POLITEKNIK MERLIMAU MELAKA

WATER LEVELLING APPLICATION BASED ON COMMUNICATING VESSEL CONCEPT

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CHAPTER ONE

INTRODUCTION

1.1 LEVELLING

Levelling (*or Leveling*) is a branch of surveying, the object of which is: i) to find the elevations of given points with respect to a given or assumed datum, and ii) to establish points at a given or assumed datum. The first operation is required to enable the works to be designed while the second operation is required in the setting out of all kinds of engineering works. Levelling deals with measurements in a vertical plane. A level surface is defined as a curved surface which at each point is perpendicular to the direction of gravity at the point. The surface of a still water is a truly level surface. Any surface parallel to the mean spheroidal surface of the earth is, therefore, a level surface. A level line is a line lying in a level surface. It is, therefore, normal to the plumb line at all points. Horizontal line It is a straight line tangential to the level line at a point. It is also perpendicular to the plumb line.Vertical line is defined a line normal to the level line at a point. It is commonly considered to be the line defined by a plumb line.Datum is any surface to which elevation are referred. The mean sea level affords a convenient datum world over, and elevations are commonly given as so much above or below sea level. It is often more convenient, however, to assume some other datum, specially, if only the relative elevation of points are required.The elevation of a point on or near the surface of the earth is its vertical distance above or below an arbitrarily assumed level surface or datum. The difference in elevation between two points is the vertical distance between the two level surface in which the two points lie.Vertical angle is an angle between two intersecting lines in a vertical plane. Generally, one of these lines is horizontal. Mean sea level is the average height of the sea for all stages of the tides. At any particular place it is derived by averaging the hourly tide heights over a long period of 19 years. Bench mark is a relatively permanent point of reference whose elevation with respect to some assumed datum is known. It is used either as a starting point for levelling or as a point upon which to close as a check.

1.2 OBJECTIVE

i. Obtaining level reading by using water level.
ii. Comparing the levelling result between water level with auto level.
iii. Reduce the cost of instruments and their maintenance in levelling.

1.3 PROBLEM STATEMENT

i. Tool purchase and maintenance that is expensive.
ii. Requiring a lot man power.
iii. Tool is not enough when conducting practical.

1.4 SCOPE

i. Comparison the result between commnicating vessel method and manual level method.
ii. Levelling area committed from TBM1 to CRM5.
iii. Distance every backsigth to foresight is 30 metres.
iv. Transferring TBM1 to BM2 to caring out work of topography behind civil engineering brick workshop.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

An introduction to laser levels. Laser levels come in many shapes and sizes and can perform a wide selection of jobs in construction and building. Some laser levels cost a few pounds and some many thousands of pounds. Following is a basic introduction to different styles of laser levels and the sorts of applications they are suits to.

The most basic of laser level is a short spirit level with a vial and a laser emitted from one of the ends. This type of laser level used to be very popular a number of years ago when for sophisticated laser levels cost much more. These days this type of level are still in expensive but very few and far between, mainly because there is a vast array of other inexpensive multi line and to laser now available that can perform many more tasks.

2.2 FIRST RESEARCH

The rapidly declining stock of groundwater for irrigation poses a significant threat to agriculture in India. As a result, there has been great interest in policies that could be used to encourage farmers to adopt various water-saving technologies. This report discusses the results of a pilot study on the adoption of one particular water-saving technology, laser leveling. This pilot represents a follow up to an earlier IGC-funded survey in which over 800 farmers in the state of Punjab were asked about their perceived benefits and obstacles to adopting laser leveling. One of the objectives of that earlier study was to map out the farmers' social networks in order to shed light on the degree to which friends, family, and other contacts influence a farmer's attitudes and adoption decision. However, the network mapping component of this first survey was unsuccessful, and the main objective of the new study reported here was to correct

this shortcoming by using a revised methodology to elicit these networks. While this report will largely focus on this new network data, farmers were also asked about their attitudes to and use of laser leveling, their irrigation practices, and their agricultural practices more generally, and headline results on these topics will be reported at the end, *Nathan Larson* (March 2013)

2.2 SECOND RESEARCH

While India is the largest user of groundwater in the world (with heavy demand from both agriculture and households), current patterns of groundwater use are not sustainable in the long run. Water tables are falling rapidly, in large part due to the fact that individuals do not bear the cost of the water they use: free water extraction is a property right attached to land ownership, and the electricity needed to pump water to the surface is highly subsidized. If current trends continue, some estimates suggest that national food production could fall by around 25 per cent by 2025 (Seckler et al, 1998). In principle, the best policy to curtail over-extraction would be to price water at its social marginal cost, or barring this, to end the electricity subsidy that makes pumping water electively free. However neither of these is practical in the short run; the first would require metering and monitoring millions of private wells nationwide, while the latter is politically problematic. Given these limitations, there is a strong argument that policy intervention to encourage the use of water-saving technologies is a logical second-best measure. Laser leveling is one such technology: in brief, it is a method of smoothing agricultural fields to high precision by using laser guidance. Laser leveling is an "add-on" technology, in the sense that it supplements rather than replaces the traditional method of levelling a field. In traditional leveling, a grading implement with a blade is towed behind a tractor over the surface of a field; the height of the blade is adjusted manually by the operator so as to achieve a surface that appears smooth and level to the human eye. The innovation in laser leveling is to use a laser guidance system to raise and lower the blade of the grading implement automatically. The result is a significantly flatter field than an unaided human operator could achieve. Evidence suggests that the benefits of leveling can be substantial. In controlled experiments on agricultural plots, researchers at Punjab Agriculture University found that laser leveling increases crop yields by around 11 percent and results in water saving of around 25 percent, holding constant other inputs like fertilizers and seed quality. These experiments have also demonstrated that levelling reduces weeds by up to 40 percent and labor time spent weeding by up to 75 percent (Bhatt 2 and Sharma). However, because these results were achieved by academic researchers implementing best practices, it remains to be seen whether real farmers operating in uncontrolled conditions will achieve similar benefits. Assessing this question was one purpose of our study, *Sheetal Sekhri* (Feb 2013)

2.3 THIRD RESEARCH

In Punjab, where both of our studies were conducted, village agricultural cooperative societies play a central role in providing access to laser leveling for farmers. These cooperatives, largely established in the last decade, o§er a variety of services to farmers, including equipment rental, seed and fertilizer sales, and short term loans. In the last six years, the state of Punjab has encouraged them, by means of a 30% subsidy on the purchase price, to acquire laser levelers that are then made available for rental by farmers. At present, there are over 2000 laser leveler units in service in Punjab, most owned by cooperatives.1 While the up-front rental cost to farmers is significant (500 rupees/hr, or roughly 750 rupees/acre), past evidence suggests that the private returns (in higher yield and lower labor costs) are high enough to recoup that investment within one to two years (Jat et al., 2009), and that the benefits of leveling persist for five years or more. Thus, leveling could be a compelling investment for farmers even if they do not internalize the positive externality of reduced water use. Despite its benefits and wide availability, adoption of this technology remains relatively low — in Punjab prior estimates indicate that only one-seventh of all cultivable land has been laser levelled, *Rajinder Sidhu* (2013)

CHAPTER THIRD

METODOLOGI REVIEW

3.1 CALIBRATION

Measuring the difference calibration of water level and auto level before start the leveling work:

i. Place the two staff side by side exactly opposite each other, making sure the level of the water inside the tube also corresponds on the staff. If the water level is too high, tip some water out. If the level is too low, add some water.

ii. Place one of the staff on point A and the other on point B. At the lowest point A, the level of water in the pipe will rise. At the highest point B, the water level will fall.

iii. Calculate the difference between the water level and the auto level reading.

iv. The difference in level between water level and auto level should be not too much.

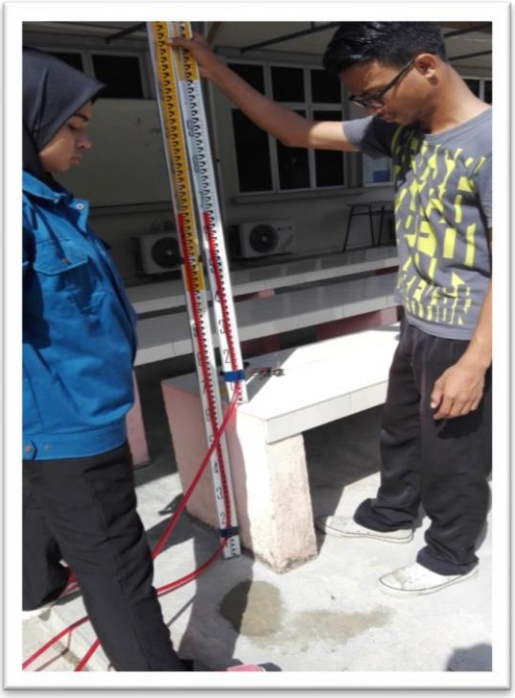

Figure 3.1: Calibration of water level

Figure 3.2: Calibration of auto level

3.2 WATER LEVEL

i. Purchase or make your own water level. There are several quality levels available to purchase at a very minimal cost. If you opt to make your own, you can use a water jug, syrup flavour, and a clear plastic tube.

ii. Substanded staff in TBM as backsight and tool in the middle of between second staff. Reading being recorded.

iii. Removing staff in backsight to foresight and staff in foresight becomes backsight.

iv. Well off tool in the middle of staff.

v. Repeating move that is same to get next reading until CRM 5.

vi. Repeating move that is same TBM 1 again.

Figure 3.3: work of levelling by using communicating vessel concept

3.3 TOPOGRAPHY

To set out a topography grid line with a cube water level, the following procedure is used:

i. Removing level reduce to TBM that near fieldwork area.
ii. Putting a staff only in TBM, subtended a staff and we moved in every point.
iii. Backsight reading and foresight to every point being recorded.Without move staff from TBM.
iv. After being recorded, calculations to get level reduce continued. (Topography measurement works does not require accuracy that high compared accurate level measuring instrument.)

Figure 3.4: work of topography by using communicating vessel concept

3.4 GRANT CHART

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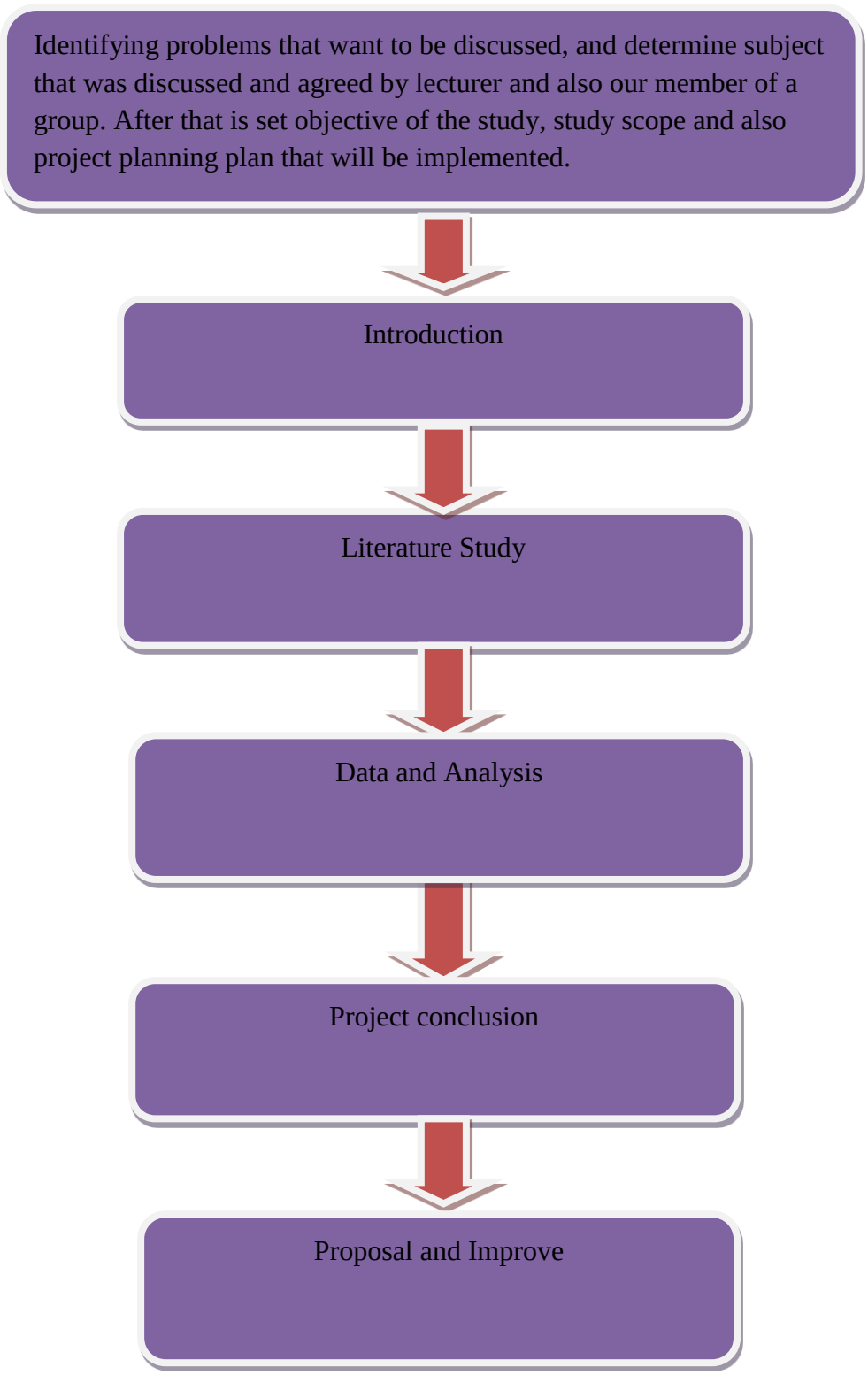

Figure 3.5: flow chart of work progress

3.5 WORK PLANNING

Table 3.1: Work Planning

WEEKLY /ACTIVITIES	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 13	M 14	M 15	M 16
Hold discussion on study that that want to in do.																
Subject selection and seek information on level survey.																
Developing proposal.																
Taking existing data and develop report first draft 50% completed.																
Creating method take barrel level measurement use water tube and develop report second draft 75% completed.																
Completing overall draft report and project presentation.																
Developing final report.																

3.6 WORKING ACTIVITIES

Table 3.2: Working Activities

WEEK	ACTIVITIES CONDUCTED
1 (20/06/2016 - 24/06/2016)	i. .Attending class in friday. ii. Lecturer which teaches study topical subject namely Miss Zuraini gives information about project that need to be implemented. iii. In direction to form group at least 4 people
2 (27/06/2016 - 1/07/2016)	i. Given first assignment to think and choosing suitable title. ii. After discussion was made we had agreed to choose our study topic namely water levelling applications based on communicating vessels.
3 (04/06/2016 - 08/06/2016)	EID CELEBRATION
4 (11/07/2016 - 15/07/2016)	i. Given options to choose supervisor to monitor during our project carried out. ii. Supervisor we are Mr Firhan bin Salian. iii. Developing our subject to lecturer and request for an opinion on subject that wish to be studied.
5 (18/07/2016 - 22/07/2016)	i. Lecturer explain format to produce report. ii. We are beginning to devise project.
6 (25/07/2016 - 29/07/2016)	i. Providing material to carrying out practical work.
7 (01/08/2016 - 05/08/2016)	i. Required lodge chapter report a and two on introduction and literature. ii. Completing chapter report a to be sent to lecturer

	before revised for marking
8 (08/08/2016 - 12/08/2016)	i. Completing chapter two. ii. Getting source from internet about literature study
9 (15/08/2016 - 19/08/2016)	i. Take at least three examples of the literature I'v ever studied.
10 (22/08/2016 - 26/08/2016)	i. Submit chapter one and two lecturers who monitor us, Mr. Firhan.
11 (29/08/2016 - 02/09/2016)	i. Conduct practical 1 namely calibration water level and levelling in water level tool
12 (05/09/2016 - 09/09/2016)	i. Conduct practical 2 namely topography in water level
13 (12/09/2016 - 16/09/2016)	QURBAN CELEBRATION
14 (19/092016 - 23/09/2016)	i. Making calculations to get outcome of comparison between two implements used ii. Making a discussion to generate slide project presentation
15 (26/09/2016 – 30/09/2016)	HIDROGRAPHY CAMP
16 (03/10/2016 – 07/10/2016)	i. Presentation Final Year Project ii. Submit Report Final Year Project

CHAPTER FOUR

ANALYSIS AND DISCUSSIONS

4.1 INTRODUCTION

Accuracy and precision is very important in the surveying work especially levelling. Therefore, in chapter 4 will summarize the results of studies conducted on the use of water levelling. The resulting surveying will also be compared with auto levelling methods. It made for an analysis to determine the accuracy and precision level measurements carried out work.

4.2 THE COMPARISON OF DATA BETWEEN METHODS WATER LEVELLING AND AUTO LEVELING

Table 4.1: comparison in Calibration

Method of leveling	***Water Level***	***Auto Level***
Backsight	0.626m	0.805m
Foresight	1.227m	1.405m
Different/Result	0.601m	0.600m

Table 4.2: comparison result in transfer level from BTM 1 to CRM 5

Method of leveling	*Arithmetic Checking*	*Misclose*
Auto Level	0.003m	±0.017m
Water Level	0.005m	±0.024m

Table 4.3: comparison result in topography work

Point Num.	***Water Level***	***Auto Level***	**Differential**
1.	20.147m	20.153m	±0.006m
2.	20.074m	20.082m	±0.008m
3.	19.999m	20.005m	±0.006m
4.	19.930m	19.934m	±0.004m
5.	19.852m	19.858m	±0.006m
6.	19.795m	19.796m	±0.001m
7.	19.899m	19.900m	±0.001m
8.	19.995m	20.002m	±0.001m
9.	20.113m	20.118m	±0.005m
10.	20.195m	20.200m	±0.005m
11.	19.045m	19.042m	±0.003m
12.	19.084m	19.084m	±0.000m
13.	19.084m	19.085m	±0.001m
14.	19.111m	19.103m	±0.006m
15.	19.174m	19.171m	±0.003m
16.	19.352m	19.347m	±0.005m
17.	19.342m	19.341m	±0.001m
18.	19.320m	19.314m	±0.006m
19.	19.307m	19.306m	±0.001m
20.	19.364m	19.365m	±0.001m
21.	19.323m	19.320m	±0.003m
22.	19.284m	19.283m	±0.001m
23.	19.285m	19.285m	±0.000m
24.	19.334m	19.318m	±0.016m
25.	19.370m	19.366m	±0.004m

4.3 ANALYSIS OF THE DATA

In *calibration*, the data obtained are very satisfactory and meets the 'misclose' allowed. This is caused because the 'misclose' obtained does not exceed ±10mm (millimetres). These differences can be seen in reference the *tables 4.2.1*. Not only that, but the differences between the water level and auto level only just 1mm (millimetres). The method of water level indicates the accuracy of this method is in accordance with the prescribed standards.

In transfer levelling work, results of the data are still in accordance with prescribed standard JUPEM. *Table 4.2.2* shows the excellent result for '*Arithmetic Checking'* and '*Misclose'* using water levelling method. But, the auto levelling is more accurate then water level. Such things may be caused by human error and the environment. For example, the reader does not read the graduated value at staff carefully, not hold the staff vertically and state of the heat cause blurred vision. The result of the data calibration is acceptable.

In topographic work, the data obtained are very satisfactory. The data in *table 4.2.3* shows the lowest value of different between water level and auto level method is ±0.000m and the highest value of different data is ±0.016m. More than that, the average of all value data is ±0.004m. Therefore, the result of data shows very suitable for the small area of the topography. The highest value is probably due to the time difference observed. Furthermore, the work of topography is absolutely not require high measurement accuracy and precision normally works topography is less <0.100m away. As a whole, the water level is very appropriate in the work of point level surveying and details (topography).

4.4 THE OVERALL ANALYSIS OF THE PROJECT

Works levelling surveying are very important in any project. Therefore, the method of water levelling is among one of the most suitable method for this work.

This is because, the water level is indicates the accuracy of this method is in accordance with the prescribed standards. In transfer levelling work and topographic, this method is still can use because the result are very satisfactory and the data are still in accordance with prescribed standard. This factors is refer from the analysis of the data retrieval from the surveying. Next, the water levelling method using the low cost and decreases the men-power when do the surveying.

Of these advantages, there are also some disadvantages in using water levelling method. For example, work of this method can't be carried out in crowded areas or areas of way to vehicles. These factors caused because this method will block traffic and disrupt the reading on the staff because of the transition staff. More than that, the water levelling method can't be done in areas that are high degree of slope because the water in the tube will spill over. Lastly, this method cannot be done in large area. It is caused due to the vast area requires a long tube and calculating way much mislead consumers and only suitable for areas with an area of below 30 meters square($<30m^2$).

CHAPTER FIVE

CONCLUSION

In conclusion, our group has successfully carried out the tasks that has been given to us. From work that we did, we've got to compare the result between water level with auto level and we've got to identify the reasons the occurrence of misclose.

Before we start our work, we do the calibration for both the measurement instruments to compare the difference of result. The result that we've got is 0.001m only.Based on the result that we've got in the leveling survey by using the concept of water level and the auto level, misclose for water level is 0.024mm and for auto level is 0.017mm.

From the result of the topography survey the high value difference is ±0.016m while the low value difference is ±0.000m. The average for all value is ±0.004m. So, water level and auto level instrument can be used because of differences is acceptable.

Overall, the procedure of this concept will cut the cost of man power, can manage from buying the expensive instrument and tools maintenance and can avoid from having incomplete instrument problem during survey work.