ACCURACY OF LOCATION CURRENCY AND PROCESSING OF RECEIVED DATA ON INTERNATIONAL TRANSPORT CORRIDORS AND HIGH-SPEED MASTERS

The main stages of geodetic survey of the railway are considered, both in the new construction and in the reconstruction of existing sites. The analysis of the line plan on curves and direct sections of the railways of Ukrainian international transport corridors is given. Calculations are made on the method of recording the accuracy of measurements at high speed and extra-high speed, confirmed the need to take into account the type of volumes of work, the establishment of rational parameters of the plan in accordance with the specified levels of maximum speed.

Keywords: geoinformation systems, arrows method, curve measurements, line plan, radius measurement, international transport corridors, mileage wagons.

Geodetic works are carried out at surveys of railways in the areas of the oncoming route for the purpose of obtaining information on the features of the relief, anchorage of the route and samples of the locations of railway buildings and structures; at the reconstruction of the railways; and the construction of other roads carry out the removal of the existing overpass.

Geodetic works carried out for the final selected option consist of the breakdown of the whole route on the pickets using various geodetic instruments. Geodetic works with the help of the theodolite determine the angles of rotation of the trail, and measure the distances between the vertices of the corners by the distance measurements.
In the course of these works also create a post, planned high-altitude film basis, laying in a line 30-50 m from the highway, a fixed post, signs 400-500 m. For the design of adjacency to railway congresses, parks of tracks and turning devices perform shooting Probable areas at a scale of 1: 500-1: 1000 [1, 2, 7, 10].

Geodetic works in the construction of railways begin with the restoration of the route. Then carry out control measurements of the turning points of the route, breakdown of pickets, determine the excess. In the same period, the axis of artificial structures, elements of track development, various design marks, deviations are transferred to the locality. A detailed breakdown of the earthen canvas begins with the designation of the points of the longitudinal profile of the track in 20-40 m and the plus points of the excess, to the right and to the left of which postpone the design distances to the characteristic points. Perform a detailed breakdown of circular and transitive curves. All points of the earth’s cloth on each picket are fixed with pair of remote signs, mounted on the theodolite perpendicular to the track at a distance of 30-50 m. They form a parallel longitudinal axis, necessary for the restoration of the axis of the earth’s canvas, the boundaries of slopes and breaking of drains; the marks of these signs serve as time-honored signs. On the earthen cloths perform a shooting: with the help of a tool restore the longitudinal axis, on pickets and fractures of the longitudinal profile check the design dimensions, slope slope and mark points. In the construction also used laser viziers, levelers and theodolites, which allow you to install in the project position or to verify simultaneously a large number of points of the route. With a detailed breakdown of the upper structure of the track using the theodolite. To determine the design position of rails in height, taking into account the increase of external rails above the inner in curvilinear areas, use a leveler. When shooting railway tracks, determine the coordinates and fix the centers of street transfers, the turning angles, the elements of the curves and make the leveling of the tracks across the width of 50 m [11].

The breakdown of railway buildings and structures, their main axes and characteristic points are performed by the method of rectangular and polar coordinates, linear, angular and generated nick. Design marks are made using a leveler. When installing the columns, the supports of the contact network and lines of communication verticals are checked by the theodolite.

Geodetic works on the reconstruction of the railway and the construction of other tracks are based on the characteristics of the existing track. When using large-scale aerial photographs of terrain, they determine the angles of rotation of the chord by the device for shooting PSKA curves, which provides sufficient accuracy of measurements. At the same time, there is a plan of the track and areas of the area with artificial structures and buildings of the track-and-field economy. The coordinates of the points, the size of the intercellular, the dimensions of the approach of buildings, and the like, are determined by the method of photogrammetry. When ground-based curves are used roulette or theodolite and level rail from the special, boot (method by I.V. Gonikberg) [1, 5], as well as an electronic station, which performs the shooting of the curve in an arbitrary coordinate system with subsequent calculation on the computer.

Geodetic works are carried out at the construction of bridges and other artificial structures. The length of the bridge transition is determined by the light meter. When splitting the bridges in height, install rammers: for bridges 50-300 m long on each shore no less than one, for bridges longer than 300 m — not less than two. For the «transfer» of heights across the rivers geometry, trigonometry or hydrostatic leveling are used. The breakdown of the center of the foundation of the bridge support is carried out with at least three starting points. The breakdown of frame frames of pile-shells or caissons is carried out afloat by three theodolites installed at the support points to observe the position of the center of the foundation, and the fourth, oriented along the axis of the bridge, to track its turn. Effective use of the system of light-meter laser [4, 10].

In the breakdown of tunnels of main railways and subways, geodetic works are performed on the surface of the earth; build a geodetic network for the transmission of coordinates and markings to all portals, trunks, railways. In this case, the planned justification is the triangulation (horizontal location of the reference points) or the linear-angular network, thickening (laying) polygonometry in the immediate vicinity of the workings. When breaking through the tunnels, as they progress through the slaughter through the portals, they put some or other landing gear (from the points of the ground base) up to the moment of collision of the counter tunnels. In the construction of tunnels through the vertical trunks in the face of the surface transmit plan coordinates, directional angle (orientation) and marks. As we progress along the slaughter, underground polygonometric passages are laid and lead to leveling, which ensures the propagation of the shield in terms of and height up to the execution of the stabbing. To control the management
of the shield are the use of laser geodetic instruments. When laying railway lines in tunnels, geodetic works include the breakdown of the lining and portals of the tunnel, the axis of the track and the objects of the track economy, observing the deformation of the rocks during its passage.

This brief description of the work when performing field surveys for a new building or reconstruction of an existing railway gives a clear idea of the sequence of works, devices used, the number of persons involved in this process. And with great probability one can say that there are errors, inaccuracies, and other moments that are different in nature for the future construction of historical monuments (the Leaning Tower of Leaning, a UNESCO World Heritage Site, in 2006, the tower peak was rejected by 5.3 m from the center of the building) and sometimes fatal [4, 6, 8, 12].

Taking into account the above described and the results of the study [9, 10, 11], we can state that for today there are many ways that are used to obtain the parameters of the state of the tracks and curves. It is precisely the existence of various methods of practical application that each of them has both positive and negative sides. Therefore, in order to choose one way or another, it is necessary to perform both statistical and mathematical substantiation.

When performing the curves in various ways — the way of arrows, the way Gonikberg, when shooting a road map of the track carriages — the results are different. It was established that the accuracy of the results depends not only on the parameters of the measuring instruments and the skills of the performers, but also on the method itself, which determines the technology of measurement and execution of calculations. This issue became especially relevant in the reconstruction of the line plan for the introduction of high-speed traffic, to which higher requirements and characteristics of the accuracy of the situation both in the plan and in the curve, regardless of the temperature indicators, are presented in the table.

### CONCLUSIONS

Speed limits that are installed do not always correspond to the actual state of the terrain. This fact can be explained by the fact that in the distances of the tracks, rass-hanks are executed in a simplified scheme, not in full. The main attention is paid to three parameters — the radius of the track, the increase of the external rail and the steepness of its displacement. In fact, when determining the maximum allowable speed, coupling parameters that are to be determined for adjacent and composite curves are not taken into account.

In the conditions of Ukrainian railways, the speed problems in two thirds of cases are related not to the radius, but to the length of the transitional curves of the track and to the direct inserts between adjacent curves, and therefore, when setting the maximum permissible speed of movement in complex areas of the railway plan, more attention should be paid to adjacent curves, which fall under the category of dependent, that is, when one affects the conditions of the train on the other.

Analysis of the source data obtained by different methods of plotting the line showed that for determining the maximum permissible speed it is necessary to have reliable information about the parameters and state of the lines and curves. Before conducting reconstruction of railway lines for increasing the speed of trains, and even more so for the introduction of high-speed traffic, it is necessary to conduct the certification of plots.

Often obsolete data on the line plan is used, and the curves are considered geometrically smooth, with no deductions in their maintenance. The false information can be significantly reflected in the results of calculations to determine the permissible speeds of motion, which is especially important on high-speed sections. Due to the significant differences between the parameters of the road plan on the longitudinal

### Table: The value of the curve parameters and the corresponding permissible speed [9]

<table>
<thead>
<tr>
<th>Curve parameter and allowable speed of movement</th>
<th>The values of curve parameters obtained by different measurement methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Way of arrows</td>
<td>Track measuring tape</td>
</tr>
<tr>
<td>Permissible speed, km/h</td>
<td>100</td>
</tr>
<tr>
<td>Raising the outer rail, mm</td>
<td>100</td>
</tr>
<tr>
<td>Radius, m</td>
<td>656</td>
</tr>
<tr>
<td>Angle of curve turn, degrees</td>
<td>27° 56'</td>
</tr>
<tr>
<td>First transitive, m</td>
<td>90</td>
</tr>
<tr>
<td>Circular, m</td>
<td>240,00</td>
</tr>
<tr>
<td>Second transient, m</td>
<td>70</td>
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<tr>
<td>Speed limit:</td>
<td></td>
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<tr>
<td>– by αν</td>
<td>106</td>
</tr>
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<td>– by Ψ</td>
<td>100</td>
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<td>– by i</td>
<td>124</td>
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</tbody>
</table>
profile, in the passport of the curves according to the actual measurements, it is proposed to carry out work on the certification and the establishment of a real allowable speed on them, taking into account the current state of the track.

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