

Methods of Converting a Complete Drawing, Application in the Image of Objects

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Abstract: Currently, it is impossible to imagine the work and development of any branch of the national economy, as well as science and technology without drawings. Drawings (projects) are first developed for newly created devices, machines and structures. According to the drawings, their advantages and disadvantages are determined, and changes are made to their design. Only after discussing the drawings (projects) are prototypes made. The engineer must be able to read the drawing in order to understand both the design and operation of the depicted product, as well as to present his technical thoughts using the drawing.

Keywords: tasks, engineer, technical, specialist, science, drawing, projects, construction.

In the light of the tasks imposed on engineering and technical workers, the level and quality of training of specialists in higher educational institutions is becoming increasingly important. Currently, it is impossible to imagine the work and development of any branch of the national economy, as well as science and technology without drawings. Drawings (projects) are first developed for newly created devices, machines and structures. According to the drawings, their advantages and disadvantages are determined, and changes are made to their design. Only after discussing the drawings (projects) are prototypes made. The engineer must be able to read the drawing in order to understand both the design and operation of the depicted product, as well as to present his technical thoughts using the drawing.

The number of academic disciplines that form the basis for the training of specialists with higher education includes the course "Engineering Graphics". This course prepares students to perform and read drawings, both in the learning process and in subsequent engineering activities. Knowledge of engineering graphics allows an engineer to execute and read drawings in the same way that knowledge of the alphabet and grammar allows a person to read and write.

Engineering graphics is an academic discipline that studies the issues of product images on a plane.

The main objectives of the course "Engineering Graphics":

- 1) to teach how to perform simple drawings, i.e. to depict simple products in a complex drawing and in axonometric projections;
- 2) teach to read drawings, instill skills of mental representation of shapes and sizes of products based on their images in the drawing;
- 3) consider graphical ways of solving individual problems related to geometric images and their mutual location in space;
- 4) to familiarize with the basic requirements of the standards for drawings and diagrams;
- 5) develop the skills of drawing techniques.

Studying engineering graphics also develops spatial representation and logical thinking. The proof of many theoretical propositions of engineering graphics is carried out through logical reasoning. The study of engineering graphics requires not only knowledge of theoretical material, but also the ability to accurately and accurately execute drawings, high drawing techniques.

The knowledge and skills acquired in the study of engineering graphics are necessary and are developed in the study of other academic disciplines, as well as in subsequent engineering activities.

Ways to transform a complex drawing.

The method of complex projection is based on the fact that a point (object) is projected onto several mutually perpendicular projection planes using rectangular projection, and then these projection planes are combined with one plane.

When using two projection planes, the P1 plane is positioned horizontally and is called the horizontal plane of the surface. The plane P2 is positioned vertically in front of the observer and is called the frontal plane of the surface. The line of intersection of these projection planes is called the projection axis and is denoted by the letter X .

The point is projected simultaneously onto both projection planes. The projection of a point onto the second plane of projection P2 is the second, complementary element. If projecting rays are drawn from the projections A1 and A2, they will intersect at a single point as belonging to the same plane, which in turn is perpendicular to the planes of projection P1 and P2, as well as the X axis.

The A1 projection is called the horizontal projection of point A, and the A2 projection is called the frontal projection.

Two projection planes divide the entire space into 4 parts, which are called quadrants. The quadrants are numbered in the order indicated.

It is difficult to use a spatial system of mutually perpendicular projection planes for the image of objects, therefore it is reduced to a flat appearance. To do this, the horizontal plane of projections is rotated downwards around the X axis and combined with the frontal plane of projections P2, b). The result is a complex of two projections of point A on the same plane b). The resulting image is called a complex drawing.

A two-projection complex drawing is a drawing consisting of images of an object on two projection planes combined with the drawing plane.

In a complex drawing, the line A1 A2 connecting the projections of point A is called a communication line.

When making images of objects, in some cases it becomes necessary to introduce a third projection plane perpendicular to the two existing ones. This new projection plane is designated P3 and is called the profile projection plane.

The three projection planes extend the space into eight parts – octants, which are numbered in order.

In general, an object can be positioned in any octant.

To form a complex drawing, the horizontal plane of projections P1 rotates downward around the X axis, and the profile plane of projections P3 rotates to the right around the Z axis is combined with the frontal plane of projections P2. As a result of this combination, a three-projection complex drawing is formed, for example, points A, with axes X, Y, Z.

In general, a complex drawing can be obtained if, as a new projection plane, we take any plane perpendicular to one of the main projection planes, which means:

A complex drawing is an image on one plane of several interconnected rectangular projections of an object, obtained after a certain alignment of the projection planes with the drawing plane.

Projection axes in a complex drawing.

Considering the complex drawing, it can be noted that based on the properties of parallel projection, the parallel movement of the projection plane system does not change the shape of the projections of the object. Only the position of the projection axes changes in the drawing.

Projection axes are necessary in two cases: if a method of replacing projection planes is used; if geometric shapes are set by the coordinates of their points. In these cases, the axes are needed for measuring dimensions, i.e. they are not used in their original purpose, but as bases for measuring dimensions.

Ways to replace projection planes.

The essence of this method lies in the fact that the spatial positions of the specified elements remain unchanged, but the system of projection planes changes, on which new images of geometric images are built. Additional projection planes are introduced in such a way that the elements of interest to us are depicted on them in a position convenient for a specific task.

Let's consider the solution of four initial problems by replacing the projection planes.

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