



**WINZELER**  
STAMPING COMPANY

**Alloy** - A substance that has metallic properties and is composed of two or more chemical elements of which at least one is an elemental metal.

**Annealing** - A process involving the heating and cooling of a metal, commonly used to induce softening. The term refers to treatments intended to alter mechanical or physical properties or to produce a definite microstructure.

**Anodizing** - Process of applying a controlled oxide layer to the surface of aluminum.

**Automatic Press** - A press with built-in electrical and pneumatic control in which the work is fed mechanically through the press in synchronism with the press action.

**Bending** - The straining of material, usually flat sheet or strip metal, by moving it around a straight axis lying in the neutral plane. Metal flow takes place within the plastic range of the metal, so that the bent part retains a *permanent set* after removal of the applied stress.

**Blank** - (1) In forming, a piece of sheet material, produced in cutting dies, that is usually subjected to further press operations (2) Work piece resulting from blanking operation. (3) A pre-cut metal shape for a subsequent press operation

**Blanking** - The operation of punching, cutting, or shearing a piece out of stock to a predetermined shape.

**Burr** - Raised, sharp edge inherent in cutting operations such as shearing, blanking, punching and drilling.

**Burr Height** - Height to which burr is raised beyond the surface of the material.

**Carbon steel** - A steel that owes its specific properties chiefly to the presence of carbon, without substantial amounts of other alloying elements. Also termed ordinary steel, straight carbon steel, or plain carbon steel.

**Coining** - (1) A closed-die squeezing operation in which all surfaces of a workpiece are confined or restrained, resulting in a well-defined imprint of the die on the work. (2) A *restriking* operation used to sharpen or change an existing radius or profile. Coining can be done while forgings are hot or cold and is usually performed on surfaces parallel to the parting line of the forging.

**Compound Die** - Any die designed to perform more than one operation on a part with one stroke of the press, such as blanking and piercing, in which all functions are performed simultaneously within the confines of the blank size being worked.

**Coordinate measuring machine, (CMM)** - A machine for measuring three dimensional (X, Y, Z) coordinates on a component for inspection or geometry description purposes" (Automotive Steel Partnership, 1991, p.3).

**Corner Radius** - Outside radius.

**Counterboring** - Machining or coining operation to generate a cylindrical flat-bottomed hole.

**Countersinking** - Machining or coining operation to generate a conical angle on a hole.

**Crimping** - The forming of relatively small corrugations in order to set down and lock a seam, to create an arc in a strip of metal, or to reduce an existing arc or diameter.

**Deburr** - To remove the sharp, knife-like edge from parts.

**Dedicated Tooling** - Commonly referred to as "hard tooling"-- tooling made to produce a specific part.

**Deep drawing** - Characterized by the production of a parallel-wall cup from a flat blank of sheet metal. The blank may be circular, rectangular, or a more complex shape. The blank is drawn into the die cavity by the action of a punch. The drawing of deeply recessed parts from sheet material through plastic flow of the material when, the depth of the recess equals or exceeds the minimum part width.

**Die** - Tool with a void or cavity which is precisely fitted to a "Punch" used to shear or form sheet metal parts.

**Die Clearance** - Amount of space between the punch and die opening.

**Die Marks** - Scratches, scrub marks, indentations, galling or burnishing of sheet metal work pieces by tooling.

**Die stamping** - The general term for a sheet metal part that is formed, shaped, or cut by a die in a press in one or more operations.

**Draw die** - A specific type of form die that basically involves forcing the flat sheet of metal into a die cavity with a punch while holding the work piece around the cavity to control metal flow.

**Drawing** - (1) Engineering document depicting a part or assembly. (2) In metal forming, the stretching or compressing of a sheet metal part into a die by a punch to create a 3-dimensional part.

**Ductility** - Ability of a material to be bent or otherwise formed without fracture.

**Edging** - (1) In sheet metal forming, reducing the flange radius by retracting the forming punch a small amount after the stroke but before release of the pressure. (2) In rolling, the working of metal in which the axis of the roll is parallel to the thickness dimension. Also called edge rolling.

**Embossing** - A process for producing raised or sunken designs in sheet material by means of male and female dies, theoretically with no change in metal thickness. Heavy embossing and coining are similar operations.

**Extruding** - (1) The turning up or drawing out of a flange around a hole which has been punched in a previous operation. Also called hole flanging. (2) The punching and flanging of a hole in one operation generating a slug. (3) The cutting or tearing (piercing) and flanging of a hole in one operation without generating a slug. Also called spearing or spear punching.

**Finite Element Analysis (FEA)** - A method of analysis developed for prediction, practical forming of the instantaneous velocities, strain rates, strains, stresses and temperatures within the deforming metal.

**Flange** - Formed projection or rim of a part generally used for stiffness or assembly.

**Forging** - A metal forming process which a billet with carefully controlled volume is deformed (hot or cold) by a punch in order to fill a die cavity.

**Forming** - Operation converting a flat sheet metal workpiece into a three dimensional part.

**Gage** - The thickness of sheet or the diameter of wire.

**Gauge** - (1) Instrument for measuring, testing, or registering. (2) Numeric scale for metal thickness.

**Grain Direction** - Orientation of a surface finish generated by abrasive method.

**Hydraulic press** - A press in which fluid pressure is used to actuate and control the ram.

**Insert** - A separate steel which is mounted upon or into another section to aid in ease of repair or to extend wearability. May be of similar or dissimilar metal than parent metal.

**Lead Time** - Time required to manufacture a product from order placement until availability.

**Master Die** - Universal tool receptacle for holding changeable tool systems.

**Mechanical press** - A forging press with an inertia flywheel, a crank and clutch, or other mechanical device to operate the ram.

**Metal Thinning** - Thickness reduction during any forming operation.

**Multiple-slide press** - A press with individual slides, built into the main slide or connected to individual eccentrics on the main shaft that can be adjusted to vary the length of stroke and the timing.

**Normalizing** - A process of heating the steel above the critical temperature and cooling it freely in air. It is a special case of annealing. Normalizing does leave the metal in a uniform, unstressed condition but may not leave it machinable.

**Notching** - Operation in which the punch removes material from the edge or corner of a strip or blank

**Orange peel** - Texture of steel that appears like an orange, either from the steel mill or after forming.

**Perforating** - The punching of many holes, usually identical and arranged in a regular pattern, in a sheet, workplace blank, or previously formed part. The holes are usually round, but may be any shape. The operation is also called multiple punching.

**Piercing** - The general term for cutting (shearing or punching) openings, such as holes and slots, in sheet material, plate, or parts. This operation is similar to *blanking*; the difference is that the slug or piece produced by piercing is scrap, while the blank produced by blanking is the useful part.

**Press** - A machine having a stationary bed or anvil and a slide (ram or hammer) which has a controlled reciprocating motion toward and away from the bed surface and at right angle to it. The slide is guided in the frame of the machine to give a definite path of motion.

**Press bed** - The stationary and usually horizontal part of a press that serves as a table to which a bolster plate or lower die assembly is mounted.

**Press brake** - An open-frame single-action press used to bend, blank, corrugate, curl, notch, perforate, pierce, or punch sheet metal or plate.

**Press capacity** - The rated force a press is designed to exert at a predetermined distance above the bottom of the stroke of the slide.

**Press forming** - Any sheet metal forming operation performed with tooling by means of a mechanical or hydraulic press.

**Progressive Die** - A die with two or more stations arranged in line for performing two or more operations on a part one operation usually being performed at each station.

**Progressive Tool** - Die using multiple stations or operations to produce a variety of options. Can incorporate piercing, forming, extruding and drawing, and is usually applied to high quantity production runs.

**Prototype** - First part of a design which is made to test tolerance capability, tooling concepts and manufacturability.

**Punch** - (1) The male part of a die-as distinguished from the female part, which is called the die. The punch is usually the upper member of the complete die assembly and is mounted on the *slide* or in a *die set* for alignment (except in the inverted die). (2) The act of piercing or punching a hole.

**Punch Press** - Machine supplying compression force for reshaping materials.

**Punch Side** - Opposite side from burr side for pierced features; side on which the punch enters the material.

**Quick Change Inserts** - Tool sections or parts which may be changed without removing the entire tool from the press.

**Reduction** -(1) In cupping and deep drawing, a measure of the percentage of decrease from blank diameter to cup diameter, or of the diameter reduction in redrawing. (2) In forging, extrusion, rolling, and drawing, either the ratio of the original to the final cross-sectional area or the percentage of decrease in cross-sectional area.

**Restriking** - The striking of a trimmed but slightly misaligned or otherwise faulty forging with one or more blows to improve alignment, improve surface condition, maintain close tolerances, increase hardness, or effect other improvements.

**Reverse drawing** - Redrawing of a sheet metal part in a direction opposite to that of the original drawing.

**Scrap** - Leftover, unused material relegated to recycling.

**Screw press** - A high-speed press in which the ram is activated by a large screw assembly powered by a drive mechanism.

**Shearing** - Cutting force applied perpendicular to material causing the material to yield and break.

**Sheet forming** - The deformation of a piece of sheet metal by tensile loads into a three-dimensional shape, often without significant changes in sheet thickness or surface characteristics.

**Shut Height** - Clearance in a press between ram and bed with ram down and adjustment up.

**Stamp** - (1) The general term to denote all press workings. (2) To impress lettering or designs by pressure into the surface of a material.

**Stress cracking** - The fracturing of parts which have retained residual stresses from cold forming, heat treating, or rapid cooling.

**Stroke** - RAM travel from top dead center (TDC) to bottom dead center (BDC). The vertical movement of a ram during half of the cycle, from the full open to the full closed position or vice versa.

**Tapping** - Operation to create internal threads by either cutting or forming.

**Tensile strength** - Tensile strength is the ratio of maximum load to original cross-sectional area. Also known as ultimate strength. Compare with *yield strength*.

**Tolerance** - Permissible variation from a specification for any characteristic of the product.

**Transfer Die** - (1) A die in which parts are blanked before or at the beginning of the operations and a mechanical transfer device which is part of the die moves the work pieces from station to station. This type is run in a conventional press. (2) A succession of small or sub dies all mounted in one transfer press to make a part with the parts being moved from one die to another with a mechanical transfer device which is part of the press.

**Transfer press** - A press having an integral mechanism for transfer and control of the workpiece.

**Wear plates** - Plates made of hardened tool, steel, or bronze. Used where dies receive the greatest wear to enable resurfacing and shimming of the plates to renew wear surfaces. Normally they are used in pairs, one steel and the mating one bronze

**V Die** - Tool used in conjunction with a V punch.

**V Punch** - Vee shaped tool used for angle forming.

**Vibratory Finishing** - Burr removal process in which an appropriate number of parts, depending on part size and abrasive material, is accelerated and decelerated by mechanical means inside of a drum-like enclosure.

**Yield strength** - The stress at which a material exhibits a specified deviation from proportionality of stress and strain. An offset of 0.2% is used for many metals. Compare with *tensile strength*.