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TO THE QUESTION OF THE TOPOGRAPHIC SURVEY OF RESERVOIRS

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ABSTRACT

To determine the volume and degree of silting of the reservoir, systematic topographic surveys are performed: the coastal strip enclosed between the normal retaining level (NRL) and the level of the meter volume (LMV), the plane table and the flooded part, which are used in channel surveys (laying tacks along coastal alignments). The implementation of the survey by these methods is associated with a significant expenditure of funds for the breakdown and fastening of the diameters; they account for 25-40% of the estimated cost of engineering and geodetic surveys.

АННОТАЦИЯ

Для определения объема и степени заиливания водоема проводятся систематические топографические исследования: прибрежная полоса, заключенная между нормальным удерживающим уровнем (NRL) и уровнем метрического объема (LMV), плоский стол и затопленная часть. , которые используются при русловых съемках (постановка галсов вдоль береговых трасс). Выполнение обследования этими методами связано со значительными затратами средств на разбивку и крепление диаметров; на них приходится 25-40% сметной стоимости инженерно-геодезических изысканий.

Key words: Tacheometric surveying, NRL, LMV, Theodolite, Topographic plan

INTRODUCTION

The essence of the proposed method (similar to the total station) of shooting the coastal strip of reservoirs is that after installing the theodolite in paragraph N (Figure 1), the height of which is determined by geometric leveling, the limb is oriented along the side of the survey course N, N +1. Then sequentially pointing the telescope at the characteristic points of the water line j = 1,2, ..., n, take samples in horizontal and vertical circles and write them in a log; it also marks the shooting time points tj of the point j and, making sure that the orientation is correct, proceed to the next point.

By surveying the points of the water line along the perimeter of the reservoir at this and other points, before their closure in the vicinity of the starting point, the first series of observations is completed [1,2]. Moreover, the planned position of each point j is characterized by its polar coordinates the horizontal angle βj and the distance Sj, calculated from the solution of the right triangle JN'J by the formula:

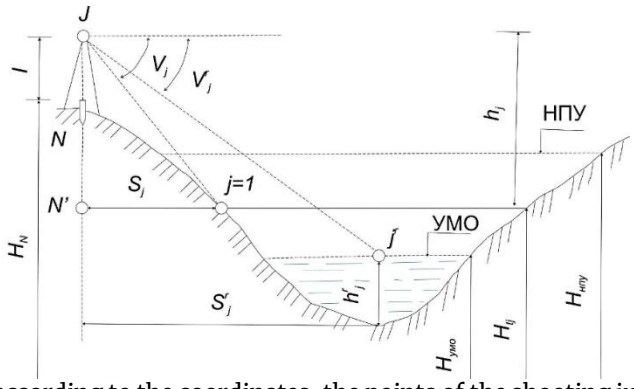
$$Sj=hjctg\nu j = (HN+i+f-H_{t_j})\ ctg\nu j \quad (1)$$

where hj=N'J is the excess of the horizontal axis of the theodolite relative to H_{t_j} (the height of the water level at the time of shooting); HN and i-heights of the survey point and theodolite, respectively; f - correction for Earth curvature and refraction; νj is the angle of inclination of the sighting axis when observed at point j;

$$H_{t_j} = H_{t_H} + \frac{H_{t_H} - H_{t_k}}{t_H + t_k}\left(t_j - t_H\right) \quad (2)$$

where H_{t_H} and H_{t_k} are the heights from the sharp levels at time tH and tk (respectively, before and after the survey), determined using the level recorder data or rail readings obtained from the position of the levels at the gauging station [3,4]. Note that at the time of shooting tj, the water surface height is assumed to be H_{t_j}, since the difference in level height under the influence of the backwater curve at two cross-sections (spaced 10 km apart from each other), calculated by the formula for the average reservoir volume, does not exceed 2 cm: this value can be neglected when calculating the accuracy of the shooting method.

Fig. 1. Scheme of the topographic survey of the reservoir.



Putting on the tablet, according to the coordinates, the points of the shooting justi fication and laying off the distances Sj from them according to formula (1) for known directions βi, find the position of each point j.

Selecting a non-standard relief cross-section height hHC, an approximate number of series of observations is calculated

$$\kappa = \frac{(H_{NRL} - H_{LMV})}{h_{HC}} \quad (3)$$

where HNRL and HLMV are the heights of the NRL and LMV, respectively. Each subsequent series is performed after a period of time.

$$T = \frac{h_{HC}}{\upsilon h_{HC}} \quad (4)$$

where υhHC is the average speed of movement when filling or decreasing a layer of water with a height hHC.

By applying to the tablet, the results of a series of observations and interpolating, the height of the points of the working levels, they find the planned position of the main contour lines with a given height of the relief cross-section, which will display the relief of the coastal strip of the reservoir.

If there is a need to draw up a topographic plan of the entire reservoir bowl, then its flooded part (below the LMV), which occupies up to 20% of the total area, is removed from convenient points by the application of direct or circular galoshes [5]. The planned position of the measuring points on them is determined similarly. At the same time, the theodolite's pipe is sighted on the mark along the line of the uzer (waterline of the boat), from the level of which the depth h_j^r was measured using a manual lot or other known means, and readings are taken in horizontal and vertical circles. After calculating the height of the bottom points and signing them near the corresponding measuring points, they find the planned position of the contours for the flooded part, which, in combination with the contours of the coastal strip, will provide a specialized topographic plan of the reservoir bowl.

When shooting, the density of the set of points of the water pattern, measurements of depths and laying between adjacent lines of water edges is taken within 1-2 cm in the scale of the plan, based on the nature of the reformation of the terrain, the scale of the survey and the height of the cross-section of the relief [6].

The accuracy of the points of the survey network is calculated taking into account the possible areas of the shooting sectors and the distances allowed for the given scale to the points S. The value of S is established as a result of the analysis of the accuracy of its determination by the formula (1), based on the specific values of h and v measured with mean square errors mh and mv,

$$m_S = (m_h ctg\ v)^2 + \left(\frac{m_v\, h}{p\ sin^2 v}\right)^2 \quad (5)$$

and comparisons with the required accuracy of mt shooting (dam, cliffs, ravines, ravines, and water mirror areas at different levels, etc.) at the accepted scale. In particular, for surveying a flat reservoir at a scale of 1: 10000 with mt = 7 m [2] at $5 \leq h_j \leq 20m$, $0°20` \leq v_j \leq 1°20`$, calculated values m_h=0.04 м, m_v=8'' и $\rho = 206\,265''$ based on formulas (1) and (5), it is possible to determine the possible interval of the length of the permissible shooting radius: from 700 to 1760 m.

Then, the average length of the side of the survey course can be Scp = 1 km, the area of the survey sector P at Δβ = 90 ° will be more than 2 km2, the width of the reservoir B should not exceed 3 km, and the survey course up to 20 km long satisfies the requirement for accuracy [2], it is necessary to create 2 categories by polygonometry [7].

As applied to surveying a mountain reservoir for which $20 \leq h_j \leq 50$ m on a scale of 1: 5000 and mt = 5 m, it can be established that 1400≤Sj≤2400 m, S_{cp} = 2 km, P = 4.5 km2, B = 4 km; to create a planned justification in this case, it is necessary to use the method of polygonometry of the 1st category.

Experiment : For experimental verification of the accuracy of the proposed method, the survey was carried out on calm quiet days after 11 h at the same time as the Tacheometric surveying of a 90-hectare section of the Charvak reservoir using the ST5 light-range finder in combination with the 2T5K theodolite. In this case, the survey of 123 points of water edges in a radius of 1.6 km on an area of about 60 hectares was carried out in four series from one point 86 measuring points in a radius of up to 2.4 km - 2T5K theodolites from two points fixed on the shore as the ends of the base. In the process of shooting from the first point, the theodolite pipe was successively pointed at each point of the water edge and measuring the depths; a reflector was installed above the points, the distance to which was determined by the light-range finder in the "rough" mode. Corresponding readings were taken in horizontal and vertical circles, time moments of the start and end of the survey were timed, the water gauge was determined the position of the level and its changes in the shooting process.

Acknowledgements: Using the survey data, using the formula (1), was calculated the distances measured by the light-range finder and obtained errors of the linear shift of the water cut-off points (2 m) and depth measurements (1.4 m). This turned out to be less than the calculated values calculated by the formula (5). Accordingly, the mean square errors of the altitude of the points of the water edges (0.06 m) and depth measurements (0.04 m) were obtained.

Chronometric measurements showed that the survey of one point takes up to 2 minutes, the time of shooting a section of the coastal strip with an area of 10-15 hectares does not exceed 1 hour.

Summarizing the above, we note that when applying the method, it becomes possible to complete the survey with a smaller number of performers, as well as to quickly determine the volume of the reservoir at different water levels in it. In addition, the conditions are improved and labor safety is increased, since there is no need to bypass the dry plots of the shore by the staff. The method is economically more efficient than the current one, mainly due to the reduction of costs for the breakdown and fastening of the diameters.

When the topographic survey of the reservoir by the proposed method, the following flow chart can be applied:

- using the topographic and geodetic materials of previous surveys and the topographic characteristics of the reservoir, specify the scale and height of the relief section, draw up a layout of the points of the survey justification;
- according to the possible values of h and mt, on the basis of formulas (1) and (5), allowable distances S are found the survey points are fixed with long-term signs, the paths of light-range polygonometry of calculated accuracy and leveling of class IV are laid on them;

choose a non-standard height of the relief cross section and use the formulas (3.4) to calculate the number of series of observations and the time intervals between them;

in each series, the exact theodolite takes pictures of the characteristic points of water edges in a radius of up to 1.5 km. Depth measurement points are taken from convenient points within a radius of 2 km.

References

1. Instructions for the production of engineering and hydrographic surveys on recaks, lakes and reservoirs for construction. VSN 4-71, Ministry of River Transport. 1972. p. 168 p.

2. Instructions for topographic surveys in scale 1: 10000 and 1: 25000. [Instructions for topographic surveys on a scale of 1: 10000 and 1: 25000.] Field work.- M .: Nedra. 1982. p. 176 p.

3. Instructions for topographic surveys in scales of 1: 5000, 1: 2000, 1: 1000 and 1: 500. [Instructions for topographic surveys in scales of 1: 5000, 1: 2000, 1: 1000 and 1: 500.] Field work. - M .: Nedra. 1982. p. 176 p.

4. Klimov O.D., Fundamentals of Engineering Survey, Moscow: Nedra. 1974. p. 252. p.

5. Nurmatov E.Kh. About using the bypass lever of the planimeter as a protractor [About using the bypass lever of the planimeter as a protractor] Geodesy and cartography. - 1984. p.

6. Bolshakov V.D., Levchuk G.P., Bagratuni G.V. et al. Surveyor's Handbook M .: Nedra. 1975. p. 1038. p.

7. Shevchuk P.M. On the creation of a planned justification for topographic surveys polygonometry method [creation of a planned justification for topographic surveys using polygonometry] Geodesy and cartography. - 1985. p. 34-36 p.