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Cost Analysis of Conventional Speed Breakers with Steel Grid - A Case Study

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Abstract **– Finding a solution to the problem faced by mankind is a but natural tendency but it should be cost effective as well as serve the intended purpose with a little of maintenance requirement. Such a problem was faced by residents of sector-10, Panchkula where the residents faced a problem due to storm water. As storm water will move everywhere, where it find its way. The storm water enters in the sector from the dividing roads of sector 10-15, 10-9, 10-5 and 10-11. Out of these dividing roads the condition of dividing at sector 10-15 and10-9 was worst. Water was causing a lot of problem to residents and standing as well as moving vehicles. In order to curb this tendency of flowing water, which creates a lot of problem to residents living nearby residents has created huge humps at dividing roads of sector which instead of solving the problem has created various other problems.**

These problems are discussed in this paper along with cost analysis and effectiveness. A comparison has been drawn with the proposed alternative with respect to cost analysis and effectiveness.

Keywords **– Cost Analysis, Conventional Speed Breakers, Steel Grid, Water.**

I. INTRODUCTION

Sometime man creates some of infrastructures according to his/her need or as a solution to ones problem. At that time his only motto is to get rid of his problem without caring for its after effects. Whereas same problem could have been solved by other alternatives which are cost effective, durable, long lasting, requires less maintenance and are more aesthetic in appearance.

One of such problem was faced by residents of Sector-10, Panchkula residents. During rainy season the storm water enters into the sector via dividing roads mainly of sector 9-10 and sector 10-15. As a result considering the problem faced by residents of sector-10, the municipal council took a decision of making a hump at the entry of such dividing so that the ingress of storm water could be checked. The layout of sector-10 with its adjoining sectors is shown in fig-1.

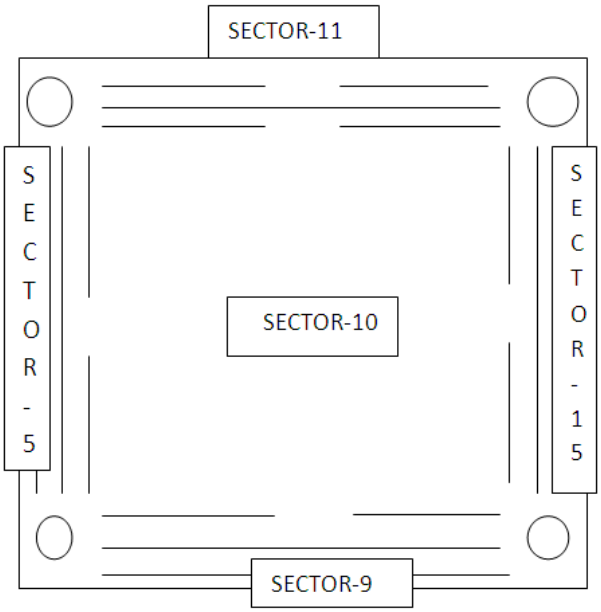


Fig.1. Layout of Sector-10, Panchkula

II. PROBLEM AREA

The humps made do not adhere to specifications being laid by IRC99. None of the below mentioned criteria's were fulfilled viz. Placement, Height, Length, Slope, Warning sign, Painted surface.

1) No warning sign board has been provided at the requisite distance prior to the approach of speed breakers.
2) Height of humps is as high as 52 cm.
3) Slope provided is higher which otherwise should be limited to 1:20.
4) Length of hump is 5m as per IRC 99-1988 but over here the length is as large as 9.24m.
5) Speed breakers are put just on the intersection of major and minor road.
6) None of the speed breakers is painted with black and white alternate strips.

Non-conformance of the specification lead to:

- Areas have become prone to accidents.
- Excessive wear and tear of vehicles.
- Increased risk for two wheeler.
- The problems are faced by residents of different sectors.
- The desired riding quality for different users is not being met.
- May lead to spinal injury, slip disc cases.

2.1 A view of the hump at the dividing road of sectors 10-15, Panchkula

Fig.2.

The table 1 shows the comparison of the road features provided and compared to the codal provisions. The following points had emerged from the comparative data in the table shown above.

- It can be inferred from the figure and data that the hump neither fulfils its specifications with respect to its height, slope, length nor does it is properly indicates its presence through warning sign or paint. Apart from this, it starts at just a distance of 4.26m from major road against the minimum specified distance of 10m by IRC-99-1988.
- It produces a lot of noise especially when heavily loaded vehicle pass over it, thereby causing a lot of inconvenience to nearby residents.
- Its height at centre is 0.53m as against 0.10m as specified by IRC which may lead to excessive wear and tear of passing vehicles. It may even can have adverse impact on the axle of sedans.

Table 1

S.No.	Description of the item	Actual Measurement	Measurement as per IRC
1	Length of hump	9.24m	5m
2	Height of hump	0.53m	0.10m
3	Distance from edge of road	4.26m	10m
4	Warning signs (if any)	Nil	Mandatory
5	Slope of hump	1:8	1:20
6	Whether humps spread on full shoulder width	No	Mandatory
7	Paint on hump surface	No	No
8	Carriage way width	9.22m	Not specified

- As per the information gathered from personal interaction with residents these humps were built to stop the ingress of storm water in the sector during rainy season. But from the photographs taken during rainy season, it does not show any type of relief from storm water. The lanes are still running full of water and the water is sufficient enough to submerge the ¾ of tyre height and enter into vehicle from base.

Fig.3.

- In the subsequent photographs (Fig.3, 4, 5) taken during rainy season it can be observed that the lane is fully flooded with water. The vehicular traffic and pedestrians face a lot of problems in crossing the area.

Fig.4.

Fig.5.

2.2 A view of the hump at the dividing road of sectors 10-9, Panchkula

Fig.6.

The table 2 shows the comparison of the road features provided and compared to the codal provisions. The following points had emerged from the comparative data in the table shown above.

- It can be inferred from the figure and data that as the height of hump is 0.33m against 0.10m as specified by IRC. The general ground clearance of four vehicles especially sedans is 0.168m. When a sedan will pass over this hump, it can have adverse impact on the axle of sedans.
- Length of hump is 13.21m against 5m as specified by IRC.
- The slope is 1:15.5 against 1:20 which will make the riding quality poor.
- It starts at a distance of 5.11m from the edge of major road against a minimum of 10m as specified by IRC. Thus a vehicle entering to major road or to minor road will not be able to control the vehicle and may lead to a fatality.

Table 2

S. No.	Description of the item	Actual Measurement	Measurement as per IRC
1	Length of hump	13.21m	5m
2	Height of hump	0.33m	0.10m
3	Distance from edge of road	5.11m	10m
4	Warning signs (if any)	Nil	Mandatory
5	Slope of hump	1:15.5	1:20
6	Whether humps spread on full shoulder width	No	Mandatory
7	Paint on hump surface	No	No
8	Carriage way width	8.66m	Not specified

- No warning sign has been put on road and even the hump is not painted with alternate black and white strips.
- The problem of water accumulation still stands even after the hump is made (Fig.7).

Fig.7.

- The top of hump is having a pit of 6 inch depth sufficient enough to make a vehicle loose its balance especially if it is a two wheeler. (Fig.8.)

Fig.8.

- The hump is not provided on the kerb area. Also due to this the water enters into the lawn of nearby resident area also. (Fig.9.)

Fig.9.

It is well observed from above data that constructing these humps was a mere failure with respect to the intended purpose and cost effectiveness.

III. Technique Adopted

The comparative observations were a reason sufficient enough to compare the present system and find its alternatives with respect to cost and performance apart from durability. In the present study two main humps were taken into consideration for the purpose of study.

1) The measurements were taken on site.
2) The technical deviations in the speed breakers were identified and listed.
3) The geographical location of different humps were studied and the information has been summarized and compared with IRC recommendations. Further,

- Cost analysis for making such hump was carried out.
- Cost analysis for placing a steel pipe grid was carried out.
- Both the cases were compared in terms of cost effectiveness and fulfillment of intended purpose.

IV. Cost Analysis

4.1 Case-1

Fig.10.

The construction cost of a concrete hump made at dividing of sector 10-15, Panchkula was worked out on the basis of certain assumptions and is given in following paragraphs. The cost may vary depending on the values assumed in calculations. (Fig.10)

4.1.1 Following assumptions with respect to dimensions were made:

Dimensions of hump:

1) Length of hump: 30ft
2) Height of hump : 1.75ft
3) Width of hump : 30ft

Quantity of concrete work: (1.75x 15) x 30’ = 787.5 cu ft = 21.91 cum

Mix = 1:1.5:3

Dry material required per cum of concrete = 1.57cum

Cement required: 179 bags

Sand required : 337cu ft

Coarse aggregates: 674 cu ft

S.No.	Item	Quantity	Rate/Unit	Amount
1	Cement	179 bags	275/-bag	49225/-
2	Sand	337 cu ft	40/-cu ft	13480/-
3	Coarse aggregates	674 cu ft	38/-cu ft	25612/-
			Total	88317/-
			Labor charges	8000/-
			Total cost inclusive of labor charges	96317/-

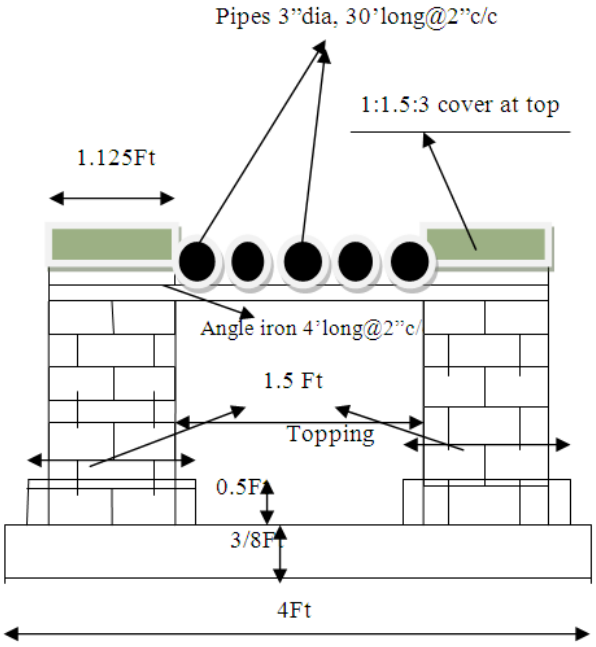
4.2 Case-2

An alternative to solve the problem of draining water was with making a steel pipe grid as is shown in photograph. It not only ensures drainage of all the storm water but is cost effective also. (Fig.11)

Fig.11. A steel pipe arrangement made at sector-17, Panchkula.

4.2.1 Assumptions made in the process are as under:

1) Pipes to be laid are 3” diameter.
2) Pipes are 30’ in length.
3) Spacing provided in steel pipes is 2”. Thus no.of pipes required are 5 in number.
4) Angle irons are 2” wide laid at a spacing of 2’. Thus no. of angle iron required= 16x4’=64 Rft.



Costing workout

S.No.	Description	No.	Length	Breadth	Height/Depth	Quantity
1	Excavation	1	30'	4'	2'	240cuft= 6.79 cum
2	Laying lean concrete 1:8:16	1	30'	4'	3/8 '	45cuft = 1.27 cum
3	Brickwork					
	Step-1	2	30'	1.5'	0.5'	45cft
	Step-2	2	30'	1.125'	1.5'	101.25cft
					Total	146.25cft=4.15cum
4	Topping(40mm) 1:2:4	1	30'	2'		60sqft =5.57sqm
5	Plaster 1:5	2	30'		2'	120sqft=11.14sqm
6	Top cover	2	30'	1.125'	0.25'	16.87cft=0.47cum
7	Angle iron	16	4'			64rft
8	Pipes 3"dia	5	30'			150rft

4.2.2 Costing

S.No.	Description	Quantity cft	Cement (bags)	Sand (cft)	Coarse aggregates (cft)	Bricks (No.)	Ballast cft
1	Excavation	240 cft	-	-	-	-	-
2	Lean concrete	45 cft	2.28	0.62m3			1.27m3
3	brickwork	146.25cft	6.01	1.03m3		1982	
4	topping	60sqft	1.40	0.097m3	0.193m3		
5	Plaster1:5	120sq ft	1.02	0.16m3			
6	Top cover	16.87cft	3.84	0.20m3	0.40m3		
			14.55	75.71cft	21.31 cft	1982	45.64cft

S.No.	Item	Quantity	Rate	Amount
1	Cement	15bags	275/-bag	4125/-
2	Sand	75.71cft	40/-cft	3028/-
3	Coarse aggregates	21.31cft	38/-cft	810/-
4	Bricks	1982	4500/-	4500/-
5	Ballast	45.64cft	30/-cft	1370/-
6	Angle iron 64Rft	83.2 Kg	60/-Kg	4992/-
7	Pipes 3" dia	150 Rft	200/-Rft	30,000/-
8	Labor			5000/-
Total cost				**Rs 53825/-**

V. CONCLUSION

It was proposed that instead of providing the concrete humps if in 0.5m wide area steel pipes would have been laid throughout the carriage way, it would have solved the purpose well in a better way.

The water that percolates down could be collected and be used without any treatment for purpose of irrigation. It will not only reduce the load on STP but will also promote green building concept in water conservation. As today's era is of gaining credits to enter the category of green buildings by minimizing water wastage and conserving it. Apart from this it will also help in ground water recharge which otherwise is going down day by day as a result of urbanization.

S.No.	Point in consideration	Concrete hump	Steel pipe arrangement
1	Aesthetics	Less aesthetic	Better appearance
2	Cost	More	Less
3	Effectiveness to purpose	Less	More
4	Durability	Less	More
5	Maintenance	Requires periodic maintenance	Less
6	Maintenance cost	More	Less
7	Wear and tear	More	Less

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