*Chapter in Book*

# Ezy-Way Leveling: An Automated Profile Leveling

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***Abstract:*** *Leveling is an important element in land surveying which deals with proper instrumentation, measurement, and analysis. Educators and practitioners are aware of the important of levelling analysis as it serve as an important input data to be used for any construction design. An improved leveling management is still remaining a challenging task as the levelling process required a skilled person to plot the levels on the map or sheet manually which is very complex process and required a lot of calculations. Therefore, we introduce "EZY-WAY LEVELING" as a new automated leveling tool that provides solution to this current gap. The novelty of the proposed EZY-WAY LEVELING can be seen from its ability to help students and engineers analyse all surveying data such as Rise and Fall and Reduced Level (RL) in an easy way and fast without using calculator. Furthermore it is easy to use, simple and user friendly .xlss excel platform that is proven less-time consuming process. The tool is ready for commercialization and ready to use any user. It is an efficient educational surveying tool that serve as guidelines for students, lecturers and engineers.*

*Keywords: leveling; rise & fall; reduced level.*



## 1. INTRODUCTION

Levelling is a branch of surveying operation that is used by surveyor and engineer for determining the elevations of certain points or the differences in height between any points on the earth's surface. It is considered as the most important data for various engineering designs, mapping, and construction (El-Ashmawy, 2014).

## 2. METHOD

The method for determining the elevations or height differences in surveying are mainly classified as geometric levelling, trigonometric levelling, and levelling (Ceylan et al., 2005). According to (Marín et al., 2008), leveling is the most reliable method for the determination of elevations and height differences in recent project. Therefore, the basic approach of profile levelling is chosen in this study.

Profile levelling is a method of surveying that carried out along the land on which a linear engineering work is to be constructed. It is also known as longitudinal leveling. The objective of this leveling is to determine the profile of the ground surface of the predetermined line, which may be single straight line or may consists of a series of straight lines changing a direction or connected to a curve as shown in Figure 1.

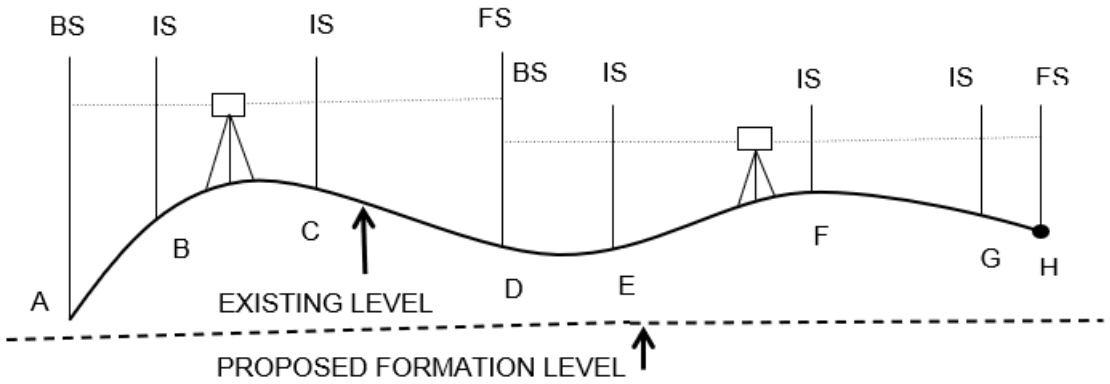


**Figure 1**: Profile leveling.

Based on Figure 1, the measurement or reading taken back towards Point A is known as Back sight reading (BS). Since a survey progresses from a point of known position to points of new position, the position of point D can be referred as Fore sight (FS) reading. All readings taken between back sight and fore sight are referred as Intermediate sights. From the observation from profile levelling, the data to determine reduce level can be tabulated as presented in Table 1.

**Table 1**: Rise and Fall method.

| Back Sight (BS) | Intermediate Sight (IS) | Fore Sight (FS) | Rise | Fall | Reduce Level (m) |
|---|---|---|---|---|---|
| 2.550 | | | | | 100.000 |
| | 1.750 | | 0.800 | | 100.800 |
| | 3.095 | | | 1.345 | 99.455 |
| | | 0.750 | 2.325 | | 101.780 |

## 3. FINDINGS AND DISCUSSION

Educators and practitioners are aware of the important of levelling analysis as it serve as an important input data to be used for any construction design. An improved leveling management is still remaining a challenging task as the levelling process required a skilled person to plot the levels on the map or sheet manually which is very complex process and required a lot of calculations. Therefore, we introduce "EZY-WAY LEVELING" as presented in Figure 2.

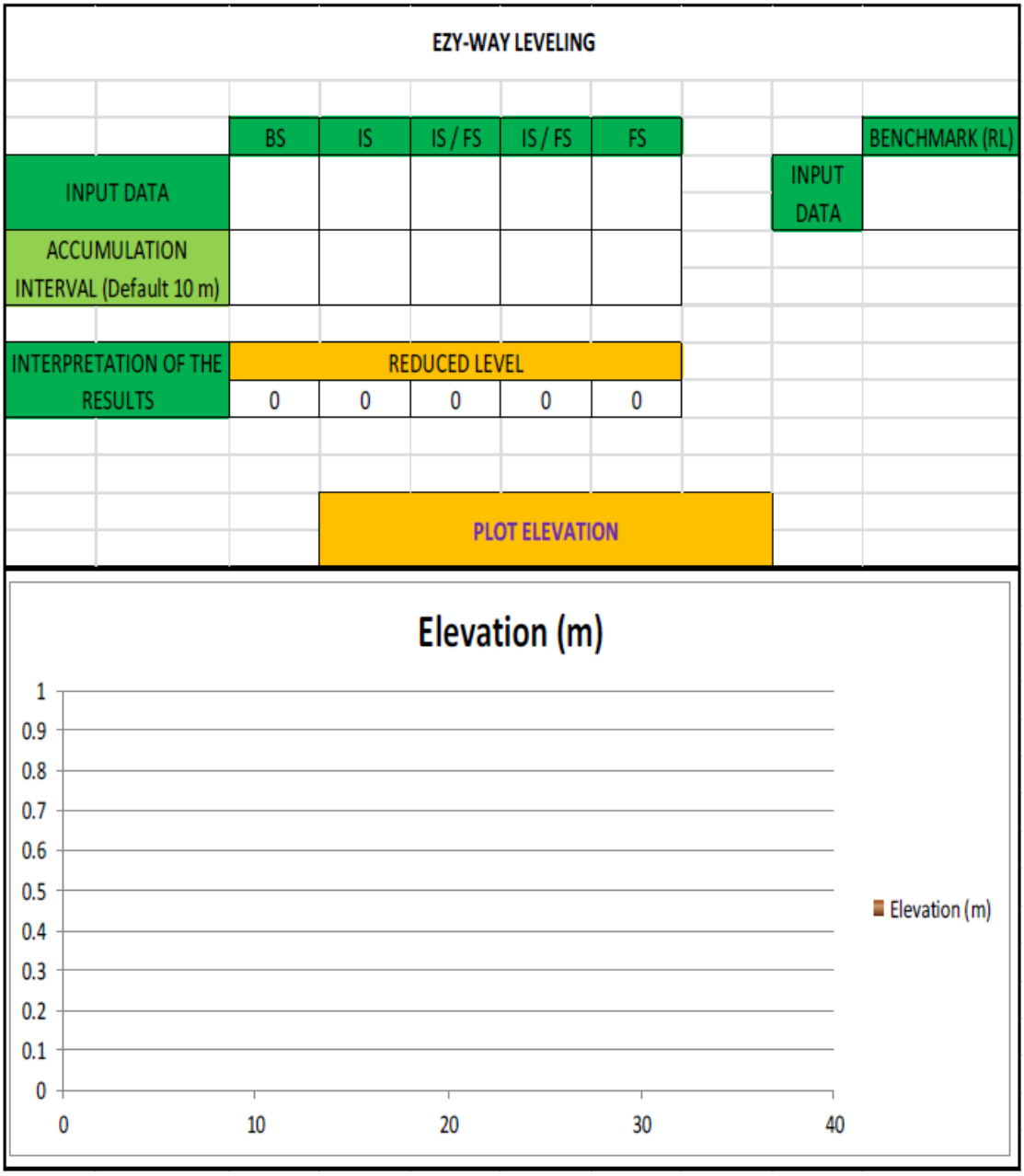


**Figure 2**: The proposed EZY-WAY Leveling tool.

Figure 3 shows the output of the automated profile levelling based on the data input from Table 1. It shows that the proposed EZY_WAY Leveling can automatically measure and mapping the complete profile levelling with ease without the need of complex calculations and manual sketch.

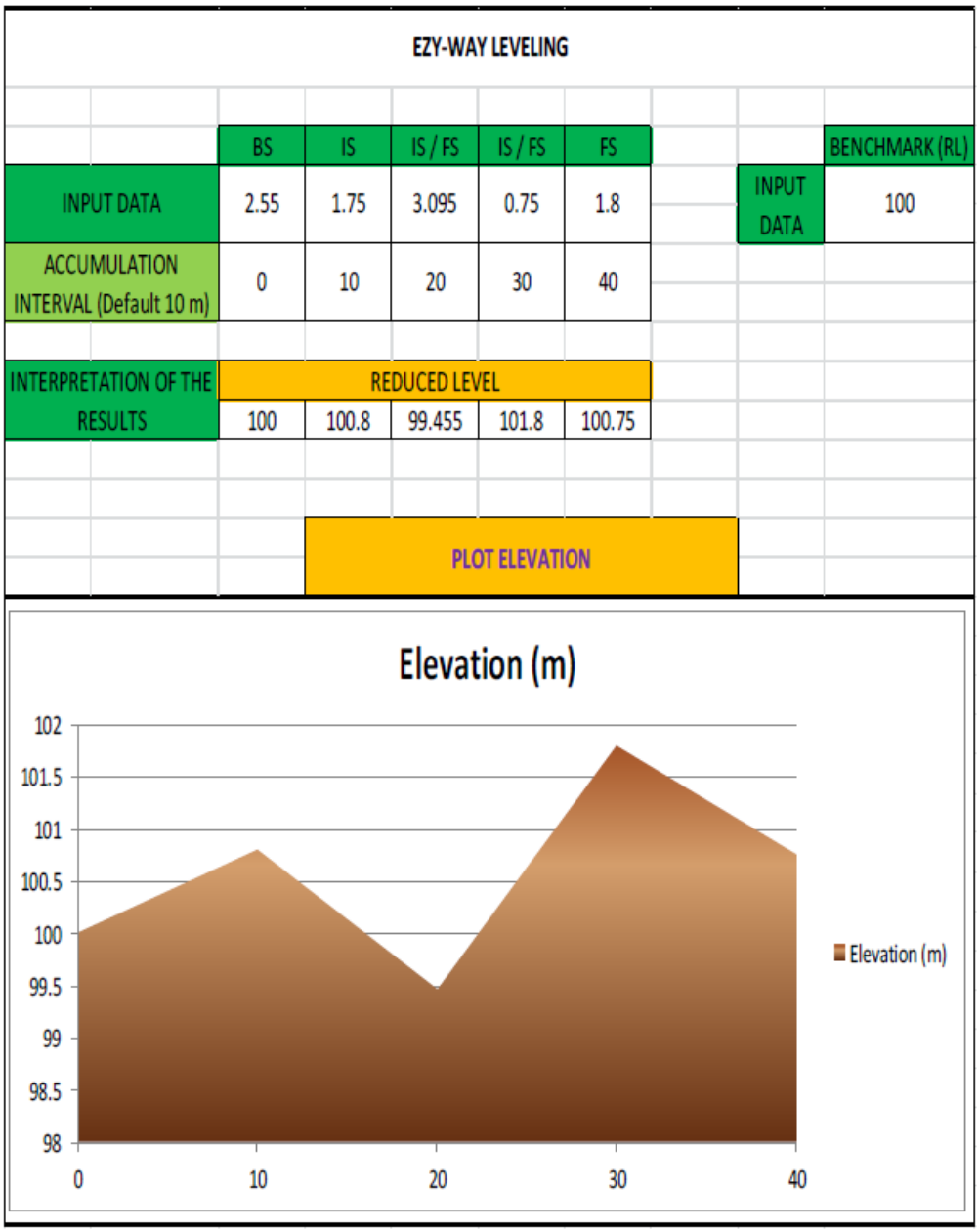


**Figure 3**: EZY-WAY Leveling – automated profile leveling based on data obtained in Table 1.

**4. CONCLUSION**

The novelty of the proposed EZY-WAY LEVELING can be seen from its ability to help students and engineers analyse all surveying data such as Rise and Fall and Reduced Level (RL) in an easy way and fast without using calculator. Furthermore it is easy to use, simple and user friendly.xlss excel platform that is proven less-time consuming process. The tool is ready for commercialization and ready to use any user. It is an efficient educational surveying tool that serve as guidelines for students, lecturers and engineers.

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