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LAYING OF THE MAIN GAS PIPELINE ON THE TOPOGRAPHIC MAP

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Abstract. The main purpose of the article is to improve geodetic topographic work and increase the need for topographic and geodetic data required for the identification and use of materials in the processing of pipes, topographic maps and materials.

Keywords: Trunk pipelines, topographic maps, pipelines, pump station, river, jar, circular curves, culverts, pickets, project line height, domer value, curve length, highway, geodetic receivers, modern technology, modern equipment.

Аннотация. Основной целью статьи является совершенствование геодезических топографических работ и повышение потребности в топогеодезических данных, необходимых для обнаружения и применения материалов при обработке трубопроводов, топографических карт, обработке материалов.

Ключевые слова: Магистральные трубы, топографические карты, трубы, насосная станция, река, банка, круглые кривые, водопроводные трубы, пикеты, проектная высота линии, величина купола, длина кривой, магистраль, геодезические приемники, современные технологии, современное оборудование.

Relevance of the topic. In the design of the main pipelines, mainly geodetic works were carried out.When designing various main pipelines and structures, the longitudinal profile is initially the main document. To create a longitudinal profile, the characteristic points on most of the main pipelines are determined.Since the main pipes are constantly being reconstructed, it is not possible to level them at the same time.. Therefore, high-precision leveling is carried out along acertain direction of the main pipeline to create a longitudinal profile through the height measurements performed on individual parts. This process requires the detection of camera tracing and elevation markings directly on topographic maps. Working rappers are used for leveling the main pipelines. Trunk pipelines are mainly facilities designed to transport oil, petroleum products, gas and water over long distances.Trunk pipes include the following structures.

1) Pipes flowing from deposits.
2) Basic structures consisting of high pressure pump stations and tanks for product collection and storage.
3) Intermediate stations every 80-100 km along the route required to maintain pressure in the pipes.
4) linear structures - wells where pipes, rivers, ravines and other barriers with a diameter of 500-1200 mm intersect..

For convenience, the route also includes a telephone cable and a field path.

The search is carried out in two stages: the initial stage of the search to determine the route and the total capacity, and the final stage of the search for the technical and working design.

The purpose of the study. The first search is to determine the start and end points of oil or gas delivery. The starting point is the main construction site, and the last point is the plant or base. Once the start and end points are identified, a search is performed to determine the shortest delivery route between them. In this case, the location of the route is projected on the existing topographic map. The route should be as close as possible to existing railways or highways in the area. During the initial search, the object is inspected, if necessary, the route is determined, the route is secured. The route should avoid crossing forests, rocky areas, steep shores and landslides, swamps, railways and highways as much as possible. Ensure that the angle of rotation does not exceed 300.

During the final search, the pipeline will be routed at the site, its turning points will be fixed, turning angles will be measured, the route axis will be divided into pickets and leveled. Large-scale topographic surveys will be carried out at the intersections of the route. Reppers will be installed closer to turning points every 2-3 km along the route. The search for the direction of the pipes is done in asimilar way to the search for the direction of other linear structures. Location details and relief will be surveyed at a width of 100 m along the width of the route. The radius of the circular curves drawn at the turns of the route is assumed to be 500-1000 m.

Object and subject of research work: The route connects to geodetic points every 50 km, and if such points are not close to the route, the GPS system can now be used. Topographic survey of the route at the intersection of rivers, canals, canals, roads, etc. on a scale of 1: 500 or 1: 1000.

In such places, the pipeline is routed through culverts.

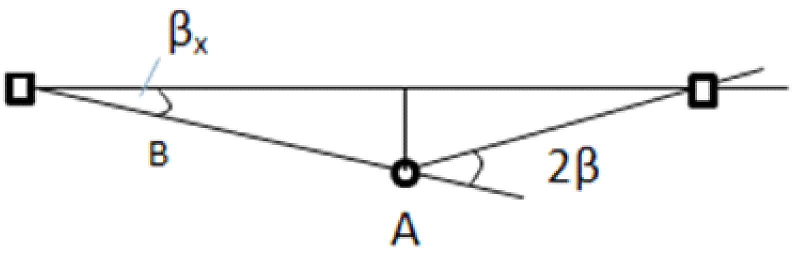

Figure 1.(Laying of turning end points in the route of pipelines).

Before starting the construction of the pipeline, the route will be restored on the ground (turning points, pickets, circular curves). A longitudinal profile of the route is created. The trench is planned in detail to carry out earthworks. The distance to the left and right of the route axis is measured every 20 meters, the banks of the trenches are marked with pegs and the depth of the trench is indicated. The trench is dug to a depth of 10-15 centimeters below the design value. In place of each picket and well, a transverse obnoska is built over the trench; it indicates the location of the route axis and the location of the picket with the well number.The pipelines are delivered directly to the bottom of the trench. In rocky places, the bottom of the trench is dug 10-15 cm deeper than the project height and it is leveled with fine soil or sand. When crossing the swamps, the pipes are laid on the ground on supports.It is constructed in the form of broken curves to compensate for thermal expansion. In this case, fixed supports are installed every 100-120m, between them free supports are installed at an angle to the axis of the track every 20-30m; an axial breaking point (Fig. A) was obtained every 50-60 m. The breaking point in stationary supports is found by measuring the X and Y values: $X = B\cos\beta$; $Y = B\sin\beta$; $(B = 50 - 60\,m)$. At point A, the pipe is routed along a small curved circular curve.

Scientific novelty of the research: When crossing rivers, pipes are laid in ditches dug at their bottom. Pipes from mountain rivers, rocks, and similar barriers run through the air in the form of suspension bridges. Attention is paid to the planning of the supports on which the pipe is laid. Once the pipes have been laid, an executive survey will be carried out. Reinforced concrete columns are installed every kilometer or 0.5 km. Before burying the trenches, these poles are connected by measuring the places where the pipes are connected, the location of the wells, the places where the diameter of the pipes changes, and the beginning and end of the culverts. The height of the pipe top and trench edge laid in the executive longitudinal profile and the height of the rafters are determined from the leveling. The heights of the pickets are found by the following formula:

$$h' = \frac{h}{d} d_1 ; \qquad h'' = \frac{h}{d} d_2 \qquad (1)$$

$$H_{ПК} = H_A + h' = 380.00 + 0.85 = 380.85 \qquad (2)$$

$$H_{ПК} = H_Б + h'' = 381.00 - 0.15 = 380.85 \qquad (3)$$

h'- the distance from the horizontal to a given point, h''- the distance from a given point to the horizontal, $H_{ПК}$- heights of pickets.

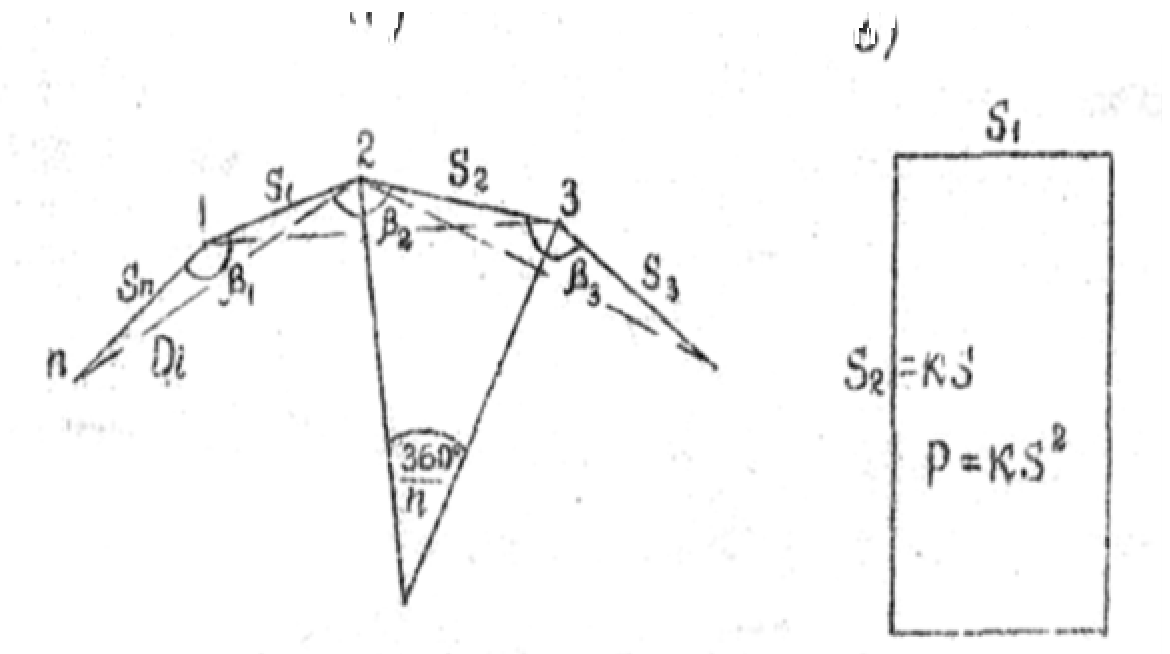

Figure 2.(Dividing distances into points based on circular curves).

Based on the pickets and intermediate points in our Table 1, the difference between the project line height and the project point and ground elevation heights is determined as follows:

Pickets and intermediate points №	Project line height Нл(м)	Ground point height Н(м)	Project and ground elevation difference hΔ(м)
Нпко	384.80	386.30	1.5
Нпк1	383.55	385.20	1.65
Нпк2	382.30	383.25	0.95
Нпк3	381.05	382.80	1.75
Нпк4	379.80	381.55	1.75
Нпк5	379.60	381.30	1.7
Нпк6	379.40	381.10	1.65
Нпк7	379.20	380.85	1.97
Нпк8	379.53	381.50	1.58
Нпк9	379.87	381.45	1.9
Нпк10	380.20	382.10	1.8
Нпк11	379.65	381.45	1.8
Нпк12	379.10	380.90	1.7
Нпк13	378.55	380.25	1.8
Нпк14	378.00	379.80	1.8
Нпк15	377.97	380.25	2.28
Нпк16	377.94	380.10	2.16
Нпк17	377.91	379.55	1.64
Нпк18	377.88	380.00	2.12
Нпк19	377.85	379.30	1.45
Нпк20	377.83	379.20	1.37
Нпк21	377.80	379.50	1.7
Нпк22	376.60	379.00	2.4
Нпк23	375.40	377.00	1.6
Нпк24	374.20	376.00	1.8
Нпк25	373.00	374.75	1.75
Нпк26	371.80	374.10	2.3

I lowered these pickets to the profile, then drew the project line of the pipe and determined the inclinations along the project line.

Calculation of circular curve elements:

The angle of rotation φ1 is as follows:

φ1 = 06° 25'   R = 575 m

The tangent of the circular curve T1 is calculated as follows:

$$T1 = R \cdot tg\frac{\varphi}{2} = 575 \cdot tg\frac{6°25'}{2} = 32.23 \quad (4)$$

The length of the curve K1 is found as follows:

$$K1 = \frac{\pi \times R \times \varphi}{180°} = \frac{3.14 * 575 * 6°25'}{180°} = 64.36 \quad (5)$$

The domer value is calculated by multiplying the tangent D1 by two and multiplying the length of the curve:

$$D1 = 2T - K = 0.1 \quad (6)$$

Bisector B1 is calculated as follows:

$$Б1 = R \cdot (1 - 1/\cos\varphi) = 3.62 \quad (7)$$

The angle of rotation ph2 is as follows:

φ2 = 05° 50'   R = 575 m

The tangent of the circular curve T2 is calculated as follows:

$$T2 = R \cdot tg\frac{\varphi}{2} = 575 \cdot tg\frac{6°25'}{2} = 29.29 \quad (8)$$

The length of the curve K2 is found as follows:

$$K2 = \frac{\pi \times R \times \varphi}{180°} = \frac{3.14 * 575 * 6°25'}{180°} = 58.51 \quad (9)$$

The domer value is calculated by multiplying the tangent D2 by two and multiplying the length of the curve:

$$D2 = 2T - K = 0.07 \quad (10)$$

Bisector B2 is calculated as follows:

$$Б2 = R \cdot (1 - 1/\cos\varphi) = 2.99 \quad (11)$$

One of the main processes in improving the geodetic topographic work and increasing the demand for topographic and geodetic data required for the identification and application of pipelines, topographic maps, processing of materials is the reduction of these pickets on the topographic map.

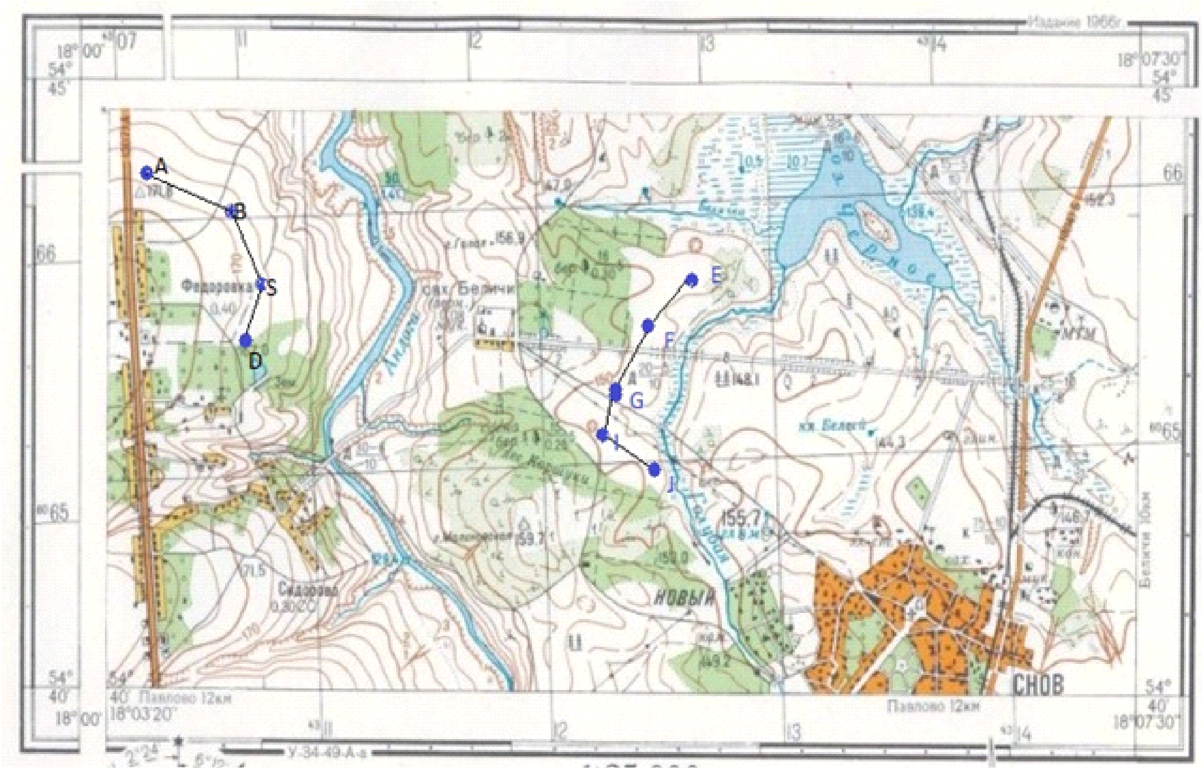

Figure 3.(tracing using horizontals on topographic maps).

Conclusion.

The accuracy of the plans will also vary due to the use of different geodetic instruments and technological processes in the performance of different surveys. However, if the various surveys are done correctly, the difference between the accuracy of the plan and the topographic maps will not be so great, and in practice their accuracy can be considered the same. Because the elements that make up the technological process of any type of shooting have a number of errors and can be equated to graphic accuracy (0.1 mm plan), for example: errors in the planning of points and lines, errors in the planning of angles, errors in the assembly of photoplans in the transformation of aerial photographs, etc. These errors in many respects approximate the accuracy of the plans, and on the basis of pickets and intermediate points it is expedient to identify and trace the markings on the project line height and ground point height on topographic maps.

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