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PROJECTION AND AXONOMETRY

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Annotation
Article Projection, Creation of Central and Parallel Projections, View, Execution of Views, Orthogonal Projection, Representation of Machine Details, Model, Three Views of a Model, Representation of a Model, Additional and Local Views, exercises for convenient and easier understanding, analysis of drawings to reinforce what we know by repeating what we don't know, gives information about axonometric images and types. The peculiarity of the article is that it covers more than five topics and provides full information about them.

Keywords: Surface, view, central and parallel, projection, emergence, angle, prism, perpendicular, frontal, horizontal, profile, orthogonal, cylindrical disc, cylinder, rectangle, isometric, frontal dimetry.

Sometimes it is difficult to imagine details through two projections. The image of the visible side (surface) of a detail relative to the observer is called a view. and other information. Drawings are made by projection methods. Projection methods are divided into the following.

It is divided into central and parallel projection. In central projection, we assume that the center of projection is at one point. We can see that the resulting projections project larger or smaller than their own size. It depends on the condition of the screen (flatness).

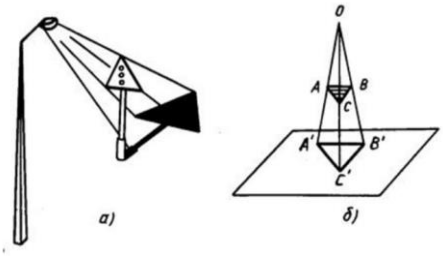

Figure 1

Right-angled parallel projection is also called orthogonal (Greek ortho-rect, gonal-angle, i.e., right angle) projection.

Parallel projection. In this case, the projecting rays are parallel to each other and are at a sharp and right angle to the projection plane. We can see in the 2nd drawing.

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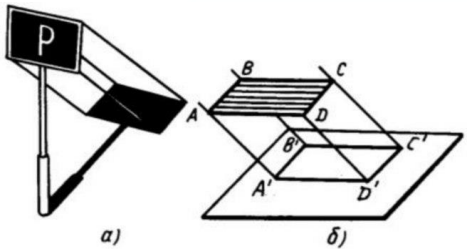

Figure 2

Right angle parallel projection.

From this, the projecting rays are perpendicular to the formation. and we assume that the projection center is infinitely distant. We see in the example of a-b in

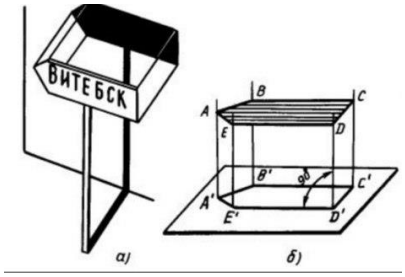

Figure 3.

In this case, the projecting rays are parallel to each other. Let's try to take a prism-shaped object and make a drawing of it. For this purpose, we take two mutually perpendicular formations and take their intersecting line as the axis of Ax. By placing the given detail (V, H) in the system, we find the right-angled projections of its formations. In this case, we call V - frontal projection, and H - horizontal projection. (picture 4)

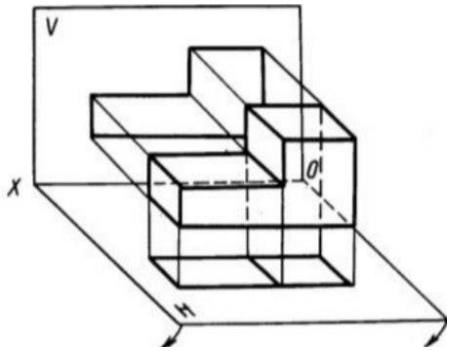

Figure 4

When we find the projections of the detail in the formation, we consider V - the frontal formation as fixed, and move the formation H downward around the X axis until it becomes one formation with the frontal formation. Then we conditionally push the boundaries of the occurrences, as a result, we get the view described in Figure 5.

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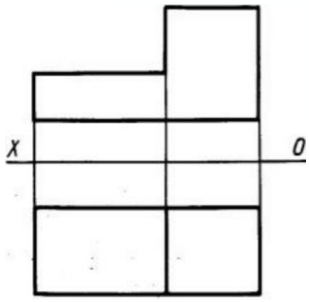

Figure 5.

From now on, when we draw the (projection) of the detail (item), we will do it in this simplified way. By the same method, now we place the detail in the system of mutually perpendicular (V, H, W) projections, and one of its projections, i.e., the intersecting line of the formation of profile projections in W and the formation of frontal projections O > and the formation of profile projections in horizontal projections Let's define the line intersected by O y axis. Now, using the above method, we will reduce all three occurrences to one occurrence. Now for that. We move the W profile in the counter-clockwise direction around the O > axis until it becomes one with the frontal formation. After that, it will look like this. (6 - drawing).

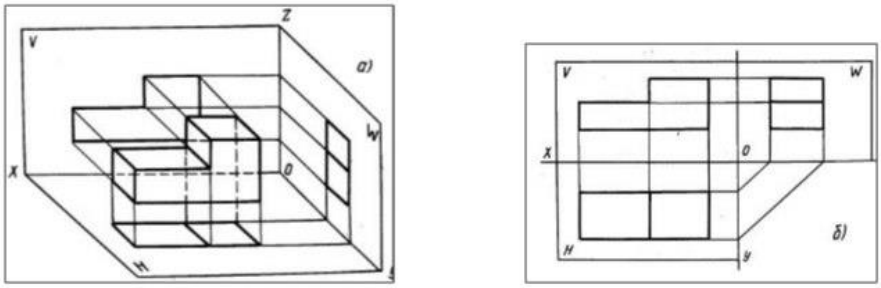

Figure 6

Such an axis of the moon is divided into two, half of it goes with the formation of the profile and the other half with the formation of the horizontal.

Appearances and their execution. Sometimes it is also referred to as the views of the projections in the drawings. In order to fully express the shape of the drawing detail, we use different images (view, cut, section). First, let's get acquainted with the appearance of the detail.

The view is placed on the drawing in accordance with GOST 2-305-68. We assume that the appearance of the detail is between the observer and the image being created. The object placed inside the cube is projected at right angles to its sides. (7 – drawing a).

According to the standard, these six projections of the detail are called views. The images formed on the 6 sides of the cube are called the main view. They form views of things in front of, above, from the left, from the right, from there and from below. Of these, the preview is called the first view of the thing. The main view is chosen as the most characteristic view of the thing, that is, the view that gives more information about it. Then the sides of the cube are spread out into a single formation. Place it as shown in (Figure 7 b).

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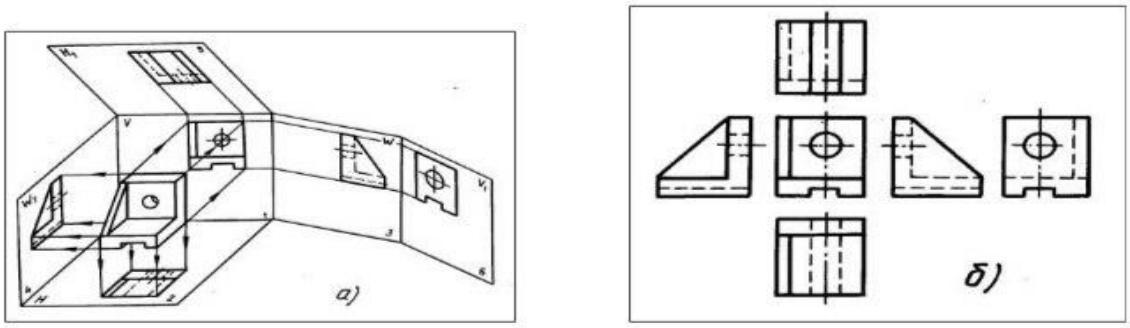

Figure 7

If views are changed for the purpose of rational placement on paper, they will be given an additional view. When drawing, we try to achieve as few views as possible. If it is not possible to depict a part of the object surface without reduction in any of the 6 views, then the view is performed on a newly selected additional plane and it is called an additional view. ((Figure 8, view in a-direction) .

If the product is limited to the part on the surface. If so, its image may be limited by a wavy line. Such additional views are called local views. In order to reduce the number of views in the drawing, local views are implemented to show a part separately.

Additional and local views can also be rotated. We show a symbol that means turned over such a view. If the additional view is in direct projection connection with the detail part, it is displayed without an additional arrow. (We can see this in

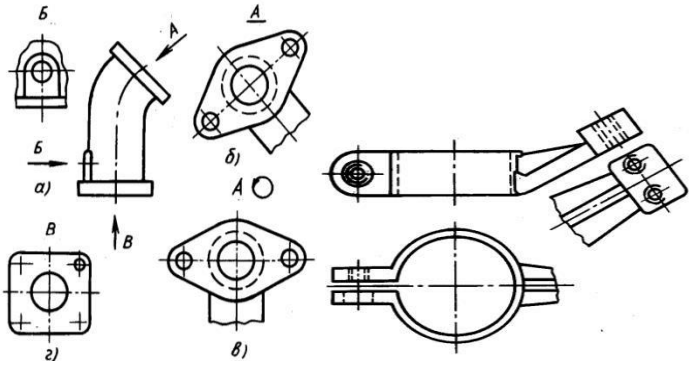

Figure 8

Figure 9

Appearances. Orthogonal projection.

Three-dimensional machine parts can be represented by two or more (depending on the shape of the part) views. As discussed in the section Projecting Bodies, the projection of bodies can be rendered in a variety of ways. Machine details are created by adding or subtracting simple objects as shown in Figure 10. Cut off part: hole, recess, etc. and their orthogonal projections are depicted in Figure 11. Therefore, the projections of machine details are projections of simple objects demakdir, buni keyingi bo‘limda tushuntiriladi.

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Figure 12 shows a typical machine detail, which consists of the following bodies:
(1) a cylindrical disc, (2) a semicircular and quadrangular body, (3) a prism with a hole consisting of a semicircular and quadrangular body, and a right-angled triangular prism. It is placed parallel to the plane of the main projections of the machine part. So, their projections are: front view, top view and side view.

N Element FV TV SV
1 Cylindrical disc Circle Rectangle Rectangle
2 Semi-cylinder and four semi-circles and four Rectangles Rectangles
an angular object is an angle
3 Triangular body Quadrilateral Quadrilateral triangle
4 Quadrilaterals Rectangle Rectangle Rectangle
5 Cylindrical hole circle Rectangle Rectangle

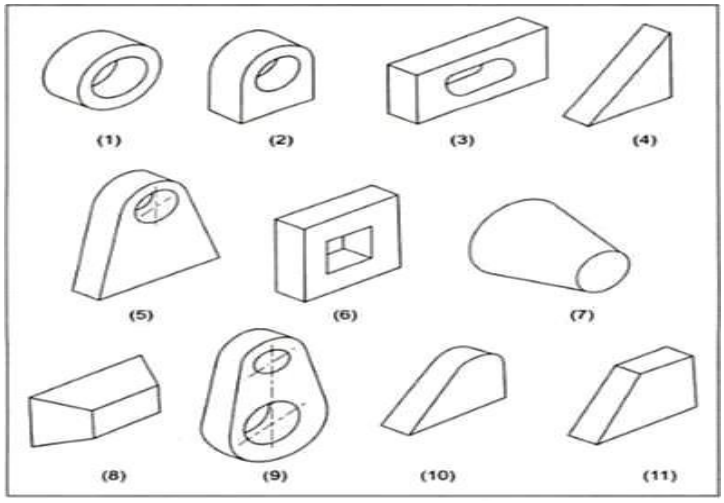

Figure 10. Shapes of simple bodies

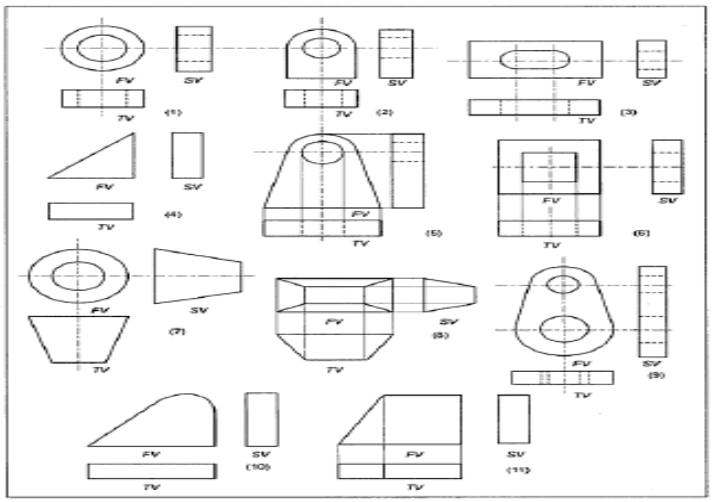

Figure11.Orthogonal projections of simple bodies.

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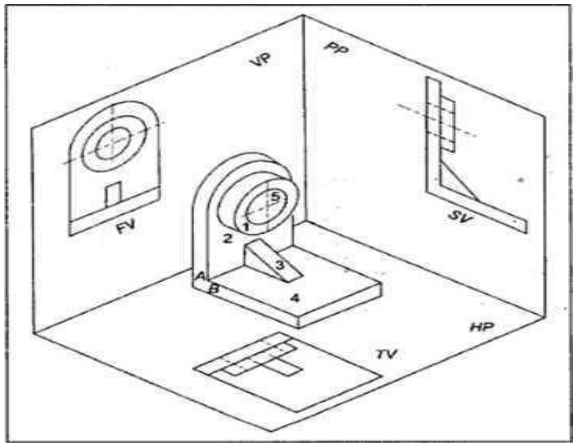

Figure 12

Views are orthogonal projections

Figure 13 shows the orthogonal projections of the machine detail in three views. These views can be seen as sums of five elementary geometric bodies.

In front view, all contours of objects remain visible for each shape in visible projection. In the top view, the projection of the triangular body (3) is visible outside the projection of the cylindrical disk (1). The part of the right angle (3) located under the object (1) is not visible, so it is marked with dashed lines. In the top and side views of the projection of such a hole is not visible, so it is marked with dashed lines. Over the projection of such a hole and not visible in side views.

It can be said that this car part is a complete product. So, when viewed from the side, the rectangular prism B and the semi-cylinder A do not have a line.

The machine part is placed in the first quarter resulting from the intersection of two planes (Fig. 13), hence these projections are called the first corner projections shown in Fig. 13(a). In the drawings, the first corner projection is marked as shown in Fig. 13 (b).

In the first angle projection method, the top view is drawn below the front view, the left view is to the right, and the right view is to the left of the front view. The bottom view is placed on top of the front view.

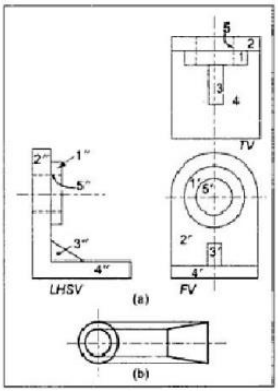

Figure 14

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Make three views of the model Make three and six views of the model according to the clear image. Additional and local views.

Three views of the model
Perform three views of the item on a clear image.
This section presents an example of how to make a three-view of an object based on a clear image (Figure 15), where the options are selected so that the invisible lines do not participate or do not participate when performing its front-over and left-side views in the drawings.

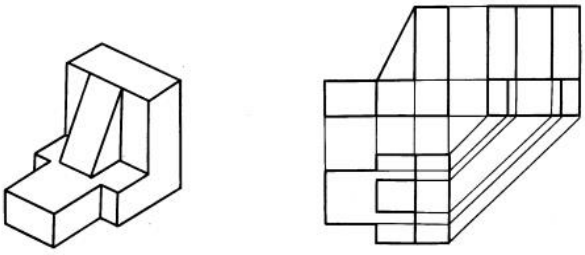
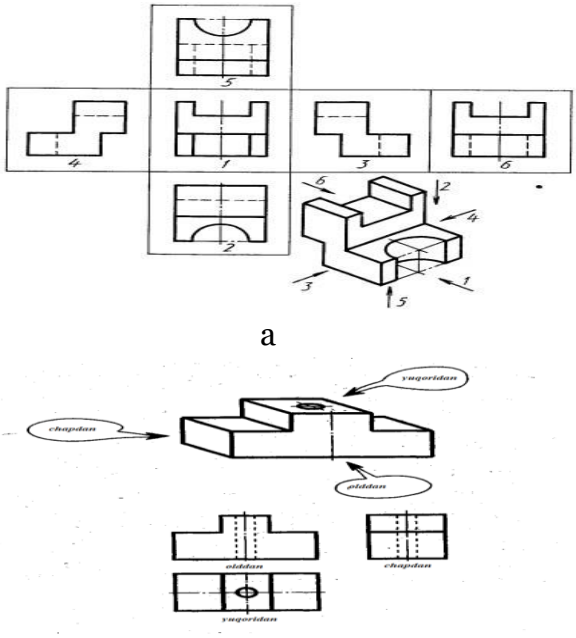


Figure 15

If the object in the visible image contains prismatic grooves, cylindrical holes located in different positions, their invisible contours are represented by dashed lines.
In performing this task, students must follow the rules of the "Appearances" topic.
Perform six views of the model according to the clear image.
Figure 16 shows directions for detailing its views. For example, direction 1 shows views from the head or front, direction 2 shows views from above, direction 3 shows views from the left.



a

Figure16

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When drawing the main views of the model based on its origin, the main (front) view is selected first. In addition to obtaining the most information about the model through this view, it is necessary to reveal the nature of its structure. The rest of the views are placed relative to the main view.
Exercise-1. Figure 17 is a flange drawing. Make a top and right view of this shape looking at the front view in the X direction.

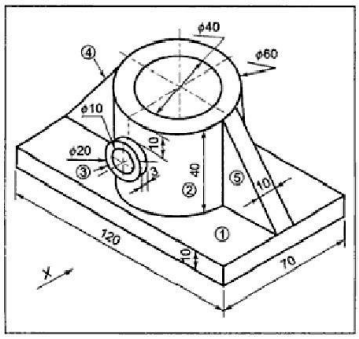

Figure 17

Solution: The object can be seen as a sum of 5 elements, which are: a rectangular body (1), a vertical cylinder (2), a small horizontal cylinder (3), and two equilateral triangular bodies (4) and (5). There are two cylindrical holes. If the depth of the hole is not given, it is assumed that the cutting tool did not pierce the part to the end, if the cutting tool goes beyond the part, the part is considered to be pierced. The cutting tool did not penetrate the material. So, a vertical hole of ⌀40mm pierced both a rectangular body and a vertical cylinder of ⌀60mm.

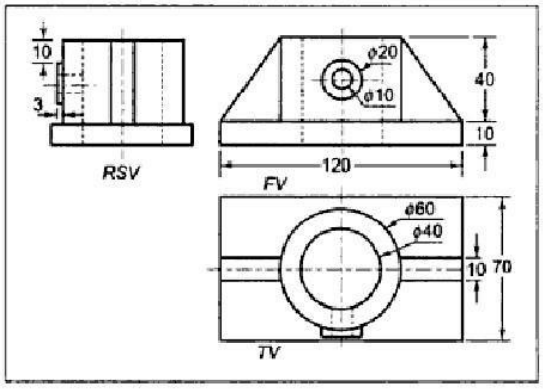

Figure 18

Figure 18 shows the solution to the problem, showing the sum projections of the 5 elements seen earlier and the hole projections.

To further strengthen our knowledge. We analyze the shape of the detail through its drawings.
When reading detailed drawings, it is very important to be able to divide them into geometric objects. In the drawing, we can see that the cover of the water conduit (water pipe) valve is drawn from a carving. How many and what geometric surfaces of this detail are composed of? In order to answer this question, we draw each geometric surface separately. The detail is formed from the sum of 6 geometric surfaces

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(actually there are more, but it is simplified in this drawing), and it is shown that only 3 different types of geometric bodies are used.

All objects in the detail are clearly visible to the eye, but we can see that they are drawn separately on one axis in Figure 19 b-drawing, assuming that they are more obvious..

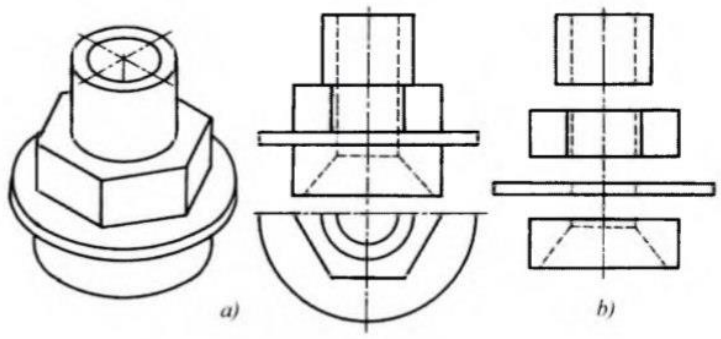
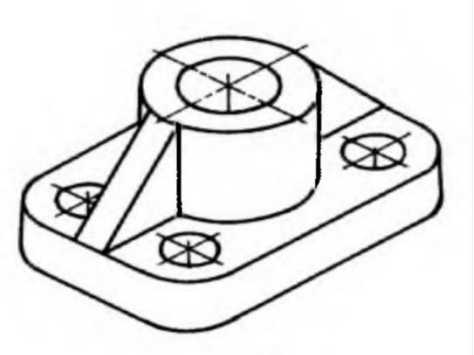


Figure 20

Let's define each detail according to the shape of its function. For example, due to the rotation of the wheel, we made the pipes cylindrical so that any liquid or gas can pass through the circular hole. The book is published in the form of a rectangle, so that it is easy to read and write. Now, let's briefly think about the technical details of the shape and why its parts are needed.

The detail described in the drawing is a cylinder with triangular walls on both sides. These walls serve to firmly hold the cylinder on the parallelepiped. Such walls in details are called "Strengthening rib" or "Rib" for short. The ribs in these parts are used to strengthen the walls of the rotating cylindrical hole. The corners of the parallelepiped on the base of the detail are also rounded. Hexagonal prisms on the details with rounded corners to make the details lighter and morbeautiful serves.



Axonometric images. In the practice of drawing, we use very simple and easy to draw axonometric images, which give the least changes to the shape of the object, which are best distinguished among many axonometric images. GOST 2.317-97 standard, we recommend using the following five axonometrics.

Rectangular isometric,

Right angle dimetry,

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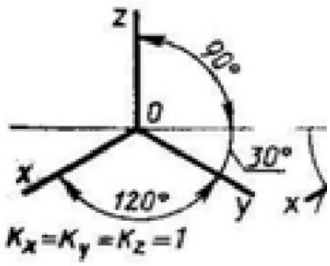
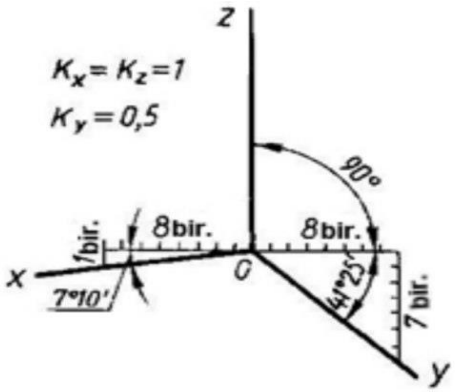
Oblique frontal isometry
Angled horizontal isometric,
Angled frontal dimetric.

In the rectangular isometric image, the three real coefficients on the axonometric axes have changed the same and it is equal to 0.82. According to GOST 2.317-69, we make the coefficient of changes equal to 1 on the axes from the execution of technical drawings in a rectangular isometric image. In this case, the image will be enlarged 1/0.82=1.22 times, but the size of the image will not affect the clarity. But due to the reduction of mathematical calculation, the time of rendering the image is reduced. That's right In the angular isometric representation, the angle between the axes is equal to 120*, we can see in drawing 21.



A rectangular dimetric image.

The change coefficients presented in the rectangular dimetric image are 1 on the X and Z axes and 0.5 on the Y axis. The angle between the X and Y axes is 97(0)10(1), and the Y axis is 41(0)25' can be seen in drawings 22.



Oblique frontal isometric view. In the oblique frontal isometric image, the angle between the X and Z axonometric axes is 90(0). We can see the formation of an angle @=45(0) with a straight line where the Y axis is perpendicular to the Z axis.

X angle can be 30(0) and 60(0). Let's describe flat shapes lying on the frontal image singularity with a real coefficient of variation on the X, H, Z axes, which is homogeneous and equal to 1, without changing.

A horizontal isometric view with oblique angles.

Axonometric axes in a horizontal isometric image with oblique angles

The angle between X and Z is 90(0) and is a straight line perpendicular to the Y and Z axes. @ angle can be equal to 45(0) or 60(0). The actual coefficient of variation is the same on all three axes and is

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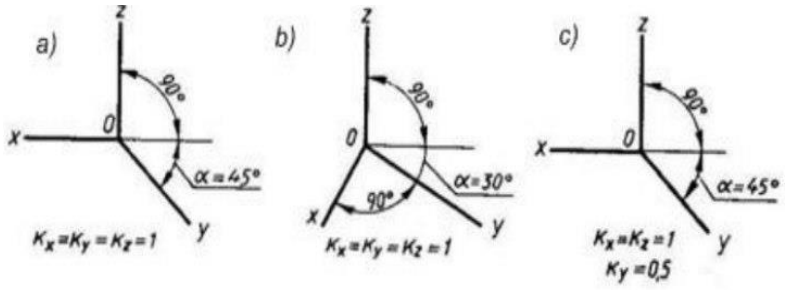
equal to 1. Let's depict the formed shapes lying on the horizontal image plane (even circles) without changing.

Oblique angle frontal dimetry image.

In the frontal dimetry image with an oblique angle, we place the axonometric axes in the same way as in the frontal isometric image. But the reduction coefficient on the Y axis is equal to 0.5, we can see it in the c-diagram. Let's describe the frontal image without changing the flat shapes lying on the plane. Let's describe the resulting shapes located on the horizontal and vertical image planes, reducing their size twice along the Y axis.



Basic concepts: cube layout, six views, "E" and "A" system, head view, horizontal view.

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