ISSN NO: 2770-4491
March 2025

Methods And Work On Geodetıc Observatıon Of Deformatıon Of Buıldıngs And Structures

Dotsent: Jurayeva Xusnora Davronovna, E-mail: xusnoragkk@mail.ru
Acting Associate Professor: Yuldashev Akmal Olimovich,
Acting Associate Professor: Saidov Bakhtiyor Mamasoliyevich,
Senior lecturer: Kenzhaev Ulug'bek Abdulakimovich,
Tashkent University of Architecture and Civil Engineering

Annotation: This article provides general information about the classical methods of geodetic observations and modern tools and technologies used to determine the quantitative characteristics of deformations of buildings and structures. Information on the organization of geodetic monitoring of high-rise buildings located on the territory of Olmozor Business City, Olmozor district, Tashkent city. shows the basic principles of geodetic monitoring of high-rise buildings and options for its use.
Keywords: deformation of buildings and structures, leveling grid, levels, total station, control marks, space measurement, geodetic method, geometric leveling, digital levels, laser scanning, global navigation satellite system, the cause of deformation.

Introduction. According to the characteristics of buildings and structures, due to natural conditions and human activity in general, buildings and structures and their individual elements experience various deformations.

In general, the term "deformation" refers to a change in the shape of the object of observation. In geodesic practice, it is customary to consider deformation as a change in the position of an object relative to its original state.

If the soil under the foundation of the buildings and structures is not compacted evenly, or the load on the soil is different, the buildings and structures will be uneven. This leads to other deformations of buildings and structures: shifts, horizontal displacements, distortions, bends, they can occur from the outside in the form of cracks and even cracks.

Therefore, it requires constant geodetic monitoring of buildings and structures during the construction process and even after the completion of construction.

Buildings and structures of all types are under constant external influence, they can be both natural and artificial. The generality of these forces affecting the building object leads to the deformation of buildings and structures to one degree or another.

Methods for monitoring the deformation of buildings and structures are currently provided in the main regulatory document SHMQ 3.01.03-19 [1].

In this normative document, as the main method of measuring vertical displacement, geometric leveling is recommended, performed by optical leveling. It is recommended to move the foundation of buildings and structures horizontally. Measured by one of the following methods, or a combination thereof: leading observations, individual directions, triangulation, and photogrammetry methods.

These methods also involve the use of optics. Geodetic instruments are carried out in theodolite or phototheodolite.

To assess the significance of the identified deformations, the obtained value of the deformation characteristic is compared with the limiting error of its determination. The mark of deformation is considered to have not changed its position (there are no deformations) if the absolute value of the characteristic of the deformation does not exceed the marginal error of its detection.

Key part: Monitoring of deformation of buildings and structures, control for deviations of objects structure from the project values due to deformations (formation of displacements, subsidences and deviations), which may occur as a result of various factors and lead to collapse. Bending is a deviation of the object axis from the vertical plane, the purpose of the deformation monitoring is to obtain information about critical deviations of buildings and structures from the project, to determine the time interval for these changes to occur.

• There are cases when it is necessary to obtain a three-dimensional model of the studied object, construction or engineering structures, in this case laser scanning is used.

• Monitoring of the deformation of buildings and structures will allow you to avoid situations in which you will have to reconstruct them or even complete reconstruction due to the inevitable destruction. Below, we consider how buildings and structures are carried out using modern methods of sediment and horizontal displacement and deflection. We carried out geodetic observation of multi-storey buildings in the territory of "Olmozor business city" in Olmozor district of Tashkent city.

Geometric leveling method: The most common method for determining the subsidence of buildings and structures is the method of geometric leveling, which allows the accuracy and speed of high measurements to be measured with an accuracy of 0.05-0.1 mm between the sedimentation marks at a distance of 5-10 m and at a distance of hundreds of meters - 0.5 mm. Class I and II observation work of industrial and residential buildings, leveling is used to determine sedimentation. General requirements for leveling classes are listed in the table below.

Table 1. General requirements for leveling classes

Bullets	Leveling Classes			
	I	II	III	IV
Visceration beam length, m	50	65	75	100
Pavement Link on Polygon or Leveling Path, mm. in units of measurementL_{km}	$3\sqrt{L}$	$5\sqrt{L}$	$10\sqrt{L}$	$20\sqrt{L}$
Inequality of the shoulder (distance from the level to the rails) at the station, m.	0,5	1	2	5
Cumulative Disparity of Shoulders in Section, m	1	2	5	10
Height of the visceration beam from the ground plane, m	0,8	0,5	0,3	0,2
Mid-quadratic error in determining the relative height at a station, mm	0,15	0,20	1,5	3,0

Signs of deformation points for the entire observation period are determined in relation to the initial measurement results or a group of indicators.

The results obtained are equalized, the actual accuracy of the signs is assessed, and sedimentation graphs are constructed from the differences in the characters in the cycles. Table 2 shows the measurement results.

Table 2. Cyclic change of absolute altitudes in buildings and structures

T/r No	Jayla-Shish O'Roni	1-cycle	2-cycle	3-cycle	4-cycle	5-cycle	6-cycle	Cycle 7	8-cycle	Cycle 9
		Absolute height	Absolute height	Absolute height	Absolute height	Absolute height	Absolute height	Absolute height	Absolute height	Absolute height m
		30.09. 2022year	06.10. 2022year	12.10. 2022year	18.10. 2022year	24.10. 2022year	30.10. 2022year	05.11. 2022year	11.11. 2022year	17.11. 2022year
1	CHM 1	452,270	452,270	452,270	452,270	452,270	452,267	452,267	452,265	452,264
2	CHM 2	452,270	452,270	452,269	452,269	452,269	452,266	452,265	452,264	452,265
3	CHM 3	452,270	452,270	452,270	452,270	452,269	452,266	452,266	452,265	452,260
4	CHM 4	452,270	452,270	452,270	452,269	452,269	452,268	452,267	452,264	452,260
5	CHM	452,27	452,27	452,27	452,26	452,26	452,26	452,26	452,26	452,260

ISSN NO: 2770-4491
March 2025

	5	0	0	0	9	8	7	6	2	
6	CHM 6	452,27 0	452,27 0	452,27 0	452,26 9	452,26 9	452,26 8	452,26 7	452,26 2	452,254

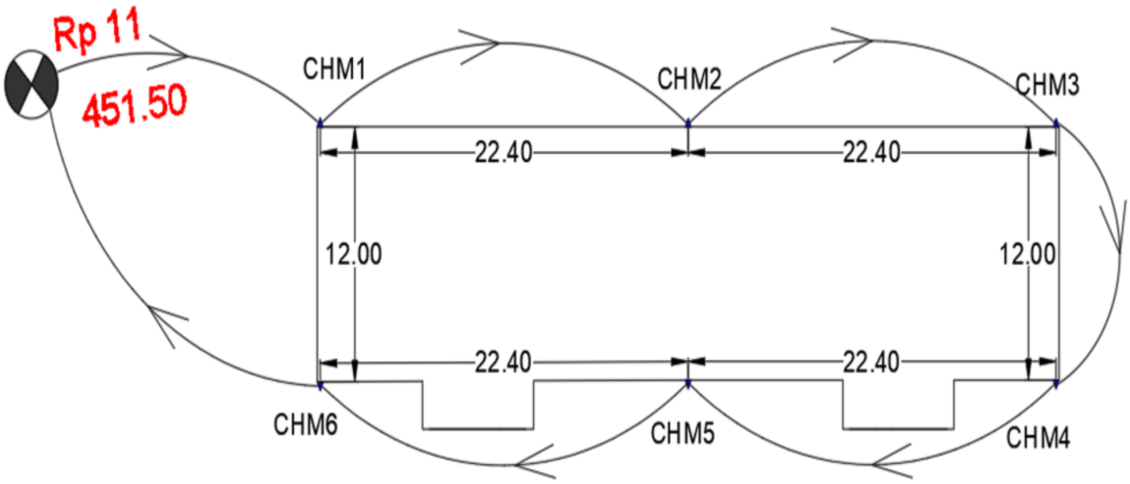

Figure 1. Leveling Path and Sinking Marks Positioning Scheme

During the sinking observation cycle, each cycle of measurements checks for the stability of the rappers we need to link to before taking a count of the sink marks installed on buildings and structures.
To do this, they are all included in the closed landfill. Such constructions are considered a first-order deformation network. The results of measurements in it are maximized. To determine the height of the deformation marks, they are introduced into a geometric leveling network, acting on the basis of the criteria of a first-order deformation network.
We use the following methods to determine the deviation (cairn) of constructs. The results of the measurement work are less accurate than the observation of sedimentation.
Methods for Determining Horizontal: Displacements and Deviations The results of measurements of the horizontal displacement of the structural points are obtained in different periods and the difference between their coordinates is determined, which is determined in a single coordinate system. There are two types of shifts in solving the problem of determining the double quantity: verification work is carried out along two coordinates or along one coordinate [2].
In the first case, the method of a linear angle is used to determine the coordinates of the points. Special networks of triangulation and trilateration, polygonometry motion, combined networks, in the form of angular and linear surfaces, where linear angular constructions are created; Networks of elongated triangles with measured sides and height. Angles are measured with high precision (0.5-2.0") short sides, numerous connections.
Determination of the geometric parameters of a building structure or structure can be carried out using an electronic taxaeometer by the method described in the proposed works.
The main issue in tracking deformations is the reliability of their detection. If this is known in advance, the more likely it is that the observed deformities are significant, the more reliably their quantitative characteristics will be determined. To the extent that the absolute values of fixed deformations are comparable to the errors in their detection, the reliability of the determination of deformations depends on the method of processing the results. In determining the condition of individual building structures, for example, the foundations of column bridge supports, often requires high-precision measurement work, and geodesic instruments are used that work precisely during the measurement work.
Electronic Taxaeometers and Digital Levels: Modern electronic taxaeometers (ET) allow you to measure horizontal and vertical angles, distances at the same time.
An electronic tacheometer (ET) is an indicator device that provides control (based on microcomputers) for connecting, controlling and measuring long-distance parts and angles. The electronic computing basis of the

tacheometer is made up of assembled detectors and the positioning part. In contrast to the rapid development of electronic taxaeometers, the high degree of automation in the measurement of angles and lines, the processing of systems, the inclusion as organizational parts, or the indication and highly automated of instruments is not a separate process, but is generally a topographic syom. At the same time, linear-angular measurements are to be carried out using an electronic taxaeometer in performing topographic measurements in a rather automated and at the same time.
Electronic taxaeometer allows us to create a fully automated map, the links to which are as follows: Electronic taxometer – stationary computer – plotter. There is also the possibility of using "taxaeometric" data in combination with data from the provided satellite receivers. A modern electronic taxaeometer can be conditionally divided into three groups: simple, universal and robotic.
1. The first group includes electronic taxeometers: minimal automation and limited installed software.
Such taxaeometers provide a measurement accuracy of 5-10", lines ±± 3-5" (mm ⁄ km).
A number of taxeomtrs of this group will have limited storage memory, with internal memory or limited memory that allows storing information only for 500 or 1000 points (pickets).
2. The second group taxeometers are equipped with advanced features and have a large internal memory. They will be designed for 10,000 points or more with a large number of installed programs.
The angle measurement accuracy provided by these instruments is, as a rule, ±1-10", with strips ±2-3 mm ⁄ km.
3. The third group includes robotic taxaeometers, which have all the capabilities of devices. In comparison with the previous groups, it is possible to classify these devices in robotic taxeometers, the presence of onboard radio communication devices, as well as automatic search and tracking systems of beam reflectors. In taxaeometers of the third group, the human factor is reduced in comparison to the previous two groups, that is, the main task is performed by the taxometer itself.
Currently, automation of geometric leveling is achieved by using the highest digital levels. Unlike traditional optical levels, digital levels are easier to work with, that is, the number received from the level is automatically entered directly into the device's memory.

Figure 2. Digital leveling and barcode racks

Measurements can be made automatically with digital levelings: you can find out distances and relative heights between railroad tracks, rivers and leveled points. Internal memory is designed to store multiple measurement results (8000-10000 points).
The measured data can be processed by the installed software. In comparison with traditional optical levels in digital leveling, the processing capacity provides up to 50% more efficiency. Digital levelers are equipped with expansion joints.
For leveling, simple rails are used in simple technical leveling works, while when working with high-

precision leveling, invar rails are usually used. For digital levelers, special barcode rails are used.

References

1.Package of geodetic works in construction SHMK 3.01.03.19. Tashkent. 2019.

2. Jurayeva X.D., Yuldashev A.O., Kenjaev U.A. “Pedagogical Cluster-Journal of Pedagogical Developments” xalqaro jurnal. “Determination of deformation of buildings and structures and their geodetic observation works”. Pol’sha. 2024. 225-233 betlar. https://euroasianjournals.org/index.php/pc/index.

3. Jurayeva X.D. European Journal of Research Development and Sustainability xalqaro jurnal. “Observation subsidency and horizontal displacement of hydraulic structures”. Isoaniya. 2022. 4-7 betlar. https://www.scholarzest.com/index.php/ejrds/article/view/2975/2388

4. Zaitsev A.K., Marfenko S.V., Mikhelev D.Sh., et al. Geodetic methods for studying deformations of structures. Moscow, Nedra Publ., 1991. 272 p. (In Russian)

5. Piskunov M.E. Metodika geodezicheskikh observatsii za deformatsiyami sooruzheniyami [Methods of geodetic observations of deformations of structures]. Moscow, Nedra Publ., 1980, 248 p.

6. A guide to observations of deformations of bases and foundations of buildings and structures. Moscow, Stroyizdat. 1975, 156 p.