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TOPOGRAPHY & CROSS SECTION MEASUREMENT FOR CALCULATING THE COASTAL BORDER

(CASE STUDY OF BERAWA-CANGGU BEACH, BADUNG)

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Abstract. *: The coastal border is a land along of the shoreline, in which its wide is proportional to the shape and physical condition of the beach, at least 100 meters from the high water level towards the land. This research is based on the results of topography and cross section measurement work at Berawa Canggu Beach, Badung Bali, followed by calculation, drawing and reporting. The required data is the existing base data in the planned area in full to find the position of High Water Level in the field which will be used for the reference of the boundary limit for the coastal planning. The results obtained from this research are: the coastal border position is measured from BM W.3 along 55.1712 meters into the land of ownership and the coastal border position is measured from BM W.4 along 50.6926 meters into the land of ownership.*

Keywords : measurement of topography, cross section, high water level

1. INTRODUCTION

1.1 Background

The coastal border is a land along the shoreline, which is proportional to the shape and physical condition of the beach, at least 100 meters from the highest tide point towards the land. The boundary of the coastal border is a coastal border space defined by a particular method. [1]

This boundary line is part of the coastal safeguards that are intended to protect the community from high tidal hazards, abrasion, ensuring public facilities around the coast, protecting the beach from pollution, and silting the river mouth.

Before building the building and applying for IMB, the land owner must know the various border lines in the land owned. Generally, however, landowners neglect by reason of not realizing or forgetting the existence of the boundary after some time, and want to modify the building. This should be avoided because every time you make a change to the building, IMB (Building Permit) must be reorganized, so that again get notice about the applicable line border.

This report was prepared based on the results of field measurement work at Berawa Beach, Canggu, Badung Bali Regency, followed by calculation, drawing and reporting.

In this report, it is described in detail about the process of fieldwork implementation, data processing until the process of topographic map depiction.

1.2 Aim and objective of the research

To obtain the existing base data in the fully planned area of the High Water Level position in the field, to meet the technical requirements of the coastal border for building planning purposes.

1.3 Scope of the research

The scope of the survey work is the topography mapping teristris and cross section includes the activities:

a. Preparation / initial survey
b. Production and installation of benchmarks

c. Polygon measurements
d. Detailed measurements of soil topography with radial system
e. Measurement of existing situation such as beaches, roads, rivers, canals, power lines and telephone and utilities and other topographic features
f. Measurement coastal situation around the area
g. Measurement of cross section
h. Processing data
i. Photo topography map
j. Final report

2. METHOD

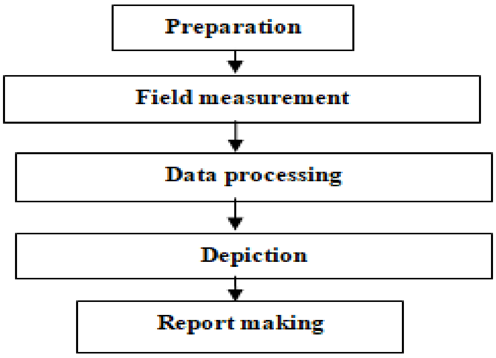
2.1 Research Location

The research and measurement were conducted in Berawa beach area, Canggu, Badung regency, Bali, in which the area is about 2 hectares, conducted for 1 week.

Picture 1. Research location

2.2 Flowchart of the Research

The process of carrying out the field measurement work to the process of drawing and reporting, which between the activities of one with the other are interrelated and is a unity. To expedite the course of work, it is needed an organization implementing the work, and the implementation steps as follows:



Picture 2. Work implementation diagram

2.3 Preparatory works

Preparatory works that have been implemented include:
a. Planning / searching of data of BM / reference point to be used as bonding measurement point.
b. Preparation of equipment to be used for the purposes of the work.
c. Preparation of personnel to be assigned to the field.
d. Setup of data recording media, such as flash or external hard drive, etc.
e. Checking tool.

In the preparatory stage, in order to obtain accurate survey results and meet the required measurement standards, all equipment is firstly checked and calibrated. Checking and calibration of the tool include: accuracy of angle reading (horizontal and vertical), optical centing, proximity to prism constant, temperature adjustment and high difference checking. [3]

2.4 Determination of reference points

a. Coordinate reference

The reference point used as the basis for reference of the horizontal control framework (coordinates) is determined from the Government 10 BM located in the Canggu Fishermen Village, BM W3 and BM W4 in Berawa Canggu Coast, is set with the initial coordinates as follows:

Table 1. The reference point used as the basis for reference of the horizontal control framework

No	BM Code	Coordinate		Description
		X	Y	
1	BM. 10 Government Owned in Canggu Fishermen Village	294579.060	9042045.800	**UTM Coordinate**
2	BM.W3	296343.600	9040212.631	
3	BM.W4	296377.823	9040152.931	

b. Elevation reference

The elevation reference point uses the elevation reference from the existing Global Positioning System (GPS) and BM markers, i.e. from Government's BM.10 in Canggu Fishermen Village, with initial elevation at BM.10 = 6,219 meters.

2.5 Installation of Benchmark (BM)

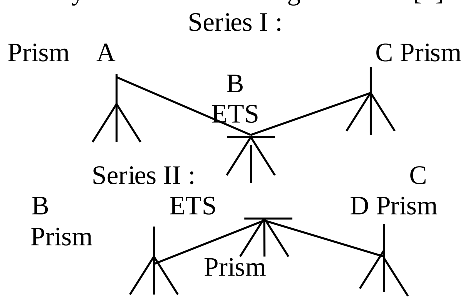
The purpose of benchmarking (BM) is to determine the reference point of topography and reference measurement for the construction phase activity at the measurement location in the future. [2] At this location 2 (two) point benchmarks are installed, and are numbered BM.W3 and BM.W4. Benchmarks are made of concrete on which are bolted to the centering point. BM is installed in a relatively safe, stable and easily visible.

2.6 Measurement of Polygon

For the purposes of the horizontal binding point as a reference for the calculation of coordinates, a polygon measurement shall be carried out which encompasses all measurement areas [3] by the following measurement methods: Polygon measurements were performed with a closed polygon system starting from BM.W3, through all the BMs and assisted points mounted.

a. Angle measurement
   1) Polygon measurements were performed with Totalcon station total electronic measuring device 111
   2) Measurement of polygons through all the benchmarks and HP points (help points) installed in the field form a closed network, covering all measurement sites
   3) The polygon angle reading system by statip to statip, the magnitude of the direct corner cover error is calculated in the field to determine the level of accuracy.
   4) For angle measurement to target use the prism attached in statip.
   5) Each corner of the polygon is measured in a series, which is extraordinary, with a remarkable reading correction of a maximum of 3 ".
   6) Incorrectly cover the maximum polygon angle of 10√ n, where n is the number of polygon points.

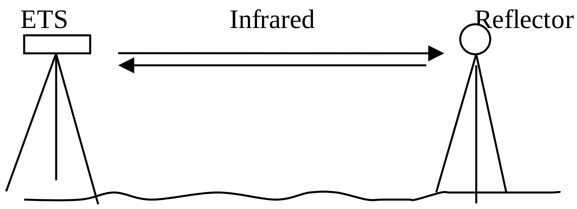
The polygon angle measurement is generally illustrated in the figure below [6]:



Picture 3. Angle measurement

b. Distance measurement
1) In addition to being used for precise angular measurement, Electronic Total Station (ETS) has an automatic distance measurement facility (EDM) via an infrared LED wave reflected in Refectif Prism.
2) An accurately obtained electronic distance (accuracy of 0.5 cm) is automatically corrected against the air pressure and temperature set at each measurement.
3) Correct distance correction shows the same result at the position of the distance behind it and the distance of the face, this is because the plane and the prism are exchanged.

The distance obtained directly is the horizontal distance.
The distance measurements are illustrated as shown below [6]:



Picture 4. Distance measurement

The provisions in polygon measurement are as follows:
1) Prior to the measurement, the measuring instrument has been checked when there is an error, calibration and it is recorded in the meter.
2) Each side distance of the polygon is measured twice from the position of the different device being read three times the display and averaged so close to the actual distance.
3) The number of polygon points between two azimuth controls is adjusted to the field conditions.

2.7 Detailed Topography Measurements

The measurement of the topographic detail points is tied from the basic mapping framework or the main polygon points, if necessary for binding of the detail points that cannot be attached to the main polygon, an auxiliary polygon is made. [5] The collection of detailed points is evenly distributed throughout the survey site, all the visible features of either the natural or man-made elements are measured as a detail point and if the element is in long shape, then the detail point taking will follow the form of the element. [4].

2.8. Area Boundary Measurement
1) To know the total area of project plan area, the boundary measurement is done by the following method:
2) Boundary measurement is done by the same method as measuring detail topography by using digital distance and angle measuring device (Total station).
3) In order to avoid shortage or over-area extent, prior to measurement, the boundaries of the area have been agreed and agreed upon by the assignor or represented.
4) Each corner of the area boundary is determined by its coordinates so that it can be calculated the actual area.

2 RESULT AND DISCUSSION

The process of data calculation is divided into several parts as follows:
a. Calculation of polygon data
b. Calculation of situational data
c. Calculation of cross section

a. Calculation of Polygon Data

The calculation of polygon data is done by the adjustment method on each point and the polygon measurement line at that location there is 1 (one) loop. [2]
1) Calculation starts from polygon point BM.W3 and BM.W4 which have coordinate value. From each of these two polygon points there is an initial azimuth value.
2) Starting from the initial azimuth of BM.W3 and BM.W4, calculations of subsequent polygon points with angles and spacing of each polygon point obtained from polygon measurements in the field.

b. **Calculation of Situation Data (Spot Height)**

The calculation of detailed situation data includes coordinate count, height difference and elevation of measuring points to reference point (where tool stand) is done by trigonometry / thachimetry and spot height count including high difference count and elevation of measuring points to reference point the establishment of the tool) by way of leveling. [3]

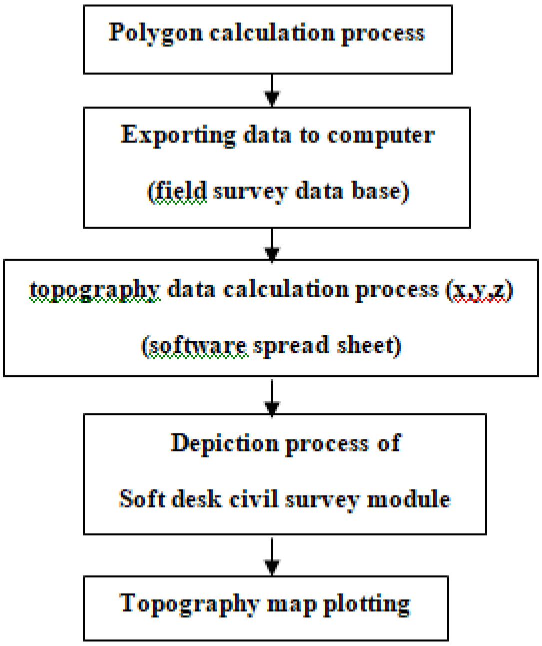
The process of calculating detailed situation / spot height data to be coordinate and elevation data (x, y, z) is done by using Microsoft excel software with polar computation system.

c. Depiction

From the result of calculation of situation data / spot height which is coordinate and elevation data (x, y, z) from the measuring point then do the drawing process by method:

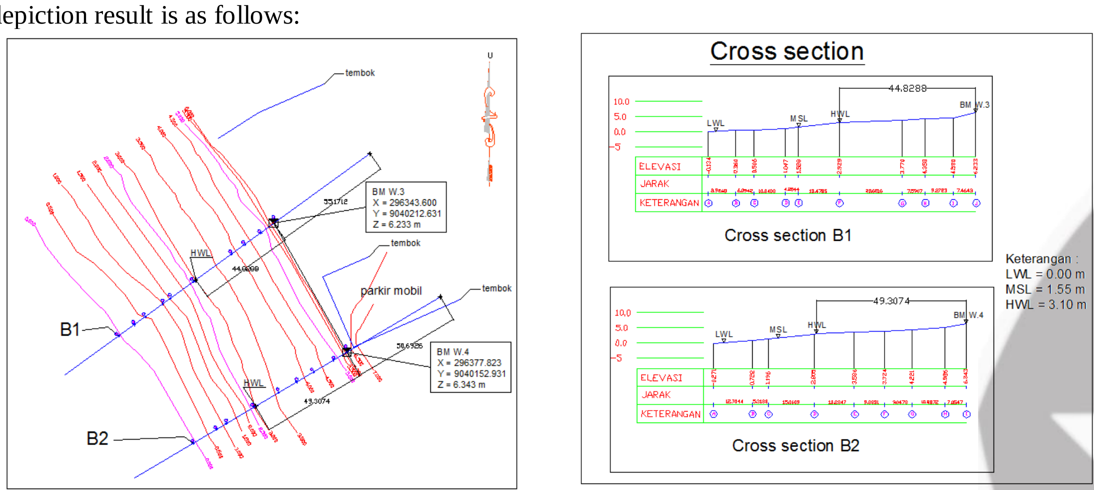
1) Before all coordinate and elevation data (x, y, z) the detail points of the situation are downloaded into he soft survey civil survey program, all data are given numeration and description first.
2) Numbering and explanation is made, in order that if there is an error in the calculation of spot height data, there is no difficulty to make corrections and corrections based on the number and description in each data.
3) After all detail situation data is calculated in the form of coordinate and elevation data (x, y, z), then downloaded by program soft survey civil survey / survey module to become picture topography (digital mapping).

Processing data diagram is as follows:



Picture 5. Processing data diagram

The depiction result is as follows:



Picture 6. Map of topography and cross section

4. CONCLUSION AND SUGGESTION

4.1 Conclusion

The conclusions obtained after making this coastal boundary measurement are:

a. The distance from High Water Level (HWL) to BM W.3 is = 44,8288 m. Beach border 100 m from BM.W3 toward land ownership = 100 m minus HWL distance to BM.W3 = 100 m - 44,8288 m = 55,1712 m. So the position of coastal border began measured from BM W.3 along 55.1712 meters into the land area of ownership.

b. The distance from High Water Level (HWL) to BM W.4 is = 49.3074 m. Beach border 100 m from BM.W4 toward land ownership = 100 m minus L to BM.W4 = 100 m - 49,3074 m = 50,6926 m. So the position of the coastal border began measured from BM W.4 along 50.6926 meters into the land area of ownership.

4.2 Suggestion

To obtain a careful High Water Level data, a tidal observation measurement should be made for a month.

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