

A CASE STUDY ON ROAD CONSTRUCTION AND ITS MANAGEMENT

A

Project Report

Submitted in partial fulfillment of the requirements for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

Under the supervision

Of

Dr. Tanmay Gupta

(Assistant Professor)

By

HARSH GOEL (171617)

PRIYANSHU SHARMA (171650)



JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

Waknaghat, Solan – 173234, Himachal Pradesh, India

Month- Aug-May Year-2020-2021

STUDENT'S DECLARATION

I hereby declare that the work presented in the Project report entitled “**A CASE STUDY ON ROAD CONSRUCTION AND ITS MANAGEMENT**” Submitted for partial fulfillment of the requirements for the degree of Bachelor of Technology in **Civil Engineering** at **Jaypee University of Information Technology**, Wagnaghat is an authentic record of my work carried out under the supervision of **Dr. Tanmay Gupta**.

This work has not been submitted elsewhere for the reward of any other degree/diploma. I am fully responsible for the contents of my project report.

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This is to guarantee that the work which is being introduced in the task report named "**A CASE STUDY ON ROAD CONSRUCTION AND ITS MANAGEMENT**" in halfway satisfaction of the prerequisites for the honor of the level of Bachelor of Technology in Civil Engineering submitted to the Department of Civil Engineering, **Jaypee University of Information Technology, Wagnaghat** is a legitimate record of work did by **HARSH GOEL** (171617) and **PRIYANSHU SHARMA** (171650) during a period from August, 2020 to May, 2021 under the oversight of **DR. TANMAY GUPTA Assistant professor**, Department of Civil Engineering, Jaypee University of Information Technology, Wagnaghat.

Date: 16-05-2021



Signature of Supervisor

Dr. Tanmay Gupta

Assistant Professor (Senior grade)

Department of Civil Engineering

JUIT, Wagnaghat



HOD
CE DEPT

Signature of HOD

Dr. Ashok Kumar Gupta

Professor and Head of

Department of Civil

Engineering

JUIT, Wagnaghat

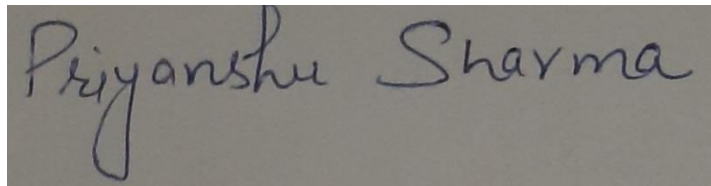
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A rectangular box containing a handwritten signature in dark ink that reads "Priyanshu Sharma".

Priyanshu Sharma (171650)

A handwritten signature in dark ink that reads "Harsh" with a horizontal line underneath the name.

Harsh Goel (171617)

ABSTRACT

What This Report Contains:

In this project, a new road is constructed from Lansdowne Jaswantdwar to Palkot. Total schedule for completion of project provided by department is 1.5 years. With managing all the activities on Primavera we are able to complete the project in 15 months. This was a new experience observing the activities schedule on software with live updating on it. We have used several machineries and labor for several different tasks.

Purpose:

The increment in traffic these days tend to seize some roads for hours. Also, because of this, there are a few roads with high traffic densities prompting road blockage for quite a long time. The answer for such circumstance can be road widening or construction of an alternate road.

Benefits: of our project as compared to the widening of road:

- This option can bring down the weight on essential course without influencing the exhibition of traffic.
- This strategy helps in improving the rush hour gridlock the executives of a city.
- And with this option the current traffic of the essential course won't get upset as it will be because of enlarging of a similar street.
- This will satisfy the Government's plan of raising new undertakings for the improvement of public.

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CHAPTER I
INTRODUCTION

1.1 General Introduction

We all know that our primary mean of transportation is only Roads. This transportation provides human, access to different types of places. There are a number of types of roads that are being prepared in a country to fulfill different types of requirements like according to its width, location, economy, traffic type rigidity, topography and material. But here we are focusing on road categories based on their locations:

- a) **National Highway (NH)** is constructed to connect all the major cities to the capitol of the country. They are spreaded throughout the country. It can be called as main road.



Fig (1) -National Highway (NH)

- b) **State Highways** are developed to associate every one of the primary pieces of states inside it. These can be called as second fundamental streets. They finally interface with NH.



Fig (2) –State Highway (SH)

- c) **District Roads** are built to interface every one of the little urban communities inside the region to business sectors and to associates the two of them to the public roadways andNH.



Fig (3) –District Road

d) **Village Roads** are constructed to connect all the nearby villages to each other and all of them to the district roads. Rural areas really have completely different variant of roads to attach farms with their respective town or any city. These also offer access to the world outside. Roads take farm products produced to city markets and children to school. It completely means that the Roads are totally helpful in whole process of life's activities.



Fig (4) -Village road

However, some variants roads are not able to fulfill the traffic demands of certain routes. Therefore, government takes necessary steps to avoid traffic conditions. Constructing new road is Modern alternative for such condition. We called it modern because of the enhancement in construction technology now days have made construction procedure an easy job to do. This improves traffic safety and capacity. However, we must show our concern towards environment and local residents that might get affected by road construction.

1.2 Details of Project:

The road which we have constructed is a **State Highway**. It is being constructed from Lansdowne to Palkot. This site is constituted of mountainous terrain type of land. The whole length of road being prepared during this project is to be black topped on its whole surface.

Below is the **Fig.** showing the region in which the road is being constructed and the blue colored curved line is showing Road which we have described above.

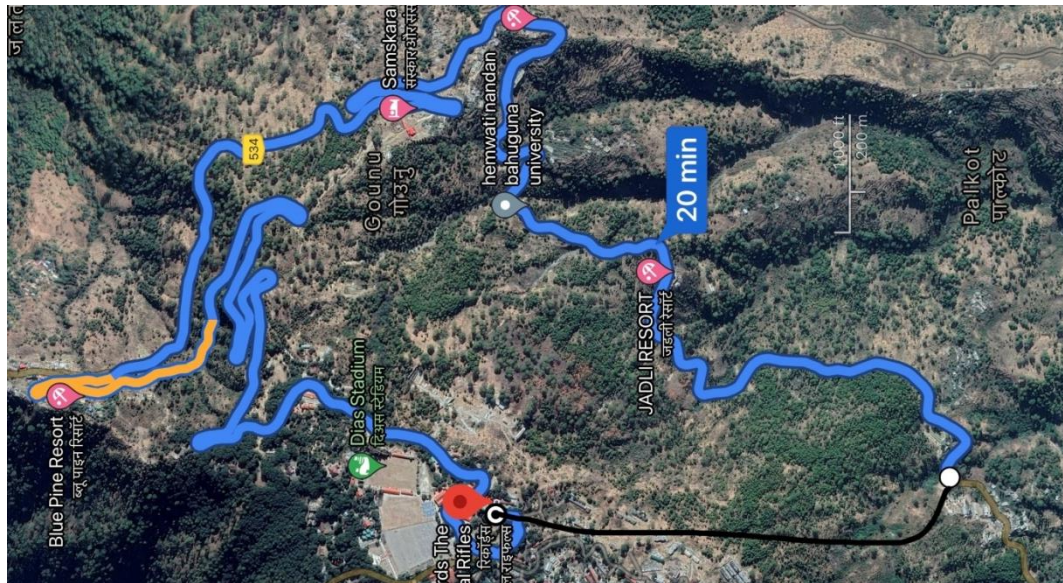


Fig (5) - The surveyed patch

1.3 Introduction of tools used

While performing this project in our toolkit there were different kinds of tools which helped us a lot. All of them are as follows:

➤ **Surfer:**

Surfer, it is an amazing forming, gridding, and surface planning bundle for researchers, architects, teachers, or any individual who needs to produce maps rapidly and without any problem. Surfer is a matrix-based planning program that interjects unpredictably dispersed XYZ information into a consistently divided framework. Lattices may likewise be imported from different sources, for example, the United States Geological Survey (USGS). Effectively imparts both straightforward and complex spatial information. Surfer gives you the devices to make great guides to plainly convey your message to colleagues, customers, and partners. This software helped us in creating a virtual contour of site and design of road using the data from total station.

➤ **Primavera:**

Dispatched in 1983 Primavera is an expert and astonishing undertaking portfolio programming program, which is utilized by project experts, schedulers, architects, organizers, and others engaged with arranging, the executives, project detailing and coordinates with other endeavour programming. It incorporates project the board, planning, hazard examination, opportunity the executives, asset the board, and cooperation and control capacities. This software helped in managing the activities associated with constructing a road. This software used necessary data such as time scheduling, manpower, machineries, resources, and much more.

➤ **MS Excel:**

Microsoft Excel is a powerful spreadsheet program used to record, manipulate, store numeric data and it can be customized to match your preferences. In this project it helped us to estimate all the costs from starting of project to end of project, even including cost of labor to cost of machinery.

The use of these softwares enhanced our work and reduced our working efforts.

This was an Introduction of all the steps involved in this report, rest in detail you will start learning from next chapter onwards.

CHAPTER II
LITERATURE REVIEW

1. "Enlarging and Renovating the 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

Central issues:

- The fundamental goals are street augmenting, redesigning the asphalt where the asphalts are vigorously harmed.
- For the assurance of the primary limit of the asphalt, non-dangerous testing hardware is utilized for example Benkelman pillar and Falling Weight Deflect meter (FWD).
- Benkelman pillar estimates static avoidances and it is worked on standard of switch arm.
- In Falling Weight Deflectometer test, the test estimates the effect load accordingly of adaptable asphalt.
- The existence of adaptable asphalt is 15 years; beginning expense is less however upkeep cost is high. Then again life of inflexible asphalt is 2.5 occasions that of flexile asphalt, beginning expense is high however support cost is extremely less.

2. "Street auto collisions in uneven areas of northern India: What must be finished?" Anil Kumar Joshi , Chitra Joshi , Mridu Singh, Vikram Singh, World diary of crisis medication, 2014.

Central issues:

- Reasons for mishaps in sloping locale are inadequately planned bends in the street, dazzle bends, and ill-advised position of street signs or lights and so forth
- Accidents can likewise happen if a street is appropriately planned and developed yet isn't painstakingly kept up.
- Defective upkeep concerns are potholes and street disintegration, broken guiderails, inability to eliminate street flotsam and jetsam and inability to keep up signs and light controls.

3. "Wellbeing plan on little sweep bend of mountain road."Runwei you, Journal of Applied mechanics and materials, 2014.

Central issues:

- Bend of little range bend is clumsy areas.
- The purposes behind mishaps cannot be right visual reaction, enormous or little treasure of bend, insufficient broadening and improper superelevation.
- The arrangements can be expanding the sweep of bend; a little span bend ought to be augmented on the two sides so that situation of focal line of street ought to be same.
- Increasing the superelevation for example super height of outside path ought to be expanded comparative with internal path.
- The purposes behind many auto collisions, when the human and vehicle factors were precluded, ultimately fell on street factors. A large portion of the mishaps were brought about by irrational street direct plan.

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.

Central issues:

- Paper centers on development quality control of expanded roadbeds. It purposes development control techniques and treatment measures to forestall longitudinal breaking of black-top asphalts.
- The longitudinal breaks don't happen ordinarily however likelihood of event is very high.
- Selection of proper treatment program ought to be finished considering the particular designing topographical conditions and street level norms.

5. **"Impact of differential settlement on asphalt design of enlarged streets dependent for enormous scope model test"**. Xiaolin Weng and Wei Wang, Journal of Rock mechanics and Geotechnical Engineering, 2011

Central issues:

- Large scope model test was performed to investigate the impact of differential setting among new and old Subgrade under stacking conditions.
- Application of georgic to the join, be that as it may, can diminish the differential settlement and further decrease its impact.

- The strain of asphalt structures increment easily with the development of differential settlement.
- The controllable settlement stage, included by high controllability, is a cutting edge innovation for the reenactments of differential settlement between the new and the old sub evaluations.

6. **"Disappointment system and plan models for low volume streets Subgrade augmenting"** Jianming Ling, Jinsong Qian and Qinlong Huang, Journal of Transportation and Research board, 2007.

Central issues:

- The essential goal of this paper is to investigate the primary asphalt trouble brought about by expressway broadening.
- Shear breaking, normally relates slippage of recently constructed Subgrade along interface. This disappointment is caused predominantly by slippage of the recently assembled Subgrade.
- Bottom-up breaking, is like that of recently constructed asphalt, however a piece of ductile pressure is because of differential deformity at the highest point of new dike.
- Top-down breaking, is an uncommon disappointment mode that happens in expressway extending instead of new development.
- Through limited component examination, research center tests and in situ examination, it is shown that distortion shows up fit as a fiddle of a backwards S (~), which will initiate base up and hierarchical breaking in surface course and semi unbending base separately.

7. **"The investigation of ground and dike treatment methods in street broadening"** Hao Wang and Xaioming Huang, Journal of Pavement mechanics and execution ASCE, 2006.

Central issues:

- Four bank treatment strategies were utilized and looked at including dike support, light weight dike, concrete profound blending heap and detachment divider.
- Geotextiles, geo network and geo cells can be utilized as support under or inside the bank to improve the security.
- The light weight bank helps in eliminating settlement because of its little self-weight. Fly

debris and Expanding Polystyrene are significantly utilized.

- Cement profound blending strategy is utilized to diminish the settlement and to expand the parallel dependability of the new dike.
- Separation divider is to launch slurry into the dirt through high constrain gag to frame concrete soil mix divider with the goal that the new bank and old dike are very much isolated.
- Based on their viability the four procedures are positioned as follows: Light weight embankment>Deep heap mixing>Separation wall>Reinforcement bank.

2.1 Objectives:

- Survey the sight via total station.
- Plotting road on golden software Surfer.
- Analyzing the exercises associated with development of street on Excel.
- Manage the activities on Primavera software

CHAPTER III
SURVEYING

3.1 SURVEYING INTRODUCTION

Looking over, it is called science, calling and procedure of deciding earthbound or 3D places of focuses and moreover points and furthermore the length between these focus. These focuses normally lie on the outside of the earth, and these focuses are regularly familiar with fabricate guides and limits for possession, areas, such as corner building or the surface area of sub-surface alternatives, or totally various capacities needed by Govt. or law, similar to deals of property. Also arranging and execution of most assortments of development need it. It's moreover utilized in transport, correspondences, planning, and furthermore the meaning of legitimate limits for land ownership. To comprehend studying right off the bat we need to find out about different hardware's required in this.

3.2 SURVEYING INSTRUMENTS:

ABOUT TOTAL STATION THEODOLITE

Total Station Theodolite can also be called in short as- (TST), it is an electronic instrument utilized for reviewing. It is also an optical instrument. The instrument essentially functions as an electronic Theodolite incorporated with Electronic Distance Estimation (EDM) to acquire slant good ways from the instrument to a specific point, and a modernized board to collect all the information and perform progressed organizes based computations.

Essentially, Easting alludes to as the length estimated in toward the east heading or the x organize and Northing alludes toward the north estimated length that is the y-facilitate.

Some of the general functions of Total Station are:

Total station processes the data collected to compute:

- Horizontal distance.
- Length between any two points.
- Elevation of objects
- All the coordinates of the observed points i.e., Easting, Northing and Elevation
- The method of different angles measured.
- The method of different distances measured.

3.3 STEPS TO USE AND LEVEL THE TOTALSTATION:

Step 1: Tripod Setup

- 3.3.1 The legs of Tripod are adjusted so that they are evenly spaced.
- 3.3.2 The head of Tripod is adjusted so it approximately matches the ground level.
- 3.3.3 Its Head should lay straight on survey point.

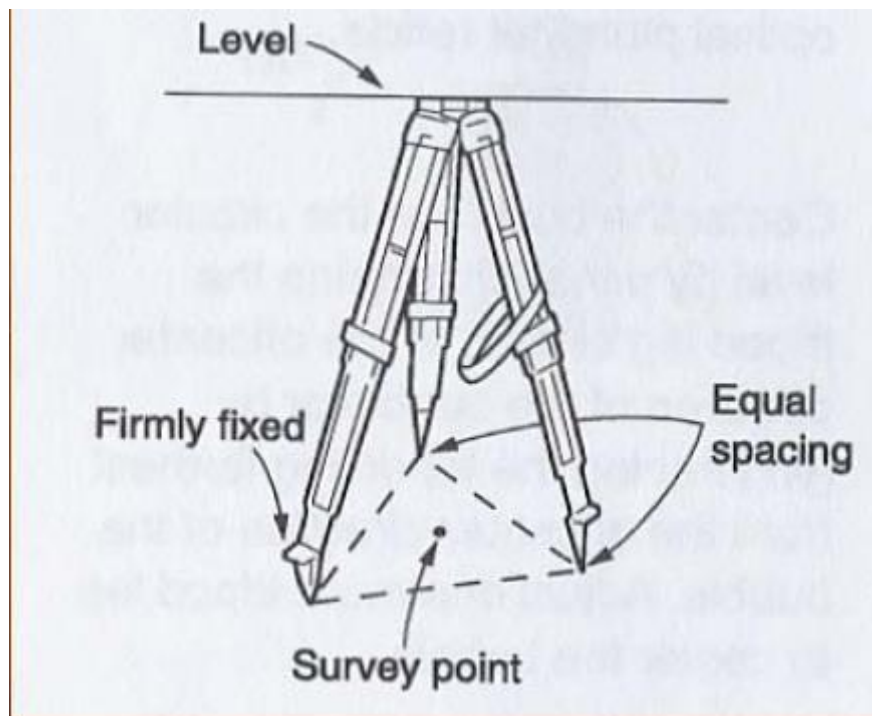


Fig (6) - Tripod setup

Step 2: Mounting the Instrument on Tripod

- 3.3.4 Instrument should be placed on Tripod
- 3.3.5 Then tighten the centering screw whereas brace the instrument with the opposite hand at the same time.
- 3.3.6 Battery should be inserted before leveling of the instrument.

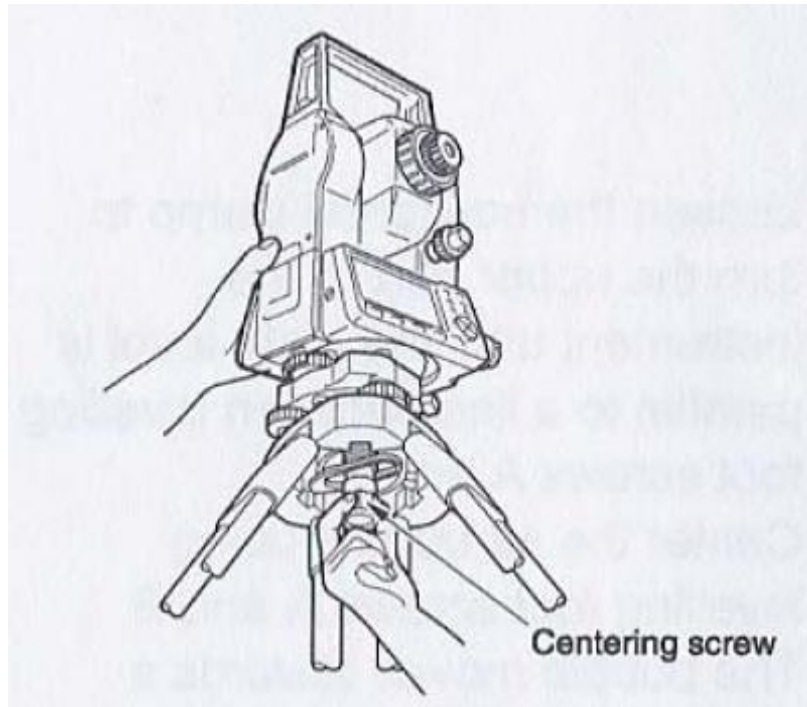


Fig (7) - Mounting Instrument on Tripod

Step 3: Focus on Survey Point

3.3.7 Then Optical plummet should be focused on the point to be surveyed.

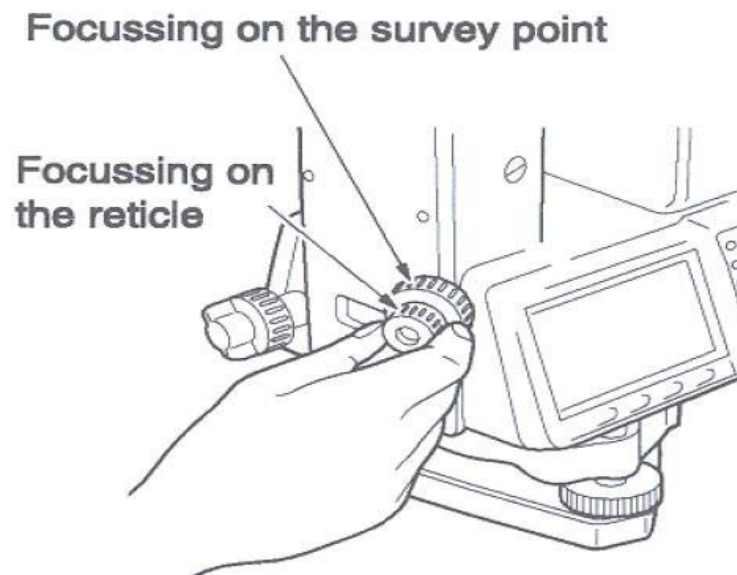


Fig (8) - Focusing on Survey Point

Step 4: Leveling the Instrument

- 3.3.8 The leveling foot screws are being adjusted to center the survey point in the optical plummet crosshair
- 3.3.9 The bubble already present in the circular level is centered by adjusting the tripod legs

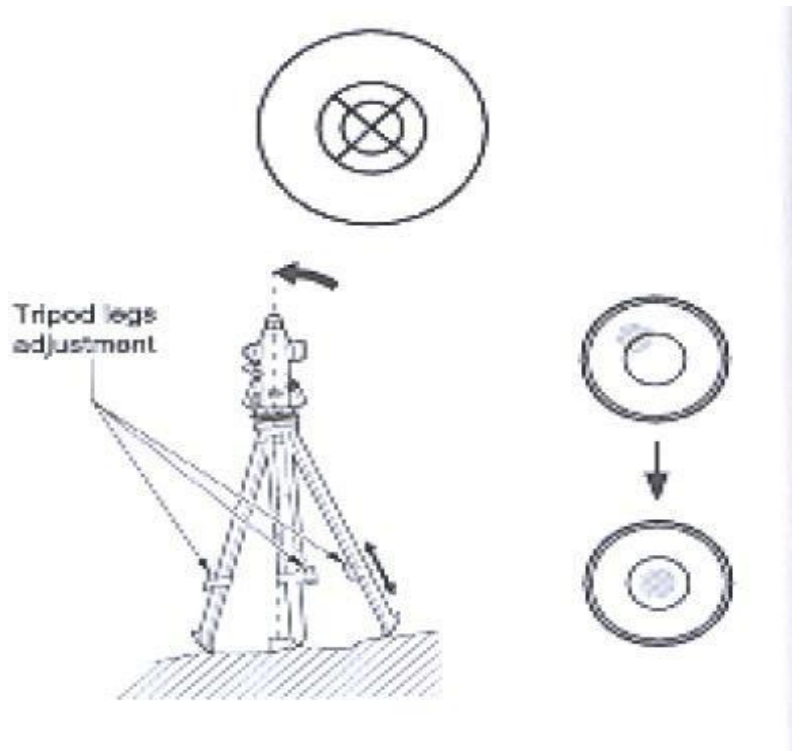


Fig (9) - Leveling the instrument

- 3.3.10 The horizontal clamp should be loosened and instrument should be turned until plate level become parallel to two of the leveling feet screws
- 3.3.11 The bubble is centered with the help of leveling screws- the bubble start moving toward the screw that is turned in clockwise direction.
- 3.3.12 The instrument is being rotated to 90 degrees and leveled using the 3rd leveling screw

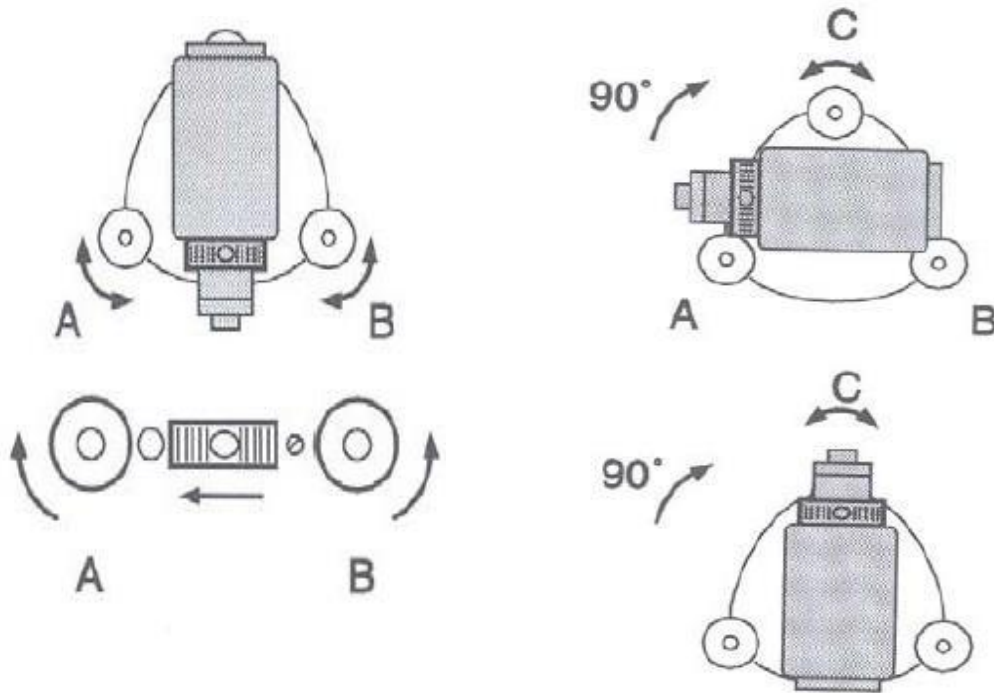


Fig (10) - Adjusting the screws

3.3.13 Now start observing the overview point in the optical dive and focus the point by extricating the focusing screw and sliding the whole instrument

3.3.14 After re-fixing the focusing screw check to ensure the plate level air pocket is level in a few ways

STEP 5: Adjust Image & Reticle Focus

3.3.15 Point the telescope to a comparatively lighter background while releasing the horizontal & vertical clamps

3.3.16 The crosshair focus is adjusted until the reticle image is sharply focused

3.3.17 Point telescope to prism target and adjust the crosshair focus until target is focused

3.3.18 Moving your head from side-to-side can help to test for parallax. The reticle focus step is repeated if parallax is significant.

3.3.19 The reticle focus may need to be adjusted when the instrument operator makes changes in the focus.

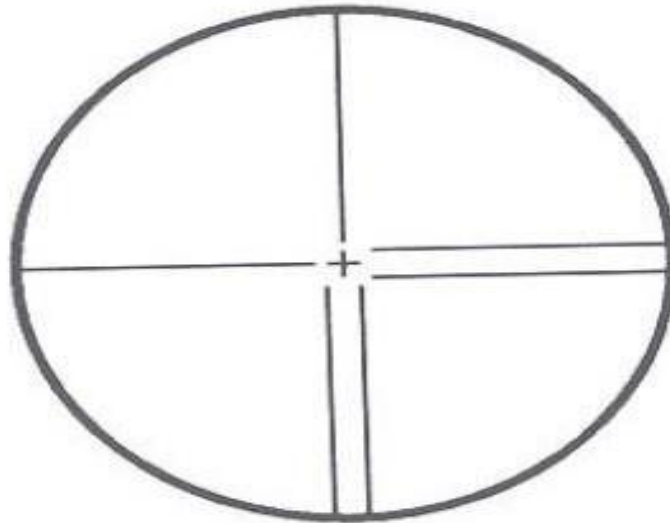


Fig (11) - Reticle Focus

Measurement of Target Height:

- 3.3.20 Set the Target Height from “MEAS” > “Menu” > “Coordinate” > “Station Orientation” > “Station Coordinate”
- 3.3.21 Now we have to set the target height to the measured height of the prism target.
- 3.3.22 Press “ESC” to return to the “MEAS” menu
- 3.3.23 Select the options present in sequence “MEAS” > “Menu” > “REM”, sight the prism target, press [OBS] to measure “S”, then press [STOP]
- 3.3.24 Now see the object which is lying above the target and then measure height
- 3.3.25 Select [REM] option and then press [STOP].
- 3.3.26 To see the crystal target, utilize [OBS] alternative on the Rescreen.

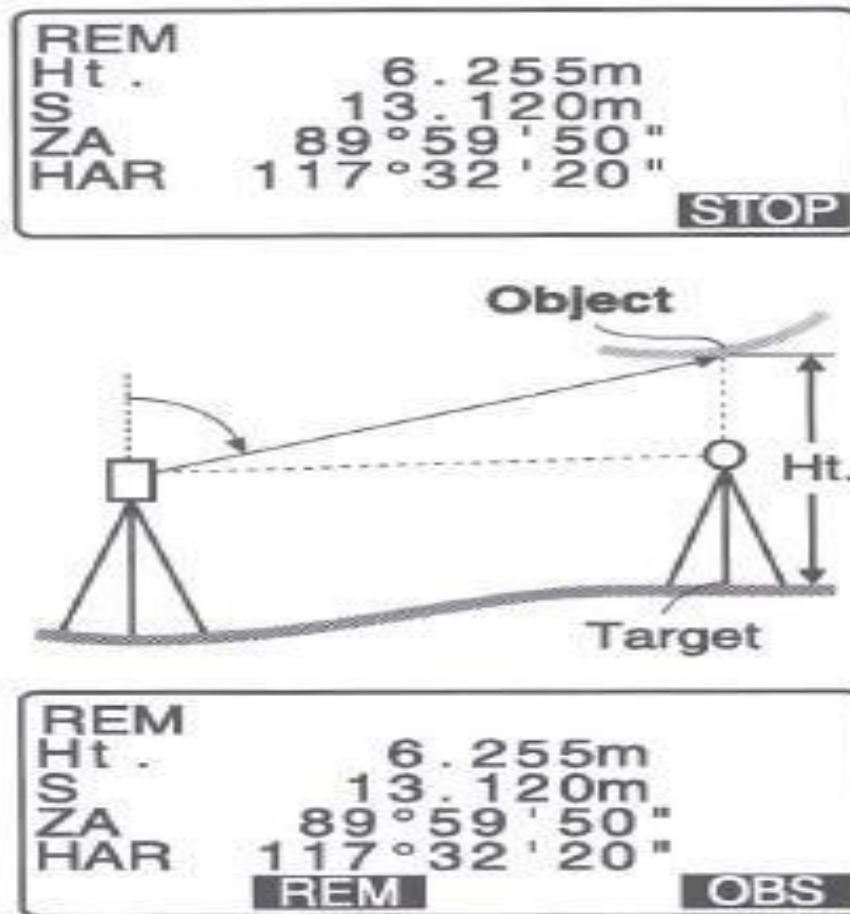


Fig (12) - Screen with different readings

3.4 WORKING STEPS:

1. Set up the Total Station at Base point and leveling it.
2. Now with help of compass see the north direction on total station and input the northing angle as 0.
3. Now using Handy GPS, Northing, Easting and Elevation values of Jaswantdwar inserted in Total Station that are 235975, 235980 and 1508m respectively.
4. As Station coordinates are inserted, now putting Back Sighting Northing, Easting and Elevation as 0, 0 and 0 respectively.
5. Now input the height of instrument and height of prism pole in total station.
6. Now sight the prism that should be around 30m from instrument. Take the readings of Northing, Easting and Elevation at right, left and center of the road, marks those points by Marker and save them.
7. Now replace the Total Station on right/left half of the street and information the station

facilitates estimated above and back sights the left/right.

8. Take next arrangements of right, left and focus and save them. Rehash the above advances and save the directions.



Fig (13) - Total station

3.5 SURVEYDATA

Table1-SurveyedData

SL. NO.	CHAINAGE	Left Carriageway Edge			Proposed Centerline			Right Carriageway Edge		
		EASTING	NORTHING	FRL	EASTING	NORTHING	FRL	EASTING	NORTHING	FRL
1	49+270	235974.744	3410003.277	1506.772	235972.567	3410008.868	1506.772	235970.390	3410014.459	1506.623
2	49+280	235965.188	3409999.562	1506.519	235963.248	3410005.240	1506.245	235961.308	3410010.918	1505.969
3	49+290	235954.449	3409996.466	1506.072	235953.687	3410002.417	1505.717	235952.925	3410008.368	1505.362
4	49+300	235942.552	3409996.856	1505.544	235943.738	3410002.738	1505.189	235944.924	3410008.620	1504.834
5	49+310	235931.645	3410000.988	1505.018	235934.443	3410006.296	1504.661	235937.241	3410011.604	1504.306
6	49+320	235922.956	3410006.945	1503.702	235926.218	3410011.981	1504.122	235929.480	3410017.017	1504.542
7	49+330	235914.888	3410011.846	1503.130	235917.672	3410017.161	1503.550	235920.456	3410022.476	1503.970
8	49+340	235906.439	3410015.618	1502.523	235908.547	3410021.236	1502.943	235910.655	3410026.854	1503.363
9	49+350	235897.342	3410018.400	1501.898	235898.992	3410024.169	1502.303	235900.642	3410029.938	1502.706
10	49+360	235887.788	3410020.932	1501.304	235889.326	3410026.732	1501.628	235890.864	3410032.532	1501.952
11	49+370	235878.122	3410023.495	1500.676	235879.660	3410029.295	1500.919	235881.198	3410035.095	1501.164
12	49+380	235868.456	3410026.058	1500.023	235869.994	3410031.858	1500.188	235871.532	3410037.658	1500.354
13	49+390	235858.791	3410028.621	1499.333	235860.329	3410034.421	1499.484	235861.867	3410040.221	1499.570
14	49+400	235849.159	3410031.176	1498.685	235850.663	3410036.984	1498.836	235852.167	3410042.792	1498.843
15	49+410	235839.581	3410033.596	1498.093	235840.968	3410039.434	1498.244	235842.355	3410045.272	1498.172
16	49+420	235829.987	3410035.731	1497.559	235831.207	3410041.606	1497.708	235832.427	3410047.481	1497.559
17	49+430	235820.310	3410037.597	1497.164	235821.388	3410043.499	1497.202	235822.466	3410049.401	1497.053
18	49+440	235810.514	3410039.285	1496.835	235811.533	3410045.198	1496.696	235812.552	3410051.111	1496.545
19	49+450	235800.373	3410041.033	1496.504	235801.677	3410046.890	1496.190	235802.981	3410052.747	1495.875
20	49+460	235789.566	3410044.077	1496.038	235792.069	3410049.530	1495.683	235794.572	3410054.983	1495.330
21	49+470	235779.682	3410050.735	1495.532	235783.812	3410055.088	1495.177	235787.942	3410059.441	1494.822
22	49+480	235772.686	3410059.950	1495.026	235777.828	3410063.042	1494.671	235782.970	3410066.134	1494.316
23	49+490	235768.151	3410069.564	1494.292	235773.589	3410072.099	1494.174	235779.027	3410074.634	1494.056
24	49+500	235763.940	3410078.633	1493.513	235769.377	3410081.169	1493.695	235774.814	3410083.705	1493.791
25	49+510	235759.797	3410087.483	1492.814	235765.134	3410090.224	1493.234	235770.471	3410092.965	1493.654
26	49+520	235755.142	3410095.794	1492.361	235760.249	3410098.944	1492.781	235765.356	3410102.094	1493.201
27	49+530	235749.692	3410103.841	1492.201	235754.646	3410107.226	1492.328	235759.600	3410110.611	1492.455
28	49+540	235743.864	3410112.297	1492.266	235748.965	3410115.456	1491.873	235754.066	3410118.615	1491.482
29	49+550	235738.617	3410121.838	1491.797	235744.137	3410124.190	1491.377	235749.657	3410126.542	1490.957
30	49+560	235735.414	3410132.072	1491.057	235741.180	3410133.732	1490.820	235746.946	3410135.392	1490.585
31	49+570	235732.838	3410141.754	1489.976	235738.609	3410143.396	1490.204	235744.380	3410145.038	1490.432
32	49+580	235730.151	3410150.701	1489.110	235735.710	3410152.959	1489.530	235741.269	3410155.217	1489.950
33	49+590	235726.096	3410158.553	1488.420	235731.124	3410161.827	1488.840	235736.152	3410165.101	1489.260
34	49+600	235720.589	3410165.401	1487.813	235724.868	3410169.607	1488.233	235729.147	3410173.813	1488.653
35	49+610	235713.551	3410171.228	1487.341	235717.195	3410175.995	1487.747	235720.839	3410180.762	1488.152
36	49+620	235705.562	3410176.818	1487.225	235709.004	3410181.732	1487.381	235712.446	3410186.646	1487.535
37	49+630	235697.418	3410182.521	1486.835	235700.813	3410187.468	1487.133	235704.208	3410192.415	1487.430
38	49+640	235689.360	3410187.945	1486.581	235692.516	3410193.048	1486.922	235695.672	3410198.151	1487.265
39	49+650	235680.978	3410192.695	1486.370	235683.820	3410197.979	1486.711	235686.662	3410203.263	1487.052
40	49+660	235672.170	3410197.181	1486.462	235674.910	3410202.519	1486.433	235677.650	3410207.857	1486.406
41	49+670	235662.689	3410202.128	1486.408	235666.029	3410207.113	1486.053	235669.369	3410212.098	1485.700
42	49+680	235653.851	3410209.681	1485.926	235658.437	3410213.550	1485.571	235663.023	3410217.419	1485.216

43	49+690	235647.955	3410219.528	1485.342	235653.368	3410222.117	1484.987	235658.781	3410224.706	1484.632
44	49+700	235644.294	3410229.255	1484.109	235649.865	3410231.483	1484.366	235655.436	3410233.711	1484.625
45	49+710	235640.617	3410237.914	1483.326	235645.945	3410240.674	1483.746	235651.273	3410243.434	1484.166
46	49+720	235635.805	3410245.706	1482.705	235640.699	3410249.177	1483.125	235645.593	3410252.648	1483.545
47	49+730	235629.781	3410253.123	1482.244	235634.406	3410256.945	1482.489	235639.031	3410260.767	1482.734
48	49+740	235623.834	3410260.237	1481.444	235627.962	3410264.591	1481.799	235632.090	3410268.945	1482.152
49	49+750	235617.248	3410265.270	1480.697	235620.020	3410270.591	1481.052	235622.792	3410275.912	1481.407
50	49+760	235609.673	3410267.727	1479.894	235610.552	3410273.662	1480.249	235611.431	3410279.597	1480.604
51	49+770	235601.564	3410267.544	1479.084	235600.600	3410273.466	1479.439	235599.636	3410279.388	1479.794
52	49+780	235592.956	3410264.789	1478.560	235591.067	3410270.484	1478.795	235589.178	3410276.179	1479.030
53	49+790	235583.617	3410261.512	1478.318	235581.631	3410267.174	1478.333	235579.645	3410272.836	1478.350
54	49+800	235574.168	3410258.197	1478.259	235572.195	3410263.863	1478.021	235570.222	3410269.529	1477.783
55	49+810	235564.489	3410254.855	1478.143	235562.744	3410260.596	1477.723	235560.999	3410266.337	1477.303
56	49+820	235554.313	3410252.180	1477.844	235553.077	3410258.051	1477.424	235551.841	3410263.922	1477.004
57	49+830	235543.992	3410250.536	1477.542	235543.205	3410256.484	1477.122	235542.418	3410262.432	1476.702
58	49+840	235533.945	3410249.468	1476.725	235533.261	3410255.429	1476.788	235532.577	3410261.390	1476.853
59	49+850	235524.832	3410248.392	1476.068	235523.341	3410254.204	1476.421	235521.850	3410260.016	1476.776
60	49+860	235517.211	3410245.390	1475.665	235514.095	3410250.517	1476.020	235510.979	3410255.644	1476.375
61	49+870	235511.188	3410240.182	1475.234	235506.565	3410244.007	1475.589	235501.942	3410247.832	1475.944
62	49+880	235507.022	3410232.866	1474.797	235501.579	3410235.392	1475.154	235496.136	3410237.918	1475.509
63	49+890	235503.839	3410223.919	1474.789	235498.204	3410225.979	1474.719	235492.569	3410228.039	1474.649
64	49+900	235500.109	3410213.987	1474.713	235494.713	3410216.611	1474.293	235489.317	3410219.235	1473.873
65	49+910	235494.203	3410204.358	1474.301	235489.513	3410208.100	1473.881	235484.823	3410211.842	1473.461
66	49+920	235486.065	3410196.415	1473.903	235482.368	3410201.140	1473.483	235478.671	3410205.865	1473.063
67	49+930	235476.987	3410190.738	1473.181	235473.879	3410195.870	1473.100	235470.771	3410201.002	1473.019
68	49+940	235468.766	3410185.909	1472.311	235465.269	3410190.785	1472.731	235461.772	3410195.661	1473.151
69	49+950	235462.162	3410180.254	1471.956	235457.711	3410184.277	1472.376	235453.260	3410188.300	1472.796
70	49+960	235457.306	3410173.304	1471.616	235451.998	3410176.101	1472.036	235446.690	3410178.898	1472.456
71	49+970	235454.319	3410165.359	1471.290	235448.486	3410166.766	1471.710	235442.653	3410168.173	1472.130
72	49+980	235453.340	3410156.429	1471.051	235447.355	3410156.853	1471.399	235441.370	3410157.277	1471.747
73	49+990	235453.073	3410146.679	1471.171	235447.076	3410146.857	1471.102	235441.079	3410147.035	1471.032
74	50+000	235452.725	3410136.188	1471.230	235446.763	3410136.862	1470.810	235440.801	3410137.536	1470.390
75	50+010	235450.541	3410125.194	1470.939	235444.843	3410127.074	1470.519	235439.145	3410128.954	1470.099
76	50+020	235445.700	3410114.968	1470.647	235440.562	3410118.066	1470.227	235435.424	3410121.164	1469.807
77	50+030	235438.781	3410105.778	1470.291	235434.594	3410110.075	1469.936	235430.407	3410114.372	1469.583
78	50+040	235429.071	3410098.922	1469.998	235426.467	3410104.328	1469.645	235423.863	3410109.734	1469.290
79	50+050	235417.599	3410095.596	1469.717	235416.907	3410101.556	1469.364	235416.215	3410107.516	1469.009
80	50+060	235405.670	3410096.206	1469.460	235406.966	3410102.064	1469.105	235408.262	3410107.922	1468.750
81	50+070	235394.597	3410100.686	1469.224	235397.739	3410105.798	1468.869	235400.881	3410110.910	1468.514
82	50+080	235385.600	3410108.542	1469.010	235390.241	3410112.344	1468.655	235394.882	3410116.146	1468.300
83	50+090	235379.668	3410118.910	1468.809	235385.298	3410120.984	1468.452	235390.928	3410123.058	1468.097
84	50+100	235377.458	3410130.543	1468.574	235383.454	3410130.765	1468.219	235389.450	3410130.987	1467.864
85	50+110	235378.628	3410141.504	1468.205	235384.572	3410140.685	1467.938	235390.516	3410139.866	1467.671
86	50+120	235380.258	3410151.520	1467.685	235386.180	3410150.555	1467.608	235392.102	3410149.590	1467.531
87	50+130	235381.865	3410161.389	1467.139	235387.787	3410160.425	1467.230	235393.709	3410159.461	1467.323
88	50+140	235383.465	3410171.206	1466.561	235389.395	3410170.295	1466.804	235395.325	3410169.384	1467.049
89	50+150	235384.861	3410180.857	1466.049	235390.824	3410180.191	1466.330	235396.787	3410179.525	1466.613
90	50+160	235385.620	3410190.433	1465.525	235391.614	3410190.158	1465.808	235397.608	3410189.883	1466.091

91	50+170	235385.740	3410200.030	1464.954	235391.739	3410200.155	1465.237	235397.738	3410200.280	1465.522
92	50+180	235385.217	3410209.646	1464.335	235391.197	3410210.139	1464.618	235397.177	3410210.632	1464.903
93	50+190	235384.183	3410219.073	1463.532	235390.098	3410220.078	1463.952	235396.013	3410221.083	1464.372
94	50+200	235382.174	3410227.882	1462.848	235387.857	3410229.806	1463.268	235393.540	3410231.730	1463.688
95	50+210	235378.454	3410236.035	1462.168	235383.728	3410238.896	1462.588	235389.002	3410241.757	1463.008
96	50+220	235373.265	3410244.146	1462.107	235378.352	3410247.327	1462.004	235383.439	3410250.508	1461.901
97	50+230	235367.800	3410253.089	1461.972	235373.127	3410255.849	1461.552	235378.454	3410258.609	1461.132
98	50+240	235363.497	3410263.108	1461.649	235369.182	3410265.026	1461.229	235374.867	3410266.944	1460.809
99	50+250	235360.891	3410273.472	1461.351	235366.760	3410274.717	1460.943	235372.629	3410275.962	1460.535
100	50+260	235359.126	3410283.533	1460.818	235365.036	3410284.567	1460.617	235370.946	3410285.601	1460.418
101	50+270	235357.401	3410293.382	1460.184	235363.311	3410294.417	1460.191	235369.221	3410295.452	1460.200
102	50+280	235355.677	3410303.234	1459.481	235361.587	3410304.268	1459.664	235367.497	3410305.302	1459.849
103	50+290	235354.066	3410312.567	1458.682	235359.862	3410314.118	1459.037	235365.658	3410315.669	1459.390
104	50+300	235351.235	3410320.509	1457.992	235356.453	3410323.470	1458.347	235361.671	3410326.431	1458.702
105	50+310	235346.199	3410326.697	1457.301	235350.173	3410331.192	1457.656	235354.147	3410335.687	1458.013
106	50+320	235338.836	3410331.229	1456.664	235341.734	3410336.483	1456.978	235344.632	3410341.737	1457.293
107	50+330	235330.156	3410335.392	1456.080	235332.721	3410340.816	1456.330	235335.286	3410346.240	1456.580
108	50+340	235321.324	3410339.503	1455.368	235323.654	3410345.032	1455.711	235325.984	3410350.561	1456.052
109	50+350	235312.403	3410342.887	1454.780	235314.307	3410348.577	1455.121	235316.211	3410354.267	1455.462
110	50+360	235303.119	3410345.585	1454.247	235304.707	3410351.371	1454.562	235306.295	3410357.157	1454.876

CHAPTER IV

SURFER

4.1 INTRODUCTION

Surfer, it is an amazing forming, gridding, and surface planning bundle for researchers, architects, teachers, or any individual who needs to produce maps rapidly and without any problem. Delivering distribution quality guides has never been faster or simpler. Adding numerous guide layers and items, tweaking the guide show, and commenting on with text make appealing and useful guides. For all intents and purposes all parts of your guides can be tweaked to deliver the specific show you need.

Surfer is a matrix based planning program that interjects unpredictably dispersed XYZ information into a consistently divided framework. Lattices may likewise be imported from different sources, for example, the United States Geological Survey (USGS). The framework is utilized to deliver various sorts of guides including shape, shading help, and 3D surface guides among others. Numerous gridding and planning choices are accessible permitting you to deliver the guide that best addresses your information.

A broad set-up of gridding techniques is accessible in Surfer. The assortment of accessible strategies gives various understandings of your information, and permits you to pick the most proper strategy for your requirements. Moreover, information measurements permit you to plan factual data about your gridded information. Surface region, projected planar region, and volumetric computations can be performed rapidly in Surfer. Cross-sectional profiles can likewise be processed and traded.

The framework documents can be altered, consolidated, separated, cut, questioned, and numerically changed. For instance, matrices can be cut to make cross-sectional profiles, or the Grids | Calculate | Math order can be utilized to make an isopach map from two framework records. Matrices can be altered with an instinctive UI in the lattice supervisor.

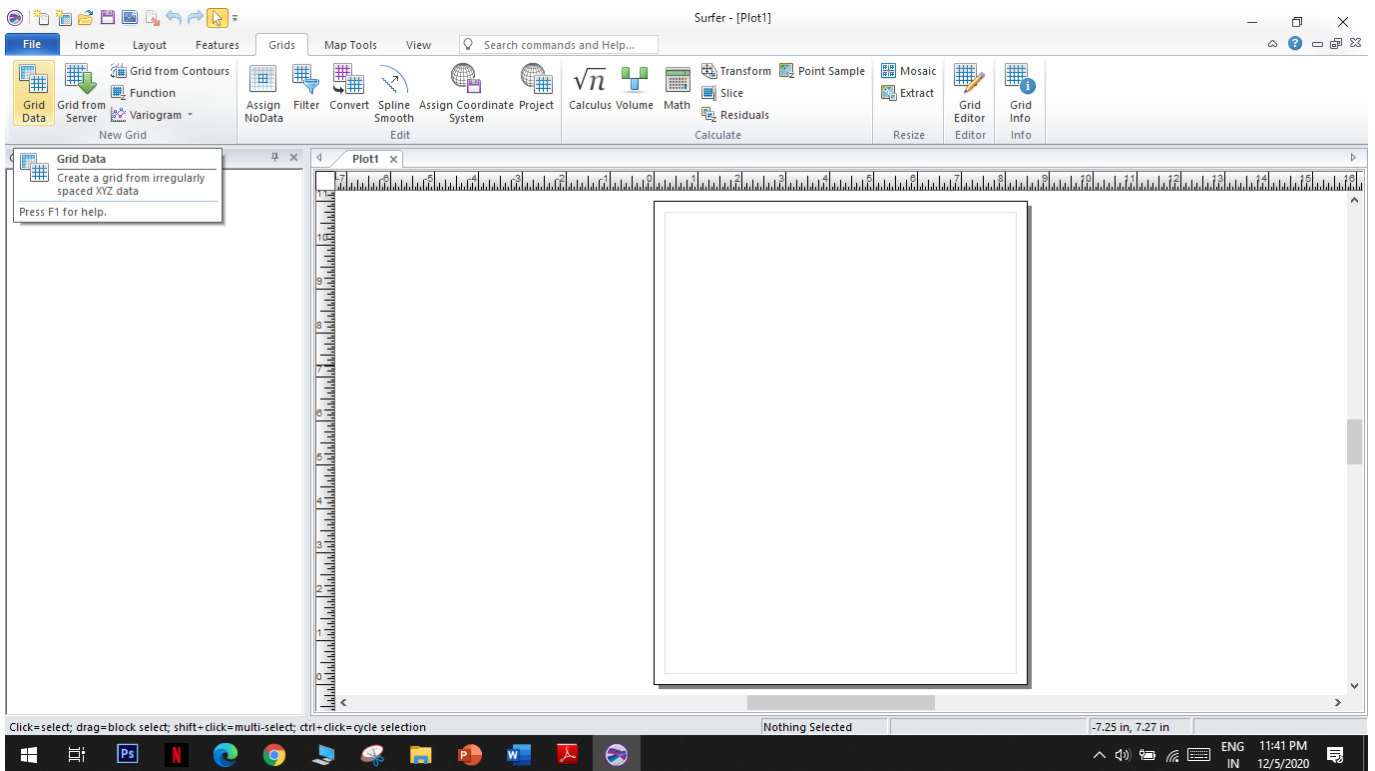
Effectively impart both straightforward and complex spatial information. Surfer gives you the devices to make great guides to plainly convey your message to colleagues, customers, and partners.

Surfer Map Types

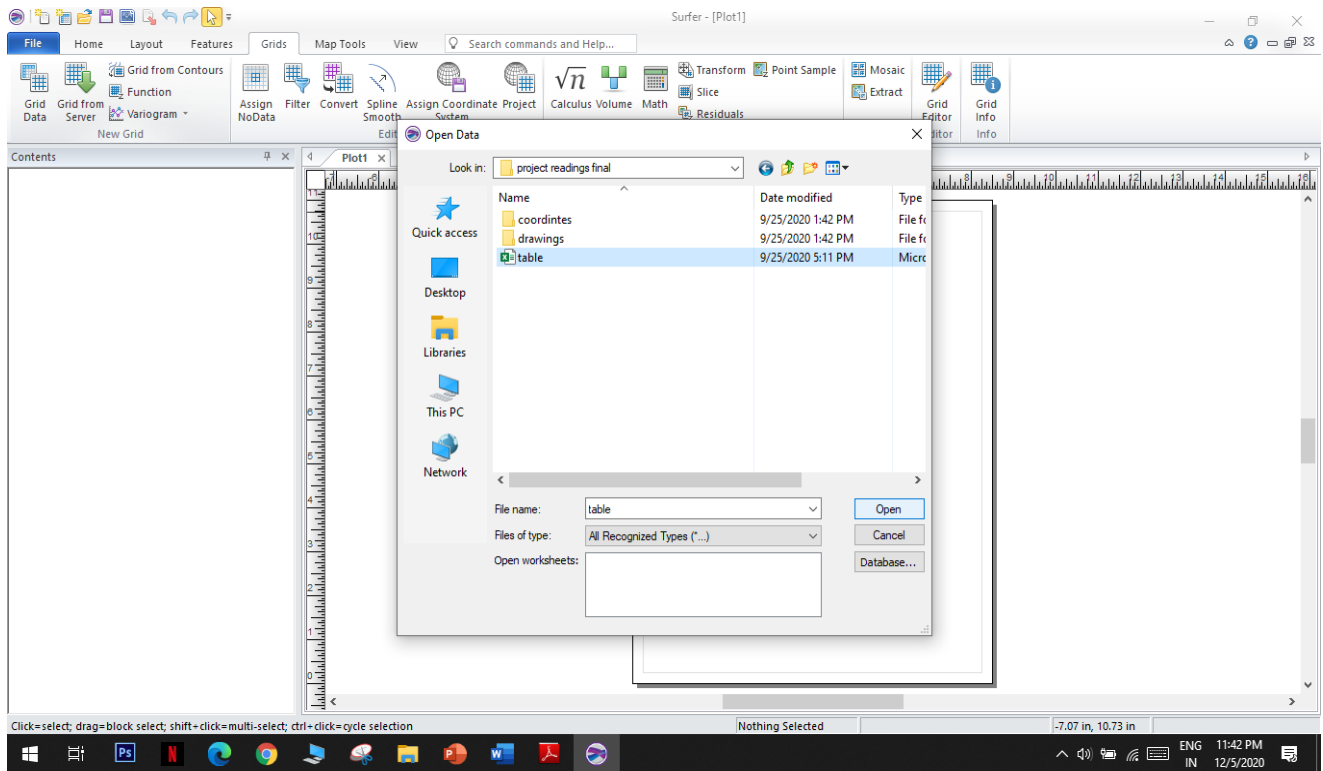
- Contour
 - Base
 - Post
- 3D Surface
- Color Relief
- Classed Post
- 3D Wireframe
- 1-Grid Vector
- 2-Grid Vector
- Watershed
- Grid Value
- View shed
- Point Cloud

4.2 WORKING STEPS

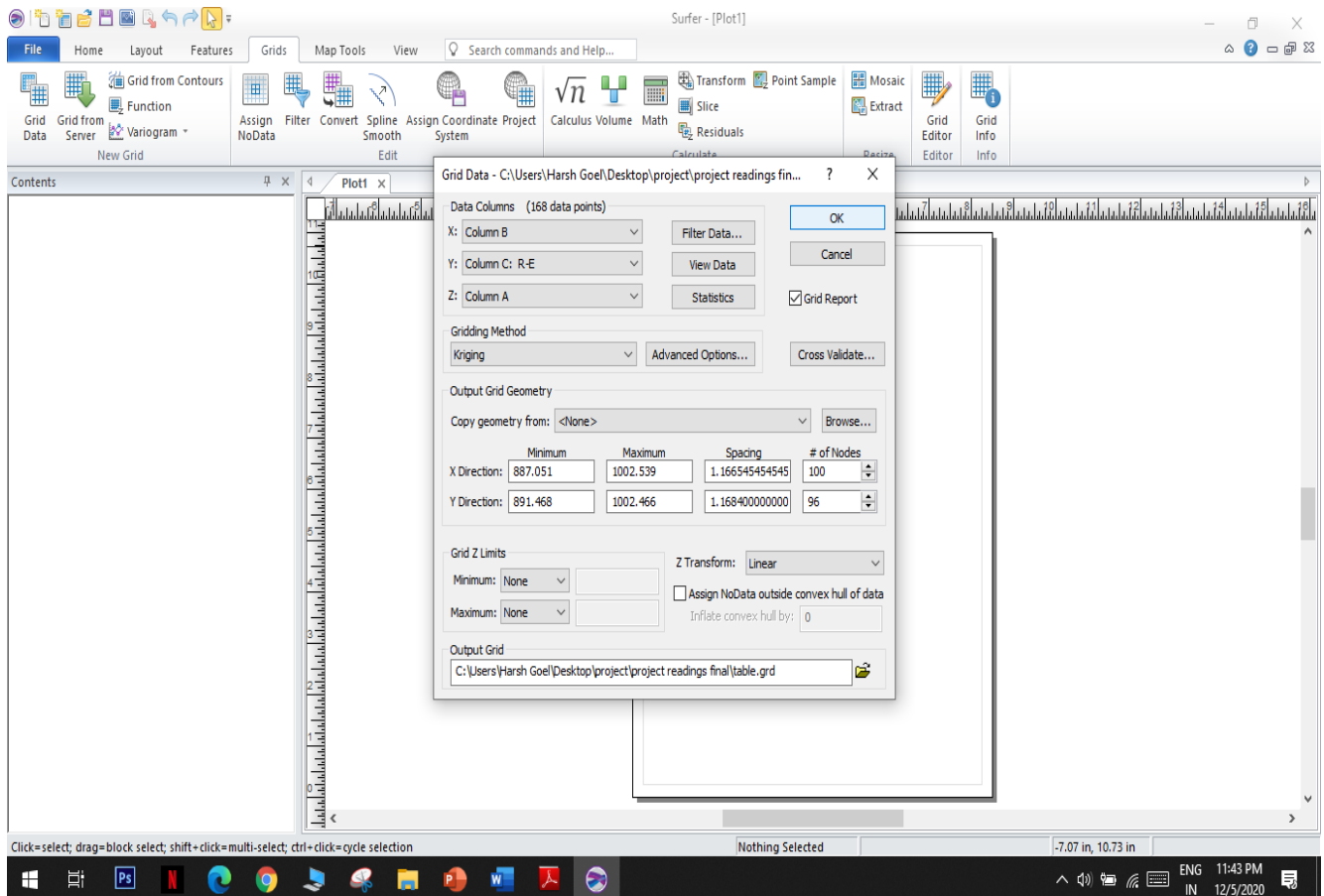
STEP 1: Create grid data



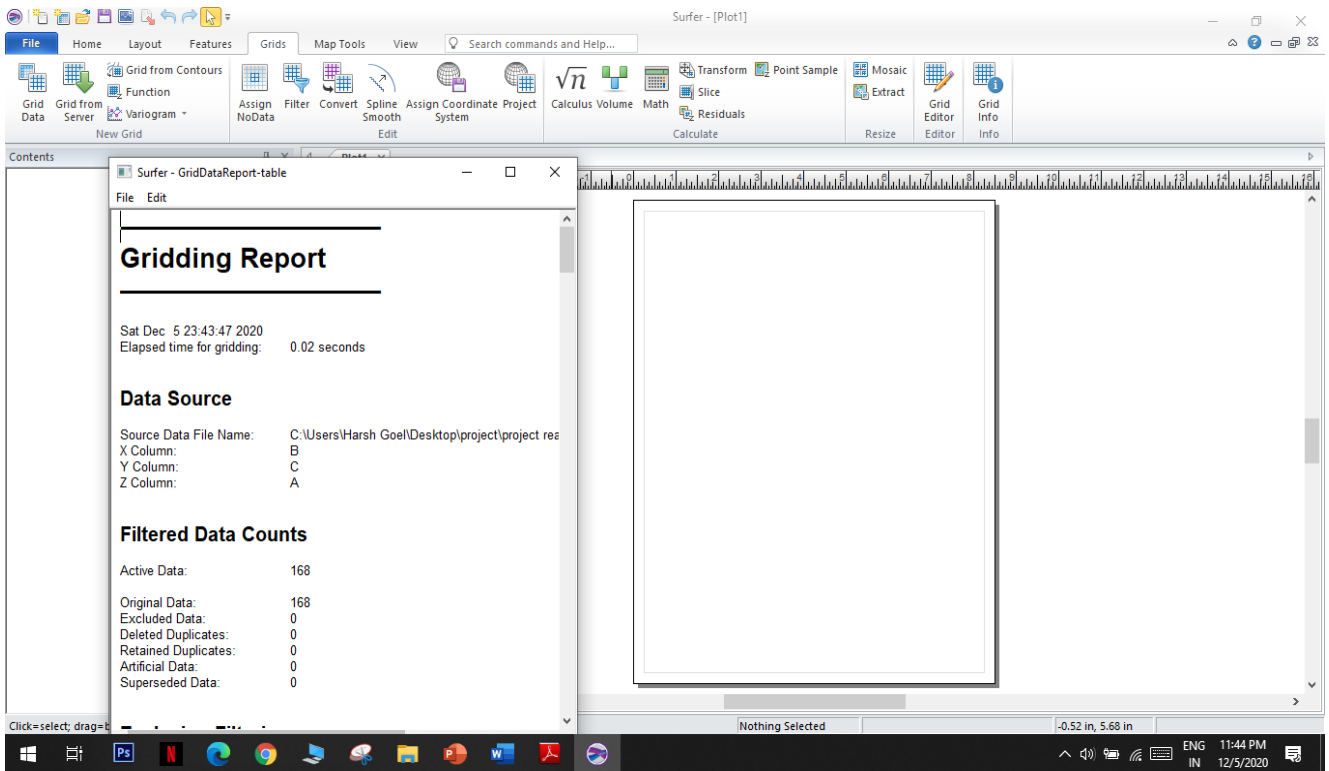
STEP 2: Save the grid data file to your desired location.



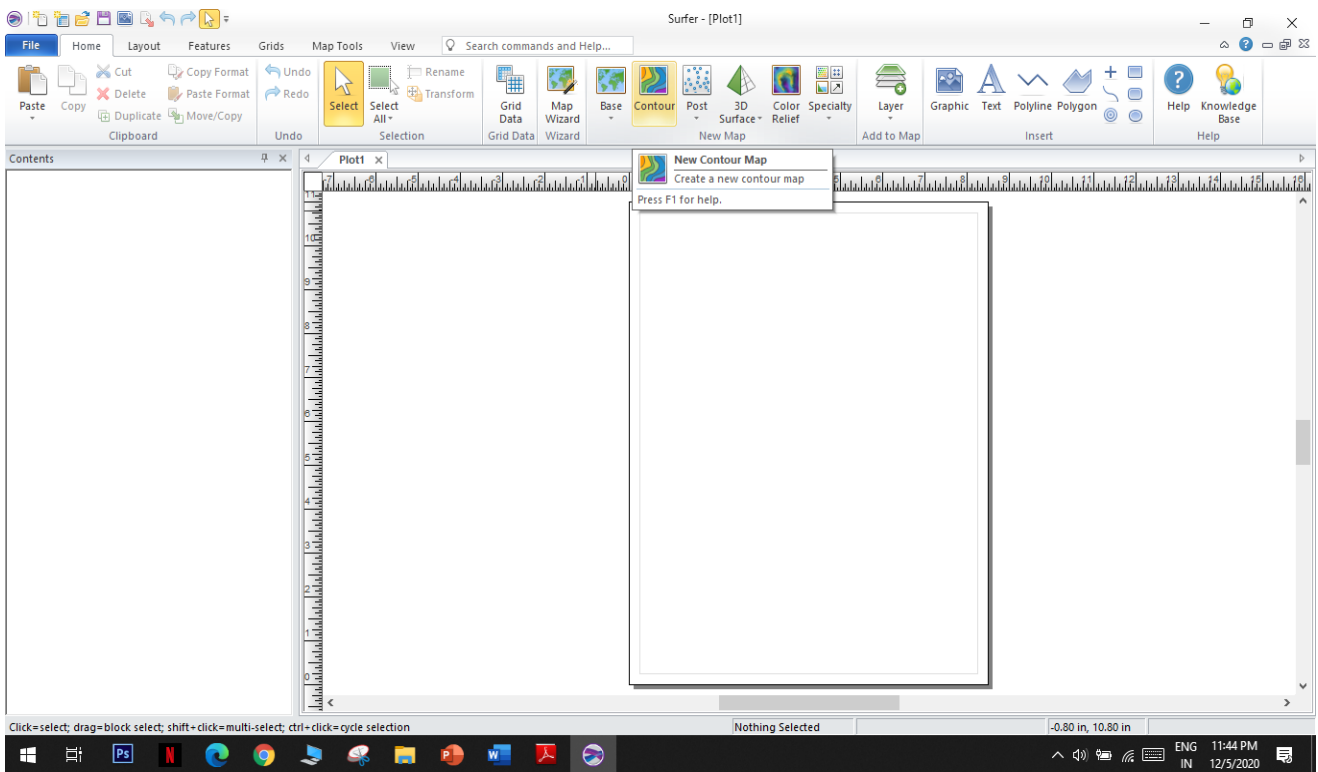
STEP 3: Assign the data columns for grid data file



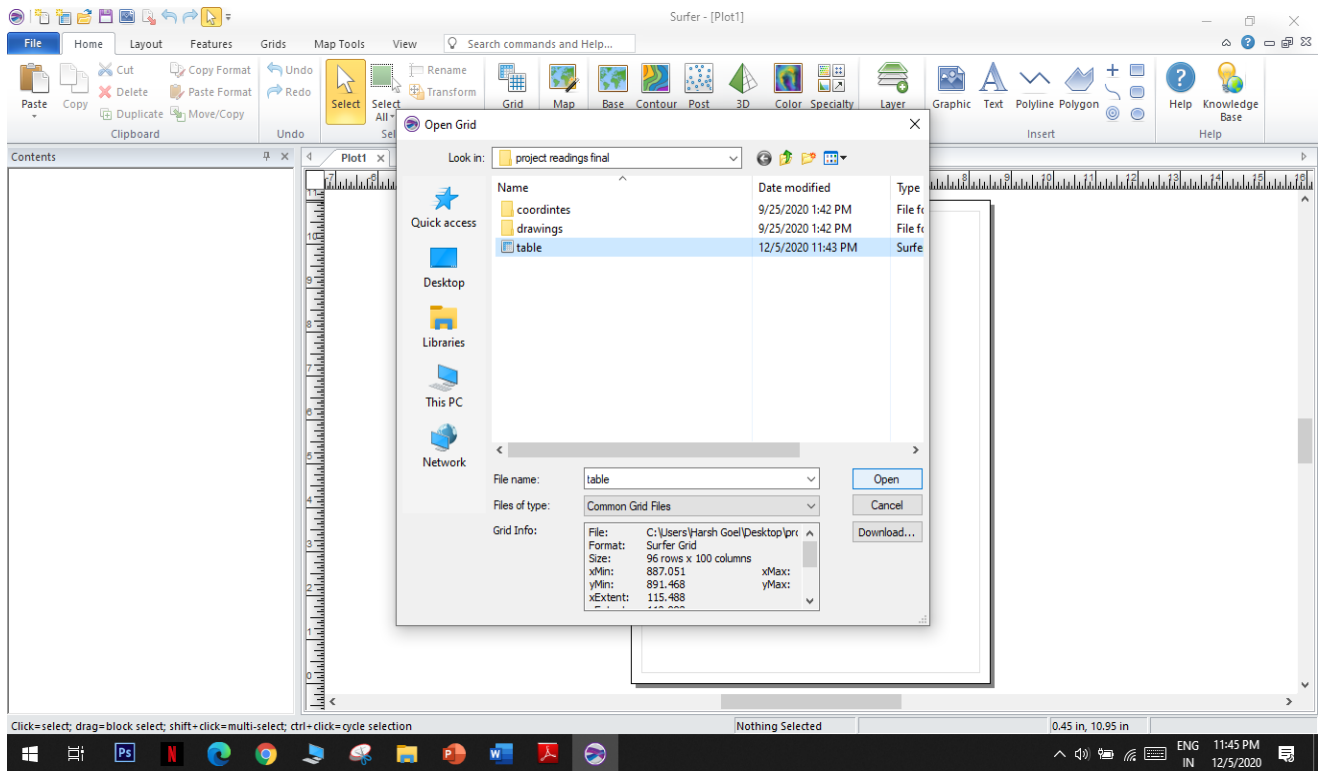
STEP 4: Grid file have been created



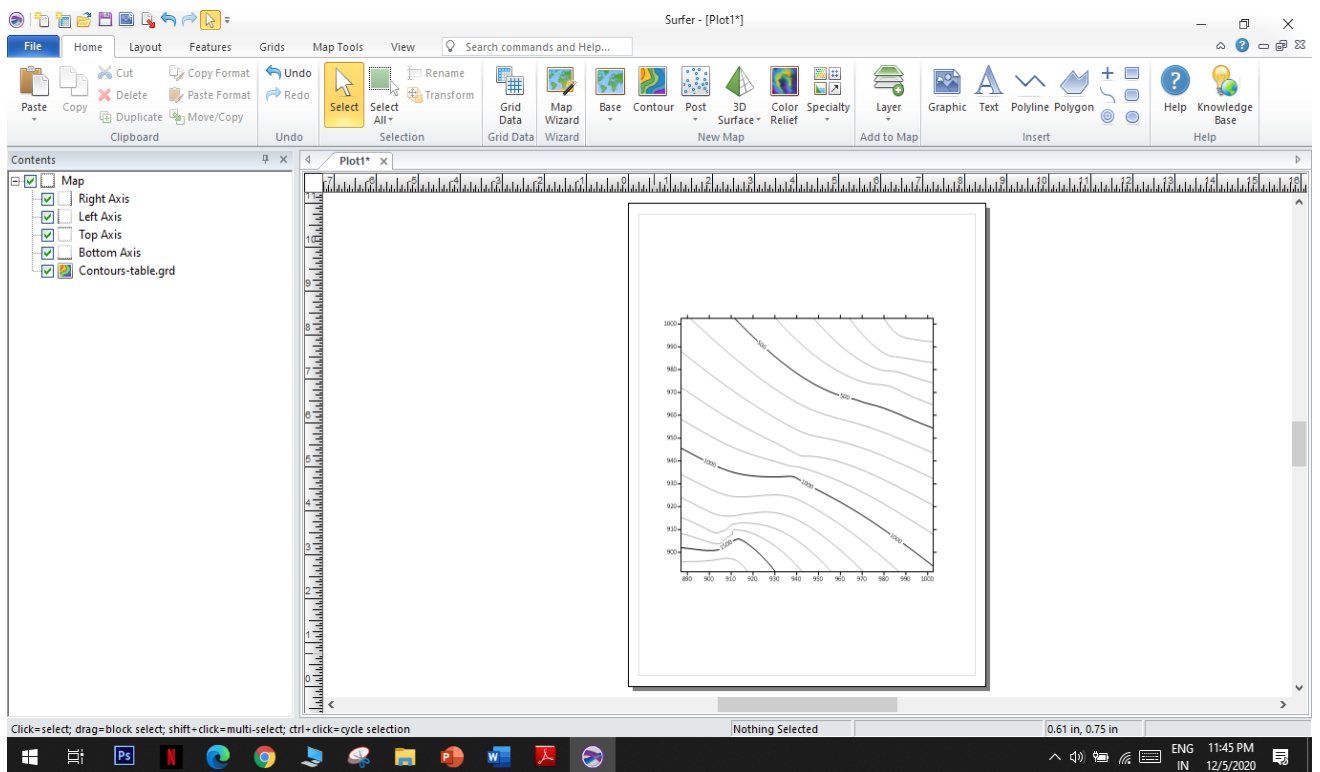
STEP 5: Create a contour map



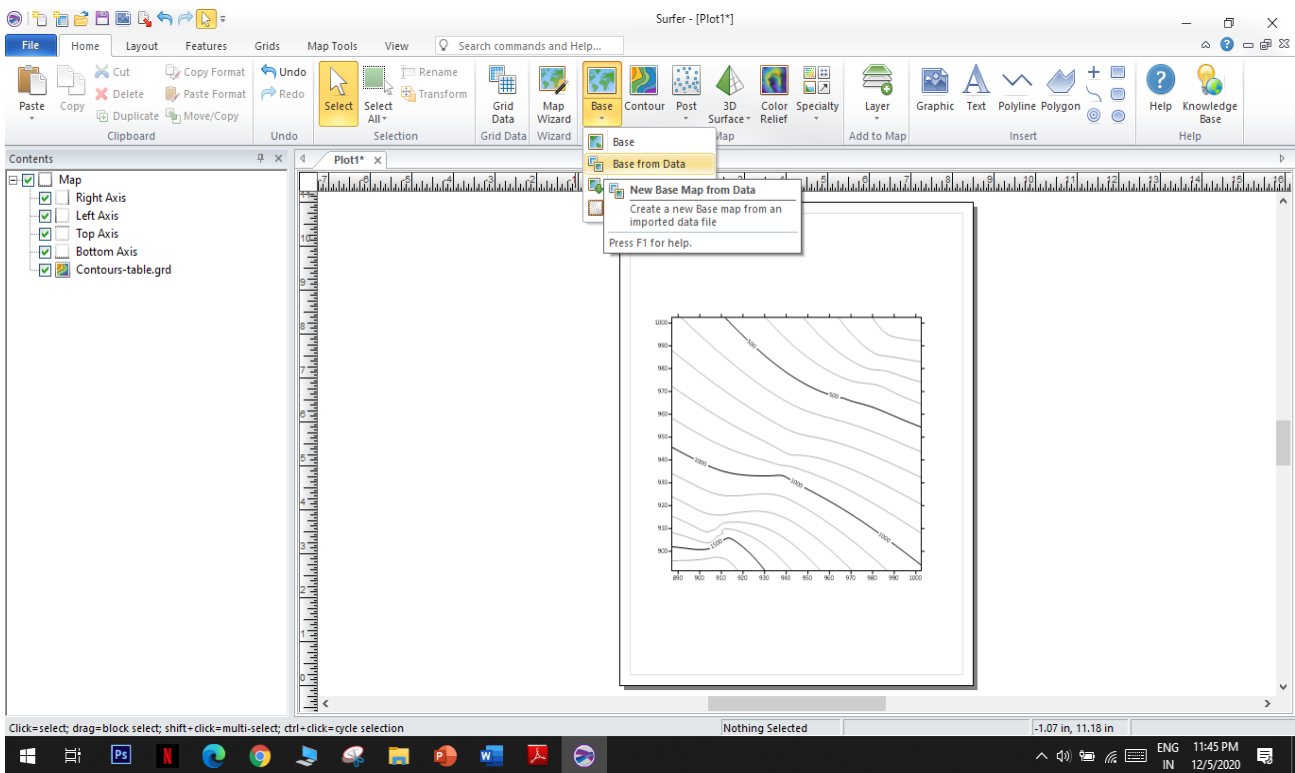
STEP 6: Select the grid data to create the contour map



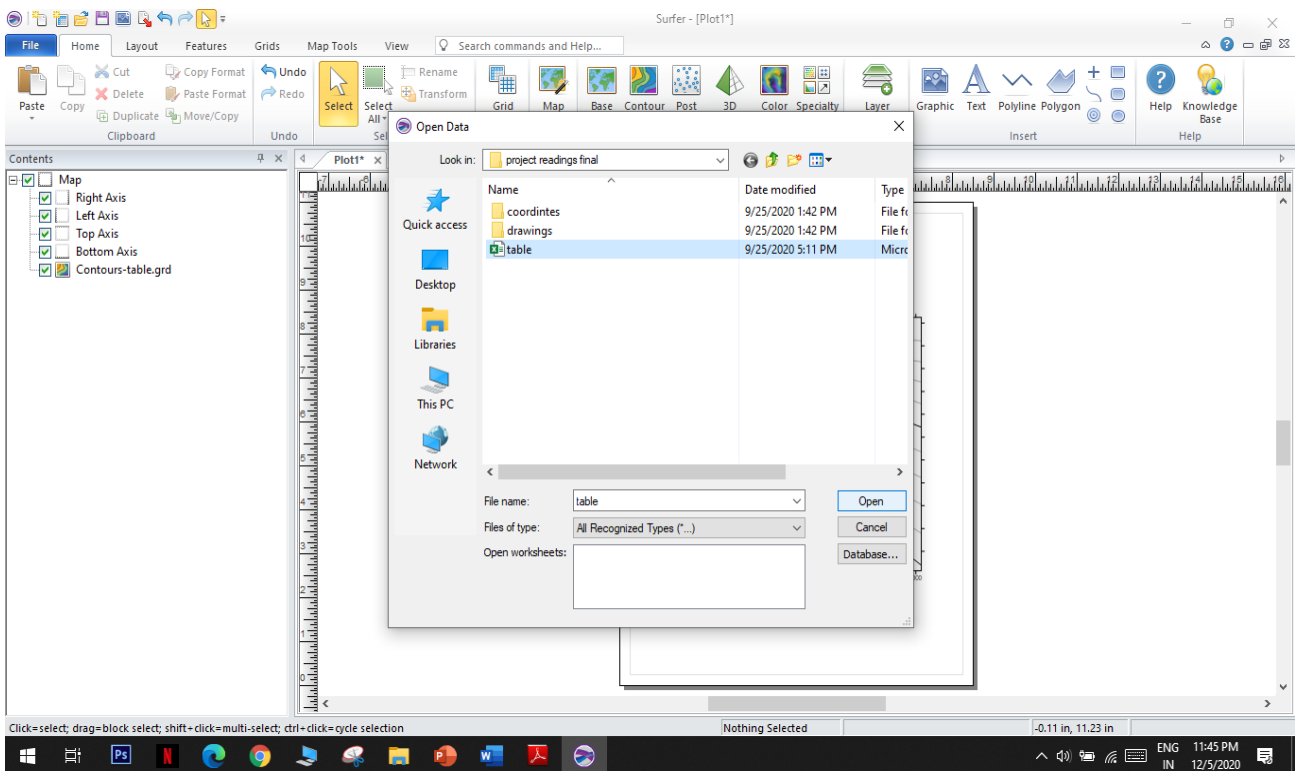
STEP 7: CONTOUR MAP IS CREATED



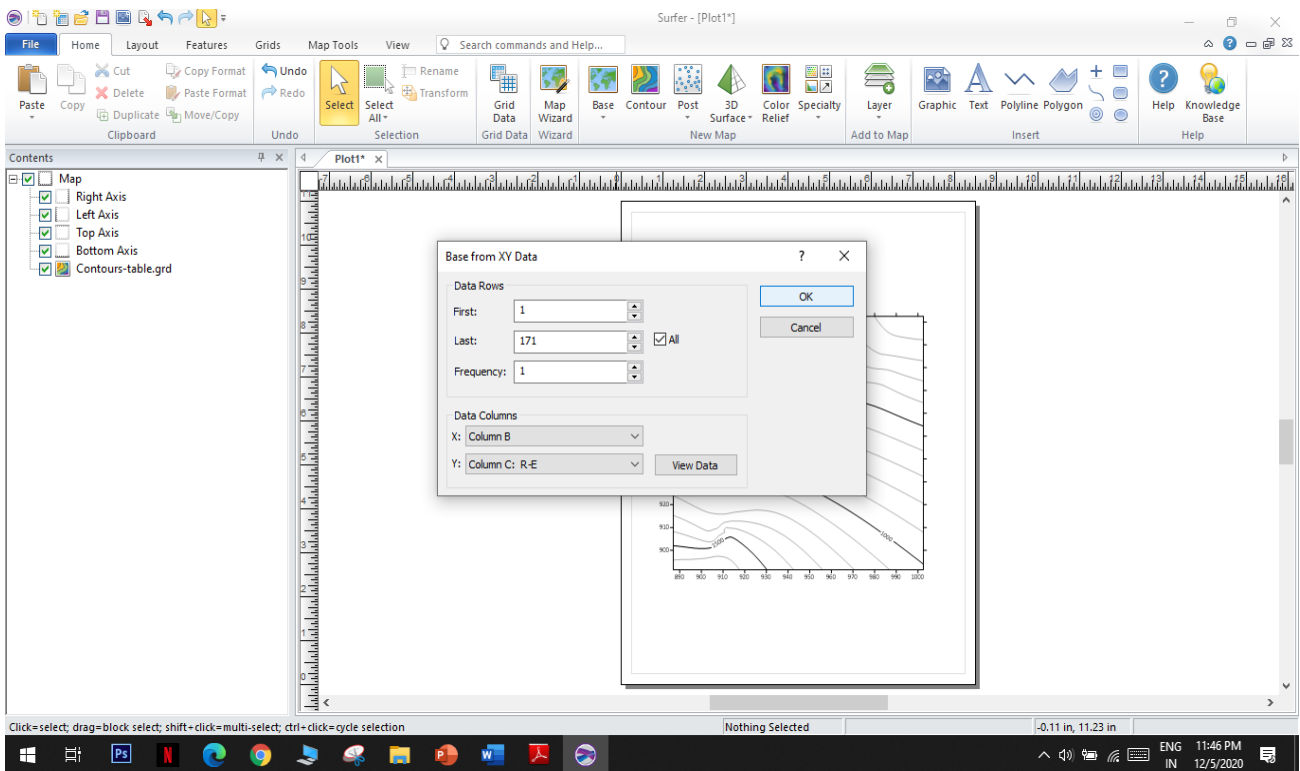
STEP 8: SELECT BASE MAP OPTION



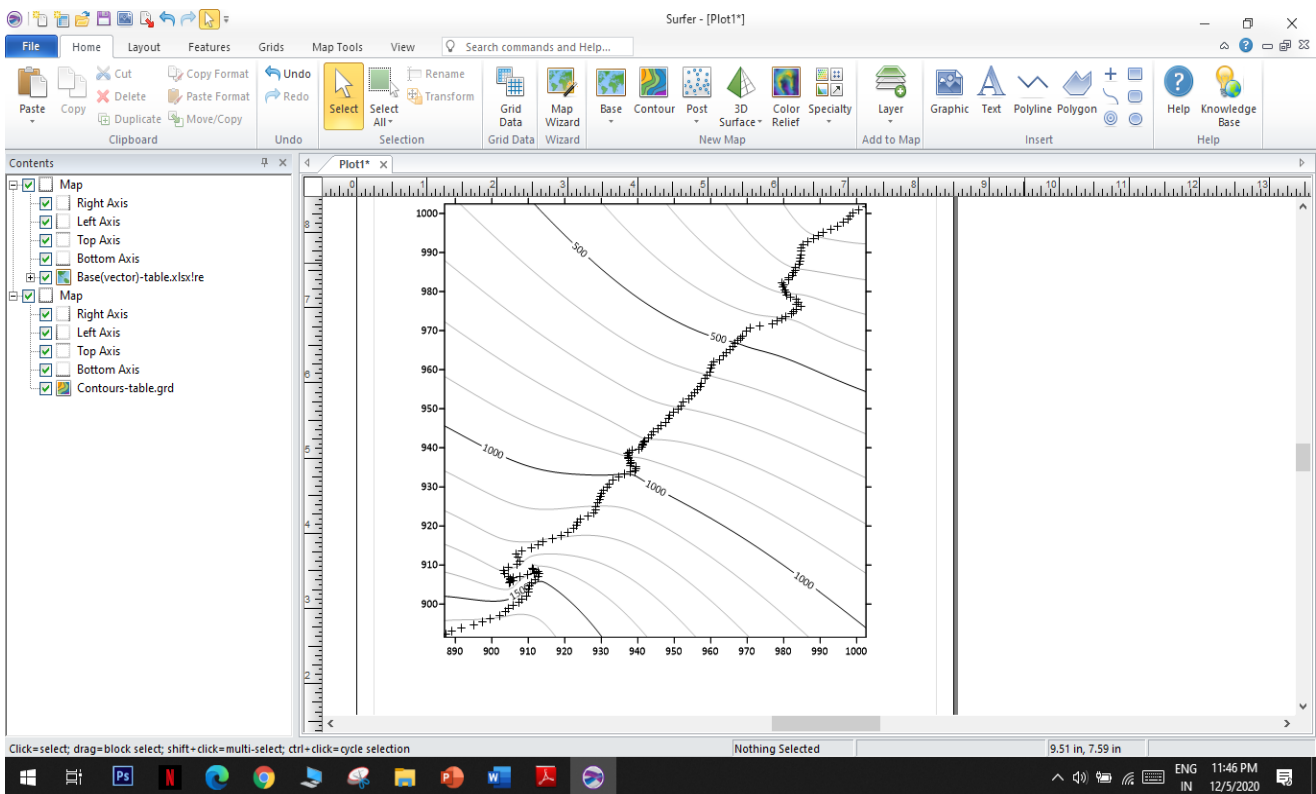
STEP 9 : Select the same data from which grid file is created



STEP 10: Assign the data columns from data



STEP 11: Map is created



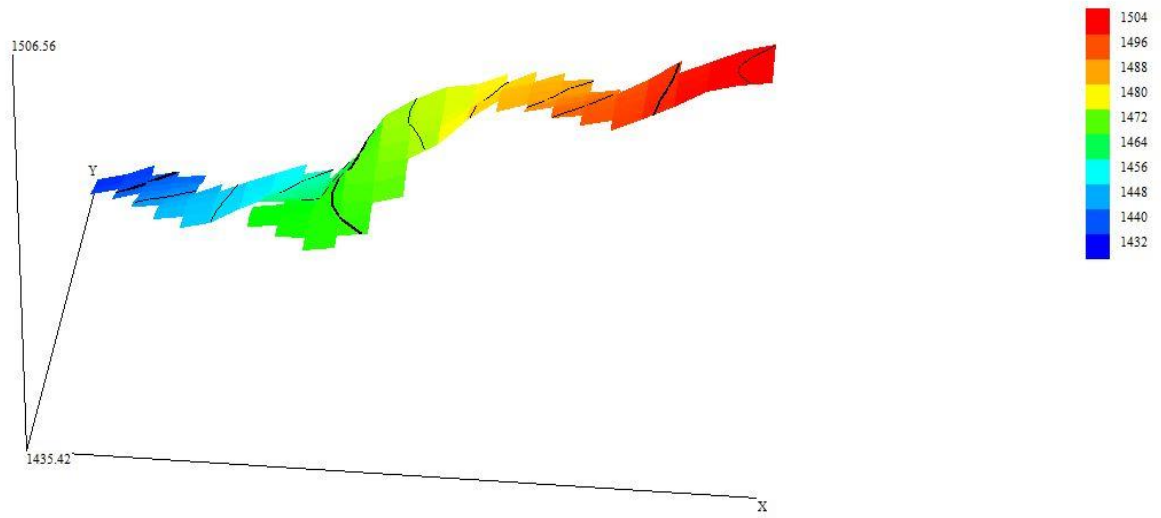


Fig (14) - 3D structure of road

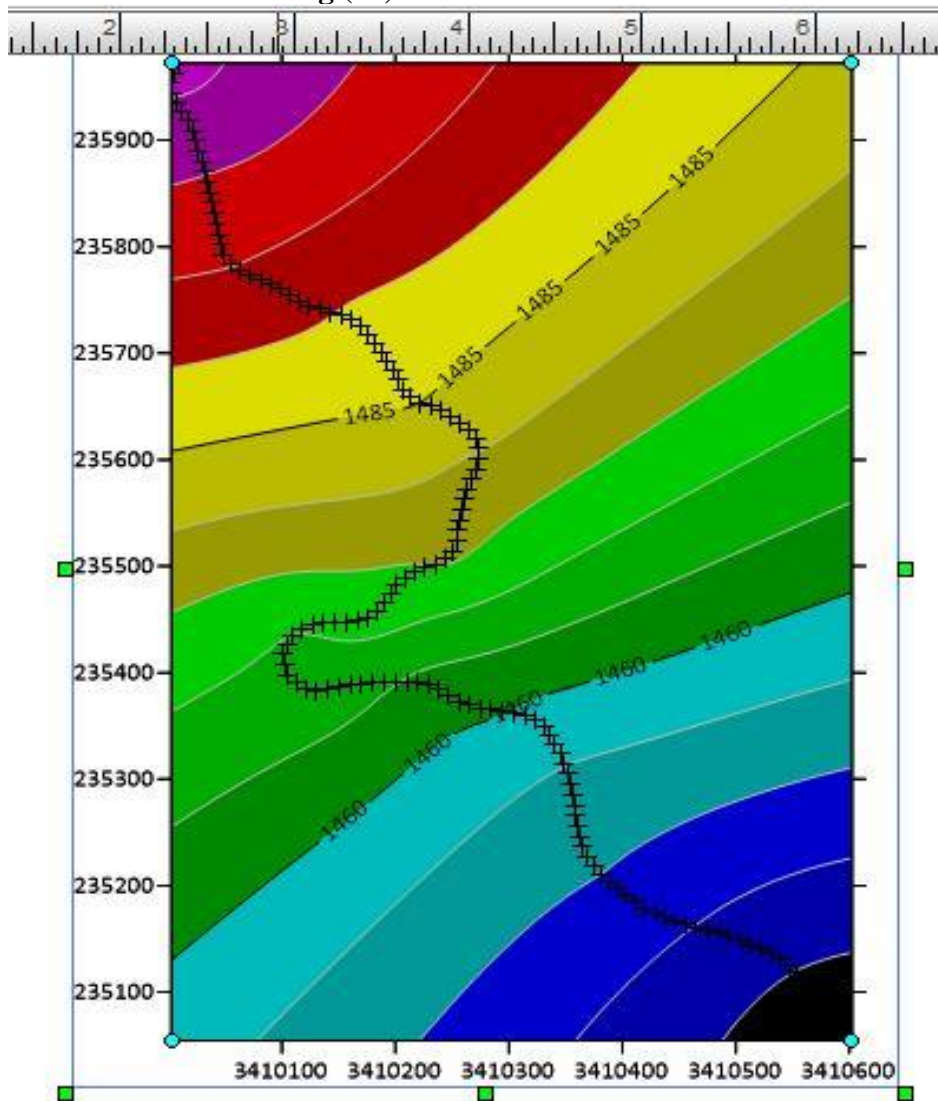


Fig (15) - 2D contour and design of road

CHAPTER V
PRIMAVERA

5.1 Introduction:

What is Primavera?

Dispatched in 1983 Primavera is an expert and astonishing undertaking portfolio programming program, which is utilized by project experts, schedulers, architects, organizers, and others engaged with arranging, the executives, project detailing and coordinates with other endeavour programming. It incorporates project the board, planning, hazard examination, opportunity the executives, asset the board, and cooperation and control capacities.

Primavera Contractor helps you plan and control your project schedule in a different way from cost to time, it displays everything, i.e., it helps you find out what will be the total cost of your project and also estimates how much time it will take to perform the whole project.

5.2 Significance of Primavera:

- In the present very aggressive and unstable business climate, huge and complex undertakings are on rising. Tragically, project chiefs are not left with any successful venture the executive's instruments that can oversee and track such immense scope complex activities.
- Here, 'Prophet Primavera' acts the hero! "Prophet Primavera' is a norm and extensive task the board instrument intended to screen and oversee complex undertakings.
- It is one of the broadly perceived undertaking the board apparatuses, which offers unrivalled checking and the executives of activities to the venture partners.
- The product apparatus is utilized across the globe in different mechanical areas

5.3 Uses and benefits of Primavera:

- Helps in Minimizing Risks.
- User-Friendly.
- Expanded Resources.
- Improved Visibility.

- Predicting of Project Activities.
- Tracking Features.
- Improved Communication.
- Enhanced Collaboration.
- The Responsibility is given to Employees in Schedule Creation.
- Disintegrate Complex Projects.

5.4 ESTIMATION OF CONSTRUCTION (Table-2)

S.no	Description	Labour Unit	Labour type	Per Quantity	units	Area to cover	Available labour	days to complete	cost of 1labour per day INR	Total cost in INR
1.01	Jungle clearance including cutting down trees	30	labour man	2000	sqm	27161.93	28	14.55103393	750	305571.7125
1.02	Rough excavation in soil/soil mixed with small boulders using mechanical means	1	excavator	1000	cu m	23328.77	1	23.32877	5000	116643.85
1.03	Rough excavation in soft rock requiring blastic disposal of excavated material by any means to dumping location	15	labour man including supervisor	1000	cu m	61881.87	35	26.52080143	900	835405.245
		1	Truck	2000	cu m	61881.87	2	15.4704675	2000	61881.87
1.04	Rough Excavation in hard rock by drilling with compressor	2	Compressor	800	cu m	4372.56	1	10.9314	4000	43725.6
		15	labour man including supervisor	1000	cu m	4372.56	30	2.18628	900	53029.56
		1	Truck	2000	cu m	4372.56	3	0.72876	2000	4372.56
1.05	compaction by mechanical means	1	compactor	2000	cu m	49817.98	1	24.90899	4500	112090.455
	Earthwork in embankment by filling with earth	30	labour man	1000	cu m	49817.98	30	49.81798	750	1120904.55
										2659625.403
	Construction of Kerb and Channel type road									
2.01	side Drain	30	labour man	1000	r/mtr	4494.03	45	2.99602	1000	134820.9
2.02	Construction of Culvert 2 Mtr Span	30	labour man	3	nos.	17	39	4.358974359	1000	170000
2.03	Construction of Culvert 3 Mtr Span	30	labour man	2.5	nos.	8	30	3.2	1000	96000
2.04	Construction of Culvert 6 Mtr span	30	labour man	1	nos.	4	40	3	1000	120000
2.05	Construction of RRM Breast Wall 2.00 Mtr height	30	labour man	100	R/Mtr	680	50	4.08	1000	204000
2.06	Construction of RRM Breast Wall 3.00 Mtr height	30	labour man	75	R/Mtr	280	35	3.2	1000	112000
2.07	Construction of RRM Retaining Wall 2.00 Mtr height	30	labour man	100	R/Mtr	440	40	3.3	1000	132000
2.08	Construction of RRM Retaining Wall 4.00 Mtr height	30	labour man	60	R/Mtr	1200	45	13.33333333	1000	600000
2.09	Construction of RRM Toe Wall 1.00 Mtr Height	30	labour man	100	R/Mtr	800	43	5.581395349	1000	240000
2.1	Construction of RRM Toe Wall 2.00 Mtr Height	30	labour man	50	R/Mtr	700	40	10.5	1000	420000
2.11	Construction of RRM Parapet Wall	30	labour man	500	R/Mtr	1372	44	1.870909091	1000	82320
	Plastering	30	labour man	400	R/Mtr	1372	45	2.286666667	1000	102900
2.12	Providing & Fixing ordinary KM stone	30	labour man	2	nos.	5	45	1.666666667	1000	75000
2.13	Providing & Fixing sub KM stone	30	labour man	10	nos.	18	45	1.2	1000	54000
2.14	Providing/Fixing of Delinator.(300 mm)	30	labour man	50	nos.	144	46	1.87826087	1000	86400
										2629440.9
	Preparation of sub-grade in SMB by									
3.01	excavating upto 20 cm avg depth	30	labour man	1000	Sqm	5278.32	50	3.166992	900	142514.64
	consolidating with power roller	1	power roller	1000	Sqm	5278.32	2	2.63916	12000	63339.84
	Watering	30	labour man	1000	Sqm	5278.32	45	3.51888	900	142514.64
	Preparation of sub-grade in SR by									
3.02	excavating upto 20 cm avg depth	30	labour man	500	Sqm	13150	45	17.53333333	900	710100
	consolidating with power roller	1	power roller	1000	Sqm	13150	2	6.575	12000	157800
	disposal of surplus material by any mean to dumping location	1	Truck	2000	cu m	13150	4	1.64375	2000	13150
	Preparation of sub-grade in HR by									
3.03	excavating upto 20 cm avg depth	30	labour man	500	Sqm	1962.84	44	2.6766	900	105993.36
	consolidating with power roller	1	power roller	1000	Sqm	1962.84	2	0.98142	12000	23554.08
	disposal of surplus material by any mean to dumping location	1	Truck	2000	cu m	1962.84	4	0.245355	2000	1962.84
3.04	GSB 15 cm thick (compacted) with stone aggregate including									

	disposal of surplus material by any mean to dumping location	1	Truck	2000	cu m	19978.34	4	2.4972925	2000	19978.34
	Watering	30	labour man	1000	Sqm	19978.34	44	13.62153545	900	539415.18
	Compaction with power vibratory roller	1	power roller	1000	Sqm	19978.34	2	9.98917	12000	239740.08
3.05	Providing, laying, spreading stone aggregate grading as per Table-400-13	30	labour man	600	Sqm	18635.35	45	20.70594444	900	838590.75
	compacting graded stone aggregate with power vibratory roller	1	power roller	1000	Sqm	18635.35	2	9.317675	12000	149082.8
	premixing the material with water to OMC in mechanical mix (Pug Mill)	1	pug mill	1500	Sqm	18635.35	2	6.211783333	10000	124235.6667
	laying in uniform layers in sub base/base course on a well prepared base	30	labour man	600	Sqm	18635.35	45	20.70594444	900	838590.75
3.06	premixing the material with water to OMC in mechanical mix (Pug Mill)	1	pug mill	1500	Sqm	37270.71	2	12.42357	10000	248471.4
	laying in uniform layers in sub base/base course on a well prepared base	30	labour man	600	Sqm	37270.71	44	42.35307955	900	1677181.95
	compacting graded stone aggregate with power vibratory roller	1	power roller	1000	Sqm	37270.71	2	18.635355	12000	447248.52
3.07	Providing and laying 50 mm thick DBM layer	30	labour man	500	Sqm	17623.86	45	23.49848	800	845345.28
	Rolled to the required specification	1	power roller	1000	Sqm	17623.86	2	8.81193	12000	21486.32
3.08	Providing and laying 30 mm thick BC on bituminous concrete layer	30	labour man	500	Sqm	17623.86	45	23.49848	900	951688.44
	mix composition requirement as per Table - 500-8/9/10	1	pug mill	700	Sqm	17623.86	2	12.58847143	10000	251769.4286
3.09	Providing and applying Prime Coat with bitumen emulsion	30	labour man	500	Sqm	17232.36	45	23.05648	900	933787.44
	g clearing of road surface & spraying primer using mechanical means	1	sprayer	2000	Sqm	17232.36	2	4.32309	7000	60523.26
3.1	Providing and applying tack coat with bitumen emulsion using emulsion pressure	1	emulsion pressure distributor	5000	Sqm	35247.73	2	3.524773	8000	56396.368
	surface cleaning	1	mechanical broom	5000	Sqm	35247.73	2	3.524773	5000	35247.73
3.12	Providing and Providing road marking with thermoplastic paint	30	labour man	1000	Sqm	1643.41	45	1.095806667	800	39441.84
										10121520.37

This estimation was done with the help of MS Excel software. Microsoft Excel is a powerful spreadsheet program used to record, manipulate, store numeric data and it can be customized to match your preferences.

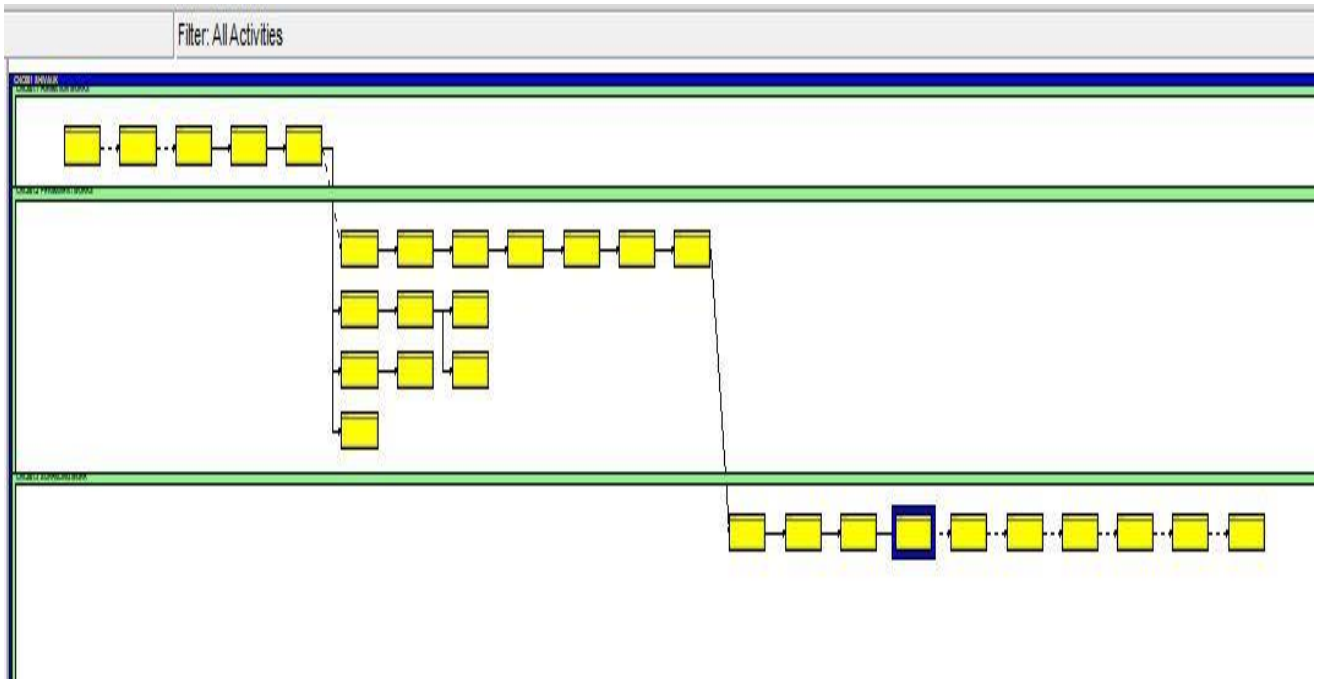


Fig (16) -Network diagram

Resources

Activities Resources Projects

Display: All Resources

Resource ID	Price / Unit	Resource Name	Resource Type	Unit of Measure	Primary Role	Default Units / Time
1	Rs500.00/d	unskilled labour	Labor			1/d
2	Rs800.00/d	skilled labour	Labor			1/d
3	Rs1,000.00/d	labour with supervisor	Labor			1/d
4	Rs5,000.00/d	excavator	Nonlabor			1/d
5	Rs2,000.00/d	truck	Nonlabor			1/d
6	Rs4,000.00/d	compressor	Nonlabor			1/d
7	Rs8,000.00/d	power roller	Nonlabor			1/d
8	Rs6,000.00/d	pug mill	Nonlabor			1/d
9	Rs5,000.00/d	emulsion pressure distributor	Nonlabor			1/d
10	Rs3,000.00/d	mechanical broom	Nonlabor			1/d
11	Rs4,500.00/d	compactor	Nonlabor			1/d
12	Rs5,000.00/d	sprayer	Nonlabor			1/d
13	Rs70.00/unit	diesel	Material			8/d

General Codes Details Units & Prices Roles Notes

Fig (17) - Resources

Activities						
Activities	Resources	Projects				
Layout: Classic Schedule Layout			Filter: All Activities			
Activity ID	Activity Name	Original Duration	Remaining Duration	Schedule % Complete	Start	Finish
SHIVALIK		469	469	41.94%	03-Aug-20	14-Oct-21
FORMATION WORKS		140	140	100%	03-Aug-20	11-Dec-20
A1000	JUNGLE CREARANCE	21	21	100%	03-Aug-20	21-Aug-20
A1020	ROUGH EXCAVATION OF SOFT SOIL	27	27	100%	25-Sep-20*	20-Oct-20
A1030	ROUGH EXCAVATION OF HARD ROCKS BY DRILLING	11	11	100%	03-Nov-20*	12-Nov-20
A1010	ROUGH EXCAVATION OF SOIL/BOULDERS	24	24	100%	24-Aug-20*	15-Sep-20
A1040	COMPACTION AND EARTHWORK	25	25	100%	18-Nov-20	11-Dec-20
PERMANENT WORKS		53	53	100%	23-Dec-20	10-Feb-21
A1170	PROVIDING AND FIXING SUB KM STONE	2	2	100%	05-Feb-21	06-Feb-21
A1180	PROVIDING AND FIXING DELINATOR .900MM	2	2	100%	09-Feb-21	10-Feb-21
A1070	CONSTRUCTION OF CULVERT 3M SPAN	4	4	100%	23-Dec-20	26-Dec-20
A1080	CONSTRUCTION OF CULVERT 6M SPAN	3	3	100%	23-Dec-20	25-Dec-20
A1050	CONSTRUCTION OF KERB AND CHANNEL TYPE ROAD SIDE DRAIN	3	3	100%	23-Dec-20*	25-Dec-20
A1160	PROVIDING AND FIXING ORDINARY KM STONE	3	3	100%	02-Feb-21	04-Feb-21
A1100	CONSTRUCTION OF RRM BREAST WALL 3M HEIGHT	4	4	100%	29-Dec-20	01-Jan-21
A1110	CONSTRUCTION OF RRM RETAINING WALL 2M HEIGHT	4	4	100%	28-Dec-20	31-Dec-20
A1060	CONSTRUCTION OF CULVERT 2M SPAN	5	5	100%	23-Dec-20	28-Dec-20
A1150	CONSTRUCTION OF RRM PARAPET WALL AND PLASTERING	5	5	100%	26-Jan-21	30-Jan-21
A1130	CONSTRUCTION OF RRM TOE WALL 1M HEIGHT	6	6	100%	01-Jan-21	06-Jan-21
A1090	CONSTRUCTION OF RRM BREAST WALL 2M HEIGHT	5	5	100%	30-Dec-20	04-Jan-21
A1140	CONSTRUCTION OF RRM TOE WALL 2M HEIGHT	11	11	100%	01-Jan-21	11-Jan-21
A1120	CONSTRUCTION OF RRM RETAINING WALL 4M HEIGHT	14	14	100%	06-Jan-21	19-Jan-21

Fig (18) –Project Layout-1

Filter: All Activities					
Resources	Budgeted Labor Cost	Budgeted Nonlabor Cost	Budgeted Total Cost	Calendar	Total Float
	Rs10,865,350.00	Rs4,649,500.00	Rs19,594,450.00	Standard 5 Day Workweek	0
	Rs2,215,750.00	Rs465,500.00	Rs3,277,650.00	Standard 5 Day Workweek	0
0 unskilled labour	Rs295,750.00	Rs0.00	Rs295,750.00	Standard 5 Day Workweek	
0 excavator, truck, diesel	Rs0.00	Rs243,000.00	Rs545,400.00	Standard 5 Day Workweek	
0 truck, compressor, labour with supervisor, d	Rs330,000.00	Rs110,000.00	Rs594,000.00	Standard 5 Day Workweek	
0 labour with supervisor	Rs840,000.00	Rs0.00	Rs840,000.00	Standard 5 Day Workweek	
0 compactor, labour with supervisor, diesel	Rs750,000.00	Rs112,500.00	Rs1,002,500.00	Standard 5 Day Workweek	
1	Rs2,321,600.00	Rs0.00	Rs2,321,600.00	Standard 5 Day Workweek	0
1 skilled labour	Rs72,000.00	Rs0.00	Rs72,000.00	Standard 5 Day Workweek	
1 skilled labour	Rs73,600.00	Rs0.00	Rs73,600.00	Standard 5 Day Workweek	
0 skilled labour	Rs96,000.00	Rs0.00	Rs96,000.00	Standard 5 Day Workweek	
0 skilled labour	Rs96,000.00	Rs0.00	Rs96,000.00	Standard 5 Day Workweek	
0 skilled labour	Rs108,000.00	Rs0.00	Rs108,000.00	Standard 5 Day Workweek	
1 skilled labour	Rs108,000.00	Rs0.00	Rs108,000.00	Standard 5 Day Workweek	
1 skilled labour	Rs112,000.00	Rs0.00	Rs112,000.00	Standard 5 Day Workweek	
0 skilled labour	Rs128,000.00	Rs0.00	Rs128,000.00	Standard 5 Day Workweek	
0 skilled labour	Rs156,000.00	Rs0.00	Rs156,000.00	Standard 5 Day Workweek	
1 skilled labour	Rs180,000.00	Rs0.00	Rs180,000.00	Standard 5 Day Workweek	
1 skilled labour	Rs192,000.00	Rs0.00	Rs192,000.00	Standard 5 Day Workweek	
1 skilled labour	Rs200,000.00	Rs0.00	Rs200,000.00	Standard 5 Day Workweek	
1 skilled labour	Rs352,000.00	Rs0.00	Rs352,000.00	Standard 5 Day Workweek	
1 skilled labour	Rs448,000.00	Rs0.00	Rs448,000.00	Standard 5 Day Workweek	

Fig (19) - Project cost-1

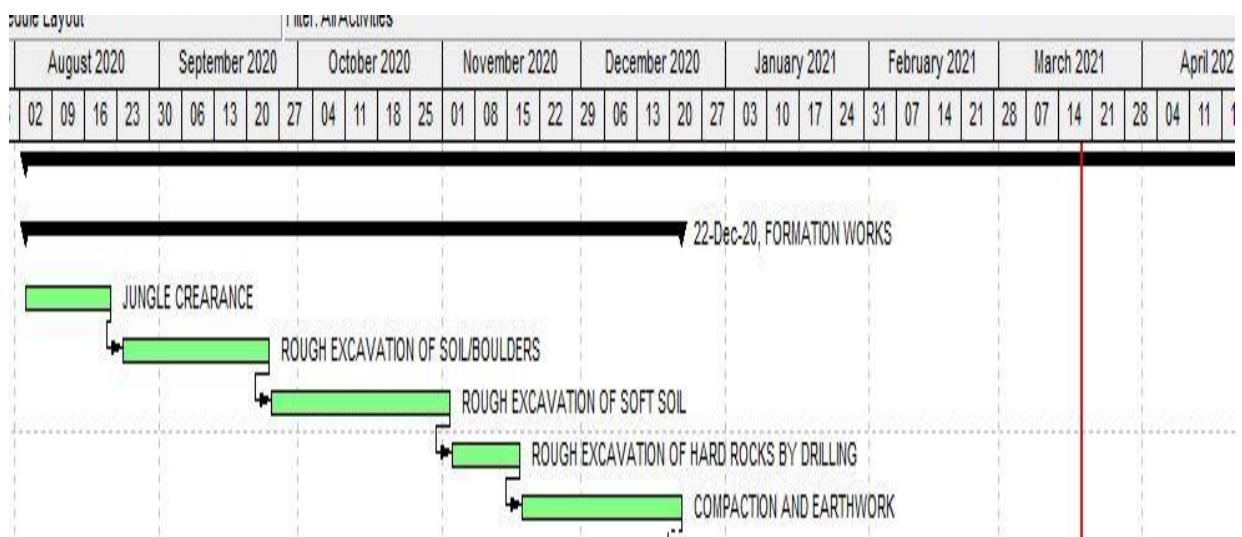
SURFACING WORK		263	263	18.71%	11-Feb-21	14-Oct-21
A1280	PROVISIONING AND PROVIDING ROAD MARKING WITH THERMOSTATIC PAINT	4	4	0%	11-Oct-21*	14-Oct-21
A1210	PREPARATION OF SUBGRADE IN HR	4	4	0%	02-Apr-21*	06-Apr-21
A1190	PREPARATION OF SUBGRADE IN SMB	10	10	100%	11-Feb-21*	20-Feb-21
A1260	PROVIDING AND LAYING 30MM THICK BC ON DBM LAYER	16	16	0%	30-Aug-21*	13-Sep-21
A1270	PROVIDING AND APPLYING PRIME COAT WITH BITUMEN EMULSION	14	14	0%	21-Sep-21*	04-Oct-21
A1250	PROVIDING AND LAYING 50MM THICK DBM LAYER	18	18	0%	04-Aug-21*	20-Aug-21
A1240	PREMIXING THE MATERIAL WITH WATER TO OMC IN MECHANICAL MIX	23	23	0%	02-Jul-21*	23-Jul-21
A1200	PREPARATION OF SUBGRADE IN SR	26	26	90.87%	25-Feb-21*	20-Mar-21
A1220	GSB COMPACTION INCLUDIND STONE AGGREGATE	27	27	0%	08-Apr-21*	03-May-21
A1230	Providing, laying, spreading and compacting graded stone aggregate	34	34	0%	17-May-21*	17-Jun-21

Fig (20) –Project Layout-2

	Rs6,328,000.00	Rs4,184,000.00	Rs13,995,200.00	Standard 5 Day Workweek	0
skilled labour	Rs96,000.00	Rs0.00	Rs96,000.00	Standard 5 Day Workweek	
1 power roller, skilled labour, truck, diesel	Rs144,000.00	Rs96,000.00	Rs329,600.00	Standard 5 Day Workweek	
1 power roller, skilled labour, diesel	Rs400,000.00	Rs160,000.00	Rs672,000.00	Standard 5 Day Workweek	
1 pug mill, skilled labour, diesel	Rs576,000.00	Rs192,000.00	Rs947,200.00	Standard 5 Day Workweek	
mechanical broom, sprayer, skilled labour, er	Rs504,000.00	Rs364,000.00	Rs1,103,200.00	Standard 5 Day Workweek	
1 power roller, skilled labour, pug mill, diesel	Rs648,000.00	Rs504,000.00	Rs1,555,200.00	Standard 5 Day Workweek	
power roller, pug mill, skilled labour, diesel	Rs828,000.00	Rs644,000.00	Rs1,987,200.00	Standard 5 Day Workweek	
1 skilled labour, truck, power roller, diesel	Rs936,000.00	Rs624,000.00	Rs2,142,400.00	Standard 5 Day Workweek	
1 truck, power roller, skilled labour, diesel	Rs972,000.00	Rs648,000.00	Rs2,224,800.00	Standard 5 Day Workweek	
skilled labour, pug mill, power roller, diesel	Rs1,224,000.00	Rs952,000.00	Rs2,937,600.00	Standard 5 Day Workweek	

Fig (21) - Project cost-2

BAR REPRESENTATION OF ACTIVITIES WITH RESPECT TO ITS COMPLETETION



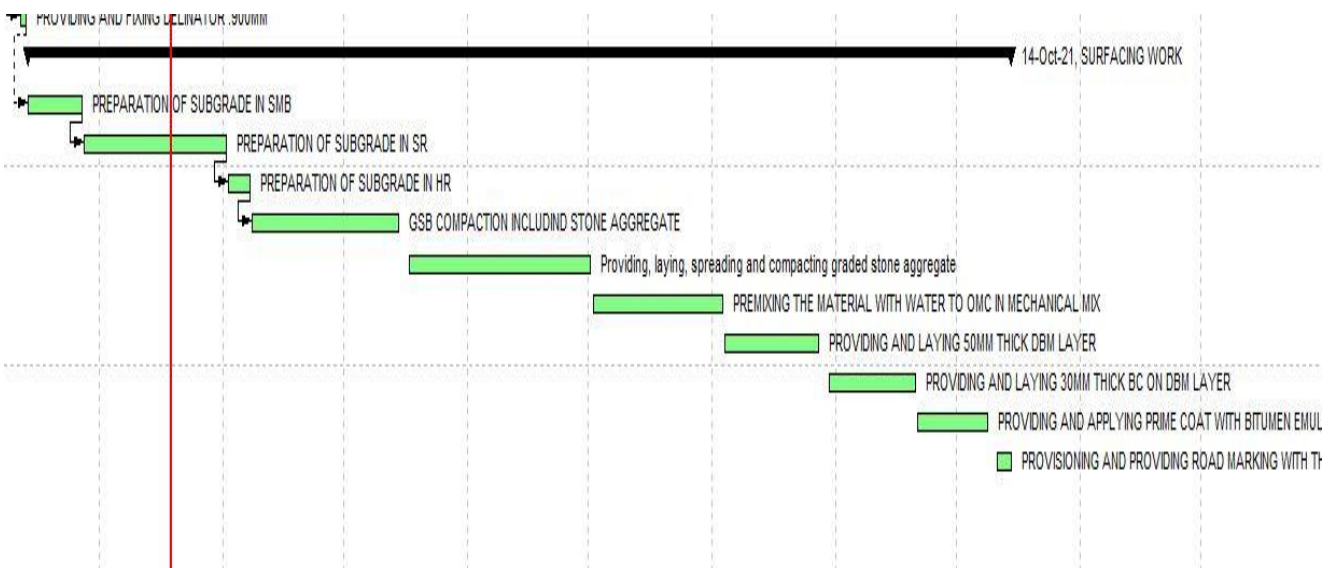
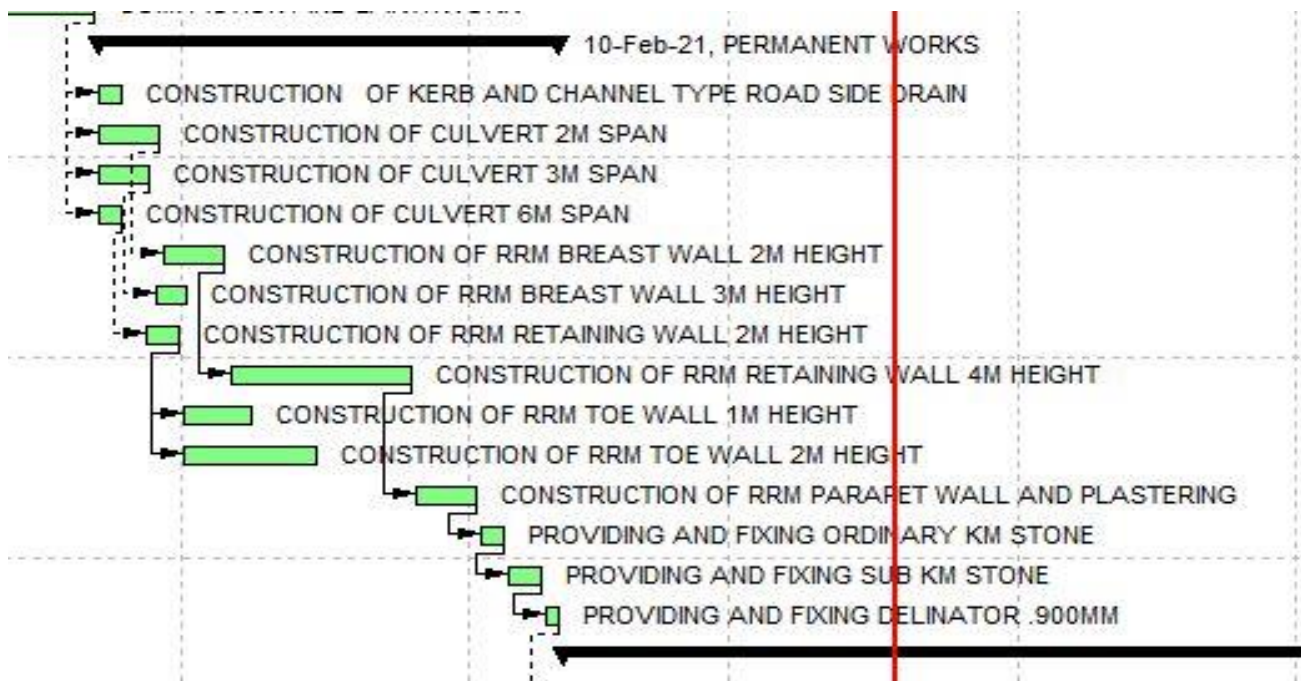


Fig (22) –Bar representation

CHAPTER VI
DESIGN AND THEORY

Breast wall

Breast wall is a freestanding wall that resists some weight on one side and prevents the erosion of an embankment.

There are 2 types of retaining walls:

1. Gravity wall: It is the most basic type of reinforced retaining wall is the, which is of massive concrete that is prevented from falling over by simple gravity.
2. Cantilever Retaining wall has cantilever footings, which have tie beams balancing the asymmetrical load.

Material used for making retaining wall:

- Some common materials used for retaining walls are treated lumber
- Concrete block systems
- Poured concrete
- Stone
- Brick.

Some important points:

- Breast wall and Retaining wall structure stand off to protect a freshly cut or old surface of a natural hill face.
- Breast wall and Retaining wall structure prevent of hill slides under the action of weather and rain water flowing over hills slope. Retaining wall is provided to the downside of the road while breast wall uphill side of the road in hilly area.
- Impact of snow, avalanches, landslides and surcharge are not considered in the design of Breast wall while in retaining wall all those factors are considered.
- Height of breast wall shall not exceed 3 meter and for retaining wall we did not have such type of criteria.
- Breast wall are not required to be constructed where back mass comprises of rocks or stable strata deposit of soil mass and for protecting the unstable soil mass we need retaining wall.



Fig (23) - Retaining Wall

Toe Wall



Fig (24) – Toe wall

It is generally a low retaining wall especially: an embankment wall in a railroad cut.

Or we can say that an embankment wall in a railroad cut.

Toe walls are structures designed to restrain soil to a slope that it would not naturally keep to (typically a steep, near-vertical or vertical slope). They are used to bound soils between two different elevations often in areas of terrain possessing undesirable slopes or in areas where the landscape needs to be shaped severely and engineered for more specific purposes like hillside farming or roadway overpasses.

Kerbs and channels

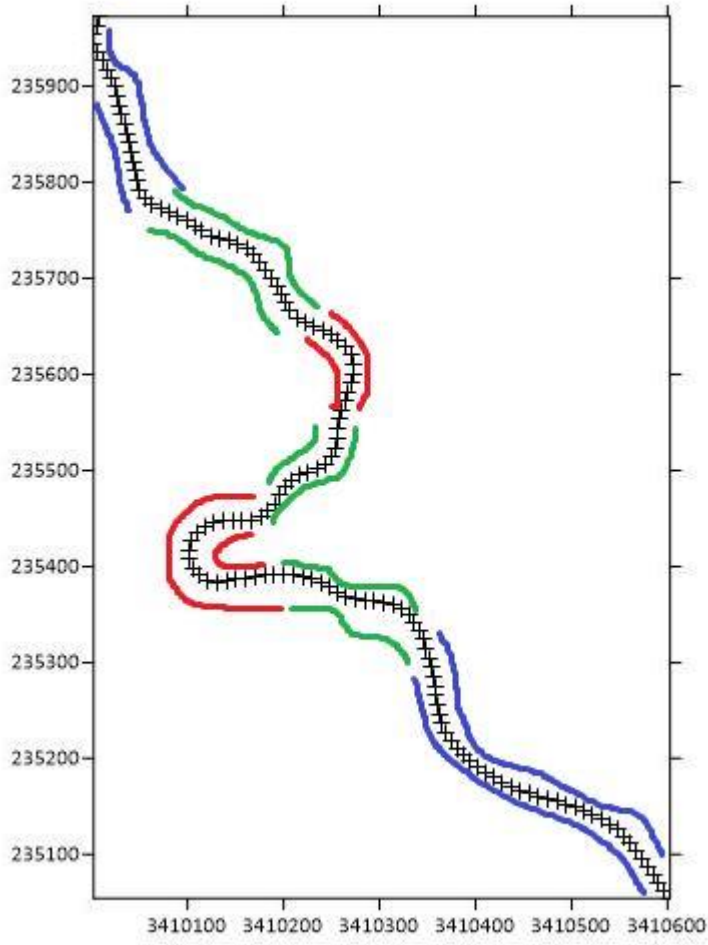
Kerbs and channels are designed to:

- help drainage
- improve delineation of traffic flows
- protect pedestrians
- reduce nature strip maintenance
- improve the aesthetics of road alignment
- The useful life of kerb & channel will vary considerably due to a range of environmental & other factors. A life of 50-80 years is typical for kerb & channel in some areas.
- Kerb and channels form a barrier between the road pavement and the nature's strip which aims to: direct storm water into storm water drains and protect the edge of the road from erosion.

Kerbs are generally constructed of cut stone or cement concrete slabs. The kerb and the road surface near the edge together form a side-channel which carries rainwater that comes from the road surface. 4 Types of Kerbs Kerb is the boundary between the pavement and shoulder or footpath.

Q. what is culvert?

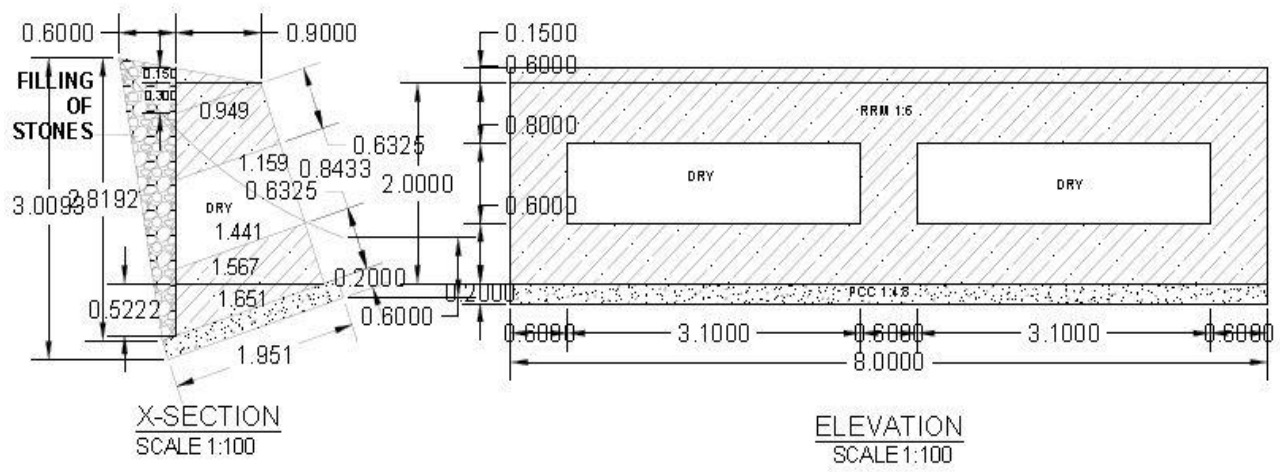
A culvert is a small channel that allows water to flow under a road, railroad, trail, or similar obstruction from one side to the other. Typically embedded so as to be surrounded by soil, a culvert may be made from a pipe, reinforced concrete or other material.



RED	RETAINING WALL
GREEN	BREAST WALL
BLUE	TOE WALL

Fig (25) -Different walls along Road.

BREAST WALL 2.0 m HT 20.0 m LONG (BM)



RETAINING WALL 2.0 m HT 8.0 m LONG (BM)

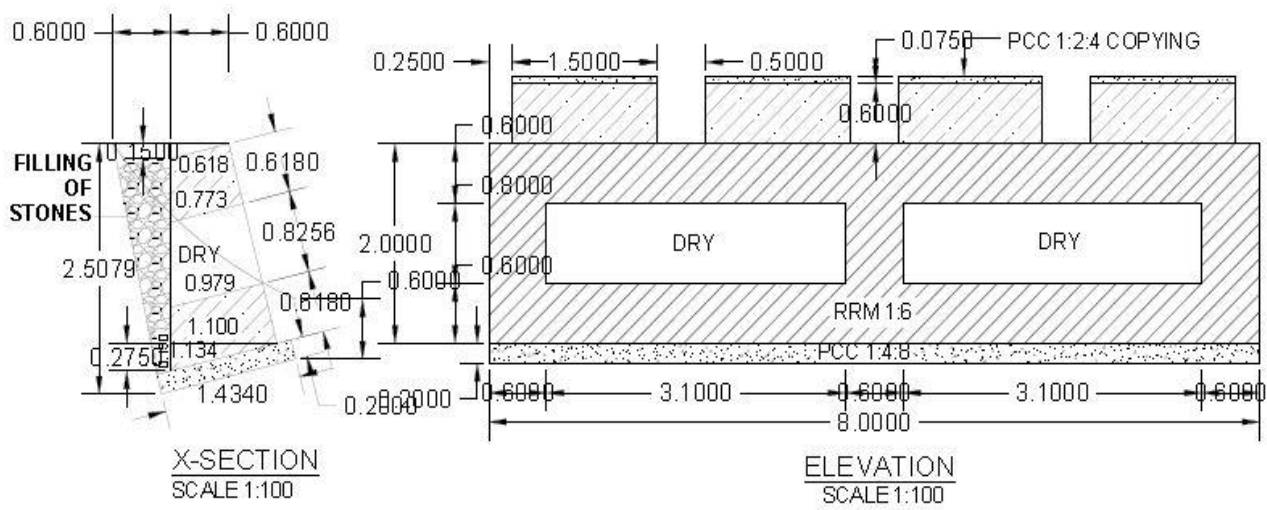


Fig (26) – Breast walls.

RETAINING WALL 4.0 m HT 8.0 m LONG (PCC 1:3:6)

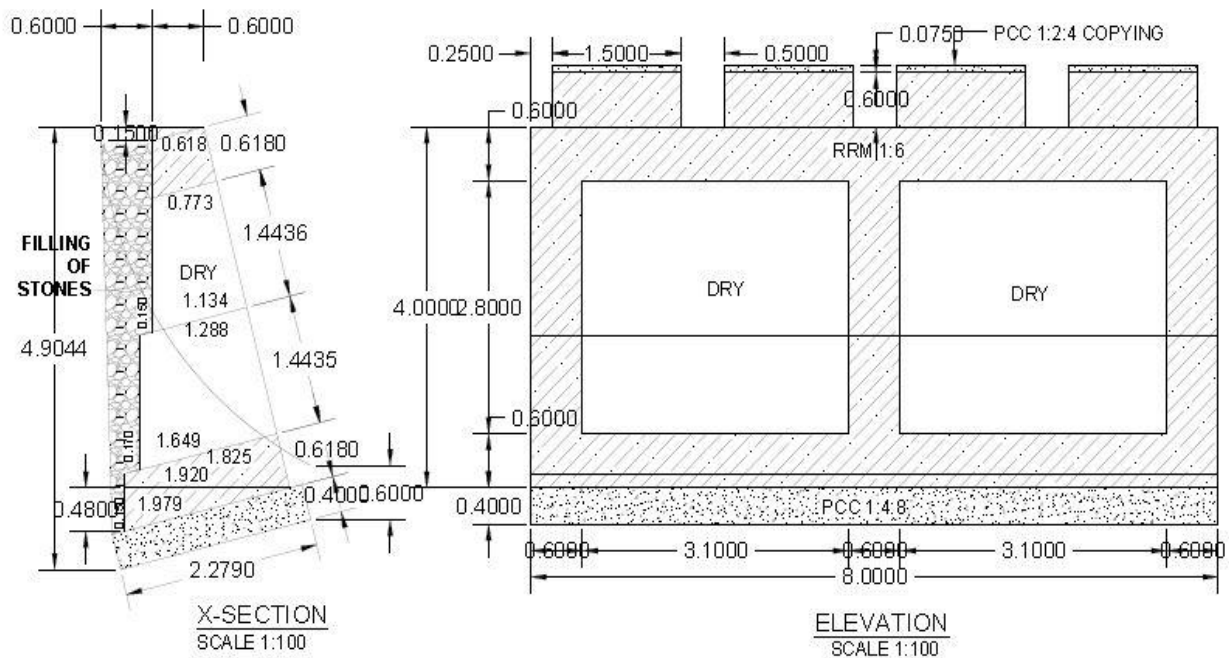


Fig (27) –Retaining wall

TOE WALL 1.0 m HT 8.0 m LONG (CM)

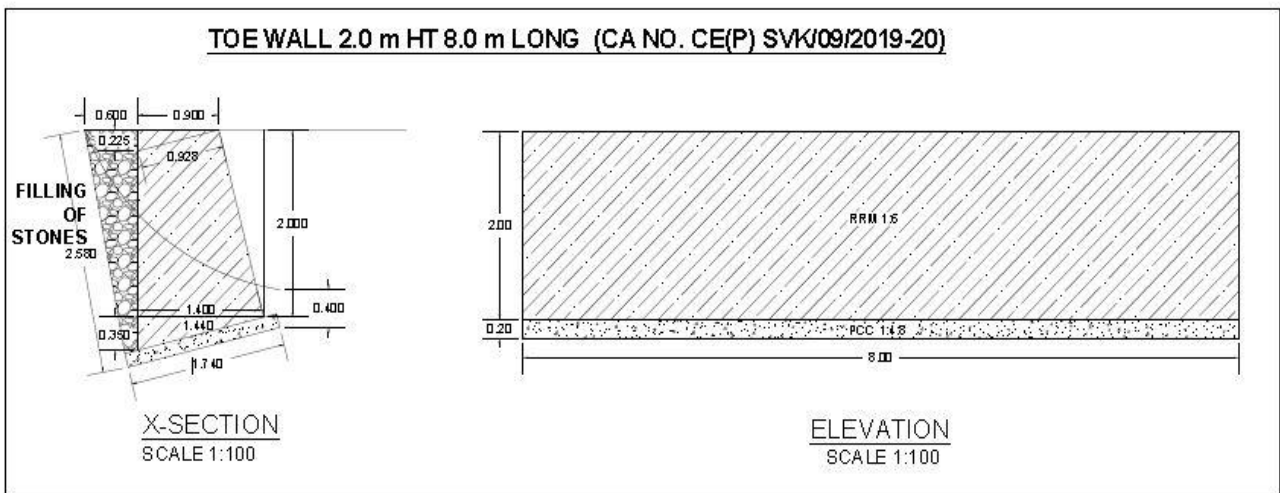
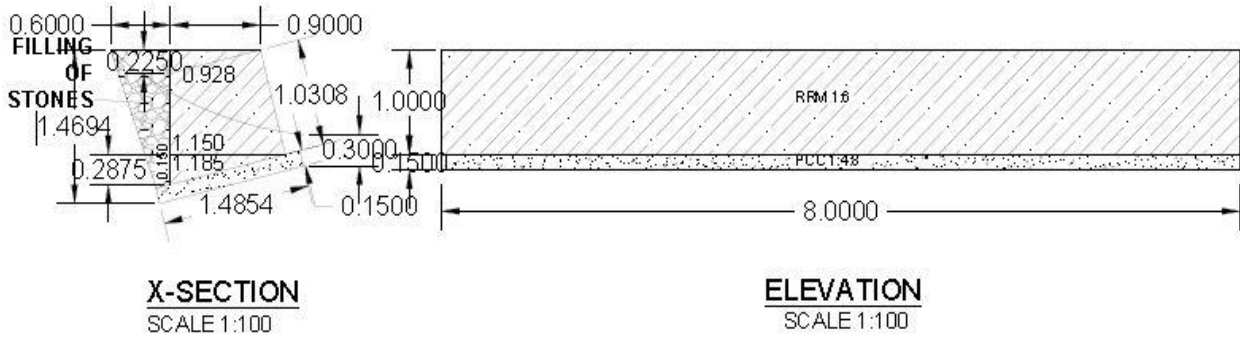


Fig (28) –Toe Wall

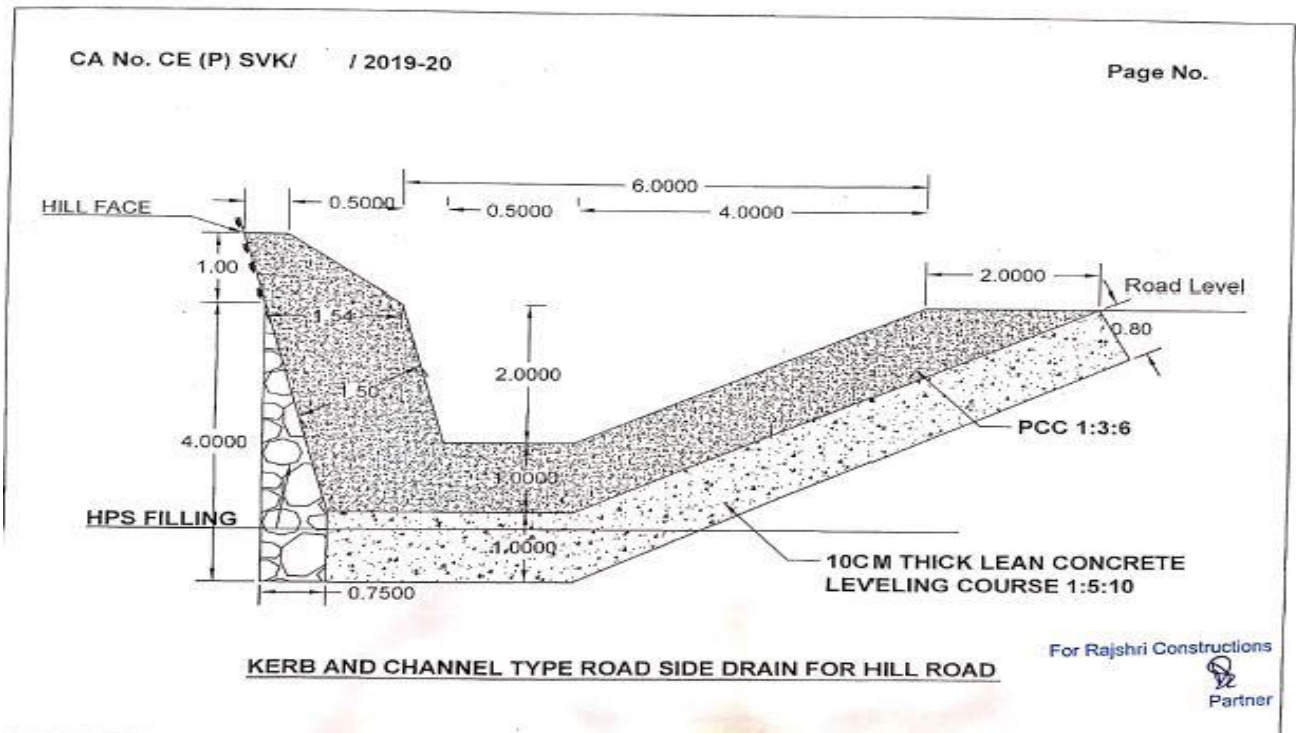


Fig (29) –Kerb and Channels

6.1 WHAT IS ROAD OR PAVEMENT?

Pavement or Road, it is an open, or we can say that it is a public way for the moving of vehicles, people, and animals. Pavement is always completed with a hard-smooth surface. This helps make them durable and road pavement generally deteriorate over the time. Below are the reasons for that:

- The huge effect of traffic, especially heavy vehicles.
- Environmental factors also effects such as weather/pollution.

A huge No. of people is completely dependent on Roads to move their vehicles and products in less amount of time and more reliably and also with more comfort ability.

6.2 FUNCTIONS

- One of the essential capacities is load conveyance. It tends to be portrayed by the tire loads, tire setups, redundancy of burdens, and conveyance of traffic across the asphalt, and vehicle speed.
- Pavement material and mathematical plan can influence speedy and effective seepage. These dispensing with dampness issues like mud and beating (puddles). Seepage framework comprises of:
 - **Surface drainage:** It removes all water present on the pavement surface, sloping, chambers, and kerbs.
 - **Subsurface drainage:** It removes water that seeps into or is contained in the underlying sub-grade.

6.3 Roads in Lansdowne

- Slopes are 0 to 6 percent.
- In India, all matters related to geometric design are handled according to IRC (Indian Road Congress).
- The width of single lane highway is 3.75m.
- Width of 2 or more lanes is taken by considering the width of each lane as 3.5m.
- So the width of 2 lane highway is 7meters. For without raised kerbs (it is the boundary between pavement and footpath or island or median)....

- For raised kerbs it is 7.5meters.

Geotechnical Review of Lansdowne

Nature of soils of the area have been framed either through pedogenetic measures or they are shipped soils. The pedogenetic soils are the one which have shaped due to long time of exposedness to air forces, physical and synthetic enduring and rock slides.

Such sorts of soils are gotten from stone Gneissic, schistose and phyllite rocks. This dirt's got high level of silica from their parent body, while the dirt's shaped from the limestone are wealthy in calcium carbonate.

The shipped soils are conveyed and saved by the streams. Their parent body and source rocks lie at distant spots. A portion of this dirt's has blended beginning of frigid and fluvio-chilly beginning. This dirt's of takus, fans and porches are residue to clayey soil and are ripe. The earthy colored woodland soils contain high level of natural matter.

We know that the Katil soils are usually stony, youthful and amazingly poor. Soils of Upraon are gravelly and sandy Loams; they are earthy colored of Talaon. The Talaon soils are earthy colored in shading with clayey surface. The stony surface gives higher pace of disintegration.

Topography and soils. The State is essential for the Western Himalaya and isolated into four zones agreeing height in particular, the Tarai-Bhabar-Shivalik (Sub-Himalayas) with elevation going from 750-1,200meters, Lesser-Himalayas between 1,000 – 3,500 meters, Greater-Himalayas between 3,500-4,800m with snow-line ascending to 5,400m, and Trans Himalaya (Tethys) averaging 5,300m. By and large, the district is topographically and pedologically temperamental and inclined to slides and disintegration. Soils of the Uttarakhand Himalayas overall are very shallow, seriously impregnated with un-endured pieces of parent rocks

1) Site Overview:

This venture imagines broadening of streets in Pauri Garhwali District of Uttarakhand state. Under this venture single path streets are altered as twofold path streets. The undertaking incorporates the improvement streets associating JASWANTDWAR to PALKOT

2) Project Details:

- Project: Construction Roads.
- Project Guide: Dr. Tanmay Gupta.
- Location: Jaswant D War to Palkot
- Length of Road: 1.6 Km.

3) Geometric design:

a) Terrain Classification

The overall incline of the nation arranges the landscape across the space.

Territory is for the most part a stretch of land, particularly with respect to its actual highlights.

Terrain classification for different area is shown in the following Table:

Table 3: Terrain Classification:

Terrain	Classification cross slope in %
Plain	0-10
Rolling	10-25
Mountainous	25-60
Steep	>60

b) Carriageway width:

The width of carriage way depends upon the:

- Predicted Traffic Volume.
- Traffic capacity of each lane.

Carriage way width of different classification is as follows:

Table 4: Carriage Width

Classification	Width of Carriage way
Single Lane	3.75m
Two lanes without Raised kerbs	7.0m
Two lanes with raised kerbs	7.5
Intermediate carriage way	5.5m
Multiple pavements	3.5m per lane

4) Construction Equipment's:

During the construction of highway there are various equipment's that are being used like graders, bulldozers, pavers, dump trucks, and feller bunchers etc.

Some of the equipment's used at this site are as follows:

- Excavators: It is the excavation machinery which works with the great efficiency. It consists of a boom, stick, bucket and a cab on the rotating platform. It is capable of removing even big sized boulder. It is used in various types of digging such as in gravel banks, clay pits, digging cuts in the road works and filling the shoulders.



Fig (30) -Excavator:

- Motor Grader:

It is a form of heavy equipment which is used to create a flat surface with the help of a long blade. It is also known as road grader. Its blade is like a plow which we know that it always stays close to the earth and creates proper flat surface.



Fig (31) - Motor Grader

➤ **Dozers:**

These machines at construction sites are mainly used to push heavy things. It is also used for clearing and grading land. It has a broad hydraulic blade like motor grader in front and a continuous tread.



Fig (32) -Dozer

➤ **Compacters:**

Compacters are mainly of two types-

Earth compacter- it is used to compact soil and gravel.

Asphalt compactor: After laying asphalt with paver this machine is used for final smoothing purpose.



Fig (33) -Compacter

➤ **Sensor Paver:**

At the construction site this machinery is generally used to distribute, shape and compact the asphalt layer with the facility of adjustable width of screed.



Fig (34) -Sensor Paver:

➤ **Bitumen emulsion sprayer:**

This sprayer at the construction site is used to spray the prime coat on the DBM.



Fig (35) -Bitumen emulsion sprayer-

5) Factors affecting design of Highway

Ground or surface transportation is most broadly utilized transportation on the planet. As indicated by the most recent study as we think around 80% of individuals of India has embraced street transportation as method of transport so development of asphalts ought to be done as it is sufficiently able to help out the heap and solid for their whole plan life.

Asphalts are designed constructions which are utilized as streets, runways or as stopping zones. Numerous variables like number of vehicles, speed, climatic conditions and different elements influence are to be considered for the plan of asphalt.

Here are a portion of the principle factors which impact the asphalt plan:

1. Wheel Load:

It is significant thing to decide the asphalt thickness to be received. By giving the sufficient thickness the heap coming from the wheels doesn't influence the Subgrade soil. The wheel load acts at a point on asphalt and causes deformity that is the reason it should be kept away from.

2. Axle Configuration:

It is significant piece of vehicle which empowers the wheel to pivot while moving. By giving various axles, vehicle can convey more loads. Thus, the pivot load likewise impacts the plan of asphalt. In the layer hypothesis of adaptable asphalt configuration wheels on one side of axles are considered to plan the asphalt.

3. Vehicle speed:

On the off chance that the vehicle is moving at creep speed, additionally harm happens to the asphalt. In the event that vehicle speed is progressively expanded, it will cause more modest strains in the asphalt.

4. Repetition of burdens:

Built asphalt is utilized by a few vehicles in its plan life. The wheel loads are rehashed constantly because of this some distortion happens on the asphalt. Total deformation is the amount of all wheel loads following up on it. So in plan of asphalt recurrence of burden is likewise thought of. For the plan of asphalt, single hub with double wheels conveying 80kn burden is considered as standard pivot.

5. Subgrade Type:

To build asphalt sub evaluation soil should be tried. Different test like CBR, Tri pivotal and so forth Will assists with deciding the nature of Subgrade. From this we can embrace the necessary thickness to the asphalt. Assuming Subgrade soil is poor, the asphalt should harm without any problem.

6. Temperature impact on asphalt plan:

Temperature is the significant ecological factor to be considered in the plan of asphalt. In the event of black-top streets (*Asphalt is an adaptable asphalt inherent various layers with a consistent progression of material traveling through the black-top paver*), temperature influences the versatile modulus of surface course. In extremely hot condition black-top layers lose their solidness. At low temperature, black-top layers become weak and breaks are

shaped.

If there should be an occurrence of inflexible asphalt, temperature stresses are created. Twisting of cement is additionally conceivable because of variety of temperature in top and base layers of asphalt.

7. Precipitation:

Dampness variety or precipitation from downpour influences the profundity of groundwater table. Great seepage office ought to be accommodated acceptable strength and backing. The ground water table ought to be at any rate beneath 1m from the asphalt surface.

CHAPTER VII
CONCLUSION

This Project discusses about the students gaining knowledge and skills on using the modern equipment. This project also presents other skills which students imbibed after performing the open-ended experiment such as analyzing the data collected from the field in the software and producing terrain maps of different configuration & views and calculating the quantity of earthwork as output from the software. The software also presents a statistical data for further study. The current project is performed assuming the coordinates whereas real– time coordinates must be considered as input in total station for more accuracy which is the future scope of this work.

Normally looking over for development of street is not just about the situation of the street. Finished land studies help us to decide that the ideal street configuration, including the materials to be utilized and the strategies utilized in building. In the event that particular street highlights are to be experienced (steep grades, and so on) the land overview information will help in the choice for how these are to be overseen. This incorporates apparently fundamental subtleties, for example, the ideal width of the street right to more convoluted perspectives, for example, if an extension or passage will be used.

All through the term of development, assessors are expected to evaluate and gauge progress, especially close by innovation like GPS, which has now a day's become an instrumental asset in contrasting plans with the development cycle.

Surveying done for construction of roadway is not just about the preparation of the road, but also about the design of the roadway. Land surveys help us to determine that the roadway design, the materials to be used and the methods used in building. The land survey data will help in the decision taking for how these are to be managed if only important features of road are taken like steep inclines etc. This includes seemingly basic details such as the optimal width of the road all the way to more complicated aspects such as if a bridge or tunnel will be utilized.

Surveyors are needed to assess and measure progress, particularly alongside technology such as GPS, which has now become an instrumental resource in comparing plans to the construction process throughout the duration of construction.

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Name: Priyanshu Sharma & Harsh Goel Department: Civil Engineering

Enrolment No: 171650 & 171617 Contact No.: 8219727990 & 7807493063

E-mail: 171650@juitsolan.in & 171617@juitsolan.in

Name of the Supervisor: Dr. Tanmay Gupta (Senior Grade)

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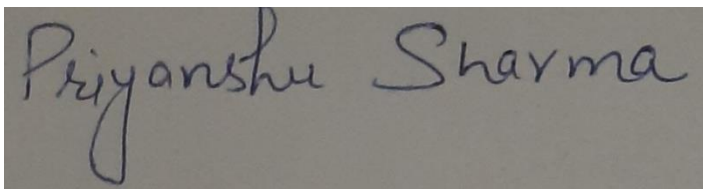
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