

Lab 5 – Horizontal Angle Measurements Using Total Station

Part A- Angle Measurements

Overview

In this lab, you will measure horizontal and vertical angles using total stations. You will measure horizontal angles using two different methods: the close-the-horizon methods and the repetition method. You will follow angle measurement procedures outlined in chapter 6 of the textbook.

Each group will measure the horizontal angles between the two sides of the Engineering Physics building (Figure 1). You will also measure the vertical/zenith angle to the top of southwest corner of the EP building and determine its elevation. Each group will have a total station, a reflector prism, and a measuring tape. Your group should meet at the surveying lab (BEL 121) to check out the equipment. After completing fieldwork, each group should return the equipment back to the surveying lab.

Lab Tasks

Task 1: Check out the equipment from the surveying lab BEL 121 at the time assigned to your group. Head to the data collection site in the Engineering Physics (EB) building lawn area

Task 2: *Horizontal Angle measurements using close-the horizon-method*

1. Setup and level the total station at the point assigned to your group
2. Point the total station to the point that marks the left hand side of the angle. Lock the motion and set zero on the instrument.
3. Free the motion and aim the total station to the point that marks the right hand side of the angle (second corner of the building, write the measured angle in your field notes
4. Rotate the total station back to the first point. If there was no error in your measurements, the horizontal angle reading should be zero (or 360 degrees). Document the error in the measurements.
5. Repeat steps 2-5 two times [what is the average value of the angle measurement? What is the average value of the error?]

Task 3: *Horizontal Angle measurements using the repetition method*

1. Set the total station to work on the repetition angle measurement mode
2. Point the total station to the point that marks the left hand side of the angle. Lock the motion and set zero on the instrument.
3. Free the motion and aim the total station to the point that marks the right hand side of the angle (second corner of the building, write the measured angle in your field notes
4. Turn the total station back to the left pointing again to the first point and write the measured angle in your field notes (if you use the repetition mode, then this reading should be double your measured angle in step 3)
5. Repeat this process for two times – what is the average value of the measured angle?

Task 4: Using the known elevation of the BM (2586.83 Ft), find the elevation of the point you are occupying with the total station by measuring the vertical distance between the two points using the EDM tool in the total station. [You need to factor the instrument height and the prism height in your elevation estimation]

Task 5: Measure the zenith angle to top of the southwest corner of the EP building. Using the EDM tool measure the horizontal distance to this corner. Use the horizontal distance and the zenith angle to determine the elevation of the top of the southwest corner of the building.

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Task 6: Return the checked equipment to the surveying lab (or hand the equipment to the next group).

Lab Deliverables for Part-A

Field notes showing all lab activities, due at the end of the lab period

Lab Resources

Text book- Chapter 6/Class notes



Figure 1: Engineering Physics (EP) building lawn area with points for horizontal and vertical angle measurements

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Part B- Witnessing Benchmark Points

Task 1: Witness the following three benchmark points:

| Benchmark | Elevation | Description |
|------------------|-----------|---|
| (USC & GS) Q-348 | 2,583.13 | In top of concrete wall in engineering building, 33.80' E of E. curb of Line St., 16.5' SW of the NW corner of the building, 4.2' W. of the W. side of the building |
| UI-66 | 2,564.64 | Southeast of the intersection of 6 th and Rayburn |
| UI-30 | 2,562.39 | side of 6th street, west of the main entrance of LLC |

Task 2: Use existing monuments to provide an updated documentation of the two benchmark points.

Lab Deliverables for Part-B

Field notes with the new witnessing description of the two benchmarks

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Group Assignment – Section 01

| Group | Student | Start total-Station Work | Total Station Point | Start Bench Mark Witnessing Work |
|--------------|-----------------------------|---------------------------------|----------------------------|---|
| 1 | Thomas, Arthur Matthew | 9:30 AM | A | 10:30 AM |
| | Fischer, Stephanie Lynn | | | |
| | McCabe, Keith Chandler | | | |
| | Payne, Spencer William | | | |
| 2 | Benscoter, Kelsey Jae | 9:30 AM | B | 10:30 AM |
| | Wright, Eric Benjiman | | | |
| | Millard, Lauren Marie | | | |
| | Linja, Charles Scott | | | |
| 3 | Clark-Cline, Cody Allen | 9:30 AM | C | 10:30 AM |
| | Sonnen, Benjamin David | | | |
| | Slonaker, Jeffrey David | | | |
| | McClung, Cody Alexander | | | |
| 4 | Bellecy, Robert Peter | 9:30 AM | D | 10:30 AM |
| | Heighes, Riannon Lorayne | | | |
| | Cook, Ryan John | | | |
| | Reagle, Samuel | | | |
| 5 | Pline, Eric James | 10:30 AM | A | 9:30 AM |
| | Charlo, Bryant James | | | |
| | Smith, Charles Robin | | | |
| | Rodgers, Garrett John | | | |
| 6 | Kohring, Brett Austin | 10:30 AM | B | 9:30 AM |
| | Maxey, Darin James | | | |
| | McGriff, Callan Elizabeth | | | |
| | Sherer, Sydney Trebor | | | |
| 7 | Nufer, Taylor Eugene | 10:30 AM | C | 9:30 AM |
| | Leavitt, Vance Albert | | | |
| | Martin, Craig L | | | |
| | Logerwell, Breanna Dee | | | |
| 8 | Thome, Clint Alan | 10:30 AM | D | 9:30 AM |
| | Sommer, Kelby Lee | | | |
| | Wisdom, Katherine Elizabeth | | | |
| | Bradley, Briana Kay | | | |

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| Group | Student | Start total-Station Work | Total Station Point | Start Bench Mark Witnessing Work |
|--------------|-------------------------------|---------------------------------|----------------------------|---|
| 1 | Bode, Marshall Hendrick | 9:30 AM | A | 10:30 AM |
| | Robinson, Camden Tye | | | |
| | Iveson, Roger Matthew Oliver | | | |
| | Salove, Ethan Jay | | | |
| 2 | Johnson, Spencer Theodore | 9:30 AM | B | 10:30 AM |
| | Forrest, Teri Lee | | | |
| | Brown, Nicholas | | | |
| | Eddy, Nathan Michael | | | |
| 3 | Gussenhoven, Sarah Marie | 9:30 AM | C | 10:30 AM |
| | Fitzsimmons, Benjamin Charles | | | |
| | Wommack, Kenneth Eugene | | | |
| | Donaldson, Beau Denton | | | |
| 4 | Clark, Jesse Dalton | 9:30 AM | D | 10:30 AM |
| | Mojica, Pedro Kenneth | | | |
| | Gonzalez, Angel Edward | | | |
| | Holmberg, Eric | | | |