickness.

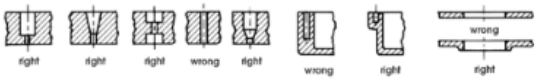
RIBS

Ribs that strengthen flat surfaces should be narrower than the main wall of the diecasting and should be offset to avoid metal bulk at intersections. Perpendicular intersections are less bulky than angular ones.



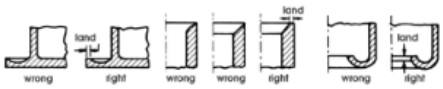
HOLES

Minimum practical hole diameter depends on metal characteristics, and maximum hole depth depends on hole diameter. For zinc die castings, recommendations are: minimum diameter, .040", maximum through-hole depth, 8-diameters; and maximum blind-hole depth, 3-diameters. For aluminum die castings or magnesium: minimum hole diameter, .080"; maximum through-hole depth, 4-diameters; and maximum blind-hole depth, 2-diameters. In some cases, the holes can be cast from two sides. Large holes in thinwall sections of the diecasting should be reinforced with flanges to ensure that the area remains flat.



ROUND vs. SQUARE CORNERS

Exceptions to the general rule that edges of ribs and walls should be rounded are edges formed by meeting tool members. Such edges should be sharp, making the tool stronger and longer lasting. Similarly, feather edges should be avoided. A small land – .030" to .040" – is recommended.



KNURLS, TEETH

Die castings can incorporate internal or external teeth, knurling, or other features for easy gripping. Only straight knurling is practical (diamond knurls require more complex tooling). Recommended pith is at least .080", and knurl depth should be shallow. In addition to knurling, other possible gripping aids are small ribs, grooves, splines, and flats.