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Planning & Design Of New By-pass Road Connecting Popatpura To Vavadi, Ghodhara, Gujarat By Using Autodesk CIVIL 3D Software

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Abstract—The development of effective road transport system is primary need of any developing country. Also provision of new road network is essential for developing countries to carry out its transportation functions smoothly as with increasing traffic volume urban and non-urban roads reach to their saturation level with passage of time. So for this job the best available Highway Geometric Design Software must be used for designing of road. Keeping this in view we have used Autodesk Civil 3D Software for the geometric design of the proposed bypass road of Godhara, Gujarat to provide its geometric design. The Software uses 3D design to give the values of different components of geometric design such as Horizontal and Vertical Alignment, Super elevation, etc.

***Keywords*—Geometric Design, Autodesk Civil 3D, Horizontal Alignment, Vertical Alignment.**

I. INTRODUCTION

Scope of transportation system has developed very largely. This led to the increase in vehicular traffic especially in private transport network. Thus road space available was becoming insufficient to meet the growing demand of traffic and congestion started. Capacity analysis is fundamental to the planning, design and operation of roads, and provides, among other things, the basis for determining the carriageway width to be provided at any point on a road network with respect to the volume and composition of traffic. Due to this circumstance will occur problem such as accident, traffic speed reduction etc. The vehicle traffic passing through Godhara is growing day by day. The intensity of the traffic and pedestrians crossing has increased significantly and there is no increasing the road width. For a variety of reasons such as increase population, industrial, commercial, increasing traffic demand can exceed the carrying capacity of the road.

II. LITERATURE REVIEW

Hong Sung-Joon discussed to evaluate the actual highway geometric design properly, and propose a well-balanced design policy especially considering the drivers perception and behavior. In this paper, after classification of all the design elements, the new concept of 'reversely calculated speed' as and evaluator of road alignment is introduced and examined. The analysis of the reversely calculated speed for actual alignments on Expressways in Japan shows the drivers perception of physical limitation given by road alignment. Then the actual operating vehicle speed is estimated and analyzed using database of vehicle detectors. Using the five-minutes mean speed, with only one passenger car, observed by detectors in the median lane on more than 7,000 km networks of Expressways in Japan, the speed running absolutely independent can be assumed as an 'operating speed' (free speed) reasonably. At last, the values of operating speed are evaluated with highway design elements such as curvature of horizontal radius and vertical grade. Highway geometry should be designed for vehicle traffic safety and efficiency, particularly on the trunk roads or Expressways on which traffic function must be most important. The horizontal radius at any point is approximately in proportion to the square of reversely calculated speed. In the future, the reversely calculated speed should be modified to represent not only highway geometric conditions but also the safety factor.

Blessing Alexander have investigated the suitability of these modalities for road design, which makes heavy use of two dimensional visual representations. They have implemented a multimodal road design interface that combines sketching and speech. Their system allows designers to specify spatial and geometric aspects of their design using a pen based interface that can recognize user input interactively in real-time. They evaluated the usability of system for the task of designing driving courses for the STISIM driving simulator. Their initial evaluation with four users suggests that users find their multimodal interface to be superior to conventional methods.

Kumar Ashok gave geometric design of existing road using MXROAD Software. Existing road used was state highway (SH 131) in Maharashtra to improve its geometric features and upgrading it from two lanes to four lanes. The Software uses 3D string modeling technologyand gives the desired values of different components of geometric design such as Horizontal and Vertical Curves, Super elevation, Shoulder, etc.

Liao Chen-Fu discussed the use of the highway geometric design package ROAD. The online tool helps students better understand the different aspects of geometric design as compared to the traditional approach. The objective of incorporating ROAD into the teaching of geometric design is not to reduce or ignore the importance of the underlying equations, calculations, or theory. The goal is to help students better understand the challenges of geometric design that transportation engineer faces. Since fall 2006, a homework exercise has been assigned to students to design a single-curve roadway geometry by hand prior to the lab project. The exercise prepares students to understand the equations and calculations of geometric design and its process. The authors hope that, through the assistance of ROAD can better understand the procedures that transportation professionals take in order to perform geometric design. And through the use of ROAD can explore different geometric designs that can satisfy given design constraints and requirements in real-world applications.

III. OBJECTIVE OF THE STUDY

- To give provision of a bypass road that is safe for travel for all road users at appropriate travel speeds
- To design geometric elements of proposed road using Autodesk CIVIL 3D

IV. METHODOLOGY

The methodology involved for the study is as follows.

A) A detailed site investigation: This will include existing site condition, traffic flow condition and identify the traffic circulation pattern in and around the study area.

B) Traffic survey and analysis: The collected data is to be analyzed to identify the Roadway Segments capacity, based on the Indian road congress guideline for capacity of rural road in plain area IRC: 64-1990.

C) Preparation of conceptual design: The next step is to propose design of road alignment elements such as Horizontal Alignment, Vertical Alignment etc. based on software Autodesk Civil 3D.

V. DATA COLLECTION

Fig. 1 Stretch Connecting Popatpura to Vavadi Khurd, Godhara

- Study area is located at Godhara, proposed road connects Popatpura to Vavadi Khurd which will serve as By-

Pass road.

- Length of the stretch: 5.51 km.
- Proposed Stretch is shown in Red Colour.

❖ Soaked CBR value obtained by performing test was found to be 6.78%.

❖ Volume count for mixed traffic, three days & 24 hours (Saturday, Sunday and Monday) data was collected. The traffic volume was collected for both directions by manual method which is given below in chart.

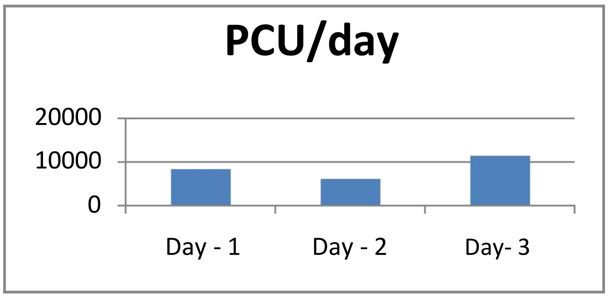
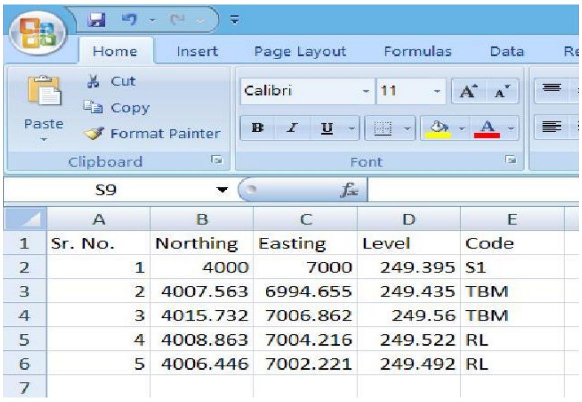


Fig. 2 Volume Count for Mixed Traffic

VI. PROCEDURE FOR AUTODESK CIVIL 3D SOFTWARE

1) Data Receiving:

The existing ground data is required for designing of highway geometry. This survey data includes X, Y, Z co-ordinates (i.e. Northing, Easting and Reduced Level). This data can be collected now days by using total station instrument. The data are shown below:-



Sr. No.	Northing	Easting	Level	Code
1	4000	7000	249.395	S1
2	4007.563	6994.655	249.435	TBM
3	4015.732	7006.862	249.56	TBM
4	4008.863	7004.216	249.522	RL
5	4006.446	7002.221	249.492	RL

Fig. 3 Existing Ground data obtained from Total Station Instrument

2) Creating Horizontal Alignment:

Creating Horizontal Alignment using survey data in Autodesk Civil 3D.

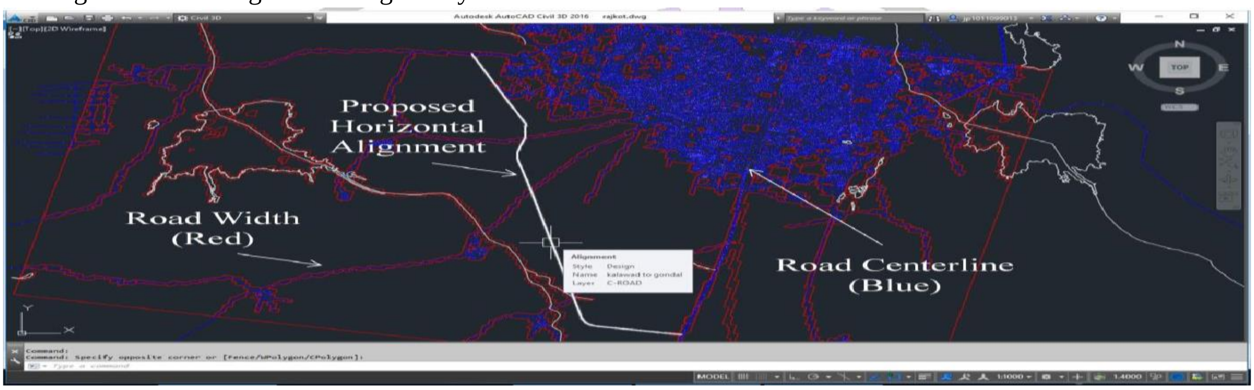


Fig. 4 Horizontal alignment in Autodesk Civil 3D

3) Creating Vertical Alignment

Creating Vertical Alignment over Existing Ground Profile in Autodesk Civil 3D.

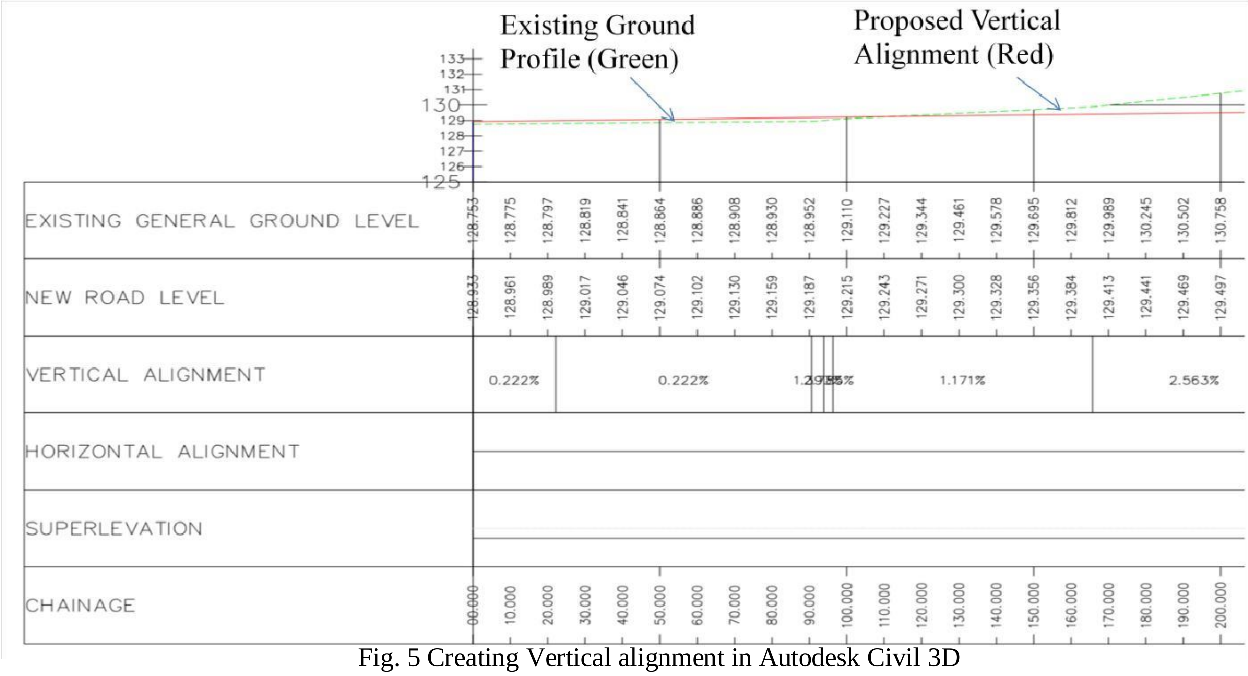


Fig. 5 Creating Vertical alignment in Autodesk Civil 3D

4) Creating Assembly:

Creating Road Assembly in Autodesk Civil 3D.

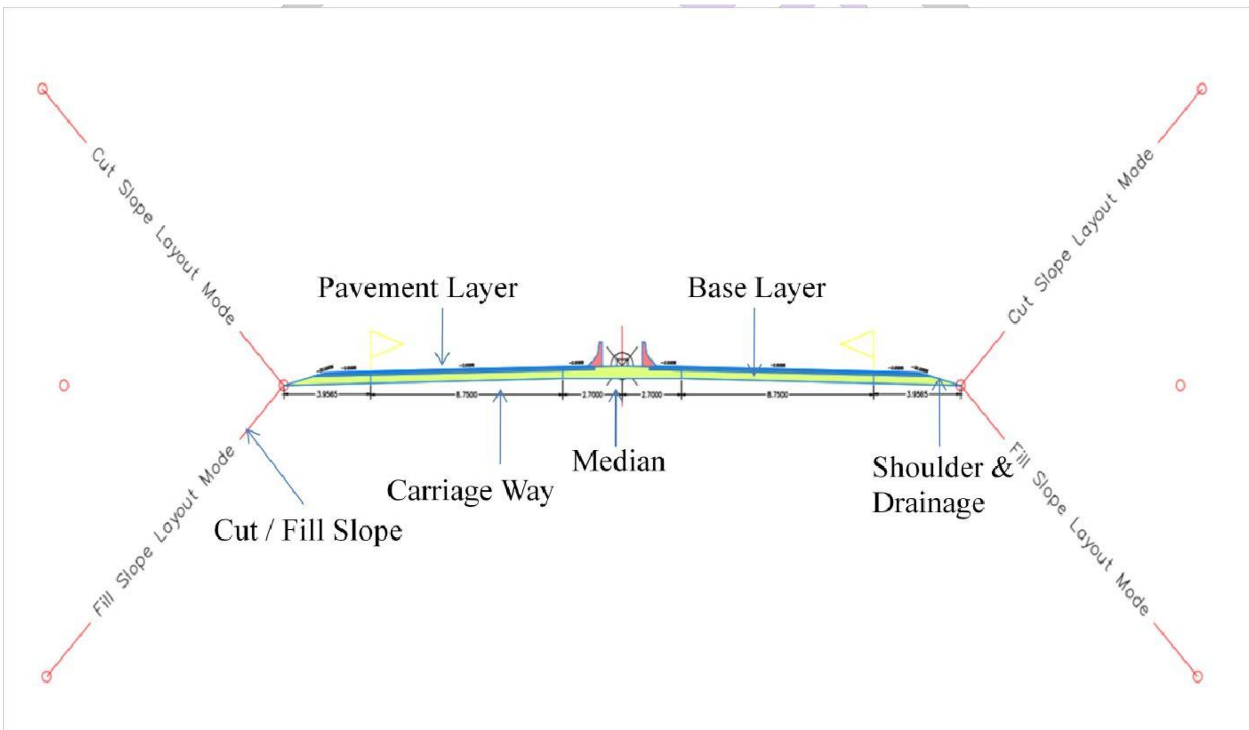


Fig. 6 Creating Road Assembly in Autodesk Civil 3D

VII. OUTPUT FROM SOFTWARE

1) Horizontal Alignment:

Table 1 Horizontal Alignment Values

Bearing	124 23 51.334
Length	5.51
Begin on Straight Chainage	0.000.000
Begin on Straight X	325544.569
Begin on Straight Y	1926768.598
Straight End Chainage	0+05.510
Straight End X	325550.079
Straight End Y	1926763.088

2) Vertical alignment:

Table:-2 Vertical alignment values

Gradient	- 1.23
Gradient Length	3.23
Begin on Gradient Chainage	0.000.000
Begin on Gradient Level	868.433
Gradient End Chainage	0+03.23
Gradient End Level	867.203

3) Earth work quantity:

Table:-3 Earth work quantity values

Points	Chainage	Volume of cut(m3)	Volume of fill(m3)
1	0	0	0
2	50	3340.93	0
3	100	3690.86	0
4	150	2012.48	0
5	200	630.46	1120.12
6	250	890.78	990.19
7	300	1531.42	591.53
8	350	1918.43	231.43
9	400	2629.37	103.43
10	450	1316.16	331.39
11	500	997.92	461.42
12	550	73149	574.18

VIII. RESULT AND CONCLUSION

- Design speeds are formulated for ruling design speed of 80 KMPH and minimum design speed of 30 KMPH
- The proposed alignment encounters minimum horizontal curve radius at one minor junctions where the speeds are restricted to minimum.
- The obtained base traffic volume data has been projected to a period of 15 years(2016-2031).
- High design precision and saving in time were achived by using Autodesk CIVIL 3D.

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