Sheet metal drawing pdf

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Section 1 Design precision Design precision can be critical for many sheet metal fabricated parts. The difference of a very small margin can result in something that fails, can't be assembled, or simply doesn't meet your expectations. In another article of the Sheet Metal Fabrication Guide, we discuss the importance of tolerances for both laser cutting and bending. A simple error in something like the size or spacing of a hole can have a big impact on the manufacturability of a part. Please review this article (link above) with your design team so you're confident you've met all the tolerance requirements before you send your drawings to your sheet metal fabricator Section 2 Design for manufacturability Not all sheet metal custom fabricators have design capacity, so getting the design, tolerances, and dimensions correct before you send drawings will save you a lot of headache. In general, the more information you can include in your drawing the better and taking a "design for manufacturability" approach is always recommended. Designing for manufacturability (DFM) means that parts are engineered in a way that makes manufacturing easy and cost effective without reducing the product performance. Designing to make the process as efficient as possible will save time and money. Section 3 General tips for your design process: Get to understand the actual processes in the shop if possible. It helps to see first-hand how things are cut, bent, and assembled If your fabrication involves assembly, keep the entire manufacturing process in mind when designing individual parts. Designing parts that are difficult to assemble can cost you in both time and budget. Keep the number of parts to a minimum. If its possible to combine two parts that are manufactured of the same material, it is generally more cost effective to do so. Simplifying the features of your part will reduce the time of production and likely your costs. Know your fabricators capabilities and design around what they can do. This includes equipment, finishing, assembly, fastening, and the availability of standard dies. Confirm the drawing formats with your fabricator to be sure they have no difficulty reading or interpreting your design. Order and track sheet metal components online through Komaspec's on-demand sheet metal fabrication platform. Visit KOMACUT.COM Section 4 What your drawings should include Always ask your fabricator for their requirements for the drawings before you send them. However, in general, you should include the 3D drawings and the 2D drawings with the following information: A fully dimensioned drawing including dimensions for formed bends, countersinks, holes, flanges Aim for three views of the part – front, top, and sides, or more if necessary A title block with your company name, part number, part description, scale, tolerances, units, etc Material type Material thickness Grain direction if using stainless steel Finish details including things like brand and number for powder coating etc Key or critical specifications and tolerances Indicate revisions changes/details from previous versions Hardware specifications and torque/loctite requirements for assembly Assembly print if multiple parts are being manufactured and assembled with Weld locations, type and length In case of discrepancies between the 2D and 3D designs, the 2D will prevail. This being said, good design practices should be followed so that the 3D dimensions match the 2D design. Our team of engineers and technicians here at Komaspec have more than 15-years' experience in sheet metal fabrication in China and are glad to review your product design together, and provide detailed design for manufacturability feedback and analysis to help you improve functionality and reduce manufacturing and tooling costs. We are glad to review your product design together and help you select the fabrication process that best suits your product's needs. Request a quote Six Types of Plastic Used for Packaging Uses of Crude Oil Products Factory Cleaning Checklist Types of Manufacturing Industries Types of Metal Melting Furnaces List of Sawmills in Louisiana Problems in the Textile Industry How to Sell Scrap Metal The Different Types of Wood and... Types of Industrial Buildings Herman Miller Cubicle Installation... How to Start a Honey Business The Average Cost of Manual Labor How to Start a Tire Recycling Business Differences Between Product & Process... US Based Companies That Manufacture... Who Owns LG Products? What Equipment Is Needed for a... How to Reduce CFC Emissions • Learn how to create sheet metal drawings • Learn about sheet metal gauges • Understand sheet metal terminology This chapter explains how to create sheet metal drawings. Gauges for sheet metal are presented along with bend radii, flanges, tabs, reliefs, and flat patterns. Sheet Metal Drawings Figure 13-1 shows a 3D solid model of a sheet metal part and a dimensioned orthographic drawing of that part. The orthographic drawing was created from the 3D model. The following sections explain how to create the 3D sheet metal drawing. Figure 13-1 EXERCISE 13-1 Creating a 3D Sheet Metal ... When light strikes a metallic object, it can reflect back onto any nearby object in an unusual way. Normally, light hitting a primary and secondary object gives varying degrees of light, shadow and cast shadows, but reflective light also happens under these circumstances – and I'll show you how to draw (opens in new tab) this in your artwork.To demonstrate the drawing techniques to make this work, I have produced the images above, working with a dark charcoal pencil (opens in new tab) and an eraser (for more on charcoals, see our guide to charcoal drawing).01. Place your objects in lightPosition your objects to make the most of the highly lit and shadowed areas Select interesting objects – such as this highly polished metallic teapot and a ceramic vase – and place them with light catching one side so you can carefully observe the highly lit and shadowed areas. Then draw basic shapes with a charcoal pencil, trying to represent these reasonably accurately, although adjustments can be made later.02. Get shadingShading the metallic object is where the fun starts Shade the object in direct light first – here the ceramic pot to the left – observing the deeper and lighter values. Then move on to shade the object in its shadow – here the metallic object. It was important to really concentrate on the depth of the cast shadow from the ceramic pot as it struck the left side of the metallic one, here. The deepening of the shadow to the right of the metallic pot follows conventional rules of light and shadow.03. Add some shadowsAdd ground shadows to bring your objects down to Earth The objects appear to be almost floating in space at this stage, so need grounding. Shade the shadows cast by the objects as they fall to the right across the table top, thus sitting the objects on a solid base.Use an eraser to highlight areas where light is reflected off the metallic object Using a charcoal eraser (opens in new tab), rub out sections of reflections and – here we rubbed out from the already shaded right side of the vase, where the light was reflected back from the teapot. You can see how this is of secondary importance compared to the other highlighted area. Finally, blend some areas using your finger to soften the transition of tonal variances on the vase for effect.This article was originally published in issue 13 of Paint & Draw, the magazine offering tips and inspiration for artists everywhere. Buy issue 13 here (opens in new tab).Related articles: Thank you for reading 5 articles this month* Join now for unlimited accessEnjoy your first month for just £1 / $1 / €1 *Read 5 free articles per month without a subscription Join now for unlimited accessTry first month for just £1 / $1 / €1 Use of tensile forces to elongate a workpiece This article has multiple issues. Please help improve it or discuss these issues on the talk page. (Learn how and when to remove these template messages) This article may require copy editing for grammar, style, cohesion, tone, or spelling. You can assist by editing it. (March 2022) (Learn how and when to remove this template message) This article provides insufficient context for those unfamiliar with the subject. Please help improve the article by providing more context for the reader. (March 2022) (Learn how and when to remove this template message) This article needs additional citations for verification. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed.Find sources: "Drawing" manufacturing – news · newspapers · books · scholar · JSTOR (March 2022) (Learn how and when to remove this template message) (Learn how and when to remove this template message) Bar drawing (diagram); the work piece is pulled from left (tension) rather than pushed from the right (compression). Drawing is a metalworking process that uses tensile forces to stretch (elongate) metal, glass, or plastic. As the metal is drawn (pulled), it stretches to become thinner, to achieve a desired shape and thickness. Drawing is classified into two types: sheet metal drawing and wire, bar, and tube drawing. Sheet metal drawing is defined as a plastic deformation over a curved axis. For wire, bar, and tube drawing, the starting stock is drawn through a die to reduce its diameter and increase its length. Drawing is usually performed at room temperature, thus classified as a cold working process; however, drawing may also be performed at elevated temperatures to hot work large wires, rods or hollow sections in order to reduce forces.[1][2] Drawing differs from rolling in that the pressure of drawing is not transmitted through the turning action of the mill but instead depends on force applied locally near the area of compression. This means the amount of possible drawing force is limited by the tensile strength of the material, a fact that is particularly evident when drawing thin wires.[3] The starting point of cold drawing is hot-rolled stock of a suitable size. Metal The success of forming is in relation to two things, the flow and stretch of material. As a die forms a shape from a flat sheet of metal, there is a need for the material to move into the shape of the die. The flow of material is controlled through pressure applied to the blank and lubrication applied to the die or the blank. If the form moves too easily, wrinkles will occur in the part. To correct this, more pressure or less lubrication is applied to the blank to limit the flow of material and cause the material to stretch or set thin. If too much pressure is applied, the part will become too thin and break. Drawing metal requires finding the correct balance between wrinkles and breaking to achieve a successful part. Sheet metal drawing becomes deep drawing when the workpiece is drawing longer than its diameter. It is common that the workpiece is also processed using other forming processes, such as piercing, ironing, necking, rolling, and beading. In shallow drawing, the depth of drawing is less than the smallest dimension of the hole. Bar, tube, and wire drawing all work upon the same principle: the starting stock drawn through a die to reduce the diameter and increase the length. Usually the die is mounted on a draw bench. The end of the workpiece is reduced or pointed to get the end through the die. The end is then placed in grips and the rest of the workpiece is pulled through the die.[1] Steels, copper alloys, and aluminium alloys are common materials that are drawn.[4] Drawing can also be used to cold-form a shaped cross-section. Cold drawn cross-sections are more precise and have a better surface finish than hot extruded parts. Inexpensive materials can be used instead of expensive alloys for strength requirements, due to work hardening.[5] Bars or rods that are drawn cannot be coiled therefore straight-pull draw benches are used. Chain drives are used to draw workpieces up to 30 m (98 ft). Hydraulic cylinders are used for shorter length workpieces.[1] The reduction in area is usually restricted to between 20 and 50%, because greater reductions would exceed the tensile strength of the material, depending on its ductility. To achieve a certain size or shape multiple passes through progressively smaller dies or intermediate anneals may be required.[6] Tube drawing is very similar to bar drawing, except the beginning stock is a tube. It is used to decrease the diameter, improve surface finish and improve dimensional accuracy. A mandrel may or may not be used depending on the specific process used. A floating plug may also be inserted into the inside diameter of the tube to control the wall thickness. Wire drawing has long been used to produce flexible metal wire by drawing the material through a series of dies of decreasing size. These dies are manufactured from a number of materials, the most common being tungsten carbide and diamond. The cold drawing process for steel bars and wire is as follows: Tube lubrication: The surface of the bar or tube is coated with a drawing lubricant such as phosphate or oil to aid cold drawing. Push Pointing: Several inches of the lead ends of the bar or tube are reduced in size by swagging or extruding so that it can pass freely through the drawing die. Note: This is done because the die opening is always smaller than the original bar or coil section size. Cold Drawing, Process Drawing: In this process, the material being drawn is at room temperature (i.e. Cold-Drawn). The pointed/reduced end of the bar or coil, which is smaller than the die opening, is passed through the die where it enters a gripping device of the drawing machine. The drawing machine pulls or draws the remaining unreduced section of the bar or coil through the die. The die reduces the cross section of the original bar or coil, shapes the profile of the product and increases the length of the original product. Finished Product: The drawn product, which is referred to as Cold Drawn or Cold Finished, exhibits a bright and/or polished finish, increased mechanical properties, improved machining characteristics and precise and uniform dimensional tolerances. Multi-Pass Drawing: The cold drawing of complex shapes/profiles may require that each bar/coil be drawn several times in order to produce the desired shape and tolerances. This process is called multi-pass drawing and involves drawing through smaller and smaller die openings. Material is generally annealed between each drawing pass to remove cold work and to increase ductility. Annealing: This is a thermal treatment generally used to soften the material being drawn, to modify the microstructure, the mechanical properties and the machining characteristics of the steel and/or to remove internal stresses in the product. Depending on the desired characteristics of the finished product, annealing may be used before, during (between passes) or after the cold drawing operation, depending on material requirements. Glass Similar drawing processes are applied in glassblowing and in making glass and plastic optical fiber. Plastics Plastic drawing, sometimes referred to as cold drawing, is the same process as used on metal bars, applied to plastics.[7] Plastic drawing is primarily used in manufacturing plastic fibers. The process was discovered by Julian W. Hill in 1930 while trying to make fibers from an early polyester.[8] It is performed after the material has been "spun" into filaments; by extruding the polymer melt through pores of a spinneret. During this process, the individual polymer chains tend to somewhat align because of viscous flow. These filaments still have an amorphous structure, so they are drawn to align the fibers further, thus increasing crystallinity, tensile strength, and stiffness. This is done on a draw twister machine.[8][9] For nylon, the fiber is stretched to four times its spun length. The crystals formed during drawing are held together by hydrogen bonds between the amide hydrogens of one chain and the carbonyl oxygens of another chain.[9] Polyethylene terephthalate (PET) sheet is drawn in two dimensions to make BoPET (biaxially-oriented polyethylene terephthalate) with improved mechanical properties. See also Extrusion References ^ a b c Degarmo, p. 432. ^ Kalpakjian, pp. 415–419. ^ Ganoksin Project. "Rolling and Drawing". Archived from the original on 2014-08-08. ^ Degarmo, p. 434. ^ Degarmo, pp. 433–434. ^ Degarmo, p. 433. ^ Degarmo, p. 461. ^ a b Spinning the Elements – Cold Drawing, Chemical Heritage Foundation, archived from the original on 2001-05-04, retrieved 2008-11-13 ^ a b Menzer, Valerie, Nylon 66, archived from the original on 2005-06-13, retrieved 2008-11-13. Further reading Degarmo, E. Paul; Black, J T.; Kohser, Ronald A. 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