SHEARING AND ITS IMPORTANCE IN DRAWINGS

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Abstract: This article covers the basic types of cuts used in graphic representation to accurately reflect the internal structure of objects, their application rules, and principles of performance in accordance with standards. The importance of cuts in drawing, hatching requirements, and methods for determining cutting planes are also briefly described.

Keywords: cut, section, drawing, hatching, cutting plane, technical drawing, engineering graphics, geometric shape, internal structure, simple cut, complex cut, stepped cut, local cut, half cut, projection, dimension marks, symmetry, GOST standard, ISO standard, drawing, construction elements, graphic designation, material code, technical analysis, contour drawing

A complete understanding of the internal structure of a particular object or part is essential for any engineer, technician, or graphic designer. It is almost impossible to get a complete picture of the shape, size, or operating principle of a complex part from external contours alone. That is why the concepts of sections and cross-sections are central to engineering graphics and technical drawing. Sections clearly and clearly show the internal structure of the object, cavities, holes, channels, and other structural elements.

This method of graphical representation significantly simplifies the processes of designing, manufacturing, controlling and technical thinking of details. Through sections, engineers understand complex shapes, analyze structures and easily read drawings. Therefore, sections are an indispensable tool not only in technical drawing, but also in practical engineering and design work.

This article discusses the concept of clipping, its types, rules of application and the methodology for displaying it in a drawing on a scientific basis. It also discusses the differences between clipping and sectioning, standards for hatching and defining the cutting plane. The article provides students and specialists with practical recommendations on the correct use of clippings, improving drawing literacy and developing technical thinking.

1. The concept and importance of cutting

The concept of sectioning is used to clearly show the internal structure of an object or part based on graphic representation. Sectioning is the process of cutting a part along a plane and showing the surface formed on the plane, as well as the hole lines, edges, ribs and other structural elements visible behind the plane. Sectioning makes drawings understandable and facilitates the processes of manufacturing, controlling and designing parts.

Depending on the number of cutting planes, cuts are divided into simple and complex cuts.

2. Simple haircut

A simple cut is a cut that is created with only one cutting plane in the drawing. There are several types of simple cuts, depending on the ratio of the cutting plane to the projection plane:

✓ Horizontal clipping - the clipping plane is parallel to the horizontal projection plane. This type of clipping is used to show the top or bottom of an object.

✓ Frontal clipping - the clipping plane is parallel to the plane of the frontal projections. This method allows you to accurately depict the front of the object.

✓ Profile cut - the cutting plane is taken parallel to the plane of the profile projections and is used to show the side edges and internal details of the object.

✓ Bevel cut - the cutting plane is located at a certain angle to one of the projection planes, convenient for objects with complex shapes.

✓ Half-cut - In symmetrical shapes, it is not necessary to show the cut completely. In this case, it is depicted together with the half-cut of the view in one projection, separated by a symmetry axis.

✓ Local clipping - used to show only a significant or small part of an object. If the edge is symmetrical and the clipping intersects the symmetry axis, the visible part is separated from the clipping part by a solid line.

✓ Complex haircut

A compound cut is a cut formed by two or more cutting planes. Compound cuts, in turn, are:

Stepped shear - occurs when the cutting planes are parallel to each other.

Broken shear - occurs when cutting planes intersect and form an angle.

Complex sections serve to show the internal parts of complex parts in a uniform, clear, and understandable way. At the same time, they have important practical value in structural analysis and manufacturing.

4. Rules for using shears

Observing the important rules for the correct use of cuts in a graphic drawing is necessary for any engineer or designer. A cut allows you to clearly show the internal structure of the part on the drawing, therefore its execution is strictly regulated by national and international standards. According to the requirements of the ISO 128 standard and the corresponding national regulations, when a cut is shown on a drawing, first of all, its cutting plane is indicated by a separate line. This line is usually a denser, thicker line, ending with an arrow. The arrow indicates the direction in which the cutting plane flows, that is, which side should be cut. Each cutting plane is named with a letter, for example, A-A or B-B, and the corresponding view of the cut is drawn using this name.

The cut surfaces resulting from shearing are marked with hatching. Hatching is a clear and visual way to show the surface of the cut material. Hatching lines are usually drawn straight, thin, and parallel. They are often placed at an angle of 45°, as this angle is considered the most convenient and understandable when reading drawings. If the 45° angle is almost parallel to the contour of the part or other lines, it is recommended to slightly rotate the lines and draw them at an angle of 30° or 60°. This way, the shear reading will be clear and without confusion.

If the drawing consists of several parts, the cut surface of each part should be distinguished from the others by the direction or angle of the hatching. This helps to visually separate each part and clearly distinguish each detail in the drawing. If the hatching lines are drawn in very narrow areas, the drawing may look confusing, so the minimum spacing specified in the standards, for example, not less than 1 millimeter, should be maintained.

In a section drawing, hidden lines behind the plane are often not shown. That is, the drawing shows only the internal view formed by the section. This makes the drawings easier to

read and simplifies the understanding of complex details. In some cases, thin elements such as very narrow walls, ribs, shafts, screws, hammers, and dowels are not indicated by hatching. This is because hatching can make them appear thick, giving the wrong impression in the drawing or distorting the original size.

If dimensions, symbols, or inscriptions are placed in the cut-out area, the hatching lines are broken at those points, leaving space for the inscriptions. This way, the drawing is clear to read and each element is easy to understand.

It is important not to confuse the concepts of shear and section. A cutting plane indicates where the part should be cut, while a section reflects the internal structure and surface of the material formed as a result of this cut. It is always necessary to follow the drawing standard and marking rules, as these rules allow for a correct understanding of the design, its production and control processes.

When cuts are made in a drawing based on these rules, the internal structure of complex objects becomes clear, and the drawing becomes understandable and scientifically perfect.

Shears are the main tool for clearly showing the internal structure of objects in engineering graphics and technical drawings. They are used to fully depict the holes, edges, ribs and other structural elements of the part. Shears are divided into simple and complex types: simple shears are formed by a single cutting plane, while complex shears are made using two or more cutting planes. There are also additional types such as local shears, half shears, stepped and broken shears.

The correct use of cuts makes drawings easier to read, helps to understand the design, and simplifies the production and inspection processes. Compliance with standards and marking rules is an important condition for creating accurate and perfect drawings using cuts. At the same time, the correct use of hatching, cutting plane markings, and dimensions allows you to accurately reflect every detail in the drawing.

In general, the concept of shear and its application are important not only in technical drawing, but also in engineering thinking and the design process.

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