

# Application of GPS in Municipal Surveying and Mapping

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**Abstract:** In municipal surveying and mapping engineering, GPS technology is becoming more and more important. In order to make rational use of GPS technology, the application research of GPS in municipal surveying meeting is put forward. Based on the principle of GPS, data acquisition of GPS in municipal surveying is carried out. The results show that this technology has important application value.

**Keywords:** Municipal surveying and mapping; GPS; Applied research; Construction engineering

## 1. Introduction

At present, China's construction engineering industry is developing rapidly and has become the pillar industry of China's economy. Municipal engineering is an integral part of construction engineering. Various new technologies are widely used in engineering construction. The application of Engineering Surveying and mapping technology has greatly improved the quality of municipal engineering. Scientific surveying and mapping technology can provide engineering data for municipal engineering to ensure the quality and quantity of municipal engineering completed[1-3]. A kind of GPS technology plays an important role in Municipal Engineering Surveying and mapping. It has a wide range of applications and high accuracy of Surveying and mapping. In the process of application, it can effectively control the accuracy of Surveying and mapping. Through the establishment of surveying control network, the measured information and data can be transmitted to the ground workbench in time. GPS technology can also achieve field data acquisition, through the establishment of three-dimensional coordinates, can accurately restore the information surveyed and mapped. This technology has the characteristics of high efficiency and accuracy, in municipal engineering. There is a good application prospect in surveying and mapping [4-6].

Municipal engineering is closely related to people's lives. Strengthening the construction of municipal engineering can bring more convenience to people's lives. In the process of municipal engineering construction, more infrastructure can be established, including municipal roads, roads and bridges, which is conducive to the convenience of people's travel and can also promote urban traffic. The rapid development of transportation industry. Before the construction of municipal engineering, it is necessary to do a good job of Engineering Surveying and mapping. Relevant staff members need to do a good job of planning, design

construction drawings, and ensure the quality of municipal engineering design programs. In the process of Engineering Surveying and mapping, it is necessary to apply GPS and other advanced technologies, which can improve the efficiency of Surveying and mapping. Engineering surveying and mapping includes many contents, which contain more information and more complicated items. Some surveying and mapping belong to field work, which is more difficult and trivial, and the field environment is more complex. If manual surveying and mapping is used, not only the efficiency of Surveying and mapping is lower, but also it will threaten surveyors and mapping personnel. Personal safety.

## 2. GPS Working Principle

The application of GPS-RTK technology depends on the transmission of information technology and measurement signals between special equipments. GPS-RTK technology system has more than two signal receivers. Surveying and mapping technology transmits between different signal receivers. Firstly, the reference station should be set up, and the corresponding signal receivers and RTK signal enhancers should be set around the reference station to locate and track the position of the satellite and complete real-time observation through electronic signal transmission. Measuring engineering data is transmitted to the receiver by digital signal, and engineering survey data is positioned and transmitted in three-dimensional system coordinates. For municipal engineering, its surveying and mapping work mainly includes engineering data, traffic conditions and engineering progress. Because of space limitation, the surveying of engineering data is difficult. The application of GPS-RTK technology can search three-dimensional coordinate system and move. The station carries out datum measurement at any time, receivers and satellite positioning maintain signal

transmission, draws engineering status in the form of geometric images, and converts data into digital signals. There are many types of GPS technology. In the process of application, we need to combine the actual situation of municipal engineering. GPS has different operation methods in different municipal work. Surveyors need to know and master the construction environment, and also need to know the geographical environment of the construction site, so as to select the best survey. Mapping method can improve the efficiency of Surveying and mapping. In the application of GPS technology, it is necessary to control the accuracy of Surveying and mapping. A control network can be established in the construction site. This can effectively apply static surveying technology and ensure the reliability of surveying data. GPS belongs to positioning technology, which can be used in multiple receivers at the same time. The application of these devices and precision instruments can ensure that the post-processing of Surveying and mapping data is simpler and easier to operate. After the establishment of the control network, because the site is open, it may be affected by obstacles in the positioning process, which will reduce the accuracy of positioning.

The technical advantages of GPS-RTK technology in Municipal Engineering Surveying and mapping are mainly embodied in the following aspects.

Firstly, GPS-RTK technology has very high precision of Surveying and mapping. It can precisely locate and measure the engineering condition and ensure the accuracy of Surveying and mapping data in different working environments. The accuracy of GPS-RTK technology is usually up to cm level. Otherwise, for the construction of small defects can be accurately measured, accurate positioning, to ensure the quality of municipal engineering construction.

Secondly, the efficiency and rapidity of GPS-RTK technology. The traditional municipal engineering survey data are completed by manual operation equipment. In some special construction sites, the error of manual operation is larger, and the engineering survey time is longer, which delays the progress of the project. The application of GPS-RTK technology can realize the rapid measurement of engineering data on the premise of ensuring the measurement accuracy.

No matter how advanced the instrument is, there will be more or less disadvantages in the use process, and GPS-PTK is no exception. It has the following shortcomings: high requirements for the measurement environment, because many factors can affect the transmission and reception of GPS signals, field surveying and mapping can not achieve the same control network, you can choose the natural environment around the control points at will, so when using GPS-PTK for step-by-step acquisition, you can not. All its functions have been

brought into full play. In addition, the multipath effect is also a common error link in GPS. To weaken it, better antenna equipment should be used, and the selected stations should be as far away from the reflector as possible.

GPS-PTK often encounters such problems when surveying ground objects: when the mobile station handheld poles coincide with the measured ground objects, PTK can not be initialized, the receiver can not receive signals or only receive weak signals, and it is impossible to directly measure coordinate positions. If you wait to receive signals, you will waste a lot of working time and reduce work efficiency. In this case, many methods can also be used to calculate the plane coordinates.

When the operator can not reach the geodetic point to be measured, or when the PTK receiver can not be placed at the geodetic point to be measured, for example, a building submerged in water. In this case, the intersection method can be used to measure the coordinate position, which is very simple to implement. The concrete steps are as follows: using PTK to measure two coordinate points on the line of two object points, and connecting the two coordinate points with the object points, so that only four coordinates can be obtained to sit the object points. Calculate it and draw its plane position.

The advantages of the same GPS-RTK technology lie in its high positioning accuracy. By building a three-dimensional coordinate system on the site of the erection project, the rapid positioning can be achieved, the number of engineering space can be quantified, and the 24-hour uninterrupted surveying and surveying can be realized to ensure the construction data. Principle and technical advantages integrity, has a strong application value. Municipal engineering has a wide coverage. Its engineering surveying and mapping should also expand the working face. The whole project should be integrated into the plane surveying. GPS-RTK technology adopts the current advanced electromagnetic technology, replacing the traverse application in the traditional plane surveying. At the same time, GPS-RTK technology should also be used in the plane surveying. RTK technology realizes the measurement of control network and local engineering data. It can divide the whole engineering plane. Using GPS and RTK technology, the distance between mobile station and reference station can be controlled within 15 km. It takes only a few seconds to measure the distance between mobile station and reference station. It improves the efficiency of Engineering survey.

In municipal surveying and mapping, point lofting and line lofting are important parts of surveying. GPS-RTK technology is widely used in two kinds of surveying. Firstly, point lofting GPS-RTK technology can use GPS for spatial positioning and in mobile station. Static

network of Surveying and mapping points is established according to coordinate system. Each project has corresponding coordinate parameters, and can be surveyed and mapped on the spot according to parameter statistics. GPS-RTK technology can document the road center line and the corresponding curve parameters. GPS mapping equipment can directly measure the corresponding lofting number.

### 3. Conclusion

GPS is an effective spatial positioning system. In the process of its application, various technologies are becoming more and more perfect. It plays an important role in the military field and surveying and mapping industry. This paper studies the practical application of GPS technology in Municipal Engineering Surveying and mapping. Through practice, it is found that the application of GPS technology can effectively ensure the accuracy of Engineering Surveying and mapping. With the help of satellite positioning system, it can collect effective information and data. This technology has the advantages of simple operation, accurate surveying and mapping, and data availability. Reliable advantages, therefore, in the municipal engineering surveying and mapping work has an irreplaceable position. The

application of GPS technology can reduce the difficulty of traditional manual surveying and mapping, reduce the workload of surveyors and mapping personnel, and has a good application prospect.

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