ROAD WIDENING WITH MXROAD AND COST ESTIMATION

A PROJECT
Submitted in partial fulfilment of the requirements for the award of the degree of
BACHELOR OF TECHNOLOGY
IN
CIVIL ENGINEERING
By

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MAY 2018

CERTIFICATE

This is to certify that the work which is being presented in the project report titled "**ROAD WIDENING WITH MXROAD AND COST ESTIMATION"** in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology in Civil Engineering and submitted to the Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat is an authentic record of work carried out by **Aditya Kalra (141612)** and **Tanmay Rajiv Banyal (141647)** during a period from July 2017 to May 2018 under the supervision of **Mr. Chandra Pal Gautam** Assistant Professor (Grade-II), Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat.

The above statement made is correct to the best of our knowledge.

Date: -…………….

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ABSTRACT

The problem of Road traffic is increasing at an exceptionally fast rate, hence the traffic intensity and volume on the road is high. Improvement are required in the present road network is to accommodate the future traffic and to provide the good riding quality.

Road widening is one of the action that can be used as the solution. However, this solution also increase the traffic performance. This is because people will switch to use the new road widened because they believe this road can accommodate the existing traffic volume. For finding out the effects of road widening toward the increasing of traffic performance and road capacity, it is necessary to conduct a research and an analysis.

The proposed road for our project is Waknaghat-Jaypee road (Till Thank You gate) has a total length of about 3km, which needs to be widened and Cost estimation for the following widening is to be done.

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CHAPTER I

# INTRODUCTION

1.1 General introduction

Roads are primary mean of transportation. These provide human access to different places. Different types of roads are made in a country to fulfil requirements, e.g. motorways are made to provide quick and safe access between necessary cities, towns, villages etc. Highways are constructed to connect two or more cities, rural areas have completely different variety of road to attach farm lands with the town or cities. Roads offer access to the outside world or the store round the corner. Roads take farm produce to cities markets and children to school. Roads are the passage of life's activities.

However most roads are already developed and widened for facilitating vehicles. Road widening is generally carried out when road is insufficient for traffic using it, or when extra lanes are required. Road widening can improve traffic safety and capacity. The widening of roads is one of the useful methods to deal with current traffic problems. However we must show our concern towards environment and local residents that might get affected by road widening.

Details of project area: Waknaghat-Gambhar pul is a link road connected with NH-22.Waknaghat is situated at 31.020 N latitude and 77.080 E longitude. It is situated at an elevation of 1540m. This road is composed of mainly mountainous terrain. The entire length of road proposed during this project is black topped surface, mostly single lane carriage way of 4.14 metres having crust thickness of 100mm.

1.2 Objectives:

- To plot the survey data on MXROAD
- To widen the road stretch extending from Waknaghat to Thankyou gate (3 km) using MX ROAD.
- To estimate the cost used in widening of road.
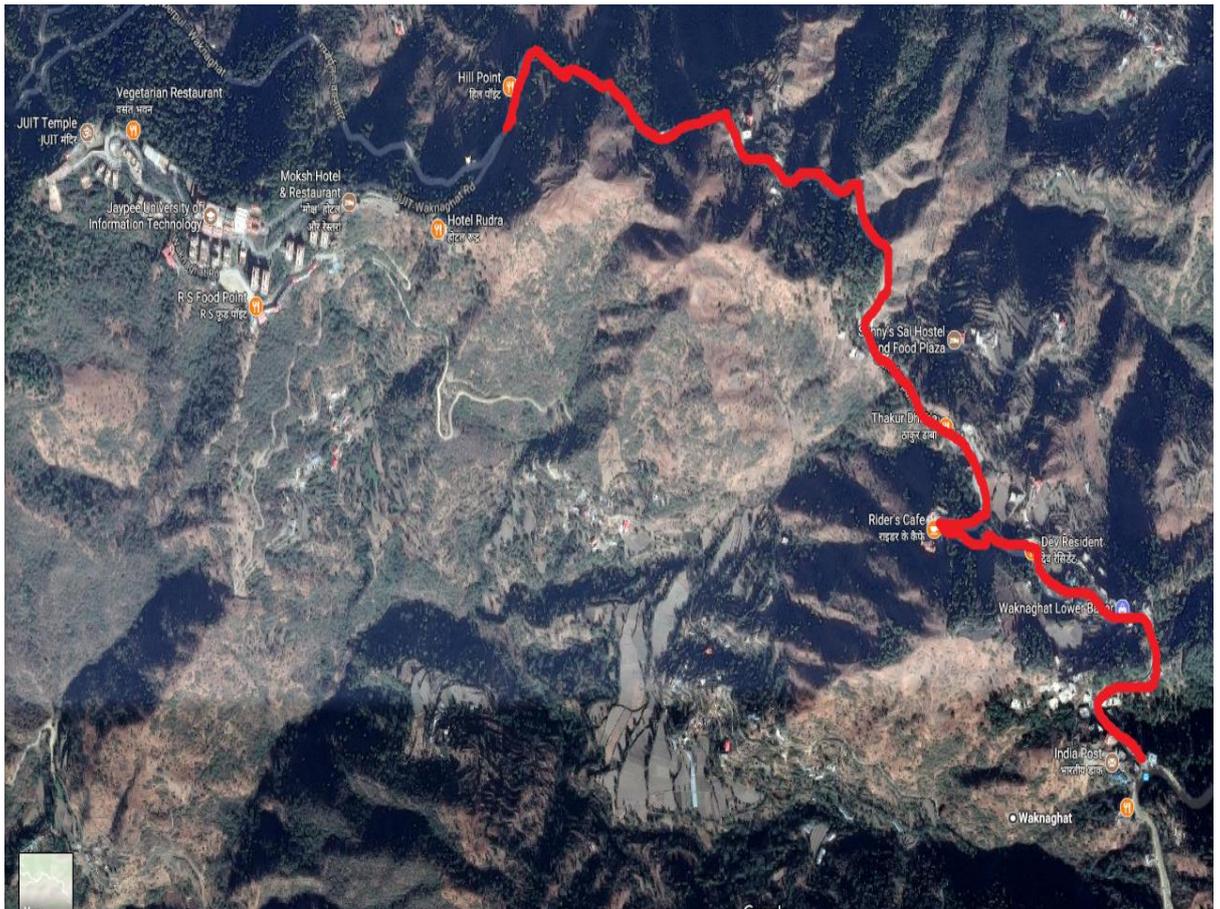
Fig(1): The Surveyed patch

CHAPTER II
LITERATURE REVIEW

1. "Widening and Renovation of Hill Road Pavement from Doddabetta to Kattabettu in the Nilgiri district"

P. Gowtham, K. Mahendran, R. Vignesh, R. Priya, V. Mathevan, and Dr. D. Vijayalakshmi, Journal of Innovation and applied Studies, 2015

Key points:

- The main objectives are road widening, renovating the pavement where the pavements are heavily damaged.

- For the determination of the structural capacity of the pavement, non-destructive testing equipment are used i.e Benkelman beam and Falling Weight Deflectometer (FWD).

- Benkelman beam measures static deflections and it is operated on principle of lever arm.

- In Falling Weight Deflectometer test, the test measures the impact load in response of flexible pavement.

- The life of flexible pavement is 15 years, initial cost is less but maintenance cost is high. On the other hand life of rigid pavement is 2.5 times that of flexile pavement, initial cost is high but maintenance cost is very less.

2. "Road traffic accidents in hilly regions of northern India: What has to be done?"

Anil Kumar Joshi , Chitra Joshi , Mridu Singh, Vikram Singh, World journal of emergency medicine, 2014.

Key points:

- Reasons for accidents in hilly region are poorly designed curves in the road, blind curves, improper placement of road signs or lights etc.

- Accidents can also occur if a road is properly designed and constructed but is not carefully maintained.

- Defective maintenance concerns are potholes and road erosion, broken guiderails, failure to remove roadway debris and failure to maintain signs and light controls.

3. "Safety design on small radius curve of mountain road."

Runwei you, Journal of Applied mechanics and materials, 2014.

Key points:

- Bend of small radius curve is accident-prone locations.

- The reasons for accidents can be Wrong visual response, large or small angel of curve, Inadequate widening and Inappropriate super elevation.

- The solutions can be increasing the radius of curve, a small radius curve should be widened on both sides so that position of central line of road should be same.

- Increasing the superelevation i.e super elevation of outside lane should be increased relative to inner lane.

- The reasons for many traffic accidents, when the human and car factors were ruled out, eventually fell on road factors.Most of the accidents were caused by unreasonable road linear design.

4. "Longitudinal Cracking Reasons and Prevention of Widened Pavements of Old Roads"

Zhu Xiaobin, Shen Junmin and Zhang Xiao, Journal of Applied Mechanics and Materials, 2013.

Key points:

- The paper focuses on construction quality control of extended roadbeds. It porposes construction control methods and treatment measures to prevent longitudinal cracking of asphalt pavements.

- The longitudinal cracks do not occur commonly but probability of occurrence is quite high.

- Selection of appropriate treatment program should be done considering the specific engineering geological conditions and road grade standards.

5. "Influence of differential settlement on pavement structure of widened roads based on large-scale model test".

Xiaolin Weng and Wei Wang, Journal of Rock mechanics and Geotechnical Engineering, 2011

Key points:

- Large scale model test was performed to analyse the influence of differential setting between new and old subgrade under loading conditions.
- Application of geogrid to the splice, however, can relieve the differential settlement and further reduce its influence.
- The strain of pavement structures increase smoothly with the growth of differential settlement.
- The controllable settlement platform, featured by high controllability, is an advanced technology for the simulations of differential settlement between the new and the old subgrades.

6. "Failure mechanism and design criteria for low volume roads subgrade widening"

Jianming Ling, Jinsong Qian and Qinlong Huang, Journal of Transportation and Research board,2007.

Key points:

- The primary objective of this paper is to explore the main pavement distress caused by highway widening.

- Shear cracking, usually relates slippage of newly built subgrade along interface. This failure is caused mainly by slippage of the newly built subgrade.

- Bottom-up cracking, is similar to that of newly built pavement, but part of tensile stress is due to differential deformation at the top of new embankment.

- Top-down cracking, is a special failure mode that occurs in highway widening as opposed to new construction.

- Through finite element analysis, laboratory tests and in situ investigation, it is demonstrated that deformation appears in shape of an inverse S (~), which will induce bottom-up and top-down cracking in surface course and semi rigid base respectively.

7. "The study of ground and embankment treatment techniques in road widening"

Hao Wang and Xaioming Huang, Journal of Pavement mechanics and performance ASCE, 2006 .

Key Points:

- Four embankment treatment techniques were used and compared including embankment reinforcement, light weight embankment, cement deep mixing pile and separation wall.

- Geotextiles, geogrid and geocells can be used as reinforcement under or within the embankment to improve the stability.

- The light weight embankment helps in removing settlement due to its small self-weight. Fly ash and Expanding Polystyrene are majorly used.

- Cement deep mixing technique is used to decrease the settlement and to increase the lateral stability of the new embankment.

- Separation wall is to eject a slurry into the soil through high pressure muzzle to form cement soil blend wall so that the new embankment and old embankment are well separated.

- Based on their effectiveness the four techniques are ranked as follows: Light weight embankment>Deep pile mixing>Separation wall>Reinforcement embankment.

CHAPTER III

SURVEYING

3.1 SURVEYING

Surveying is a science, profession and technique of determining the terrestrial or third-dimensional positions of points and additionally angles and also the distances between these points. These points typically lie on the surface of the earth, and these points are typically accustomed to build maps and bounds for ownership, locations, like building corners or the surface location of subsurface options, or completely different functions required by government or civil law, like property sales. The planning and execution of most varieties of construction need it. It's additionally employed in transport, communications, mapping, and also the definition of legal boundaries for land possession.

3.2 SURVEYING INSTRUMENT: TOTAL STATION THEODOLITE

A Total Station Theodolite (TST) is an optical/electronic instrument used for surveying . The instrument basically works as an electronic theodolite integrated with an electronic distance measurement (EDM) to obtain slope distances from the instrument to a particular point, and a computerized panel to collect data and perform advanced coordinate based calculations.

Basically Easting refers to as the distance measured in the eastward direction or the x coordinate and Northing refers to the northward measured distance that is the y-coordinate.

Some of the general functions of Total Station are:

Total station processes the data collected to compute:
- Horizontal distance.
- Distance between any two points.
- Elevation of objects and
- All the coordinates of the observed points i.e. Easting, Northing and Elevation
- The mean of multiple angles measured.
- The mean of multiple distance measured.

3.3 STEPS TO USE AND LEVEL THE TOTAL STATION:

Step 1: Tripod Setup

- The Tripod legs are adjusted to be evenly spaced
- Tripod head is adjusted so as it approximately matches the ground level
- The Tripod Head should lie directly above the survey point
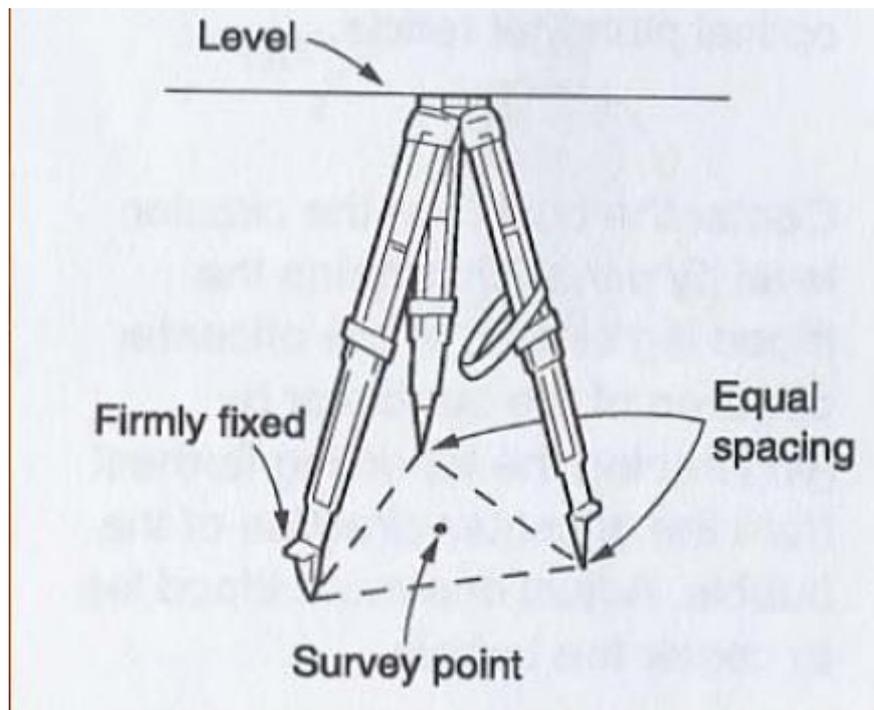
Fig(2): Tripod setup

Step 2: Mounting the Instrument on Tripod

- Place Instrument on Tripod
- Tighten the centreing screw whereas bracing the instrument with the opposite hand
- Battery should be inserted before levelling of the instrument
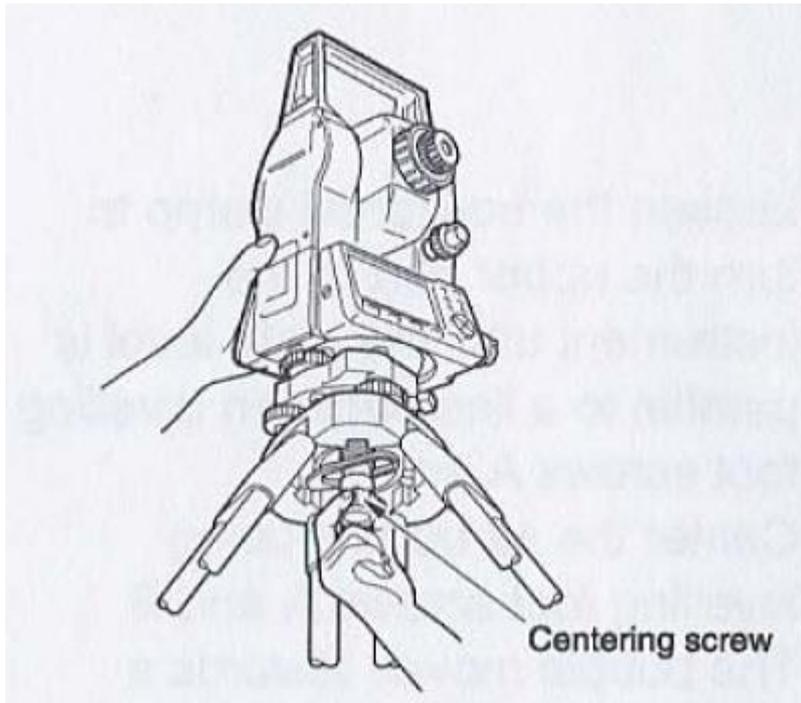
Fig(3): Mount Instrument on Tripod

Step 3: Focus on Survey Point

- Focus the optical plummet on the point to be surveyed

Focussing on the survey point

Focussing on the reticle
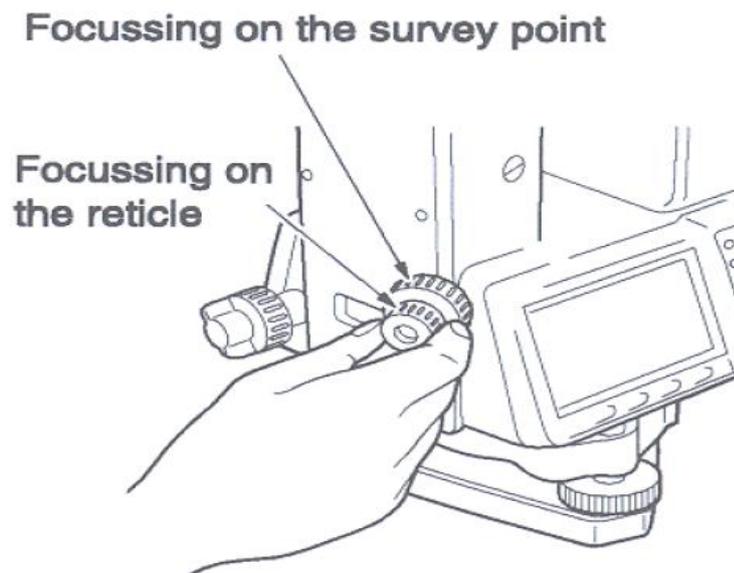
Fig(4):Focus on Survey Point

Step 4: Levelling the Instrument

- The levelling foot screws are adjusted to centre the survey point in the optical plummet crosshair
- The bubble in the circular level is centred by adjusting the tripod legs
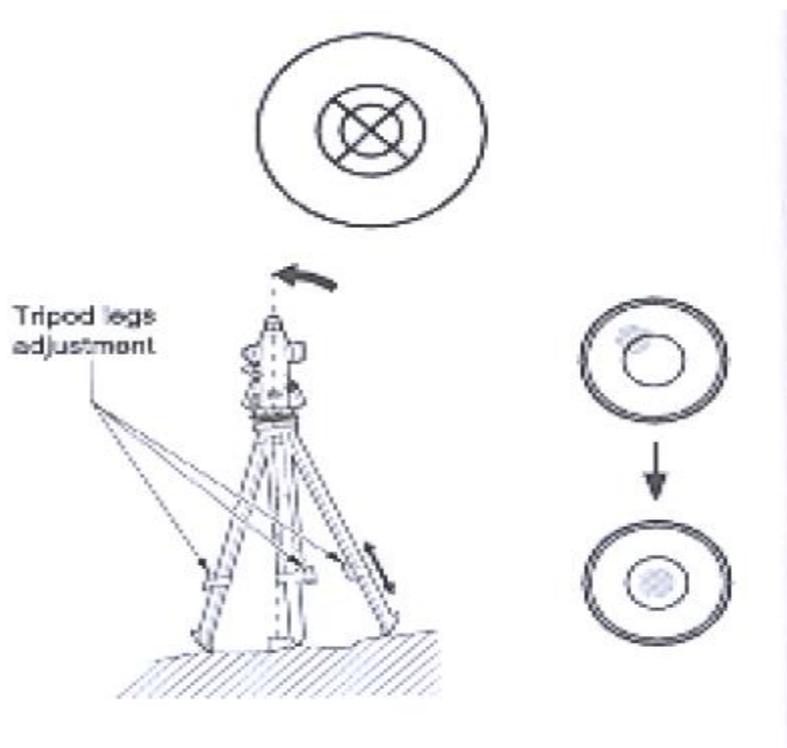
Fig(5):Levelling the instrument

- The horizontal clamp is loosened and instrument is turned until plate level is parallel to two of the levelling foot screws
- The bubble is centred using the levelling screws- the bubble moves toward the screw that is turned clockwise
- The instrument is rotated to 90 degrees and levelled using the 3rd levelling screw
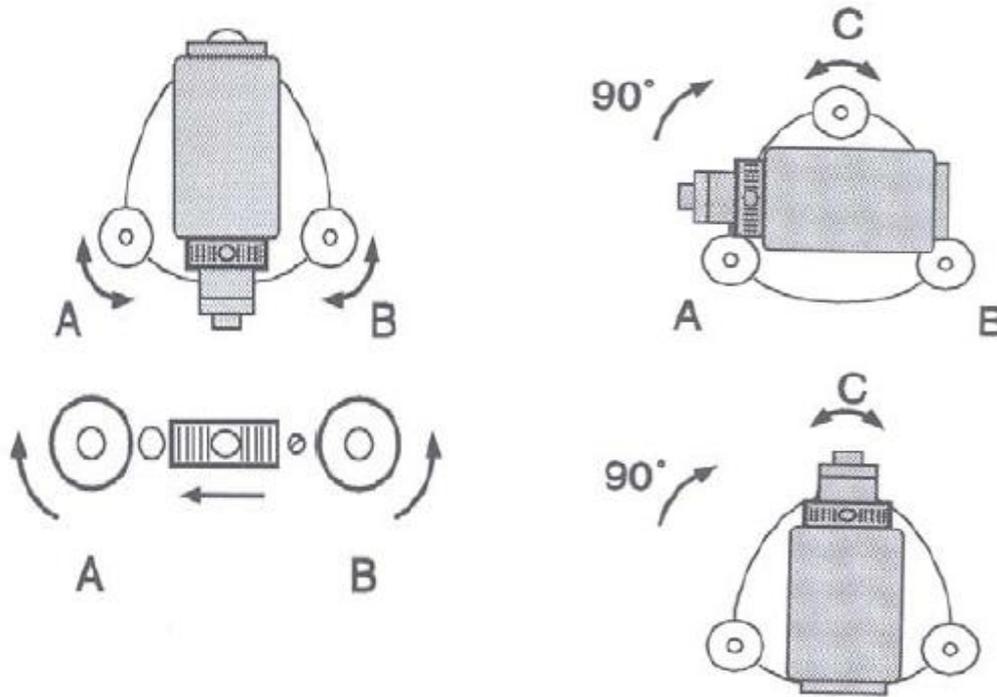
Fig(6):Adjusting the screws

- Observe the survey point in the optical plummet and centre the point by loosening the centring screw and sliding the entire instrument
- After re-tightening the centring screw check to make sure the plate level bubble is level in several directions

STEP 5: Adjust Image & Reticle Focus

- Point the telescope to a comparatively lighter background while releasing the horizontal & vertical clamps
- The crosshair focus is adjusted until the reticle image is sharply focused
- Point telescope to prism target and adjust the crosshair focus until target is focused
- Moving your head from side-to-side can help to test for parallax. The reticle focus step is repeated if parallax is significant.
- The reticle focus may need to be adjusted when the instrument operator make changes in the focus.
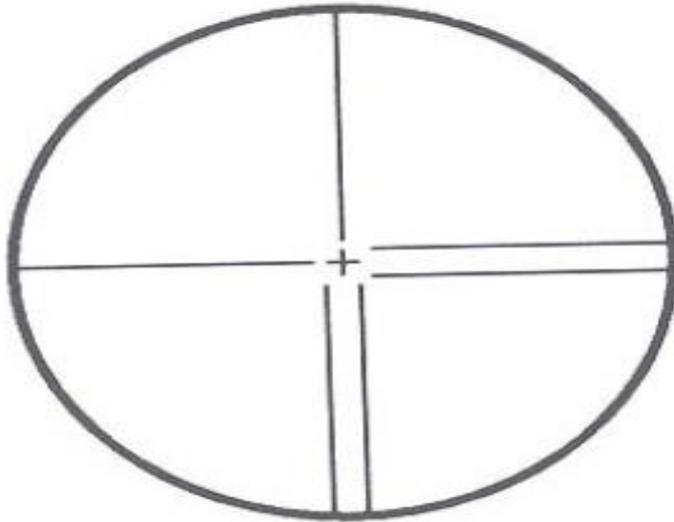
Fig(7):Reticle Focus

Measurement of Target Height:

- Set the Target Height from "MEAS" > "Menu" >"Coordinate" > "Station Orientation" > "Station Coordinate"
- Set the target height to the measured height of the prism target.
- Press "ESC" to return to the "MEAS" menu
- Select the options in sequence "MEAS" > "Menu" > "REM", sight the prism target, press [OBS] to measure "S", then press [STOP]
- Now sight the object which is lying above the target and measure height
- Select [REM] option and then press [STOP].
- To sight the prism target use the [OBS] option on the REM screen.
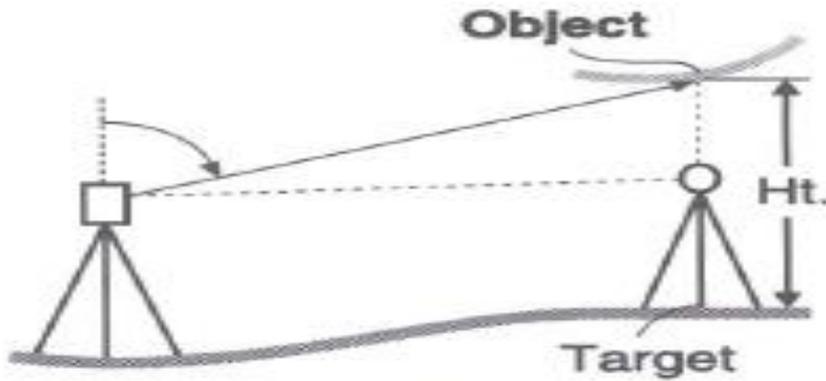
Fig(8):Screen with different readings

3D Coordinates:

- Coordinates may be absolute or relative depending on survey requirements
- Surveying the area of a mining site would require relative coordinates, therefore, the initial instrument X,Y,Z coordinates may be 699589, 3432496 and 1540m.

3.4 WORKING STEPS:

1. Setting up of Total Station at Base point (Waknaghat) and levelling it.
2. Now sight the north direction with help of compass on total station and input the northing angle as 0.
3. With the help of Handy GPS, Northing, Easting and Elevation values of Waknaghat are inserted in Total Station that are 699589, 3432496 and 1540m respectively.
4. As Station coordinates are inserted, now putting Back Sighting Northing, Easting and Elevation as 0, 0 and 0 respectively.
5. Also input the height of instrument and height of prism pole in total station. Now total station is ready to use.
6. Now sight the prism that should be around 30m from instrument. Take the readings of Northing, Easting and Elevation at right, left and centre of the road, marks those points by chalk/marker and save them.

7. Now Take the Total station and set up on right/left side of the road and input the station coordinate measured above and back sight the left/right.

8. Now take further coordinates of right, left and centre and save them. Repeat the above steps and save the coordinates.

Fig(9): Points spotted through the TST instrument

3.5 SURVEY DATA

S No.	Right Edge of the road			Centre of the road			Left Edge of the road		
	Easting	Northing	Elevation	Easting	Northing	Elevation	Easting	Northing	Elevation
1	699572	3432486	1540.176	699571	3432484	1540.167	699570	3432479	1540.291
2	699536	3432510	1539.961	699535	3432509	1539.905	699533	3432507	1539.829
3	699512	3432534	1538.699	699511	3432533	1538.643	699510	3432532	1538.599
4	699490	3432546	1537.847	699490	3432548	1537.927	699490	3432551	1538.031
5	699482	3432554	1537.427	699480	3432553	1537.28	699479	3432551	1537.078
6	699482	3432563	1537.062	699480	3432565	1536.842	699477	3432566	1536.542
7	699486	3432571	1536.74	699487	3432573	1536.509	699488	3432575	1536.249
8	699504	3432580	1536.608	699506	3432583	1536.389	699509	3432583	1536.079
9	699583	3432588	1535.508	699585	3432589	1535.388	699586	3432591	1535.205
10	699598	3432598	1535.161	699596	3432599	1535.080	699594	3432599	1535.009
11	699612	3432612	1534.004	699611	3432616	1533.984	699610	3432618	1533.43
12	699613	3432636	1532.099	699611	3432639	1532.121	699610	3432640	1532.171
13	699606	3432669	1530.499	699605	3432671	1530.600	699603	3432672	1530.686
14	699597	3432691	1529.989	699595	3432690	1530.094	699594	3432688	1530.159
15	699588	3432694	1529.738	699589	3432696	1529.857	699590	3432697	1529.917
16	699565	3432699	1529.344	699563	3432698	1529.451	699562	3432696	1529.554
17	699544	3432695	1528.055	699543	3432693	1528.171	699542	3432692	1528.283
18	699528	3432693	1526.404	699526	3432690	1526.479	699524	3432688	1526.521
19	699508	3432694	1525.406	699507	3432693	1525.437	699506	3432692	1525.476
20	699471	3432717	1524.039	699469	3432718	1524.164	699467	3432719	1524.256
21	699452	3432719	1523.135	699451	3432720	1523.335	699450	3432722	1523.579
22	699422	3432720	1521.878	699423	3432718	1522.684	699424	3432719	1522.244
23	699405	3432723	1519.633	699404	3432722	1519.633	699402	3432721	1519.598
24	699381	3432744	1517.926	699380	3432743	1518.077	699379	3432742	1518.277
25	699368	3432765	1517.141	699367	3432768	1516.937	699365	3432769	1516.801
26	699347	3432786	1516.657	699348	3432785	1516.568	699349	3432784	1516.418
27	699315	3432786	1516.073	699313	3432787	1515.998	699312	3432788	1515.914
28	699281	3432812	1513.104	699280	3432811	1513.272	699279	3432810	1513.436
29	699266	3432815	1512.373	699264	3432814	1512.518	699263	3432813	1512.644
30	699255	3432802	1510.576	699254	3432801	1510.457	699253	3432800	1510.273
31	699245	3432796	1509.736	699243	3432792	1509.675	699241	3432789	1509.497

Table I

S No.	Right Edge of the road			Centre of the road			Left Edge of the road		
	Easting	northing	Elevation	Easting	Northing	Elevation	Easting	Northing	Elevation
32	699216	3432799	1508.469	699215	3432798	1508.325	699214	3432796	1508.158
33	699196	3432814	1507.732	699195	3432815	1507.649	699194	3432816	1507.541
34	699184	3432815	1506.435	699183	3432816	1506.592	699182	3432817	1506.775
35	699175	3432821	1505.94	699174	3432820	1,506.176	699173	3432819	1506.475
36	699170	3432828	1505.154	699168	3432826	1505.281	699167	3432824	1505.533
37	699185	3432831	1503.649	699186	3432832	1503.516	699187	3432833	1503.309
38	699230	3432821	1500.68	699229	3432820	1500.66	699228	3432819	1500.642
39	699236	3432823	1500.121	699238	3432824	1500.210	699240	3432826	1500.211
40	699259	3432842	1498.857	699260	3432843	1499.070	699261	3432844	1499.474
41	699257	3432849	1497.54	699258	3432851	1497.467	699259	3432853	1497.356
42	699250	3432884	1494.787	699248	3432883	1496.611	699247	3432881	1496.491
43	699244	3432896	1494.787	699242	3432898	1494.719	699241	3432900	1494.54
44	699253	3432913	1492.739	699251	3432914	1492.915	699250	3432915	1493.054
45	699252	3432928	1492.184	699249	3432929	1491.972	699248	3432930	1491.763
46	699193	3432985	1491.183	699192	3432983	1490.987	699189	3432981	1490.683
47	699147	3433002	1490.482	699146	3433001	1490.271	699145	3432998	1489.958
48	699132	3433007	1488.392	699130	3433005	1488.328	699128	3433004	1488.285
49	699122	3433020	1483.251	699120	3433022	1483.528	699117	3433023	1483.699
50	699100	3433058	1482.209	699097	3433056	1482.357	699096	3433055	1482.427
51	699031	3433095	1481.433	699029	3433094	1481.581	699028	3433093	1481.759
52	699005	3433116	1480.059	699006	3433117	1479.957	699007	3433118	1479.84
53	699003	3433130	1479.627	699004	3433131	1479.471	699005	3433132	1479.194
54	699014	3433142	1479.078	699013	3433144	1478.965	699011	3433147	1478.796
55	699036	3433155	1477.576	699035	3433156	1477.751	699033	3433157	1477.855
56	699049	3433168	1477.016	699048	3433170	1477.314	699047	3433171	1477.448
57	699064	3433241	1476.592	699062	3433242	1476.749	699061	3433243	1476.894
58	699061	3433254	1474.492	699059	3433255	1474.566	699058	3433255	1474.648
59	699053	3433257	1473.718	699051	3433259	1473.216	699050	3433260	1473.481
60	699026	3433263	1471.478	699023	3433262	1471.548	699021	3433261	1471.539
61	699001	3433287	1470.398	698998	3433288	1470.323	698997	3433289	1470.179
62	699000	3433299	1469.756	698997	3433300	1469.63	698995	3433301	1469.517
63	699002	3433339	1468.024	699003	3433340	1468.076	699004	3433341	1468.033
64	699006	3433352	1466.144	699004	3433351	1466.195	699003	3433350	1466.201
65	698995	3433357	1461.55	698993	3433356	1461.511	698992	3433355	1461.317
66	698972	3433350	1460.793	698971	3433349	1460.797	698971	3433348	1460.714
67	698956	3433335	1460.167	698955	3433333	1460.048	698954	3433332	1459.886
68	698950	3433330	1459.732	698951	3433327	1459.563	698952	3433324	1459.348
69	698939	3433327	1458.355	698937	3433326	1458.268	698935	3433325	1458.115
70	698912	3433360	1457.172	698913	3433359	1457.31	698914	3433358	1457.576
71	698904	3433364	1456.652	698905	3433363	1456.786	698906	3433362	1456.918
72	698883	3433363	1454.004	698884	3433360	1454.082	698885	3433359	1454.271
73	698867	3433364	1453.406	698868	3433362	1453.381	698869	3433361	1453.392

S No.	Right Edge of the road			Centre of the road			Left Edge of the road		
	Easting	northing	Elevation	Easting	Northing	Elevation	Easting	Northing	Elevation
74	698847	3433362	1453.214	698848	3433359	1453.381	698849	3433354	1453.579
75	698839	3433352	1452.218	698840	3433351	1452.171	698841	3433349	1452.017
76	698836	3433352	1450.906	698837	3433349	1450.907	698839	3433347	1450.85
77	698816	3433367	1449.192	698815	3433366	1449.096	698814	3433364	1448.865
78	698801	3433383	1448.008	698800	3433381	1448.301	698798	3433380	1448.065
79	698786	3433390	1446.312	698784	3433389	1446.486	698783	3433387	1446.67
80	698772	3433389	1445.746	698771	3433388	1445.989	698769	3433387	1446.234
81	698762	3433389	1445.266	698761	3433387	1445.411	698760	3433385	1445.704
82	698748	3433398	1444.133	698744	3433399	1444.28	698741	3433398	1444.394
83	698731	3433412	1443.267	698730	3433411	1443.28	698727	3433407	1443.221
84	698727	3433431	1442.595	698726	3433433	1442.409	698723	3433436	1442.094
85	698726	3433453	1442.249	698723	3433451	1442.064	698720	3433450	1441.759
86	698717	3433463	1441.758	698716	3433461	1441.576	698614	3433460	1441.419
87	698710	3433467	1441.145	698708	3433465	1441.062	698707	3433464	1441.028
88	698697	3433469	1439.134	698695	3433465	1439.243	698694	3433464	1439.335
89	698648	3433449	1438.587	698647	3433446	1438.869	698645	3433445	1439.057
90	698567	3433426	1437.761	698565	3433424	1437.595	698564	3433421	1437.372
91	698556	3433421	1435.811	698555	3433419	1435.889	698554	3433418	1435.975
92	698542	3433423	1435.125	698540	3433421	1435.003	698539	3433420	1434.789
93	698529	3433427	1434.202	698527	3433425	1433.992	698525	3433424	1433.843
94	698514	3433444	1431.771	698513	3433446	1431.826	698510	3433443	1431.867
95	698487	3433476	1430.895	698486	3433473	1431.046	698485	3433472	1431.171
96	698467	3433499	1430.361	698466	3433497	1430.486	698465	3433495	1430.584
97	698461	3433505	1429.61	698460	3433503	1429.484	698459	3433501	1429.272
98	698449	3433509	1428.758	698447	3433507	1428.701	698445	3433506	1428.509
99	698430	3433508	1427.379	698428	3433503	1427.356	698427	3433502	1427.247
100	698409	3433520	1426.869	698408	3433521	1426.812	698407	3433519	1426.797
101	698397	3433527	1425.302	698396	3433523	1425.381	698395	3433521	1425.422
102	698388	3433526	1424.481	698387	3433525	1424.644	698386	3433524	1424.873
103	698375	3433523	1424.273	698374	3433521	1424.446	698372	3433520	1424.673
104	698366	3433521	1423.969	698365	3433518	1424.146	698364	3433516	1424.22
105	698361	3433519	1423.641	698359	3433517	1423.75	698358	3433515	1423.837
106	698351	3433523	1419.634	698347	3433521	1419.588	698345	3433520	1419.493
107	698334	3433539	1416.711	698333	3433537	1416.763	698332	3433536	1416.804
108	698326	3433544	1416.34	698325	3433543	1416.204	698324	3433541	1416.011
109	698305	3433543	1415.61	698304	3433542	1415.488	698303	3433541	1415.397
110	698293	3433541	1414.266	698292	3433539	1414.157	698291	3433537	1413.967
111	698267	3433512	1413.628	698268	3433511	1413.583	698269	3433510	1413.492
112	698254	3433469	1408.072	698256	3433468	1408.273	698257	3433468	1408.42
113	698249	3433439	1407.25	698250	3433437	1407.454	698252	3433436	1407.571
114	698238	3433425	1406.284	698240	3433423	1406.227	698245	3433419	1406.071

CHAPTER IV
MXROAD

Access three dimensional modeling, evaluation, pavement layout, and construction-pushed engineering, all in one software. MXROAD Suite makes work quicker, smarter, and more efficiently. MXROAD Suite enables to improve layout first-rate by using combining conventional engineering workflows of plan, profile, and go-sections with revolutionary three dimensional modeling generation primarily based on parametric relationships and constraints.

String- A string is a series of points and may be joined by straight or curve fitted lines. A string of some form represents all surfaces and features. Any line that can be drawn in horizontal and vertical representation is a string.

Model- A model is a group of strings defining a surface. Models can record different types of information, such as ground surface, a series of features, a network of data, or just points.

Capabilities of MXROAD SUITE-

- Acquire and incorporate surveys
- Create horizontal and vertical alignments
- Create profiles and cross sections
- Create project base maps
- Design and analyse corridors
- Visualize designs
- Simulate vehicle path movement
- Incorporate third-party models in civil designs

4.1 ADVANTAGES AND DISADVANTAGES OF ROAD WIDENING

ADVANTAGES:

• After widening, roads will be able to handle more traffic, thus avoiding congestions.

• Services can be extended to rural areas, which are not accessible by other modes of transportation.

• Heavy duty vehicles can be easily accommodated so delay in transit of goods can be avoided.

• There is lesser risk of damage in transmit.

DISADVANTAGES:

• Slowing down and rerouting of traffic may cause inconvenience to public.

• Environment is at greater risk due to expansion of roads.

• Road widening causes inconvenience to people residing near the site.

• Property value boosted

• The amount of dust increases in atmosphere

4.2 PLOTTING OF POINTS IN AUTOCAD

For plotting points in autocad simply apply the formula:

="POINT "&easting&","&northing&","&elevation

Paste the following column in Autocad command bar

|	E4			f_x	="POINT "&B4&","&C4&","&N4&""
	A	B	C	D	E
1					
2		Right Edge of the road			Right Side
3	CODE	Easting	northing	Elevation	3dpoly
4	CRL	699572	3432486	1540.176	POINT 699572,3432486,1540.167
5	CRL	699536	3432510	1539.961	POINT 699536,3432510,1539.905
6	CRL	699512	3432534	1538.699	POINT 699512,3432534,1538.643
7	CRL	699490	3432546	1537.847	POINT 699490,3432546,1537.927
8	CRL	699482	3432554	1537.427	POINT 699482,3432554,1537.28
9	CRL	699482	3432563	1537.062	POINT 699482,3432563,1536.842
10	CRL	699486	3432571	1536.74	POINT 699486,3432571,1536.509
11	CRL	699504	3432580	1536.608	POINT 699504,3432580,1536.389
12	CRL	699583	3432588	1535.508	POINT 699583,3432588,1535.388
13	CRL	699598	3432598	1535.161	POINT 699598,3432598,1535.08
14	CRL	699612	3432612	1534.004	POINT 699612,3432612,1533.984
15	CRL	699613	3432636	1532.099	POINT 699613,3432636,1532.121
16	CRL	699606	3432669	1530.499	POINT 699606,3432669,1530.6
17	CRL	699597	3432691	1529.989	POINT 699597,3432691,1530.094
18	CRL	699588	3432694	1529.738	POINT 699588,3432694,1529.857
19	CRL	699565	3432699	1529.344	POINT 699565,3432699,1529.451
20	CRL	699544	3432695	1528.055	POINT 699544,3432695,1528.171
21	CRL	699528	3432693	1526.404	POINT 699528,3432693,1526.479
22	CRL	699508	3432694	1525.406	POINT 699508,3432694,1525.437
23	CRL	699471	3432717	1524.039	POINT 699471,3432717,1524.164
24	CRL	699452	3432719	1523.135	POINT 699452,3432719,1523.335

Fig(10):Formula used to plot points

JOINING OF POINTS IN AUTOCAD

• 3dpoly command from the command bar could be selected

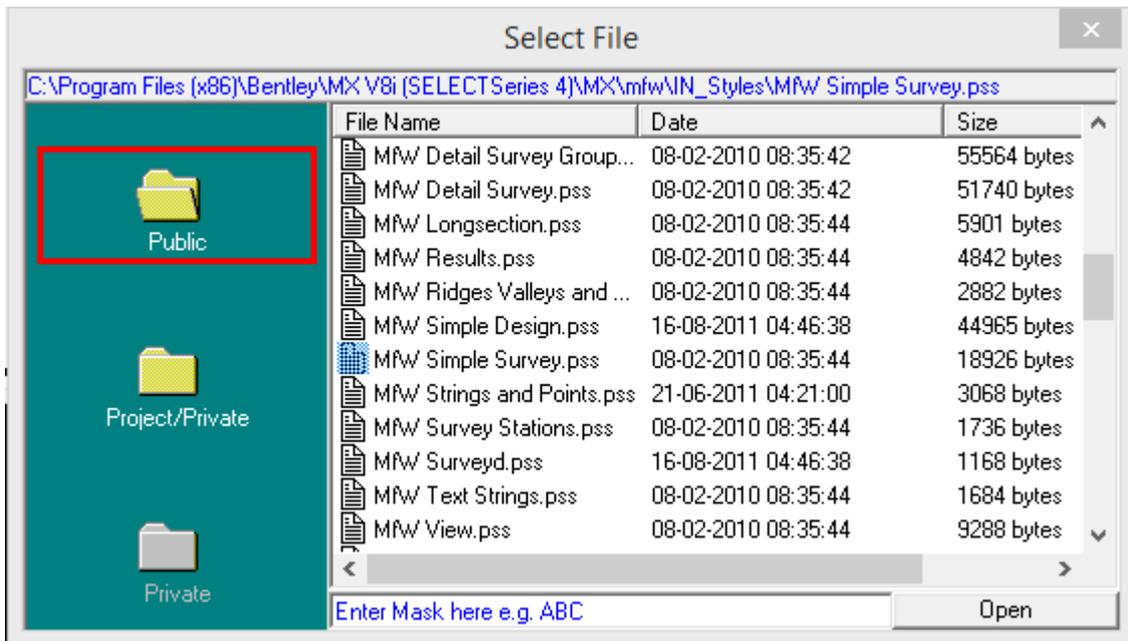• The column could be titled as 3dpoly and the column of readings is paste in the command bar.

4.3 PLOTTING OF DATA IN MXROAD

- Rename the file as draw.dwg

- Open file using the cad menu >open>draw.dwg
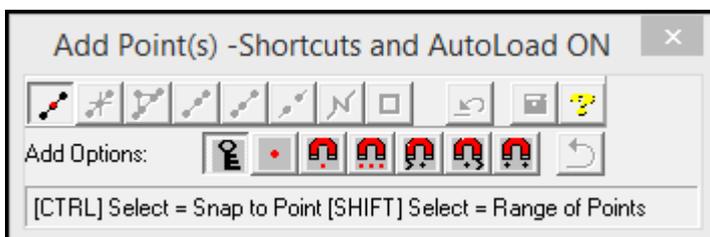
- Go to Display>Plan Set> Exist
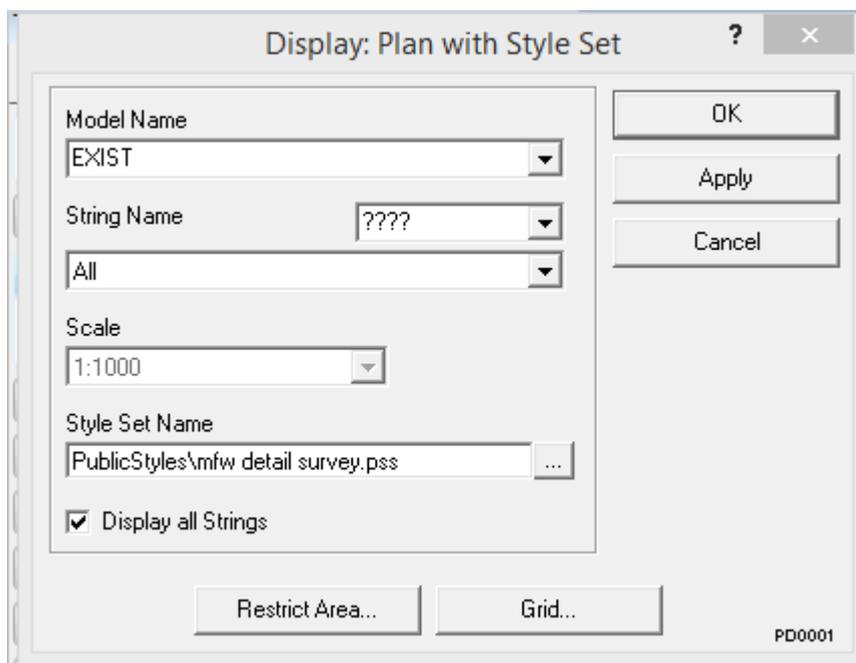
Fig(11) Display plan with style set

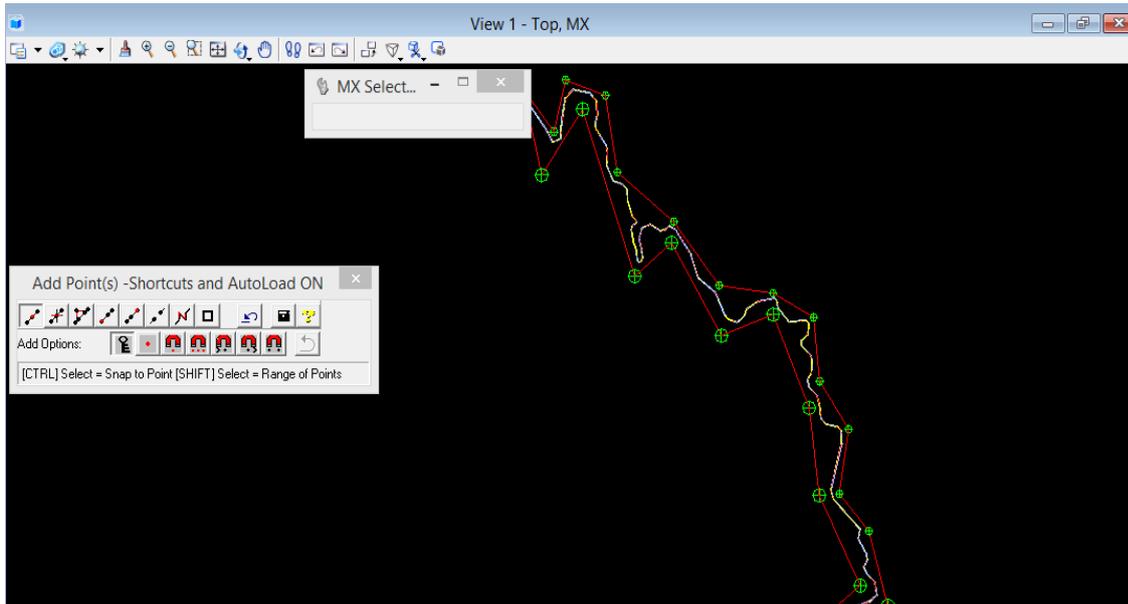- Change Style Set name > Simple survey.pss

Fig(12): Set Style

- Click on open

- The existing model will show

- Now move to Modify > Create model

- Change the model name >BOUNDARY

- Go to Modify>Create String Dynamically
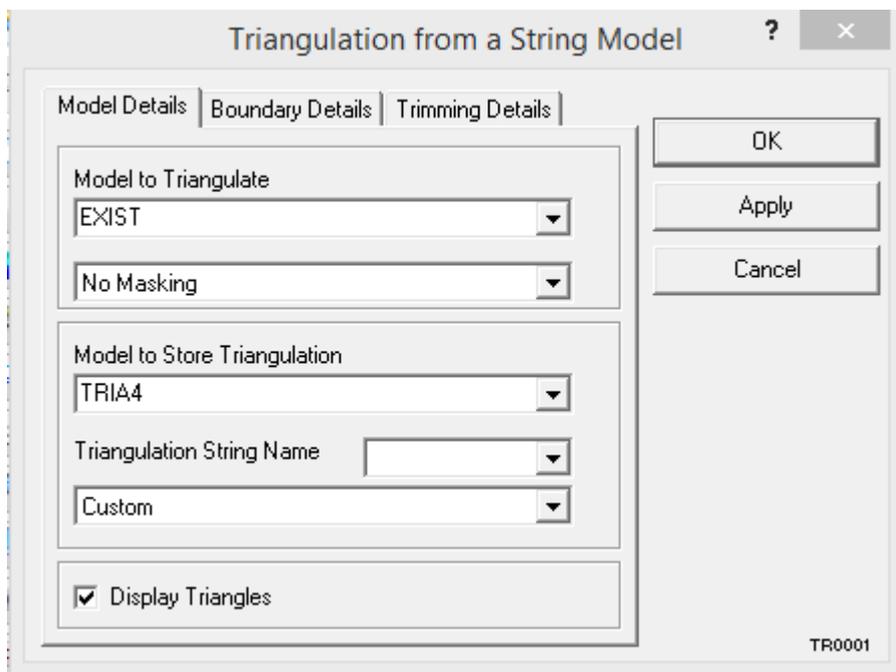
- A small dialogue box appears

Fig(13):Add points

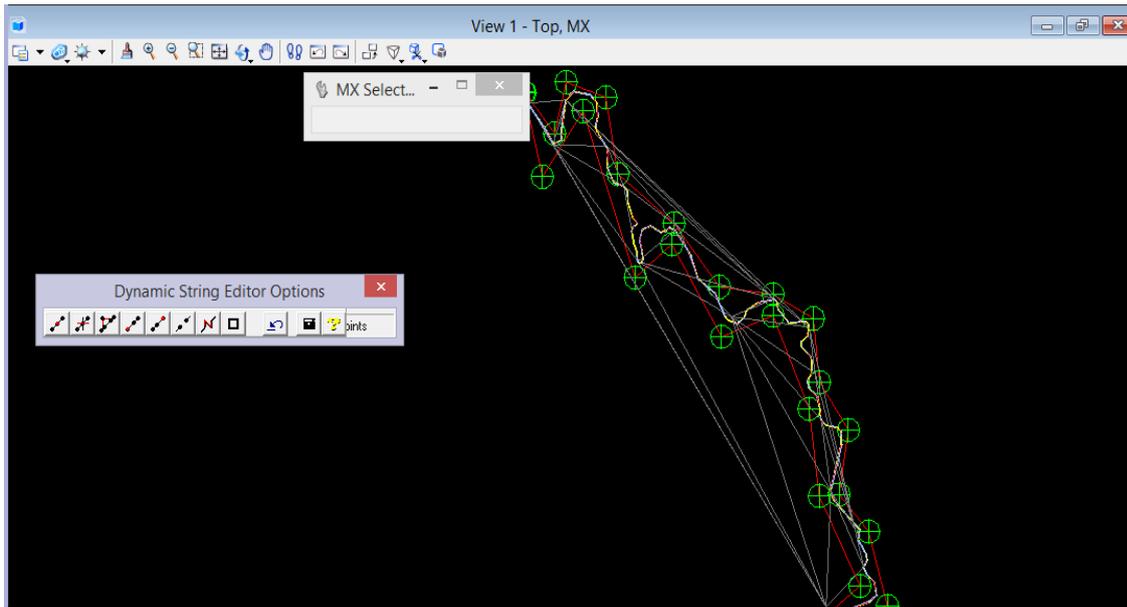- Using add points draw a boundary around the road section so it does not overlap anywhere.

Fig(14):Setting boundary points

- Now move to Analysis> Triangle> Triangulation from a string model
- Select no masking
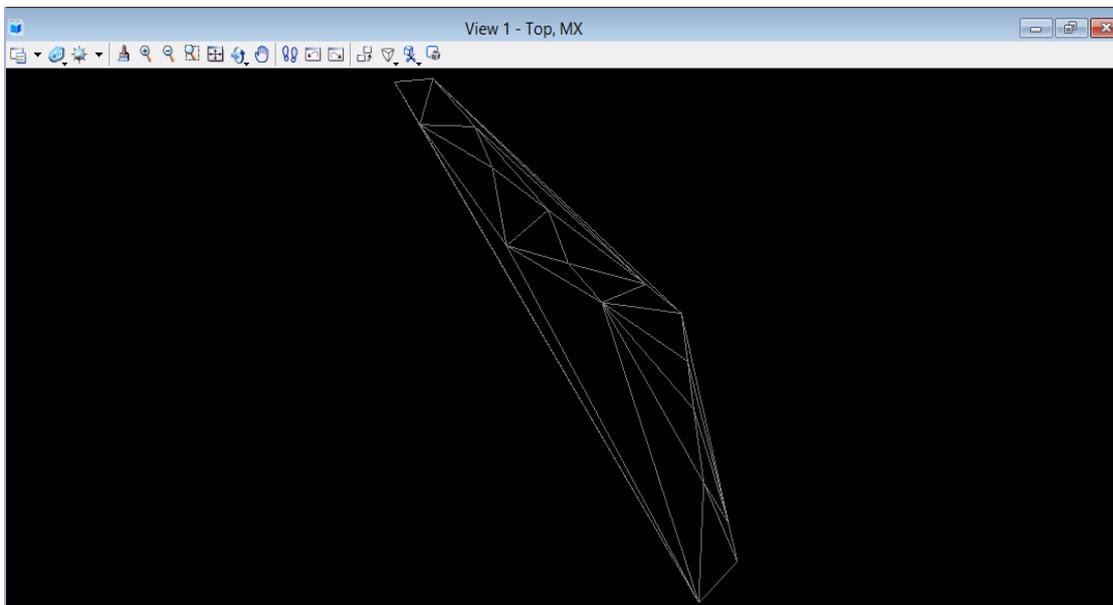- Model to store triangulation> TRIA

Fig(15):Triangulation from a String Model

- The model will appear like this
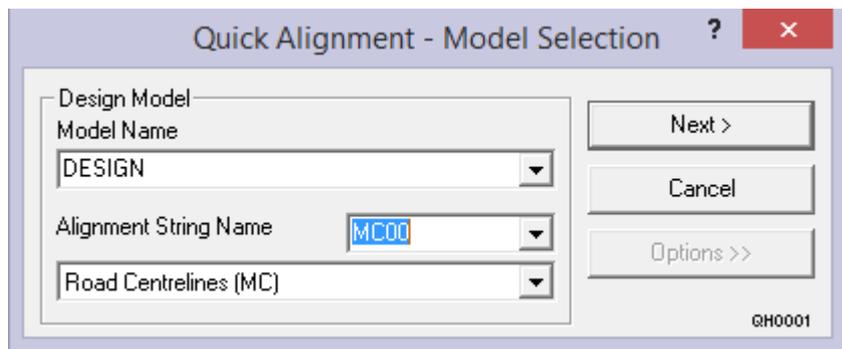

Fig(16):Selecting TRAI model

- Now go to display >plan set >Select model TRAI

- Select appropriate style set

Fig(17): Triangulated model

4.4 SETTING HORTIZONTAL AND VERICAL PROFILE

- GO to Design >Quick alignment>Horizontal design


Fig(18): Quick Alignment

- Name the model name as >Design

- Select road centreline> String name as >MC00

Fig(19): Add IP point

- Insert the IP just before and after the curve to create horizontal profile

- Similarly Click on Design >Quick alignment >Vertical profile

- Follow the same procedure to procure Vertical profile

- GO to Design >Road Design> Road widening

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- Appropriate aligning of the road is done and model is saved
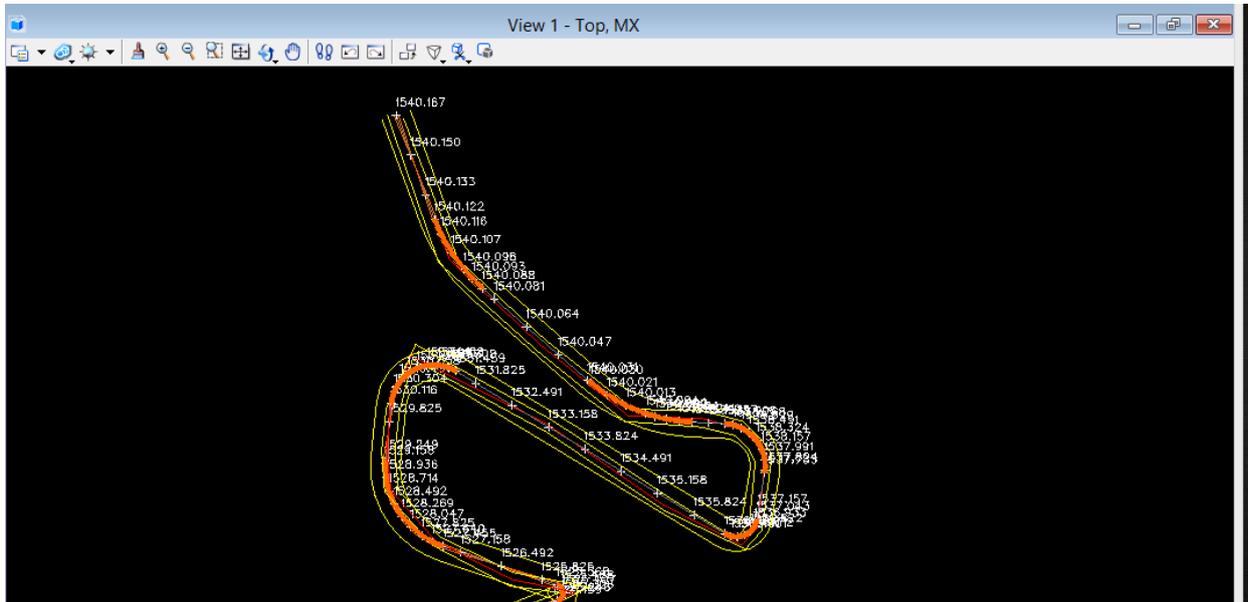
Fig(20):Widened road section
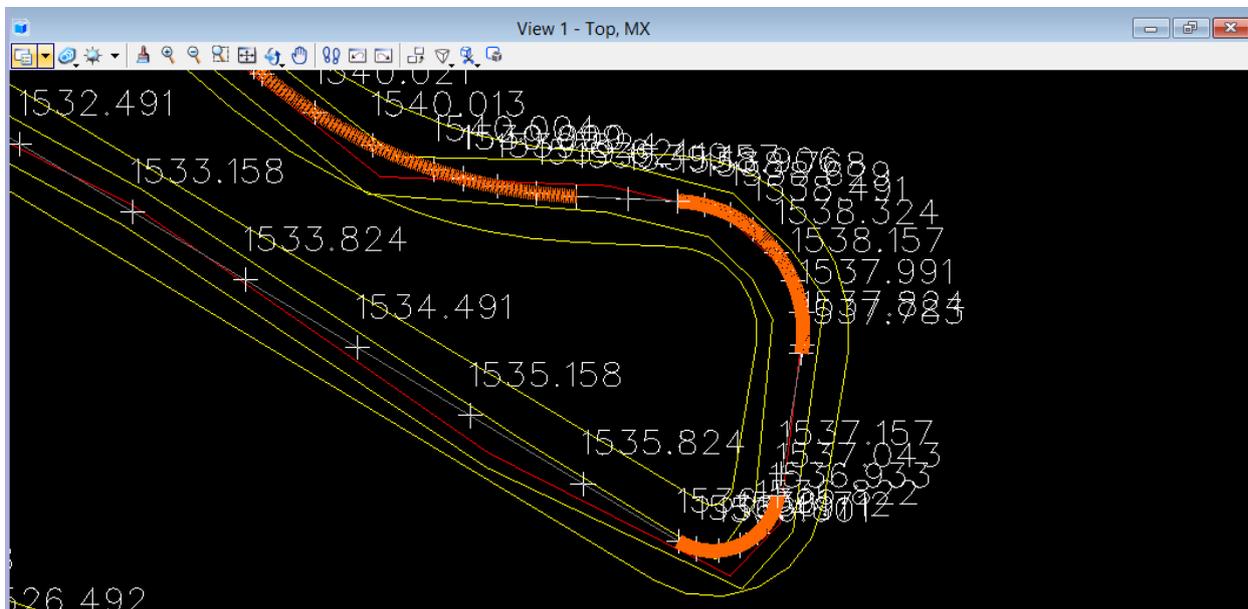
Fig(21): Display of data after widening

CHAPTER V
ESTIMATION

5.1 OVERVIEW

For all construction works or engineering processes the requirement beforehand is to know about the probable cost of construction which is called the estimated cost. If the budget available for the project is lesser as compared to the estimated cost attempts are made to reduce such cost through reducing the work or by changing certain specification. The requirement for preparing an estimate is by calculating quantities through mensuration methods and then evaluating the cost.

The estimate demonstrated here is that of a hilly road where widening is done. The amount of earthwork is calculated through technique of Mean section-Area method.

The following are the specifications of the sections created
- Every section here depicted is : trapezoidal
- Every section has a length of : 100 m
- The slope of every section is given as: 2:1
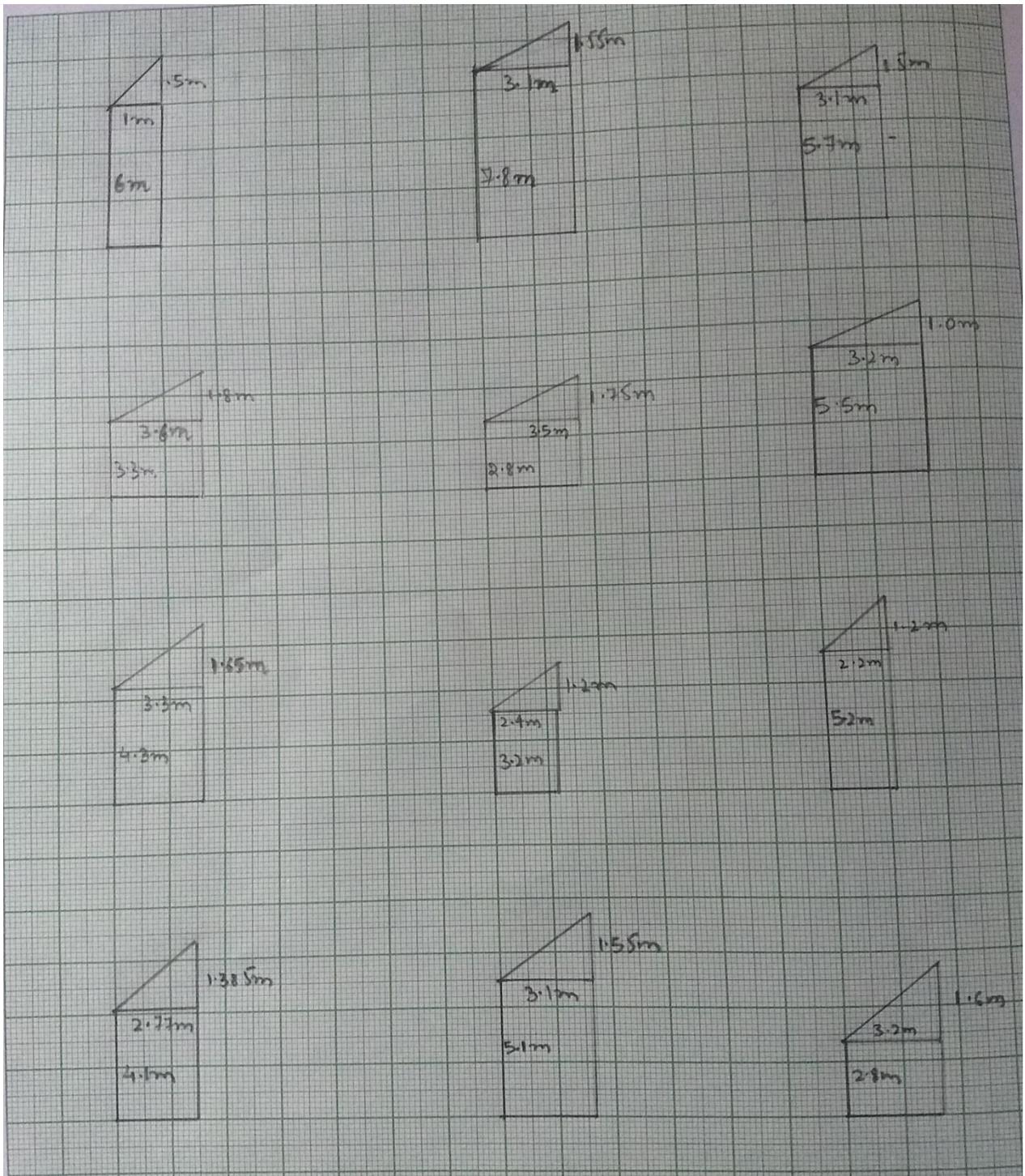
5.2 THE EARTHWORK SECTIONS
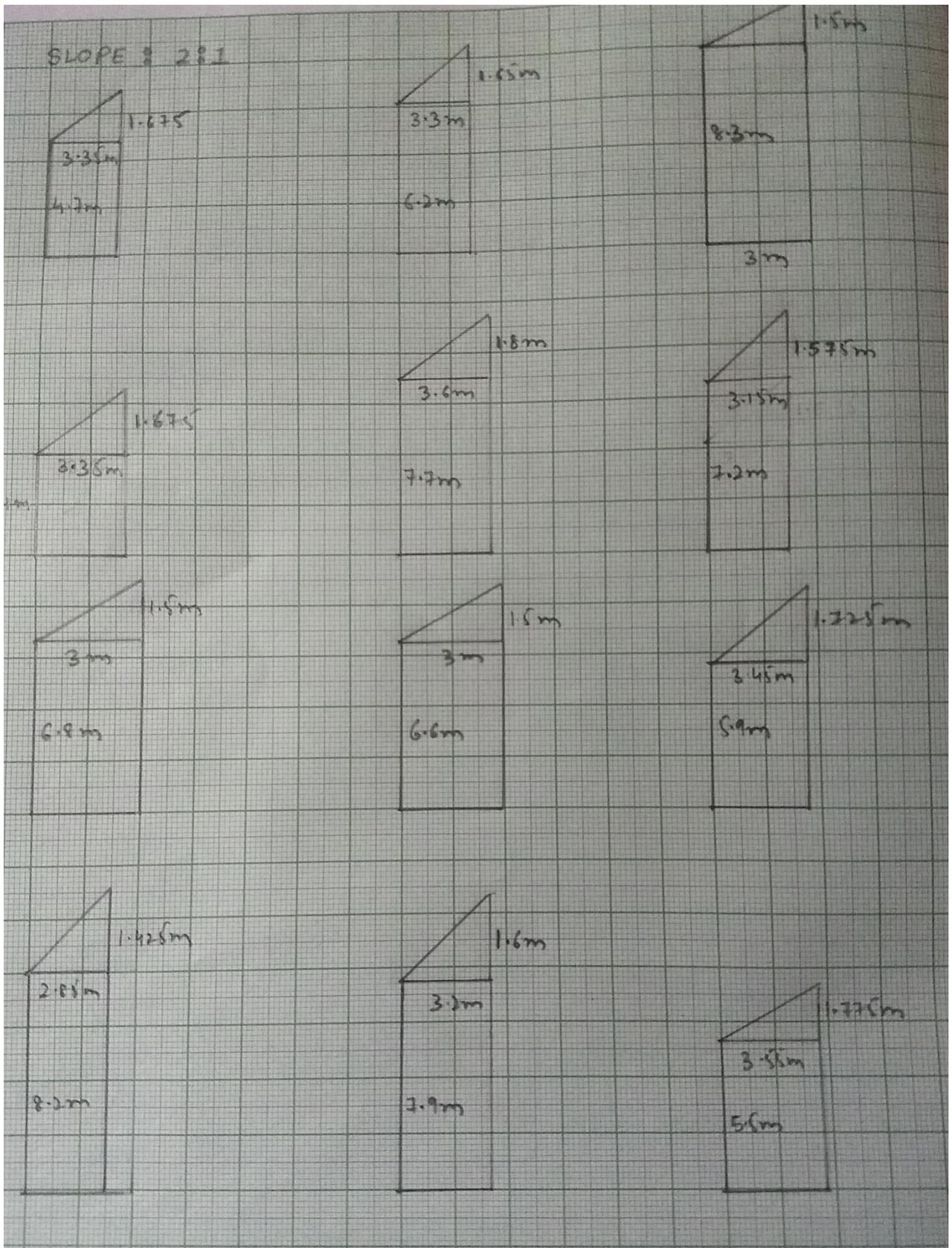

Fig (22 a):Sections drawn for the earthwork calculation

Fig (22 b):Section drawn for earthwork calculations

5.3 DATA FOR THE SECTIONS

S No.	R.D (km/m)	Area (m²)	Mean Area (m²)	Length of section (m)	Volume of earth (m³)	RL (m)
1	0/100	6.25	0	100	0	1406.28
2	0/200	26.58	16.415	100	1641.5	1413.62
3	0/300	19.35	22.965	100	2296.5	1419.63
4	0/400	15.12	17.235	100	1723.5	1423.96
5	0/500	12.86	13.99	100	1399	1427.37
6	0/600	20.16	16.51	100	1651	1431.77
7	0/700	16.91	18.535	100	1853.5	1437.76
8	0/800	9.12	13.015	100	1301.5	1442.59
9	0/900	12.76	10.94	100	1094	1445.26
10	1/000	13.27	13.015	100	1301.5	1448
11	1/100	18.21	15.74	100	1574	1453.21
12	1/200	11.52	14.86	100	1486	1460.167
13	1/300	18.55	15.035	100	1503.5	1466.14
14	1/400	23.1825	20.866	100	2086.6	1468.024
15	1/500	27.15	25.16	100	2516	1476.59
16	1/600	16.2	21.67	100	2167	1483.25
17	1/700	30.96	23.58	100	2358	1494.78
18	1/800	25.633	28.296	100	2829.6	1500.68
19	1/900	22.05	23.84	100	2384	1508.46
20	2/000	22.65	22.35	100	2235	1515.99
21	2/100	23.33	22.99	100	2299	1522.28
22	2/200	25.4	24.36	100	2436	1529.82
23	2/300	27.84	26.62	100	2662	1535.38
24	2/400	22.67	25.25	100	2525	1538.64
				Total	45323.7	

Table II

5.4 THE ABSTRACT OF COST FOR EATHWORK

SNo	Description	Qty	rate	unit	Amount (Rs.)
1	**Clearing and Grubbing Road land** Clearing and grubbing road land including uprooting wild vegetation, grass, bushes, shrubs, sapling and trees of girth upto 300 mm removal of stumps of such trees cut earlier and disposal of stacking of serviceable materials to be used or auctioned, upto a lead of 1000m including removal and disposal of top of top organic soil not exceeding 150mm in thickness as per technical specification clause 201	2.1661	22440.1	hectare	48607
2	**Excavation in hilly areas in ordinary Rock by mechanical means not requiring blasting** Excavation in hilly area in ordinary rock not requiring blasting by mechanical means including cutting and trimming of slopes and disposal of cut material with a lift upto 1.5m and lead upto 20m as per clause 1603.2	45323.7	134.45	Cum	6093771
				TOTAL	6142378

Table III

CHAPTER VI
CONCLUSION

In modern times traffic congestion is becoming a severe problem day by day. To accommodate such growing traffic, roads must be extended or simply be widened to solve this traffic problem. Road widening can increase the capacity of traffic by adding extra lanes to already existing roads to accommodate vehicles.

One such road is the Waknaghat to Jaypee road which has encountered an ever increase in inflow of vehicles during the course of years due to the increasing acclaim of the university. The Waknaghat to Jaypee road is a 3km stretch starting from the Waknaghat chowk to the Jaypee Thankyou gate. We have carried a detailed examination of the road and have successfully surveyed the existing road patch. After the physical examination of the road we were able to plot and represent the road in a digital form through means of a software called MXROAD. The software enabled us to widen the existing patch and helped us to create a visual appearance of the widened road. We also succeeded in creating an estimate for the widening of the road patch. The survey also concluded that the earthwork extracted may not be necessarily used as filling for this project.

CHAPTER VII
FUTURE SCOPE

Softwares are the future.

In older times there used to be a lot of work done manually by drafting a plan or Hand drafting. This used to be quite tedious and time consuming process. Now in modern world softwares have replaced these old methods used in civil engineering. Softwares are playing a major role in shaping the future of civil engineering. Some of the excellent softwares used are AutoCAD, Revit, MXROAD etc. Having the knowledge of these softwares can help you in getting better knowledge of the civil and building career options.

One such advanced software used in our study was MXROAD, a software used for pavement layout, evaluation and 3D modelling. The software cut downs all the paper work and calculations needed for designing a road profile. Makes work simpler and effective. Softwares like MXROAD are gaining popularity as they are able to evaluate data and helps to create great 3d profiles and representations that helps us to create human marvels.

With the introduction of these new modern softwares, old methods will soon loose their significance.

References

1. Gowtham P,Mahendran K,Vignesh R, Priya R and Dr. Vijayalakshmi (2015)."**Widening and trnovation .of hill road pavement from Doddabetta to Kattabetta in the Nilgiri district**". *Innovation and Applied Studies*.

2. You Runwei (2014). "**Safety Design on small radius curve of Mountain road**" *Applied Mechanics and Materials 2014.*

3. Joshi Anil Kumar , Joshi Chitra , Singh Mridu, Singh Vikram (2014).
   "Road traffic accidents in hilly regions of northern India: What has to be done?". *World journal of emergency medicine.*

4. Xiaobin Zhu, Junmin Shen and Xiao Zhang (2013). "**Longitudinal Cracking Reasons and Prevention of Widening Pavements of Old Roads**". *Applied Mechanics and materials.*

5. Weng Xiaolin and Wang Wei (2011). "**Influence of differential settlement on pavement structure of widened roads based on large-scale model test**" *Journal of Rock Mechanics and Geotechnical Engineering 2011.*

6. Ling Jianming, Qian Jinsong, and Huang Qinlong (2007). " **Failure Mechanism and Design Criterion for Low-Volume Roads Subgrade Widening**." *Transportation Research Record: Journal of the Transportation Research Board, No 1989.*

7. Wang Hao and Huang Xioming (2006). "**The study of ground and Embankment treatment techniques in Road Widening**." *Pavement Mechanics and Performance, ASCE.*

8. SOKKIA OPERATOR'S MANUAL, Jsima*; Japan Surveying instrument manufacturers association.*

9. MX-Road Design, Bentley V8i; *Bentley Institute Course Guide.*