

PART 2 - CONSTRUCTION TECHNIQUES OF GROUND LEVELING Comparison results

Nguyen Thu Trang

Faculty of Civil and Environment, Thai Nguyen University of Technology, Vietnam

Abstract

The ground leveling construction method is an important preparation step for works at the early stage when starting construction. In the construction industry, leveling is the first thing that needs to be done to ensure everything is perfect for the project. Ground leveling is a work in construction, the purpose is to level the ground for construction work or create a planning ground from a piece of land with the different high and low natural topography. The work of leveling at this time is to use the soil in the higher areas to fill in the lower areas. Any project no matter how big or small, from the foundation of a household to an industrial park, also requires leveling. Soil and rock leveling must also be constructed according to design standards.

The overall content of this study is organized into two parts. Part 1: Methodological content; Part 2: Comparison results.

Keywords: *Leveling, Construction, Excavation works.*

1. INTRODUCTION

Ground leveling is the construction work of leveling the ground of construction work or a planned ground from a ground with the different high and low natural topography. Leveling is the excavation of the highest areas within the land, transporting it to the lowest areas, and filling those low areas. Leveling helps to create the topography of the land to be built according to the previous intention of the owner. The design engineer of the project helps create the right terrain and slope for the project. Leveling if following a standard process will save a lot of time and effort, minimizing risks in the leveling process such as manual leveling.

Thus, the leveling work usually includes: Excavation works, Transport soil, Landfilling.

2. COMPARISON RESULTS

2.1 Construction of leveling with sand pump

This method is often used for works with narrow access roads. However, this method still ensures tightness as well as the construction progress.

2.2 Ground leveling construction steps:

Step 1: Conduct a site survey of the work to be constructed with sand pumping and leveling (the technical staff of our company will come directly to the construction site, measure, inspect and survey the entire site). works to be leveled).

Step 2: Give the norm of sand volume to be leveled or determine the volume of sand to be leveled for the work (results taken from the survey process).

Step 3: Provide construction measures for sand pumping and leveling (technical staff will give detailed calculations for the construction process of sand pumping and leveling: Sand volume, construction progress, machine means) hooks to use...).

Step 4: Quoting the price of sand pumping for leveling and signing a contract for sand pumping and leveling to the project investor.

Step 5: Carrying out the construction of sand pumping and leveling, transferring the leveling sand to the construction site

Step 6: Using a roller, flatten the surface.

Step 7: Customers, investors conduct acceptance test, hand over the premises and pay the contract.

2.3 Construction of leveling the ground using debris

Leveling by motor vehicles such as shovels, bulldozers, road rollers, large and small trucks: usually this method

is applied to works with convenient access roads for trucks.

Debris has a denser texture because it doesn't mix with mud like sand. Concrete blocks are quite solid and can help you have a solid foundation. But the gap between the concrete blocks is relatively large.

2.4 Ground leveling construction steps:

Step 1: Carry out a survey of the construction site, the location to be constructed, pouring debris and leveling the ground (the technical staff of our company will come directly to the construction site, measure, inspect and survey all works to be leveled).

Step 2: Determine the volume of debris to be leveled for the work (results obtained from the survey process).

Step 3: Proposing construction methods to fill and leveling (the technical staff will give detailed calculations for the construction process of leveling and pouring: volume of rubble, construction progress, mechanical means to be used...).

Step 4: Quoting the price of the leveling debris and signing the contract for the construction investor.

Step 5: Carry out the construction of filling and leveling, transferring the debris to the construction site.

Step 6: Use a roller to level the ground. If after rolling, the ground is not up to the standard, continue to pour the rubble.

Step 7: Customers, investors conduct acceptance tests, hand over the premises, and pay the contract.

2.5 Construction and leveling using land

This method is mainly used for road construction, and hilly soil is often used.

Due to the characteristics of hilly soil: large transportation costs, large excavation work. Liquid texture, more difficult to compaction. The leveling construction is usually long and is affected by the weather. If soil is covered, when it rains, it leads to high soil moisture, cannot be compacted, so it has to be hung up to dry, which is expensive. So this method is rarely used nowadays.

2.6 Leveling volume

The volume of excavated backfill soil will be calculated according to the following formula:

$$V = n \cdot S^2 \cdot (H_{TK} - H_0) \quad (1)$$

In there:

V: Excavation and backfill volume

n: Number of squares in the design grid

H_{TK}: Design elevation of the site

H₀: Average height of the site

$$H_0 = \frac{\sum H^I + 2 \sum H^{II} + 3 \sum H^{III} + 4 \sum H^{IV}}{4n} \quad (2)$$

H^I, H^{II}, H^{III}, H^{IV} : Height of points in 1, 2, 3, 4 squares in grid

The collected documents are guaranteed to be complete, accurate, and clear. The collected documents include all documents related to geotechnical conditions in the study area, specifically:

2.7 Construction standards for leveling ground:

The construction process and supervision of ground leveling works will be based on the following legal provisions:

According to Decree No. 209/2004/ND-CP dated December 16, 2004 on quality management of construction works.

Standard No. TCVN 4447:87 on soil work and construction regulations, acceptance test.

Standard No. TCVN 4453:1995 on construction regulations and acceptance test of reinforced concrete structures.

Prepare design documents for construction works

3. CONCLUSIONS

Some standards of the ground after leveling should be achieved

Average design elevation, leveling slope, embankment slope, digging slope, tightness of embankment in the lot, leveling is mainly embankment. The entire area is leveled and compacted in thick layers, compacted with standard compaction.

Standard of sand in leveling

The determination of standards, or requirements of sand used in leveling will be calculated and tested based on many technical factors in leveling or based on a common set of construction sand standards. Usually, leveling sand will be used depending on each different

leveling project. Depending on the characteristics of the work to be leveled. The leveling sand products after exploitation also need to be tested to give satisfactory results.

Soil standards in leveling

Only start leveling industrial works, residential areas, and special premises (soccer field, train station, airport, etc...) when the design for leveling has been completed and the block has been balanced. The amount of excavation and backfilling and the design of all underground works within the leveling area.

When leveling the ground, measures must be taken to drain water. Do not let the water overflow over the site and do not form stagnation during construction.

Filling soil must be poured in layers, the thickness of each layer of soil spread for compaction, and the number of compaction lanes for each layer depends on the type of compactor using the compaction coefficient and the type of backfill soil:

- Should spread soil with a slope of 0.005 in the direction of drainage.
- When filling the soil without compaction, the height of the settlement room must be taken into account.

For the case of leveling the ground deviation from the design level (excavating less than or exceeding the design level) in the permitted excavation part as follows:

- For soft soil: 0.05 for manual construction and 0.1m for mechanical construction.
- For hard soil: +0.1m and -0.2m. Excavations above the design elevation must be leveled with mixed rock.

The surface of the embankment made of hard rock must spread a layer of mixed rock on top of the backfill, compact it and ensure the design slope.

For the excavated part, the ground must be leveled before proceeding with the construction of underground works. Particularly for the embankment, embankment shall be carried out only after the construction of underground works within the embankment has been completed

4. ACKNOWLEDGEMENT

This work is supported by Thai Nguyen University of Technology, Vietnam.

REFERENCES

- [1] Le Anh Dung, Nguyen Hoai Nam, Cu Huy Tinh, Tuong Minh Hong, Le Ba Son; Construction organization; Construction publisher; 2019.
- [2] Le Hong Thai, Construction organization, Construction publisher, 2013.
- [3] Trinh Quang Vinh, Nguyen Van Tuan, Vu Quoc Lap, Construction organization, Construction publisher, 2019.
- [4] Vu Thang, Construction surveying, Publishing scientific and technical, 2005.
- [5] Phan Van Hien, Geodetic works, Publishing House Transport, 2004.
- [6] Pham Van Chuyen, Measurement, Construction publisher, 2010.