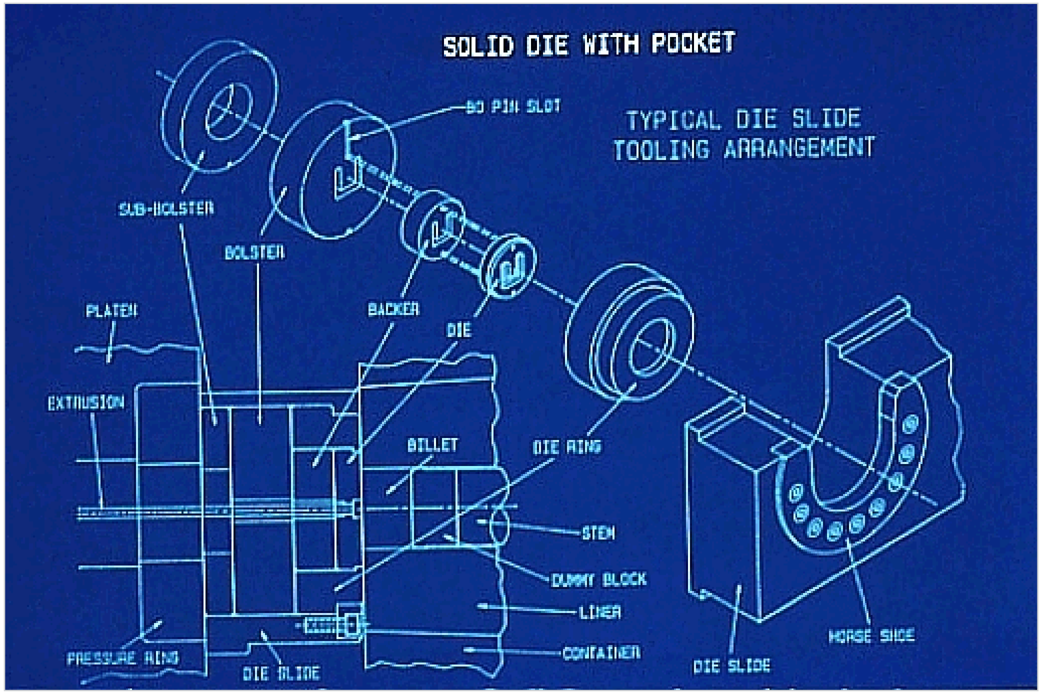
Dies & Tooling



This diagram shows the components that typically make up a die slide, the tooling assembly, for a solid die.

Dies can be made to form a virtually limitless array of shapes and sizes.

The initial costs and lead-time of aluminum extrusion dies and supporting tools are usually a good deal lower than the tooling required for vinyl extrusion, die casting, forming, roll forming, impact extrusion, stamping or pultrusion.

Several factors influence the actual cost and lead-time of a specific die; the best combination of product performance, quality and cost is achieved when the product designer, the die maker, the extruder, and the purchaser recognize each other's requirements and work together.

A typical extrusion operation will make use of a die assembly, including the die itself, which, together with a backer, is enclosed within a die ring, placed in front of a bolster, with a sub-bolster behind, all held together as a unit by a tool carrier. The backer, bolster, and sub-bolster provide the necessary support for the die during the extrusion process.

The extrusion die, itself, is a steel disk (normally H13) with an opening, the size and shape of the intended cross-section of the final extruded product, cut through it.

Dies are broadly grouped as solid (or flat) dies, which produce solid shapes, and hollow dies, which produce hollow or semihollow shapes. Combinations of solid, semihollow, and/or hollow shapes may be incorporated into a single die.

Information courtesy of Aluminum Extruders Council

For more information, go to www.midstal.com or call 920.922.7207.

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A solid die may have one or more orifices or apertures through which the softened alloy is forced (extruded). Multiple apertures in a single die produce multiple extrusions with each stroke of the press.

A solid die, as shown here, produces shapes without any enclosed voids and/or semihollow conditions.

Solid dies may, on occasion, be used to produce hollow profiles by means of a fixed or floating mandrel. The use of a mandrel for extruding a hollow shape through a flat die usually involves the use of hollow billets, cylindrical source stock that may have been cast or bored. Piercing mandrels, however, do not require the use of cored billet.

A semihollow die also produces shapes without enclosed voids; however, unlike a solid die, it produces shapes with a tongue ratio of 3:1 or greater.

A semihollow die extrudes a shape that is nearly hollow, partially enclosing a void, the area of which (the area of the die tongue) is large in comparison with the gap where the tongue is connected to the main body of the die.

While a solid or semihollow die is a single piece, it requires support from additional tools called backers and bolsters. Depending on the complexity of the extruded shape, the total cost of the extrusion tooling may include charges for these supplemental tools.

A hollow die produces shapes with one or more enclosed voids.

Hollow dies take a variety of forms. *Bridge*, *porthole*, and *spider dies*, for example, include a fixed stub mandrel as an integral part of the die. Each type of hollow extrusion die serves certain functions and carries its own advantages and disadvantages. The manufacturing methods and costs vary widely. The choice of design, and even manufacturing methods, will depend on the profile, press and container size, and production requirements.

The most common types of hollow dies are the porthole and pancake. They typically are the most cost effective and easiest to manufacture, allowing the designer to be much more creative in the placement and shaping of the ports and feed. They are also the easiest for CNC Machining (Computer Numeric Control), which allows for the die maker and die corrector to quantify any alterations for production improvements on future dies.

A critically important characteristic of extrusion dies is that the effective bearing length controls the metal flow through the die. The objective is to have all parts of the profile emerge from the die at the same speed. The longer the bearing length, the greater the resistance to the flow of aluminum and the shorter the bearing length, the less resistance to flow. Through effective design, the thick parts of a profile can be slowed through the use of longer bearings to match the speed of the thinner parts with short bearings.

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