CIVIL ENGINEERING DEPARTMENT

Workshop Conducted

Name of the Workshop: TOTAL STATION

Presentation By: T Harshavardhan

Date of Workshop: 20/09/2016

Students Attended: B.Tech II , III, IV Civil Students

Workshop Summary:

The workshop started with a half a day introduction to the opportunities for civil engineers in the field of surveying and the basics of surveying. The remaining day covered the topics on the basic options and usage of Total station instrument. They were practically taught the measurement of horizontal and vertical distance and how to find out the area and height of the building. The difference between two equipments and the reflector and prism types used according to the practical difficulty in fixing them was taught. Practically the students itself handled the instrument and made use of the workshop efficiently.

Total stations are used extensively for taking geodetic and engineering survey measurements. These measurements are made possible by accurate observation of targeted points. One example is deformation surveys (slope stability monitoring) in mines. Continuous monitoring necessitates sheltering or housing the instrument to protect it against harsh weather conditions that are characteristic of mining environments. This research was carried out to investigate and propagate the effects of atmospheric variations and how these impact on total station observations taken through a shelter (window) glass in a surface mine environment.
Tests and analysis were performed at the University of the Witwatersrand by setting up a total station permanently in a shelter with removable window glass of different properties (thickness, colour and shape). The data collected was subjected to the atmospheric corrections formulae proposed by the instrument manufacturer. The results can be summarized as follows:
 Current formulae for systematic survey error corrections adequately compensate for atmospheric parameters variation during distance measurements when measurements are not taken through glass.

 The research established that the properties of glass matter when taking total station distance measurements through a closed glass. The glass has little or no impact on vertical distance measurements but its impact on horizontal distance measurements increases as glass thickness and tint (colour) increase. The impact remains unchanged after atmospheric corrections formulae are applied which require additional error propagation.

 The research also revealed that glass thickness of less than 3.0 mm has no effect on the accuracy specification limits of the instrument, while a thickness of more than 3.0 mm causes errors in horizontal distances observed through the glass regardless of different angles intersecting the glass.

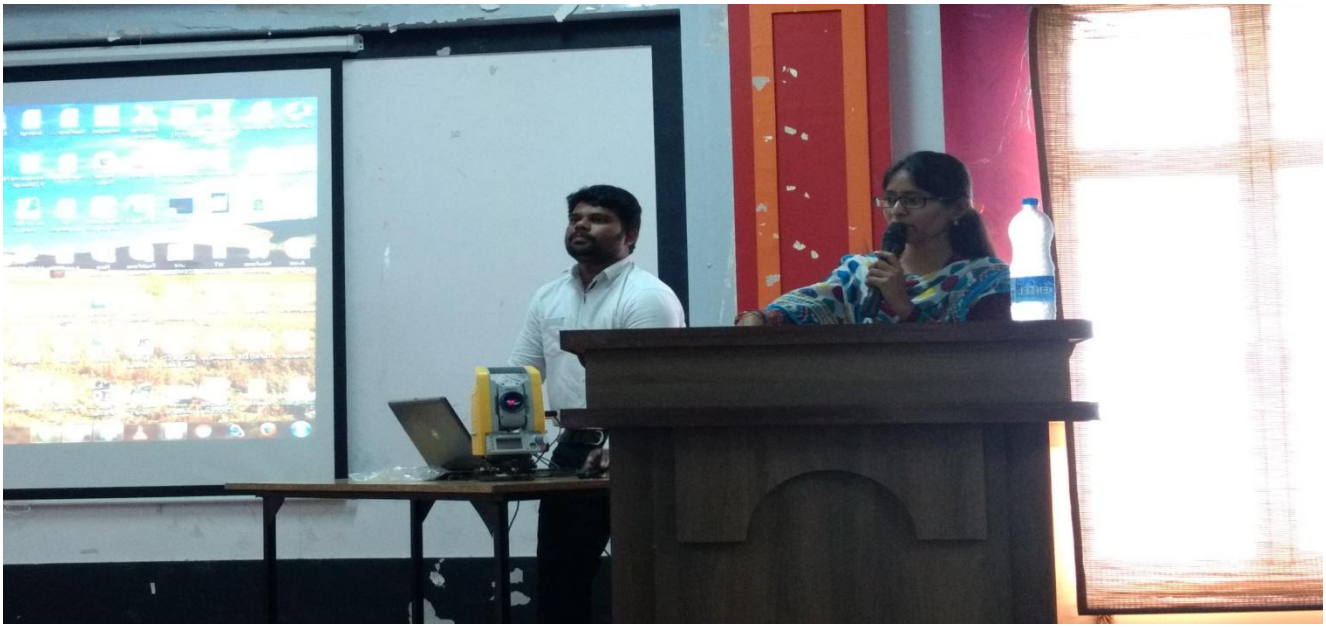
There is also positive correlation between the expected error and the colour of the glass.

 The shape of the glass has an impact on distance measurements. However, it is advisable to use only flat glass for total station observation windows; otherwise further research must be carried out to model the impact of the glass shape.

The distance between the total station and the observation window has no impact on distance accuracy. However, it is advisable to keep the distance between the total station and the observation window as short as practical.

Therefore, distance measurements through any glass medium must either be avoided or the distance must be corrected. If distance must be measured through a glass medium, the properties of the glass material must be carefully considered when selecting the glass for the observation house sheltering the total station.

This thesis develops a systematic error correction formula to remove the impact of glass thickness on distance measurements. A second formula is proposed to cater for the effect of tinted glass on horizontal distance measurements. The formulae are tested on new set of distance readings taken at the University campus and in an open pit mine to evaluate their effectiveness. The results indicate that all horizontal distances measured through glass accurately conform to the accuracy limits specification of the total station after applying the developed glass impact correction formulae. The propagation formulae were also incorporated in software called *Agcomo,* which can be used to propagate total station systematic errors at mines during monitoring surveys. The software performs well in removing both the atmospheric variations impact and the glass properties impact on distance measurements. It has the advantage of performing atmospheric corrections alone or combine atmospheric and glass corrections when the need arises. The propagation formulae were also used to develop nomograms for field observation corrections in lieu of the software programme.



Welcome Speech by Aruna .V

Group Photo after Workshop