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Economical Formation Level for Road Pavement

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Abstract: ***To establish the most economical estimate for a stretch of road by conducting a survey for RL of different points, calculating a formation level for the road where the quantity of Earthwork i.e., cutting and filling is equal, choosing such a material for pavement design which is gives more strength and is also economical. Selecting the site of a non-constructed road form MGM Institute of Hotel Management to MGM Hospital Chhatrapati Sambhaji Nagar, Maharashtra, India. Analysing the cost difference in estimate if we change the depth of formation level. Calculating the cost of construction for formation level from depth 98.00m to 99.00m. The cost calculation for earthwork varies with change in depth of formation level. The cost of pavement design is constant for all formation bed. Thus, the only variation is in the cost of construction of pavement surface. We have selected water bound macadam (WBM) pavement surface. As a future scope we will design different pavement surfaces like flexible, rigid and mixed. Designing of these pavement, different layers of the pavement as per IRC specification. The most economical formation level with most economical pavement will become the most durable and economical road design. We would use dumpy level, chain, arrows, tape, ranging rods, tripod, levelling staff for the survey of Reduce levels. Comparing the cost of construction of two types of pavements surfaces.***

Keywords: Economical, Levelling, Formation Level, Reduce Level, Estimate, Earthwork, Pavement, Cost of Construction.

I. INTRODUCTION

Roads are the most important mode of transport. For a country to develop the network of roads it is having should be good. For the construction of roads, the 80% of the cost is of laying or leveling of foundation bed that is cutting and filling. Being an engineer, the main purpose is to construct any infrastructure with full efficiency and at a very costly. If a road is having an equal amount of cutting and filling then according to studies the cost of construction reduces by 30%. So, using such formation level for the road formation bed where cutting and filling is equal, we can reduce the cost of construction. Also using such a material for the construction of pavement of road that is both strong and economical for construction. So, if we use such a material for the upper surface that is pavement then the road construction can be done at very less cost compared to the conventional construction method. Thus, roads with equal cutting and filling and economical pavement will be the most economical roads constructed.

II. RELATED WORK

Objective of Work

1) To determine the elevation of the ground surface along a given route or alignment.
2) To establish most economical formation level for the road surface.
3) To determine the number of undulations along the route.
4) To determine the quantities of earthwork needed to construct the route, such as cut and fill volumes.
5) To calculate the cost of earthwork for each formation level.
6) To provide a basis for designing the water bound macadam (WBM).
7) To provide accurate estimate for the construction of the pavement surface, including the placement of materials and the cost of labours.

III. METHODOLOGY

The site we selected is a 400m stretch of pathway or non-constructed road which starts form MGM Institute of Hotel Management to MGM Hospital. The road is a 10m wide road with soft murum on top layer surface. The road is authorized by Chhatrapati Sambhajinagar Municipal Corporation. Some portion of the road consist of trees on it. The road falls in the category of Other District Road (ODR). The road is connecting the following landmarks to each other:

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MGM Institute of Hotel Management ---- Dr. G.Y. Pathrikar College (MGM Polytechnic/ SOET) ---- The Salt Hotel ---- MGM Cricket Stadium ---- MGM Sports Canteen ---- MGM Hospital.

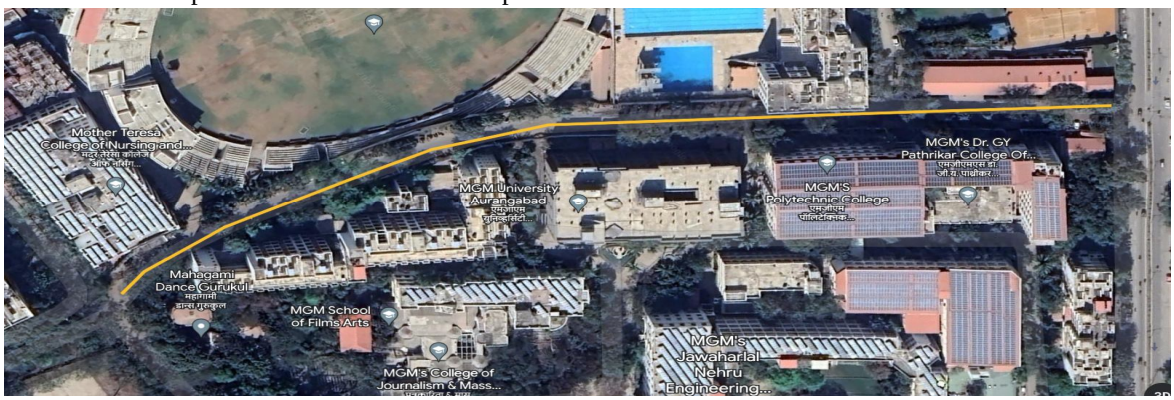


Fig. No. 1: Google Map Image of Selected Site

Methods used for calculation of Reduced level:

Instrument height method.

It adopted to find the difference in level between two points, when

1) The two points are far away

2) The difference in level between two points is large.

3) There are no obstructions in between two points concerned

This method is used in order to find the difference in elevation between two points

a) If they are too far apart.

b) If difference in elevation between them is too great.

c) If they are obstacles intervention in such cases is necessary to set off the level in several position and to work in serious of stages.

The difference of level of the point A and B is equal to algebraic sum of these difference between the sum of back sight and sum of foresight

The elevation of change point = Elevation of A Back sight of A - Foresight at change point. The formation level depth we have considered are starting from 98.00 m to 99.00 m with interval of 0.10 m in depth between adjacent formation levels. The table no. 01 shows the quantity of cutting and filling for the road after the calculations have been completed:

Table No. 1: Quantity of Earthwork for Each Formation Level

Formation level	Cutting	Filling	Difference Filling - Cutting
98.00	2572.62	347.62	-2225.00
98.10	1807.94	895.86	-912.08
98.20	1894.34	654.33	-1240.02
98.30	1651.37	852.96	-798.41
98.40	1459.97	1134.35	-325.63
98.50	1307.83	1450.76	142.93
98.60	1165.98	1787.28	621.30
98.70	1039.56	2134.55	1094.99
98.80	920.18	2501.30	1581.11
98.90	810.40	2884.10	2073.70
99.00	714.67	3275.23	2560.56

IV. EXPERIMENTAL RESULTS

We have calculated cost of construction of road for the formation level with depth of 98.00 m, 98.10 m, 98.20 m, 98.30 m, 98.40 m, 98.50 m, 98.60 m, 98.70 m, 98.80 m, 98.90 m, 99.00 m. Table no. 2 shows the cost of construction for different formation levels with the construction of Water Bound Macadam (WBM) pavement:

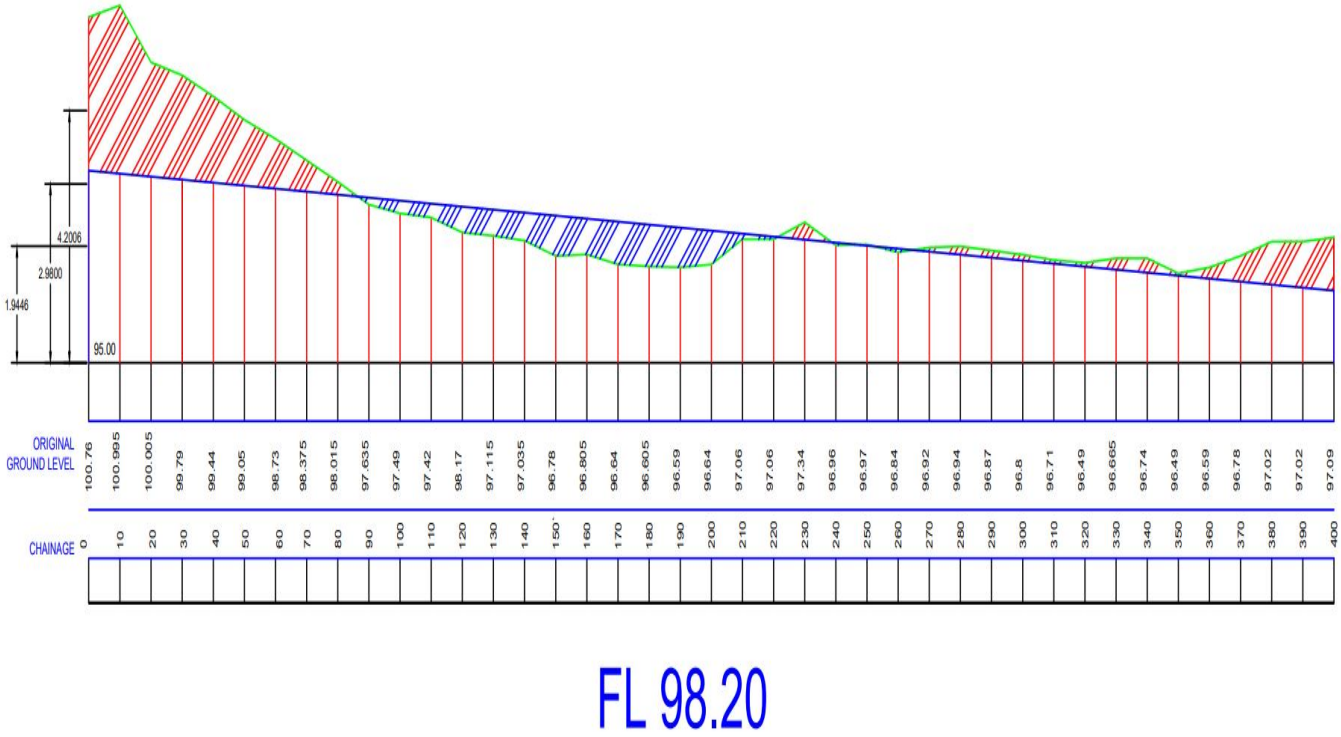
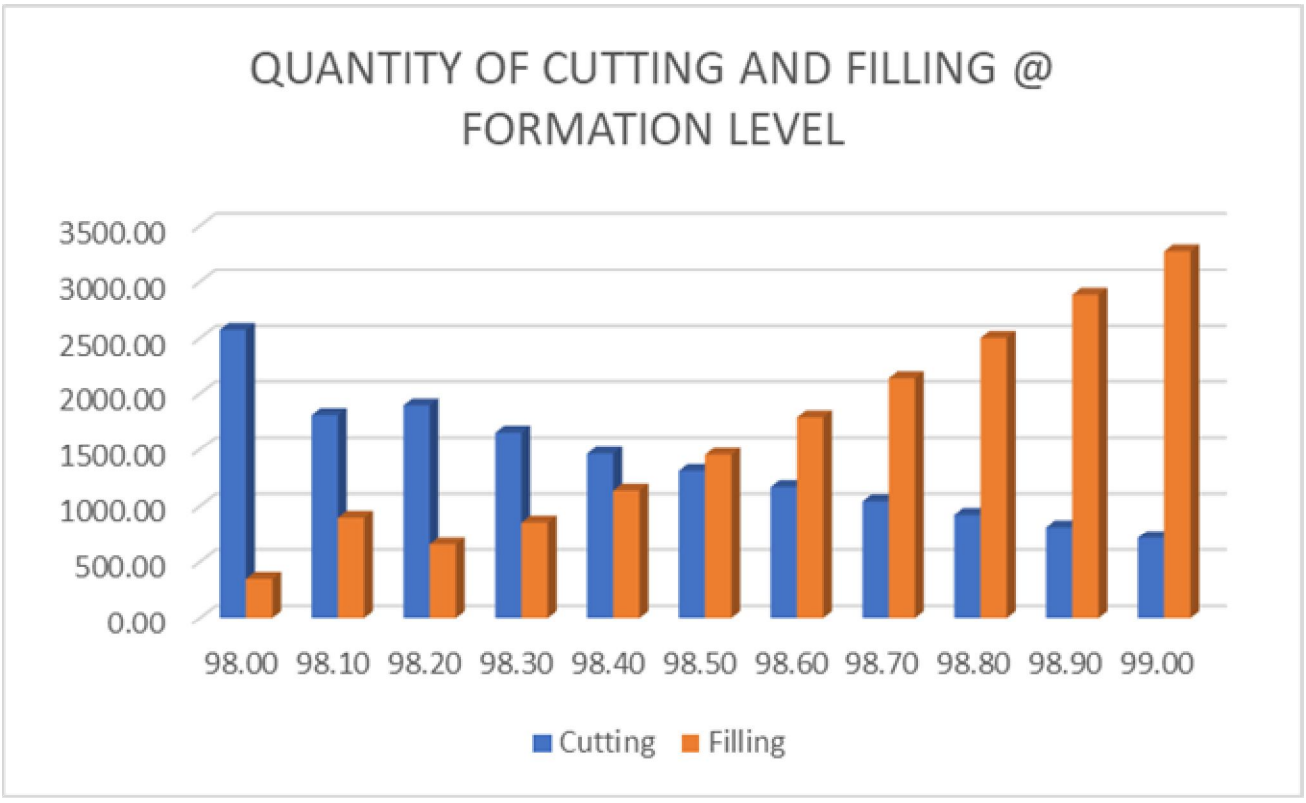


Fig. No. 2 L-Section @ Formation Level 98.20m

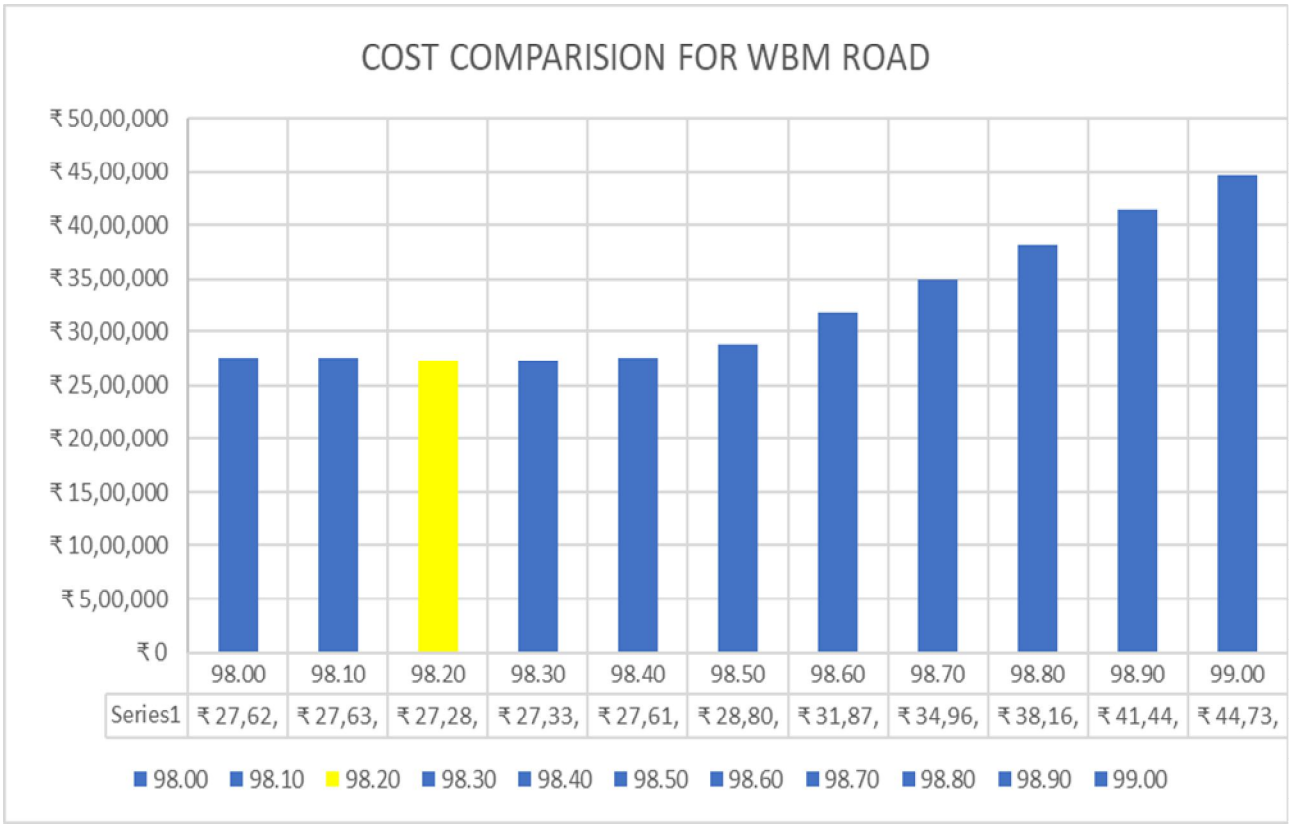
Table No. 2: Total Cost of Construction for each Formation Level

FORMATION LEVEL	COST OF CONSTRUCTION
98.00 m	₹ 27,62,860
98.10 m	₹ 27,63,476
98.20 m	₹ 27,28,388
98.30 m	₹ 27,33,348
98.40 m	₹ 27,61,614
98.50 m	₹ 28,80,206
98.60 m	₹ 31,87,301
98.70 m	₹ 34,96,081
98.80 m	₹ 38,16,430
98.90 m	₹ 41,44,765
99.00 m	₹ 44,73,555

The following graph shows the variation of cost for different formation level



Graph No. 2: Cutting Filling Quantity for Different Formation Level



Graph No. 1: Cost Comparison of Water Bound Macadam Roa

V. CONCLUSION

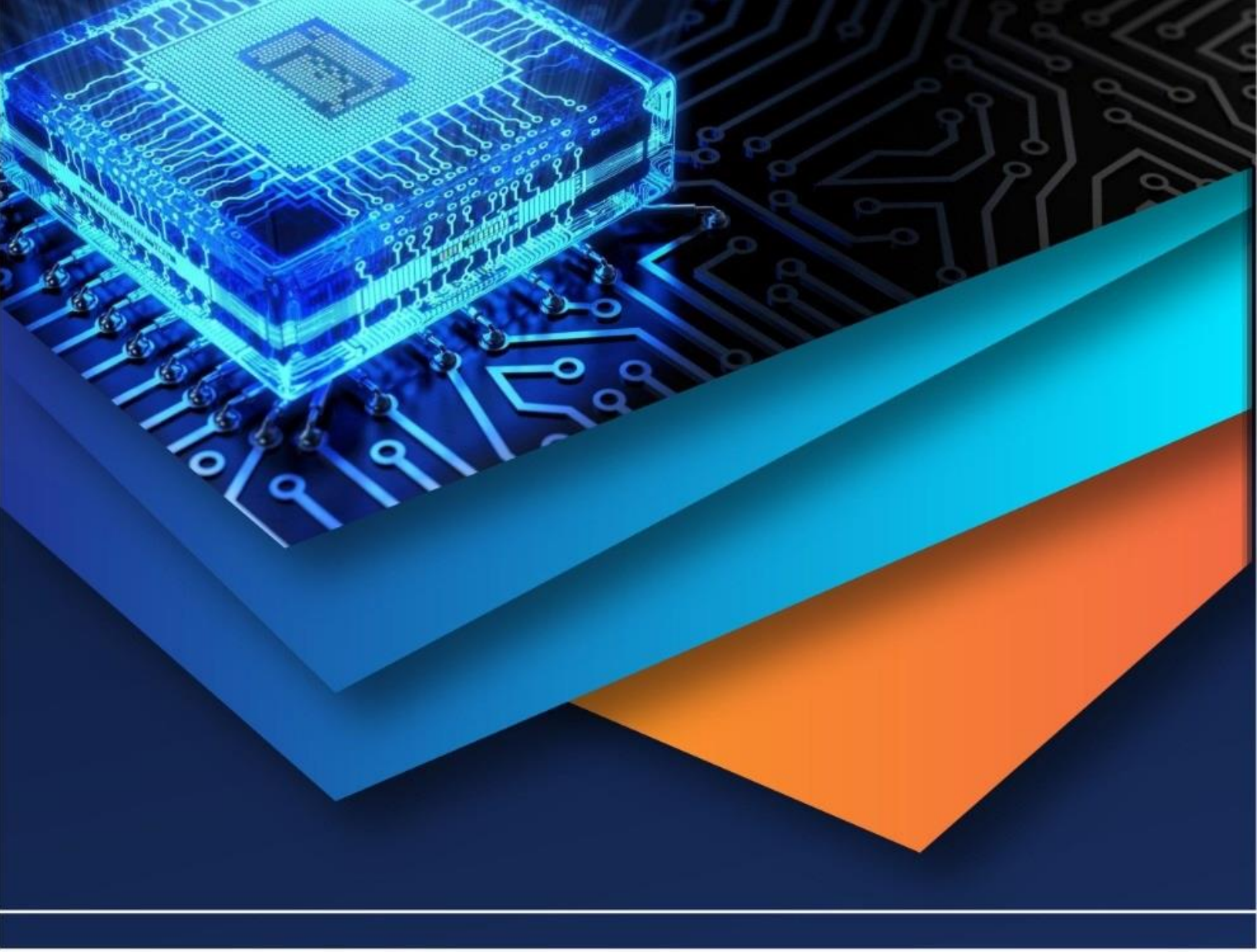
From the project work we have performed, have got following results. After analysing the results, we conclude the following points:

1) The length of road we have survey is 400 m.
2) The road starts from MGM's IHM to MGM Hospital.
3) We have calculated the formation levels from 98.00m to 99.00 m with a difference of 0.10m between adjacent formation levels.
4) The maximum quantity of earthwork is at formation level 99.00 m.
5) The minimum quantity of earthwork is at formation level 98.20 m.
6) The maximum quantity of cutting is 2572.62 m^2 at the formation level 98.00m.
7) The maximum quantity of filling is 3572.23m^2 at the formation level 99.00 m.
8) The maximum cost of construction is 44.73.555 for the formation level 99.00m.
9) The minimum cost of construction is 27,28,388 for the formation level 98.20m.
10) The most suitable and most economical formation level is 98.20m for the construction of Water Bound Macadam (WBM) road.

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