AMERICAN JOURNAL OF EDUCATION AND LEARNING
ISSN: 2996-5128 (online) | ResearchBib (IF) = 9.918 IMPACT FACTOR
Volume-3| Issue-5| 2025 Published: |30-05-2025|

THE ROLE OF THE 3D MAX GRAPHICS PROGRAM IN CREATING TOPOGRAPHIC DRAWINGS.

https://doi.org/10.5281/zenodo.15484129

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Abstract

this article is aimed at the development of spatial imagination, as well as the skills and abilities of students using the 3D Max computer graphics program when teaching topographic drawing. Knowledge of the theoretical rules and regulations of topographic drawing helps students to gain deeper knowledge in the field of topographic drawing.

Keywords

topographic drawing, descriptive geometry, plane, computer graphics, spatial imagination, surface, types of surfaces, projection, variants of different levels, skills, qualifications, practice, visual image, mountain reliefs, knowledge.

Long before the advent of paper and pencil, people drew on the walls of their homes with charcoal and chalk. Usually these were images of a dwelling, birds and animals. Later, people applied their creative ideas and inventions to the construction drawings of buildings and the layout of land plots.

The study and development of modern technologies in all fields of science and production is one of the most important tasks in the process of training future specialists. The science of topographic drawing is located in the descriptive geometry section:

The main task of topography is to obtain accurate data on the shape (relief) of the Earth's surface and to apply images on it based on numerical-symbolic projections or projections with numerical marks – a special type of rectangular projection in the design of natural and man-made engineering and construction works: various hydraulic structures, airfields, mines, mines and roads, drawing up geographical maps of various localities.

Optimization of students' work when performing graphic tasks on the subject, in the 3D Max program provides for comprehensive planning of educational activities, taking into account the conditions (number, sequence) of inclusion of tasks with creative content in the educational process.

3D Max training is an effective method that significantly improves the quality of graphic works performed by students. In the process of performing graphic tasks, students get a spatial idea of the object being performed and contribute to obtaining deeper knowledge in mathematics.

One of the convenient functions of the graphic program (drawing, performing three-dimensional and virtual projections of the model) is improved based on the analysis of reproducible, variable, partially searchable, creative and statistical indicators of factors that determine the quality of the complete transfer of the essence of the object.

These features of this program help students think creatively and develop self-study skills. In addition, the professional motivational process through the development of creativity, spatial imagination, synthetic and analytical thinking and prioritization focuses on teaching imagination when reading topographic drawings, correct design of objects in the field of modern architecture and construction.

Usually, students performed graphic tasks on the subject of topographic drawing in a more traditional way. Let's look at several ways of drawing with you through a graphic program, and with specific examples we will get acquainted with the approaches to drawing.

TYPES OF EARTH STRUCTURES.

The result of soil development is an earthwork, which is an engineering structure constructed from soil in a soil massif or erected on the surface of the soil (Figure 1).

Earth structures are divided into:

in relation to the soil surface - excavations, embankments, underground workings, backfills;

by service life - permanent and temporary;

by functional purpose - pits, trenches, holes, wells, waste heaps, dams, embankments, road surfaces, tunnels, planning areas, workings;

by geometric parameters and spatial form - deep, shallow, extended, concentrated, simple, complex, etc.

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Figure-1

Given: topographic surface and earthwork (site) M 1:1000

The slope of the cuts is 1:3,

The slope of the embankments is 1:3

Construct: lines of intersection of slopes of excavations and embankments of an earthen structure (site) with each other and the topographic surface (Figure 2).

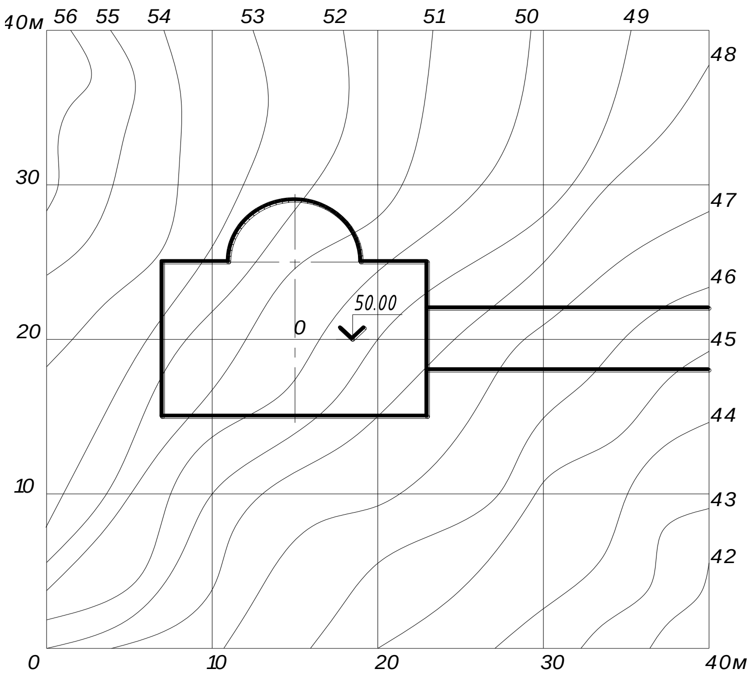

Figure-2

PROCEDURE FOR COMPLETING THE TASK

1. Apply images of the site to the drawing. Determine the zero works and directions of excavation and embankment works.

2. Determine the intervals, M1:1000 (Figure 3).

lв = 1:3=3 mm

lн = 1:3 =3 mm

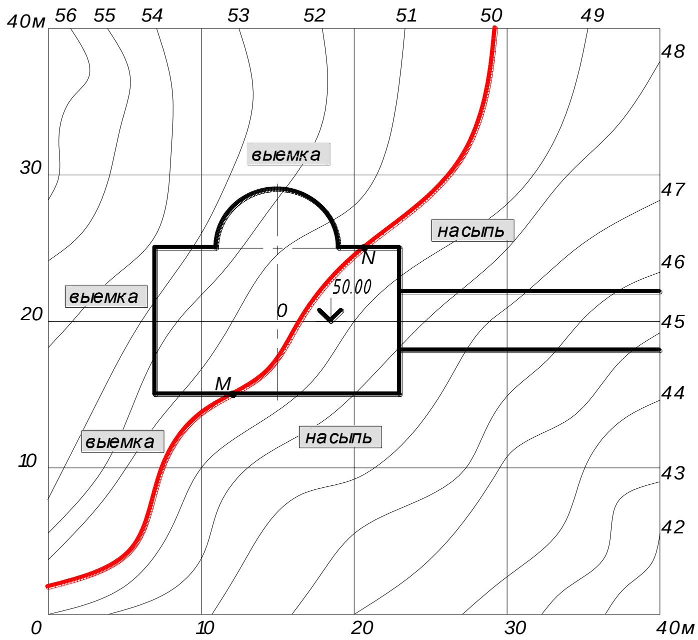

Figure-3

3. *Determine the intersection lines of adjacent slopes (Problem solution: drawing planes through straight line segments and drawing surfaces through curved arcs with a given slope, limiting the site in plan. Planes and surfaces limiting the construction site on all sides and connecting it to the terrain surface are called slopes) (Figure 4-5).*

4. *Construct the boundaries of the excavation work, i.e. the lines of intersection of the slopes of the excavation and embankment with the topographic surface (Figure 6).*

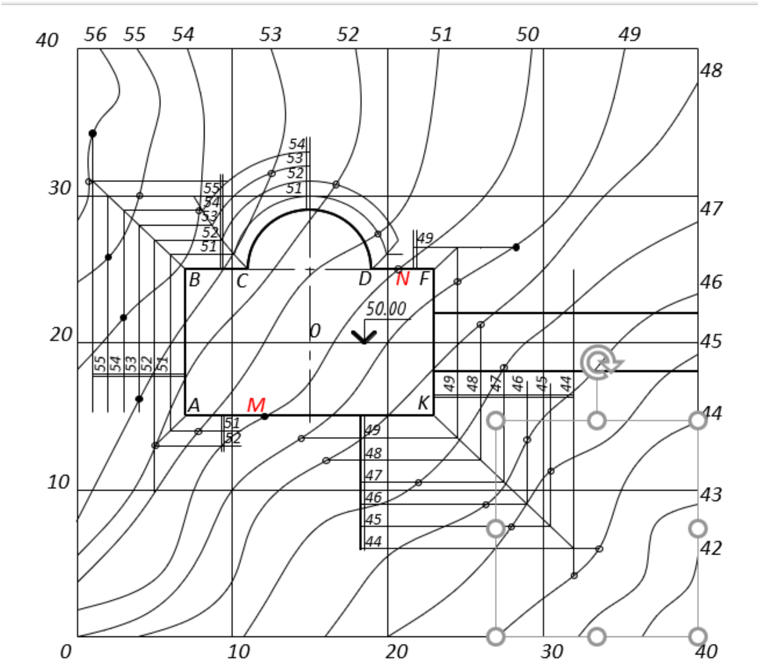

Figure-4

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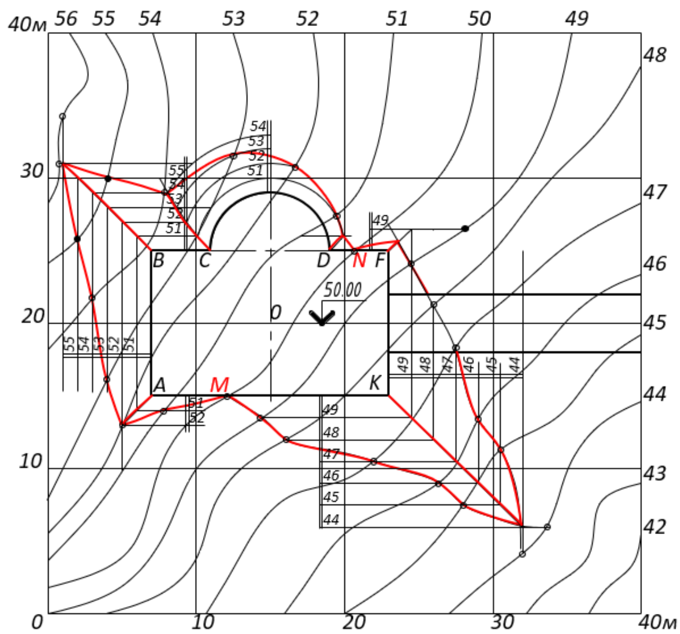

Figure-5

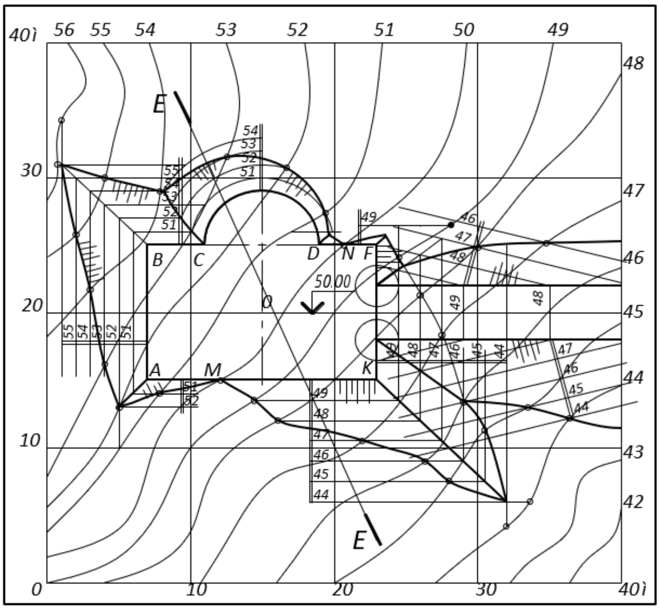

Figure-6

5. Construction lines (including design horizontals) must have a thickness of 0.1...0.2 mm.

6. The contour of the earthwork and the lines of intersection of the slopes with the topographic surface and with each other are outlined with lines 0.6-0.8 mm thick.

7. For a more visual expression of the direction of the slope of the embankment and excavation, bergstriches are applied perpendicular to the horizontal planes of the slopes.

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8. BERGSTROCHES are made with lines of different lengths, thickness - 0.1...0.2 mm with the distance between strokes of 1.5...2.5 mm. Short strokes should have a length approximately equal to half of the long strokes (Figure 7).

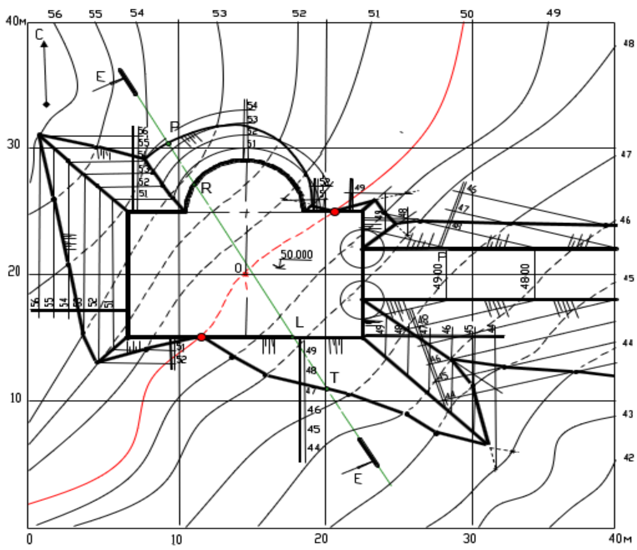

Figure-*7*

CONSTRUCTION OF THE PROFILE OF AN ENGINEERING STRUCTURE

9. On the plan, along line E-E, characteristic points (P, R, L, T) of the fracture in the section of the designed structure are marked. These points are transferred to the profile base and their heights are plotted on perpendiculars to the profile base.

10. The line connecting these points forms the cross-sectional profile of the designed structure.

11. The completed section shows the ratio of the volume of excavation work to the soil excavation and filling (Figure 8).

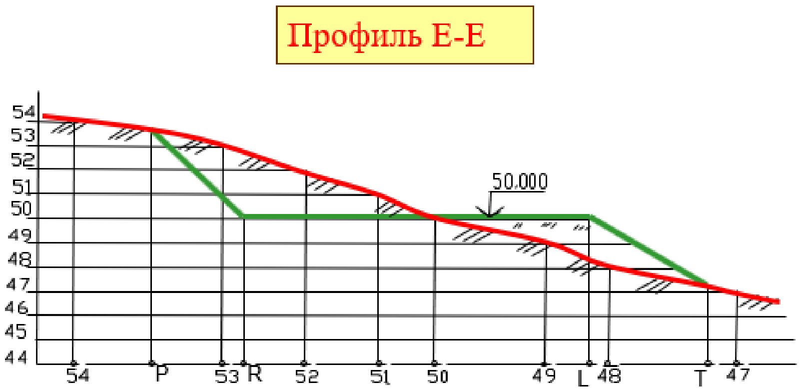

Figure-*8*

At present, when teaching topographic drawing, it is advisable to pay attention to 3D modeling. Three-dimensional modeling methods change the design and production preparation methods. The main carrier of information about the designed object is its 3D model, and the drawings created according to this model are the second form of representing the object.

The production of technical product drawings on 3D models is comparatively more efficient and less labor-intensive when the graphics system is used only as an "electronic lever".

The concept of an electronic drawing board should be understood as a set of requirements and rules that must be met by modern electronic technologies, graphic programs, all graphic images (diagrams, charts, technical drawings, sketches), regardless of what lesson they are made in and where they are used.

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