



Land Planning and Site Plane Creation, Faculty of Engineering, University of Muhammadiyah Buton

Muh. Sayfullah. S^{1*}, Ahmad Efendi¹, Agusman¹

¹Fakultas Teknik, Universitas Muhammadiyah Buton, Indonesia

Correspondence: muh.sayfullahs@gmail.com

ABSTRACT

Measurement of land development at the Faculty of Engineering, University of Muhammadiyah Buton is carried out to determine the condition of the land that will be used as a reference for developing, structuring land and planning from the University. Measurement method using the Theodolite tool. With the division of benchmark points (BM) in accordance with the conditions in the development land of the Faculty of Engineering. The measurement results can be used as a reference to carry out development planning appropriately. Processing is carried out in several stages, starting from literature studies, field surveys, data collection, measurement, data processing, to results and conclusions. The measurement process is carried out in several stages ranging from the manufacture and installation of benchmark (BM) benchmarks, BM point determination, site up Theodolite tools and detailed measurements. The results of this service activity are in the form of a development site plane plan image, elevation plan, and 3D view image. The measurement images can be used as a reference in carrying out future development of the land development of the Faculty of Engineering, University of Muhammadiyah Buton.

Keywords: Benchmark; Engineering; Land; Theodolite; UIM Buton

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1. Introduction

Soil measurement science is a science that studies ways to make measurements, both in the horizontal direction and vertical caldirection to determine the relative position of points or objects on the earth's surface and move them to a flat plane (projection plane) with certain rules and scales (Anonim, 2018). Measurement can also be defined as a scientific discipline that covers all methods for measuring and collecting information about the earth's physique and environment that can be used as needed (Hartanto, 2012). Then make drawings according to the existing field conditions used in the implementation (Sayfullah S, 2022b).

Based on the existence and work of Muhammadiyah in this area and the objective conditions of the development of Buton Regency at that time both related to real data on the institutional growth of the number of high schools / ma / vocational schools, as well as the growth in the number of graduates every year and efforts to take part in the empowerment of human resources at the university level, the establishment and development of a university became very essential and urgent. Especially in certain disciplines based on the results of contextual studies and observations, both based on regional development trends and the carrying capacity of available natural resources and human resources. The Muhammadiyah Regional Leader of Buton Regency observed that the condition felt moved and called to study the establishment of universities. Finally, the Founding Board of the Islamic University of Buton in 1999 formed a college called the Islamic University of Buton (UNISBU).

On December 3, 1999, a coordination meeting of the founding body of UNISBU was held which it was later agreed that UNISBU turned into a charitable enterprise owned by Muhammadiyah under the name of Muhammadiyah Buton University. On February 17, 2000 the Regional Leadership of Muhammadiyah Buton formed and established the Initiating Body for the Establishment of the University of Muhammadiyah Buton which was determined to plan, prepare and compile all matters related to the legality of the establishment of the University of Muhammadiyah Buton (umbuton.ac.id, n.d.).

Muhammadiyah Buton University will develop land located in Kadolokatapi District, Wolio District, Baubau City, the conditions in the field are still hills and gardens that are still cleaning the land. The development area reaches 1 hectare with a total land area of 2.4 hectares (Wa Ode Al Zarliani, 2022). Facilities and infrastructure are absolute mandatory needs to be met in order to achieve the expected goals. One of the efforts made to improve the quality of a development sdevelopment is by planning land development (Syaripuddin, 2012)

Planning for the calculation of the volume of excavations and landfills in this development uses data from surveys and measurements to be processed so that they can be presented visually so as to facilitate the land development stage (Pratama, 2017). The results of this service can present data on existing conditions, topography, excavation calculation planning and stockpiles that can be used as a reference for development planning for the development of the Faculty of Engineering, University of Muhammadiyah.



Figure 1. Theodolite

Theodolite is a tool used to measure angles in soil measurements either to determine the magnitude of the angle of a location or to determine the area of a measurement location (Darfis, 1995). Theodolite has 2 kinds of forms seen from its use, namely manual theodolite and digital theodolite (Digital *Theodolite* is usually written on DT). Description and function of Theodolite (EDT) parts:

- Rough Aiming Line / vizier (Vizier / aiming tool) = To shoot objects roughly, that is, to shoot objects so that the shadow of the object enters the binoculars.
- Focus Ring = To set the diaphragm, by rotating left or right to clarify the object / focus the shadow.
- Ocular Lens = To see objects by eye, and by turning the lens left or right can clarify the line of the cross of the axis.

- d) Vertical microscrews/Smooth adjusting screws for vertical motion
- e) To rotate the binoculars vertically (when the verticle locking clamps have been tightened) to position the object at the intersection of the cross threads (if it is hard, do not force it)
- f) Vertical locking clamps = To lock binoculars so that they cannot be moved vertically.
- g) Nivo tube = To adjust the position of the II axis of the aircraft horizontally, and can be adjusted with 3 flat tanning screws.
- h) Digital monitor/Display = For vertical (V) and horizontal (H) circle scale readings.
- i) Buttons – buttons for settings
- j) Horizontal motion locking clamps = To lock the fuselage so that it cannot be rotated horizontally.
- k) Basic theodolite aircraft = For the rest of the theodolite aircraft.
- l) Battery lid opening valve = To open and install the battery box.
- m) Battery box = 4 battery compartments, with battery type A2 (before the aircraft is put in its box make sure the battery has been discharged).
- n) Objective Lens = To bring the shadow of the object closer to make it look clearer.
- o) Aircraft body = To place parts of the aircraft.
- p) Optical guessing tool = To see and position the I axis implicated with the standing point of the plane or a specific point on earth
- q) Switch ON/OFF = To turn the plane on and off
- r) Regulator Button Cover
- s) Nivo box = Serves to set the position of the I axis to be in the vertical position.
- t) Three flat tanning screws = To adjust the position of the nivo bubbles are at the midpoint / peak.
- u) Magnetic compass = To determine the north direction, and can be used to search for azimuth

The steps or how the installation and adjustment of the theodolite aircraft work are as follows:

1. Install the statip above the point that is necessarily surfaced by the ground in such a way that the legs form an equilateral pyramid, tighten the statype screws, stick them firmly enough into the ground, and try to keep the statype head as flat as possible, to facilitate the arrangement of the tube nivo and nivo box and make sure the midpoint of the statype head is implicated with the point / peg.
2. Take the theodolite plane carefully and attach it to the statype head.
3. Position the theodolite at a certain point (if any) by installing an unting – unting or looking at the optical guessing device.
4. If the position is not right, loosen the statype head lock and slide it in the desired position, if it is too far away, the statip should be retracted and moved.
5. Center the tube nivo bubbles with 3 even-tanning screws, in the following way:
 - a. Direct the nivo tube parallel to the connecting line of the screws A and B

- b. Center the tube nivo bubbles by turning the screws A and B simultaneously out the same out into the same into the
- c. After precision, rotate the fuselage 90°
- d. Re-center the tube nivo bubbles with C screws only, (nivo box will follow balanced)
- e. Make sure the tube nivo bubble and the nivo box remain in the middle even if the plane is rotated in all directions.
- f. If it turns out that it is not balanced, repeat the 5a to 5e adjustment.

6. When the two nivos are balanced, press the power button (switch) on the ON state, and the theodolite aircraft is ready to use (the I axis is vertical and the II axis is horizontal).



Figure 2. Tripot

Useful as a place where theodolites, waterpasses etc. are placed. these three statype legs can be raised down by loosening the foot regulating screws.



Figure 3. Yalon & Measuring Signs

Two tools that in soil measurement science and other fields of science have the same function, namely as a tool that functions to read height from thread reading data and find out the size of the height of the horizontal line highlighted by theodolite or waterpass.



Figure 4. Meter

A tool that can be used to measure the height of the tool, the distance between one point and another and various other things. The way the roll meter works is by pulling the zero-numbered side in the direction it is intended and then the result can be read on the tape of the meter.

2. Methods

2.1 Measurement Methods

Polygon is one of the methods to determine the horizontal position of points in the field in the form of many facets by measuring angles and distances. The purpose of polygon measurement is to obtain the horizontal coordinates (X,Y) of the points of the field. Its purpose is as a basic framework for mapping purposes or for other technical purposes, such as for urban development, ground control and others (Hartanto, 2012). Polygon data are elements that are needed to be able to calculate a polygon (coordinates). The elements are angle, distance, azimuth (angle of major). For angle and distance, it is data that is directly obtained in the field from the calculation results.

The data needed is angle and distance data, so the equipment used is an angle measuring instrument and a distance measuring instrument, namely Theodolite and Measuring Signs (Hartanto, 2012). Closed polygons provide checks on certain angles and distances widely used in measurements of control points and topography.

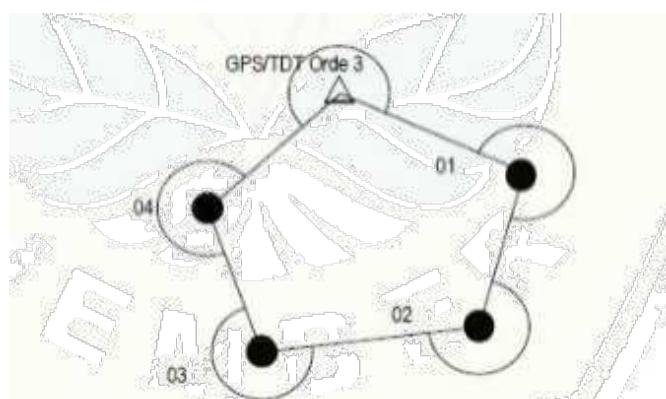


Figure 5. Closed Polygon (Direktorat Pengukuran Dasar Deputi Bidang Survai, 2011)

2.2 Measurement Data Sources

In this service, the source of service data comes from Land Management and Development of the Faculty of Engineering, University of Muhammadiyah Buton and the results of surveys at the place of service. As for the data used in this service, there are two data. First, primary data is obtained from the results of a survey directly at the place of service in the form of existing conditions, dimensions of existing buildings, elevation and

area of existing land. Second, secondary data is obtained from relevant agencies in measuring land area and land boundaries.

2.3 Data Collection Methods

The initial stage carried out in the measurement is to consult with the leadership which will be discussed in the measurement. Then look for reference sources through the study of literature related to the material to be discussed in measurements. Then conducting a field survey is carried out to find and obtain the original data at the measurement site. Data in the form of location, dimensions, elevation and documentation. In field surveys using several tools for measurement, namely:

- a) Laptop
- b) Theodolite
- c) Notebooks
- d) Tripot
- e) Detail prism and Polygon Prism
- f) Meter
- g) Umbrella

3. Result and Discussion

3.1. Land Measurement Results

Based on the measurement results in the field, the land area for the development of facilities and infrastructure at the University of Muhammadiyah Buton was obtained, which is located at KM 5 Kel. Kadolokatapi Kec. Wolio Baubau City as a whole covers an area of 7,068 m².

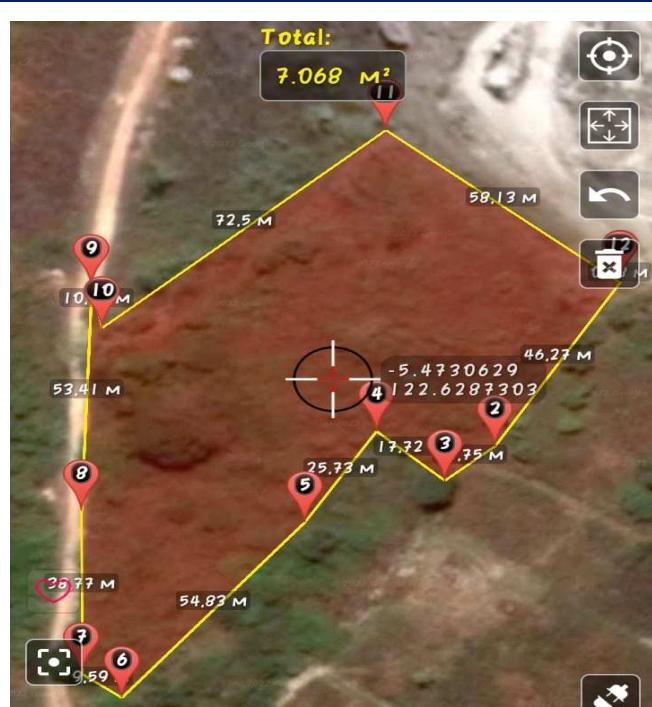


Figure 6. Measurement Land Area

3.2. Results of Topographic and Plan-Looking Measurements

The author, together with the team, has carried out topographic measurements and processed a plan that is adapted to the location of the object of service at the location of the construction plan of the Faculty of Engineering, University of Muhammadiyah Buton in Kadolokatapi District, Wolio District, Baubau City.



Figure 7. Measurement Documentation



Figure 8. Measurement Documentation

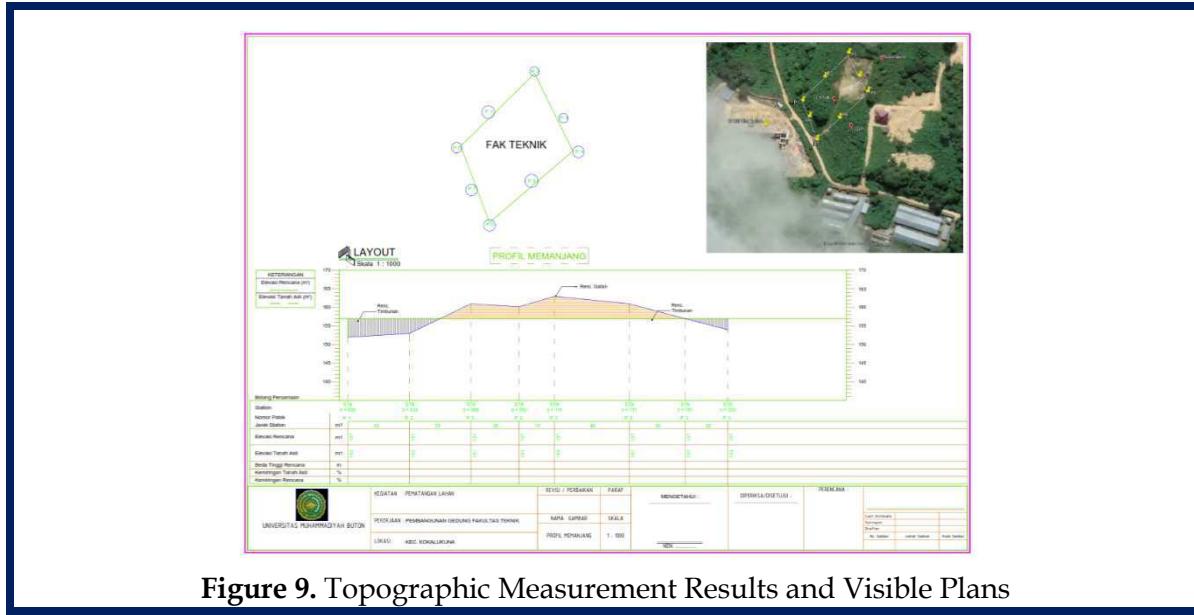


Figure 9. Topographic Measurement Results and Visible Plans

Based on the results of topographic measurements of elongated profiles, there are excavations and heaps that must be adjusted so that the development process is in accordance with the planning that has been made. The estimated stockpile that must be adjusted for elevation is about 7 m, has a length of about ± 75 m and a width of about ± 33 m and an estimated excavated tiangling that must be adjusted which is 7 m high.

3.3. Site Plan Plan from Measurement Results

Based on the site plan of the building plan to be built in the location of land arrangement other than the Faculty of Engineering, there are two other lecture buildings. The construction plan for the engineering faculty building has a building size of 30 m x 40 m which is intended for two study programs, namely the civil engineering study program and the computer engineering study program. There are 20 lecture rooms spread across the 1st, 2nd and 3rd floors, 4 rooms for civil engineering laboratories and 3 rooms for computer engineering system laboratories. Based on the results of field measurements, a Site Plan drawing plan is obtained using the help of the Autocad application (Sayfullah S, 2022a) as follows:

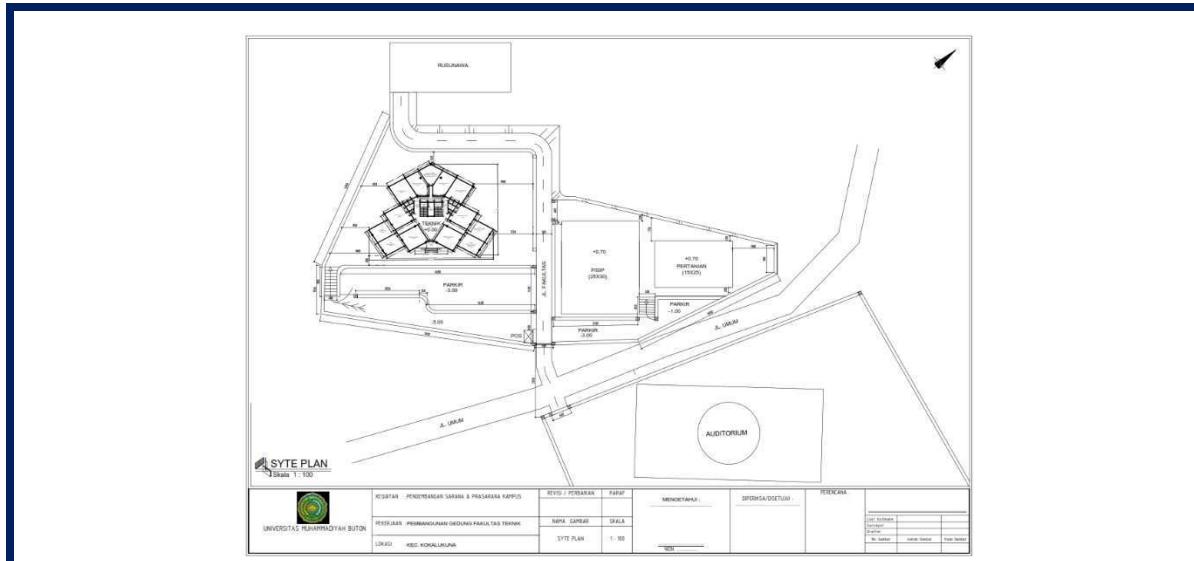


Figure 10. Visible Site Plan Plan

3.4. Plan View 3D Development Development

Based on the measurement results in the field, a 3D View Development Development image plan was obtained as follows:



Figure 11. Plan-View 3D View

4. Conclusions

Obtained from the existing condition from land management and development of the Development of the Faculty of Engineering, University of Muhammadiyah Buton. The area of land processed in land management and development of the Faculty of Engineering, University of Muhammadiyah Buton located at KM 5 Kadolokatapi Village, Wolio District, Baubau City, is 7,068 m². Obtained pictures of topographic conditions, plans, Site Plans and 3D views of the development of facilities and infrastructure of the Faculty of Engineering, University of Muhammadiyah Buton located at KM 5.

References

Anonim. (2018). Laboratorium Survey dan Pemetaan. In *Fakultas Teknik Universitas Jember*.

Darfis, I. (1995). *Penuntun Praktikum Ilmu Ukur Tanah*. Faperta Universitas Andalas. Padang.

Direktorat Pengukuran Dasar Deputi Bidang Survai. (2011). *Pengukuran dan Pemetaan Bahan Ajar Pengukuran Total Station*. Penerbit Badan Pertanahan Nasional Republik Indonesia.

Hartanto, A. & H. K. (2012). *Ilmu Ukur Tanah Metode dan Aplikasi Bagian Kedua*. Malang: Dioma.

Pratama. (2017). Analisa Volume Galian Dan Timbunan Pada Perencanaan Lahan Parkir Gedung Direktorat Politeknik Negeri Balikpapan. *Tugas Akhir. Balikpapan. Politeknik Negeri Balikpapan Jurusan Teknik Sipil*.

Sayfullah S, M. (2022a). Making Boundaries and Site Plans in Nambo Village, Lasalimu District, Buton Regency. *Room of Civil Society Development*, 1, 80–85.

Sayfullah S, M. (2022b). Pendampingan Perencanaan Konsep Desain Gapura Kantor Kementerian Agama Kabupaten Buton. *Jurnal Pengabdian Kepada Masyarakat Membangun Negeri*, 6, 213–218.

Syaripuddin, A. (2012). *Pengantar Survey dan Pengukuran*. Yogyakarta.

umbuton.ac.id. (n.d.). <https://www.umbuton.ac.id/page/detail/sejarah>.