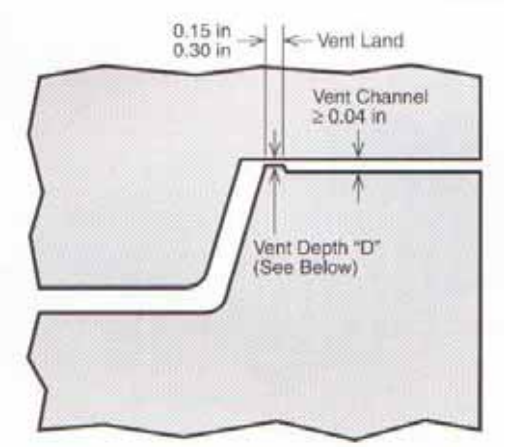
DIAMOND POLYMERS, INC.

MOLD VENTING

As molten plastic enters the mold, it quickly displaces air in the tightly sealed mold. Although some air escapes through the parting line or loose-fitting ejectors or slides, most molds need strategically placed vents for rapid and complete air removal. This section discusses vent design and placement.

Parting-Line Vents

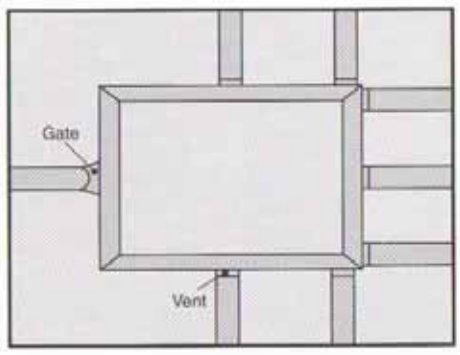
As a first choice, place vents along the mold parting line. Typically easy to cut and keep clear of material, vents in the parting line provide a direct pathway for air escaping the mold. Below figure shows standard parting-line vent guidelines for thermoplastic resins.



To prevent material from flowing into the vent during filling, the depth of the first 0.15 inch to 0.30 inch of vent length (vent land) must be small, typically less than 0.0020 inch for amorphous resins and less than 0.0015 inch for semi-crystalline resins. Vent width should be as needed to properly vent but not flash part. Your resin selection and processing conditions determine the vent's maximum depth. Other rules of thumb for venting:

- The amount of venting needed increases with part volume and filling speed:
- Add more vents or widen existing ones to increase venting; and
- To avoid flash, do not increase vent depth beyond the guidelines.

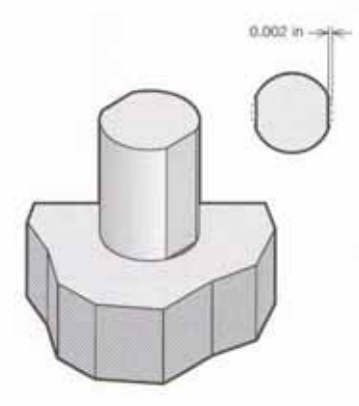
For the vast majority of resins and part geometries, more vents are better. The exceptions are resins with component – usually flame retardants or other additives – that can boil to the surface at the flow front and deposit on the mold surface and vents. These resins rely on pressurized air in front of the flow front to hold volatiles in the material. Over-venting can prevent the flow front from generating the required pressure. Add vents sparingly in molds for these materials.



Vent Placement

Vents should be placed at various locations along the runner system and part perimeter, but they are especially needed at the last areas of the mold to fill (see figure). Typically these areas are located on the parting line and lie farthest from the gate. When the last area to fill is not vented, air may become trapped in the mold, preventing complete filling of the cavity and causing a gas burn on the part. The trapped air is super heated during compression and in severe cases can pit or erode the mold steel.

When feasible, move gates or vary part thickness to change the filling pattern and direct air to parting-line vents. If air-trap areas persist, consider using ejector pins modified with flats for venting (see figure below). **Ejector-pin vents** usually self clean with each ejection stroke. Air-trap areas not accessible by ejector-pin vents may require vents placed along mold inserts or splits in the mold. This type of vent usually requires periodic disassembly for cleaning. Porous metal inserts can also provide venting for difficult air-trap areas but may require periodic cleaning.

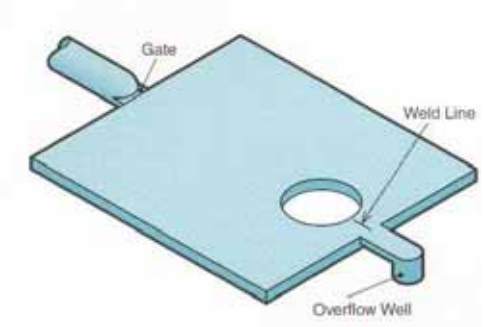


Part features produced by blind holes in the mold, such as posts and bosses, require venting at the last area to fill, usually the tip or end. Bosses can usually vent along the core insert forming the inside diameter of the boss. Posts usually require ejector-pin vents at the tip of the post. Other venting issues you should address:

- Direct mold filling along the length of the rib so gasses can escape at the ends and
- Round or angle the ends of standing ribs to prevent air entrapment.

Air trapped in unvented pockets or recesses in the mold can exit these areas behind the flow front and lead to splay or teardrop-shaped surface defects.

Sever weld lines often form where flow streams meet head on, especially at the end of fill. You can often improve the strength and appearance of these weld lines by installing **overflow wells** (see figure below). Overflow wells are modified vent features that provide an extra-deep vent channel, usually about one-third the part thickness, that empties into a cylindrical well. Venting air escapes the well around a shortened ejector pin fitted with a 0.002 inch clearance.



Cool material at the leading edge of the advancing flow fronts merges and enters the overflow well leaving hotter material to mix and fuse at the weld line. The overflow well is ejected with the part and clipped off after molding. Overflow wells can also provide ejector-pin locations for parts such as clock faces or instrument lenses that cannot tolerate ejector-pin marks on the part surface.

Vent design is an important function of the mold engineering and must be considered early in the conception of a mold layout. It is of particular importance with any product with ribs or dead corners, which can trap air. If they are inside the parting line, such vents must be connected to channels that lead the air to the outside. It is also very desirable to make the vents self-cleaning to avoid build-up of residue from the plastic which would eventually block the vent. Parting line vents and ejector pins are considered self-cleaning. If mechanical motion within the vents is not feasible, compressed air should be used at every cycle to blow them clean. If this is not practical, the vent pin must be easily accessible for periodic cleaning.