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SIMPLE AND COMPLEX IN THE APPLICATIONS FORMULATION OF DESCRIPTIVE GEOMETRY

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Abstract
In descriptive geometry teaching, mean of thought training and plane representation of the space, the theoretical base of the technical design, there are some specific aspects which, because a short time of the educational plans of the students, in different ways may affect the training of the future engineers
This paper gives the possibility to process the spatial forms, the intersection of the geometric forms, with the methods of the descriptive geometry, using the drawing software. As a discipline technique, the descriptive geometry put at our disposal the methods necessary to the representations, sections and intersections of the simple areas in particular positions.
Far from exhausting both the applications of descriptive geometry and the variations to solve the presented examples, the paper warns the students' training opportunities, stimulating their thinking geometric space. The teacher is offered the opportunity to appeal to forms of wording to ensure maximum efficiency.
Some applications can be solved by fixing the knowledge that works, others may be required as individual study subjects. It is obvious the major influence on the knowledge of the descriptive geometry by students through the careful coordination of applications, enabling them to become creators of forms that you can easily think and figure.

Keywords: cone, section, plan, geometric forms, the true size

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1. INTRODUCTION

The continuous reduction of the number of hours in the curricula, of most study objects, has led rapid scrolling, without a sufficient argument, of many chapters. From another point of view, these reductions have led to avoidance of many properties and methods of descriptive geometry, in applications.

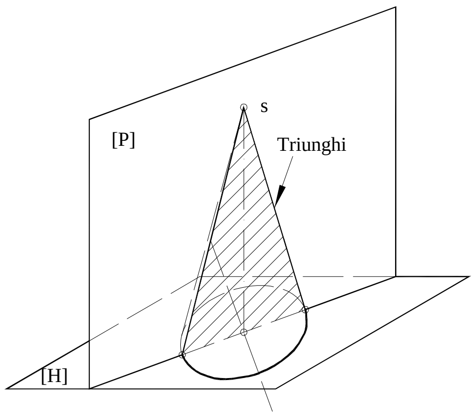
As a discipline technique, the descriptive geometry put at our disposal the methods necessary to the representations, sections and intersections of the simple areas in particular positions.

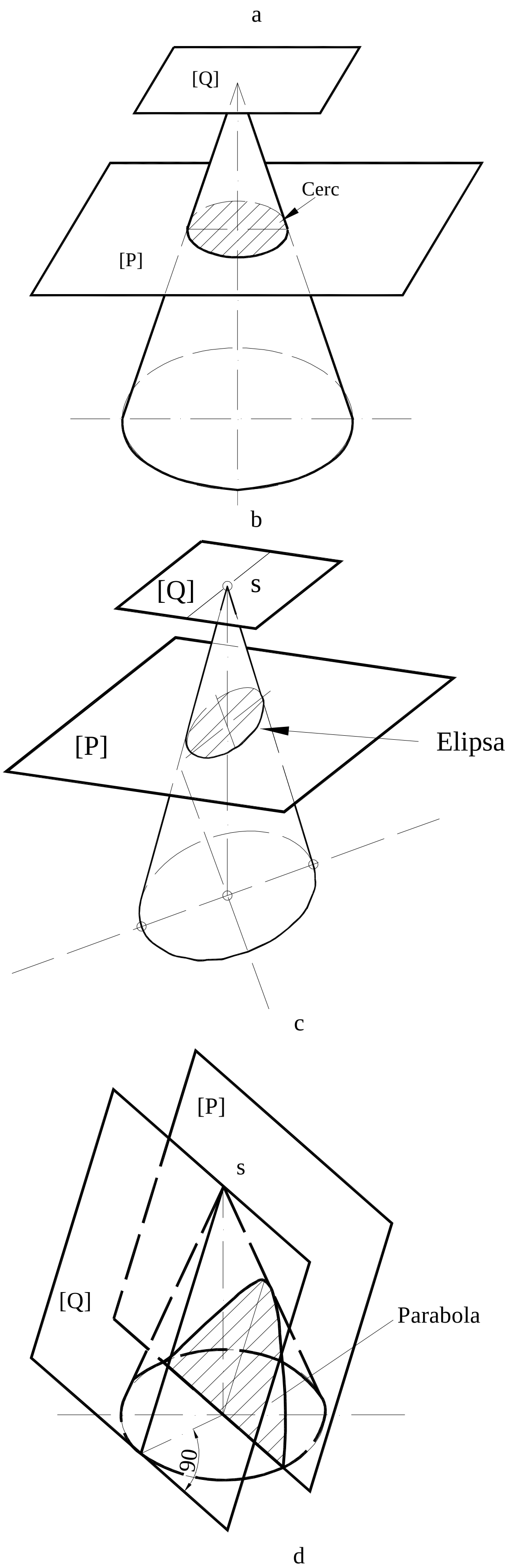
The paper highlights, from simple to complex, the creative ability and the interest of the students to shape the technical forms.

2. WEAR DESCRIPTIVE GEOMETRY METHODS

In accordance with Dandelin's theorem (Bucalo, 1997; Ivănceanu et al., 1979; Raicu, 2002; Simionescu and Dranga, 1995), the resulting flat section of the intersection of a cone with a plane has a limited contour by a surface, which can be:

- triangle, if the plane [P] is perpendicular on the cone base and contains its vertical axis (fig.1.a);
-circle, if the plane [P] is perpendicular on the vertical axis of the cone (fig.1.b);
-ellipse, if the plan [P] is of certain position (fig.1.c);
-parable, if the plan [P] is parallel with a tangent plane to the cone (fig.1.d);
-hyperbole, if the plane [P] intersects the cone through two planes (fig.1.e)





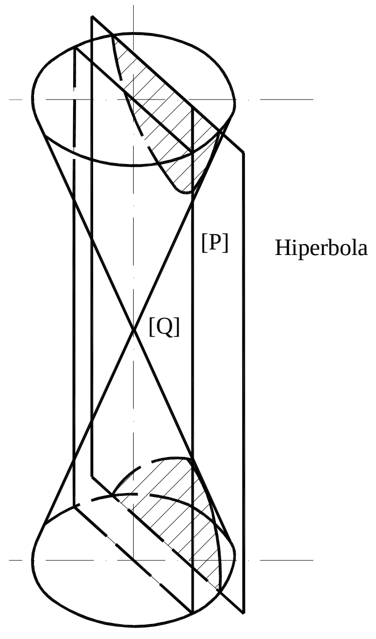


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Figure1 Plane sections in the cone

2.1. Plane section -triangle-in the cone

Being the revolution cone with the base in the horizontal plane *[H]*, with the vertex in $S(s, s')$ sectioned with a front plan *[P]*$(\overline{p_h}, \overline{p_v})$, which pass through the point[S], as in figure 2. The section made from the front plane with the cone, in vertical projection is $\Delta a' s' b'$. This triangle is designed in the true size in the vertical projection, the horizontal projection being deformed after the straight $\overline{asb}$, points situated on the horizontal element of the plane.

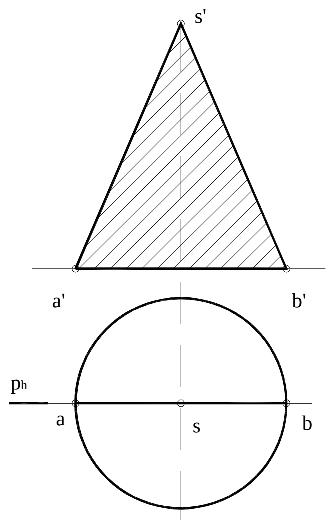

Figure 2 Triangular sections in the cone

The drawing program used allows the sectioning surface area calculation. Thus, for cone with the base diameter $\phi 60mm$, the height $70mm$, the surface area of section is $2100mm^2$.

2.2. Flat section -circle - in the con

Being the cone of revolution with the base in the horizontal plane $[H]$, with the vertex in $S(s,s')$, sectioned with a level plan $[P](\overline{p_h},\overline{p_v})$, as shown in the figure 3. The section made by the vertical element $\overline{p_v}$ of the plane with the cone will be projected in real size on the horizontal plane of projection. The vertical projection is deformed after the straight line $\overline{m'n'}$, learned of the vertical element $\overline{p_v}$. The area made by the plan with the cone is $517{,}3472mm^2$, for a height of sectioning of $40mm$.

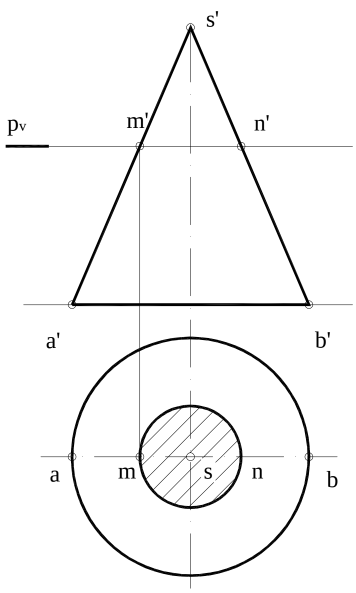

Figure 3 Circular section in the cone

2.3. Elliptical section in the cone

The cone of revolution with the vertex in $S(s,s')$ is sectioned with the end plan $[P](\overline{p_h},\overline{p_v})$, as in the figure 4.

The resulted section is an ellipse. The vertical projection of the ellipse is superposed over the vertical element of the plane. The major axis of the ellipse is front segment $\overline{12}(\overline{12},\overline{1'2'})$ the minor axis is the end $\overline{34}(\overline{34},\overline{3'4'})$, and the centre of the ellipse is $\Omega(\omega\omega')$. The horizontal projections of the points $3(3,3'), 4(4,4')$ - the extremities of the minor axis - were determined using the level plan $[N_1]$, and others points from the ellipse contour with the level plan $[N_2]$. These planes section the cone after concentric circles with the base circle. One of the focuses of the horizontal projection of the ellipse is s. The true size of the ellipse $1_0 4_0 2_0 3_0$ is found by bating the ellipse from the vertical plane in that horizontal plane of projection. The area of the elliptical section' in true size, is $1143{,}2217mm^2$.

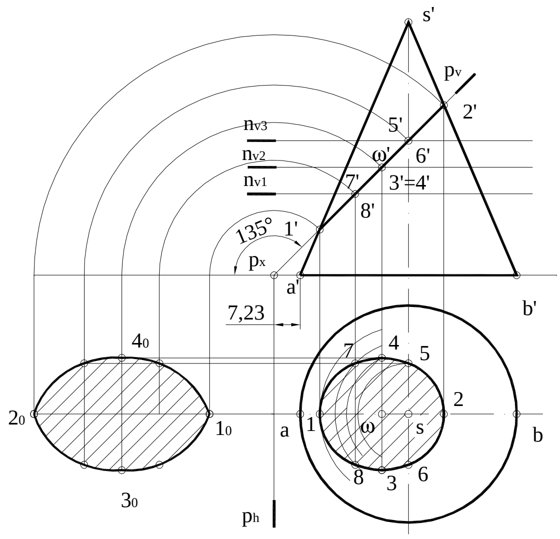

Figure 4 Elliptical section in the cone

2.4. Parabolic section in the cone

In the figure 5, the rotational cone is sectioned with the end plan $[P](\overline{p_h},\overline{p_v})$ after a parabola having its vertex in the point $5(5,5')$. The points $1(1,1')$ and $9(9,9')$ are obtained at the intersection of the plan $[P]$ with the base circle. The points $2(2,2')$ $3(3,3')$, ..., $8(8,8')$ are obtained helping the level planes $[N_1](\overline{p_{1v}})$, $[N_2](\overline{p_{2v}})$, $[N_3](\overline{p_{3v}})$, which section the cone after circles. The horizontal projection of the parable has the focuses in s. The true size of the section is found turning the vertical element of the plan $[P]$ on the horizontal plane of projection. The parable area $1_o 2_o ... 9_o$ (in true size) for the given data is $1944,5914\ mm^2$.

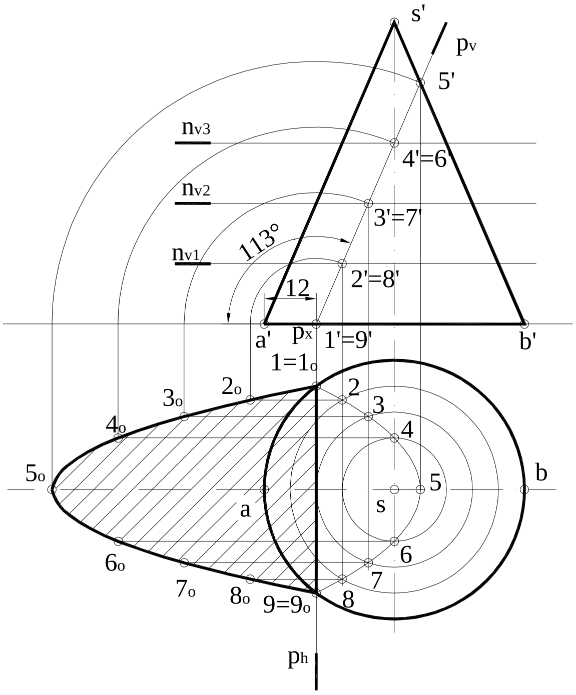

Figure 5 Parabolic section in the cone

2.5. Hyperbolic section in the cone

The cone from the figure 6 is sectioned by the end plan $[P](\overline{p_h}, \overline{p_v})$ after a hyperbole. The plan $[Q](\overline{q_h}, \overline{q_v})$, parallel with $[P]$, is passing through the vertex of the cone section the both planes of the cone.

The vertexes $C(c, c')$ and $D(d, d')$ of the section, result from the intersection of the front generators $\overline{VA}(\overline{va}, \overline{v'a'})$ and $\overline{VB}(\overline{vb}, \overline{v'b'})$ of the cone, with the section plane. The center of the section is $M(m.m')$, the middle of the segment $\overline{CD}(\overline{cd}, \overline{c'd'})$. To determine asymptotic directions, the cone is sectioned with an end plane $[Q](\overline{q_h}, \overline{q_v})$, parallel to the plane $[P]$ and went through the vertex cone. The parallels taken from m to the section generators v_1 and v_2 are the asymptotes of the hyperbole. Other points of the section are p, n, r and s. The true size of the hyperbole is found making the bating of the horizontal element of the end plan in the horizontal plane, and is the area of the section is for the part $p_o c_o n_o = 856,8167 mm^2$ and for the part $r_o d_o s_o = 856,8167 mm^2$.

3. CONCLUSION

Far from exhausting both the applications of descriptive geometry and the variations to solve the presented examples, the paper warns the students' training opportunities, stimulating their thinking geometric space. The teacher is offered the opportunity to appeal to forms of wording to ensure maximum efficiency. Some applications can be solved by fixing the knowledge that works, others may be required as individual study subjects.

In conclusion, it is obvious the major influence on the knowledge of the descriptive geometry by students through the careful coordination of applications, enabling them to become creators of forms that you can easily think and figure.

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