

PLANNING, DESIGNING AND PROPOSING A FLYOVER ROAD USING AUTOCAD CIVIL 3D SOFTWARE

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Abstract— With the increase in population, there is a continuous increase in the number of vehicles on the road. This increase in the number of vehicles also increases the chances of congestion at the road intersections which harms the normal traffic flow on road. Hence, to tackle the problem of road congestion at intersections a flyover must be built with proper designing. A Flyover can reduce the density of the traffic at the intersections by deviating the vehicles to the Flyover Road from the intersection area, under the flyover. This paper explores the designing procedures of Intersection and Flyover Road using the AutoCAD Civil 3D software. The AutoCAD Civil 3D software is used by the civil engineer professionals in the planning and designing of their projects. This software plays a very vital role in the designing process as it gives a 3D perspective view to the viewer which helps in a better understanding of the project. By using different features of the AutoCAD CIVIL3D software we can generate the total cut fill, Volume Report Sheets, etc. of that particular study area. The motive of designing of the flyover Road using the software AutoCAD Civil 3D is to get the maximum efficiency in the flow of the traffic by the use of accurate geometric design standards in a short duration of time.

Keywords— Flyover Road, AutoCAD Civil 3D, Road Intersection, Cutting and Filling Report, Volume Report

INTRODUCTION

The highways are constructed with a motive to provide comfort, safety to the road users and fluent movement of the vehicles on the road. But in the modern world, two things are increasing in parallel i.e. population and number of vehicles. This increase in the number of vehicles increases the traffic density on the roads which results in the road congestion at the intersections. Road congestion has a very negative impact on normal traffic flow. In India, the roads are classified into five major categories as per the Nagpur Road Plan i.e. National Highways(NH), State Highways(SH), Major District Roads(MDR), Other District Roads(ODR) and Village Roads(VR). This project deals with the designing of a flyover road above two intersecting National Highways.

There are mainly two structures that help in crossing over any obstacle for the safe movement i.e. Bridges and Flyovers. Even the purposes of both the structures are the same but then also there is a difference between them. The difference between Bridge and Flyover is that a bridge is constructed to cross over any water body like a valley, river, sea, etc. Where as a Flyover is constructed to cross over any congested area or road or any intersection of roads. Bridge and flyovers are structures providing passage over an obstacle without closing the way beneath. The construction of the flyover over the intersection will provide long-lasting benefits to the road users in a way by reducing the traffic congestion at the intersection and also it will increase the aesthetic view.

The designing process of Flyovers is a complex task when done by manual methods that require creativity and practicability, whereas designing a flyover using AutoCAD Civil 3D software helps in saving time and energy which results in the completion of a project on time. In the fast and continuous digitally upgrading world, many computer software has been developed to solve the problems occurring in different fields. One of this software is AutoCAD Civil 3D which is a prime software in the field of designing models related to Civil Engineering. With the use of AutoCAD Civil 3D software, the designing process of the Flyover Road becomes more efficient, more accurate and time- saving as compared to designing the same Road by manual methods. We can see the 3D view of the Flyover Road and the road intersection which would be under the flyover on the same computer screen. The Highways and the Flyover Road are constructed keeping a fact in mind that it will also help in the transportation of goods and materials that will help a country in its development and also these will increase the aesthetic view. The designing steps of the proposing Flyover Road and the Road Intersection under the Flyover is portrayed in this paper.

DESIGN METHODOLOGY

A. STUDY AREA AND LOCATION

The study area is located in Prayagraj (Allahabad) district of Uttar Pradesh. The intersection point links two National Highways i.e. the NH35 (links Kairahi and Varanasi, UP) and the NH30 (links Sitarganj, Uttarakhand and Ibrahimpattana, Arunachal Pradesh). The proposed flyover road will be designed above the intersection and along with the mentioned National Highways.



Fig. 1 Google map image of the study area

B. DATA COLLECTION

The ground surface data are required for designing the geometry of highways and flyovers. The DEM surface file was obtained from the firm handling the development of the road. The survey information is in the form of DEM (Digital Elevation Model) having the file extension as .dem. It is a gridded raster representation of DTM (Digital Terrain Model).

C. DESIGN CRITERIA

ROAD

- Design Speed = 60 kmph
- Slope = -2%
- Number of Lanes = 4
- Roadway width = 23 m
- Road widening on both sides = 3 m
- Carriageway width = 16 m
- Curb width = 0.150 m

FLYOVER ROAD

- Design speed = 40 kmph
- Slope = -2%
- Number of lanes = 2
- Flyover road width = 7 m
- Super elevation = 7%
- Curb height = 1.5 m

D. DESIGN PROCEDURE

- Import the surface file into the Civil3D software
- Create 2 intersecting alignments on the surface
- Create a flyover alignment above the intersection
- Calculate the superelevation at the flyover curve

- Create surface profiles
- Create different assemblies for corridors
- Create corridors for intersecting roads and the flyover
- Perspective view of the project

The above design procedure has been represented below with the help of figures

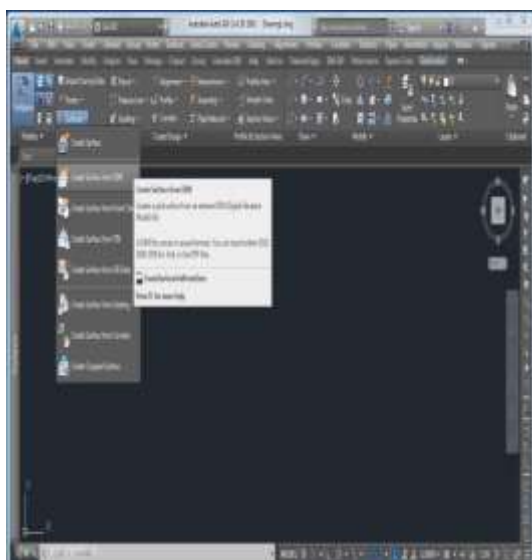


Fig.2 Importing file into Civil3D software

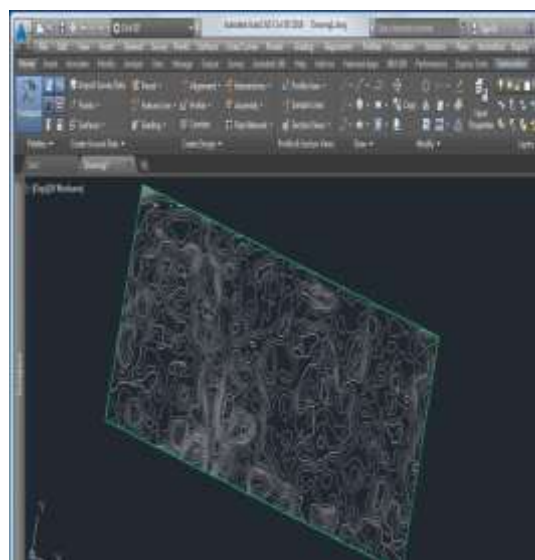


Fig.3 Surface Creation

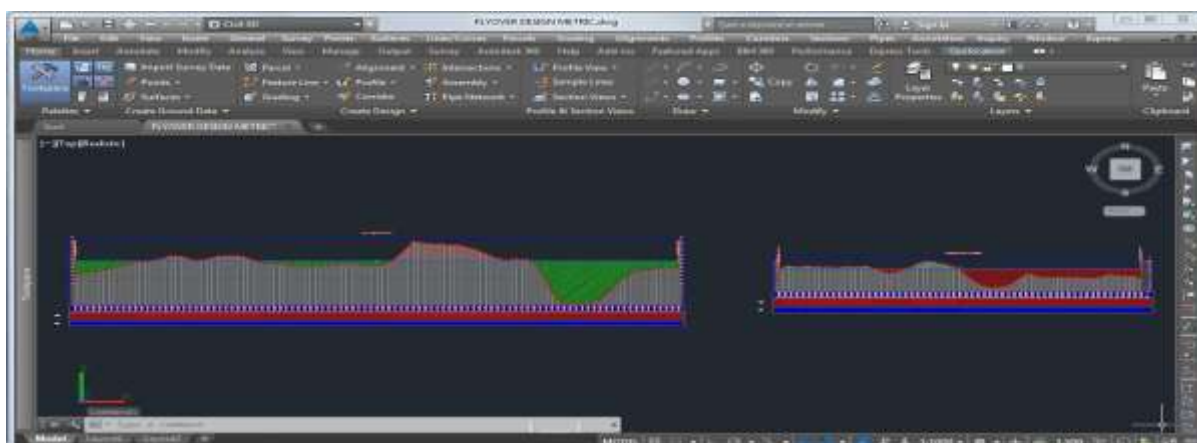


Fig.4 Profiles of both intersecting roads

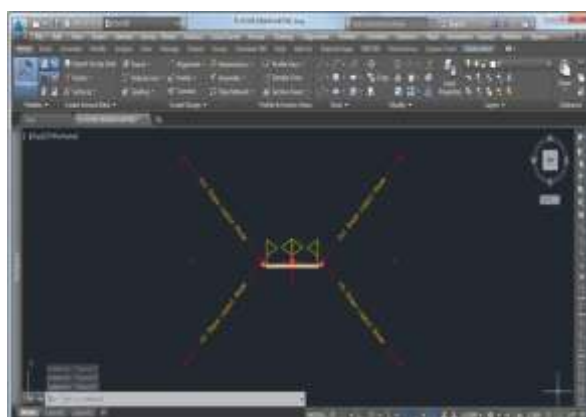


Fig.5 Assembly

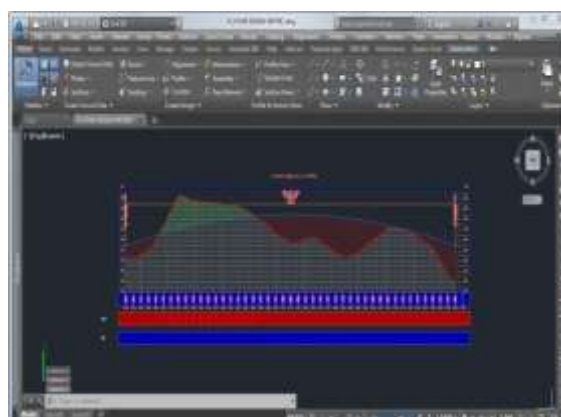


Fig. 6 Flyover Profile

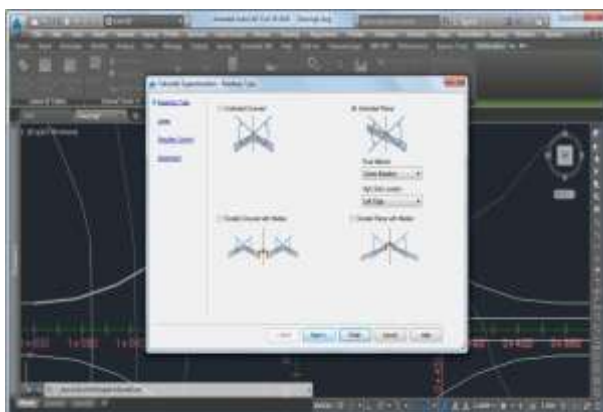


Fig.7 Superelevation Wizard

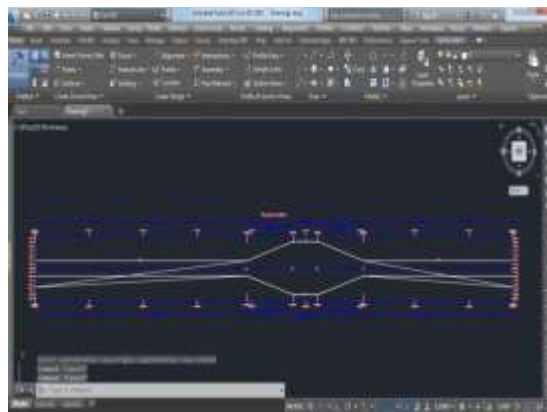


Fig.7.1 Superelevation View

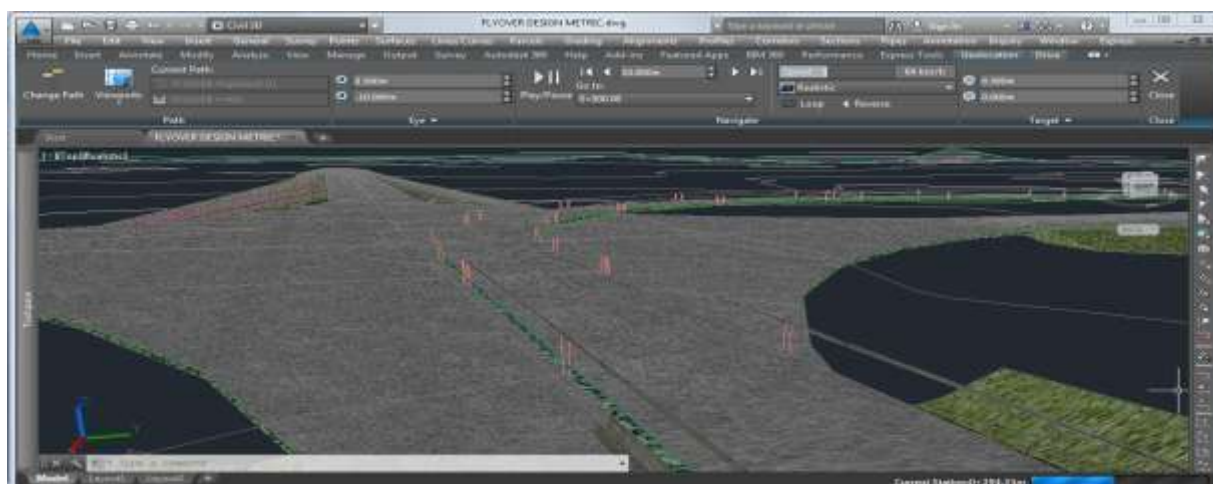


Fig.8 Perspective view of the Intersection and the Flyover Road

OUTPUT

Cut/Fill Summary						
Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
ALLD EARTHWORK CALC. (1)	1.000	1.000	5437.24sq.m	6396.56 Cu. M.	278.78 Cu. M.	6117.78 Cu. M.<Cut>
NAINI EARTHWORK	1.000	1.000	25841.53sq.m	21734.80 Cu. M.	30778.72 Cu. M.	9043.91 Cu. M.<Fill>
Totals			31278.77sq.m	28131.37 Cu. M.	31057.50 Cu. M.	2926.13 Cu. M.<Fill>

CONCLUSION

1. The paper has presented the features and the designing process of an intersection and a flyover road using AutoCAD Civil 3D for better transportation facilities.
2. The Superelevation is one of the greatest features of any road and is used in all the road designs project but when used in the designs of road intersection using AutoCAD Civil 3D software, it provides engineers with a valuable resource for creating compelling designs for years to come.
3. The superelevation at the flyover curve was calculated using the feature of Civil3D software and was assigned to the flyover alignment.
4. The AutoCAD Civil 3D software manages to reduce the efforts of human beings in the designing process of the required structures of the project and provides more precise results of the design.

5. With the use of AutoCAD Civil 3D software, the total time taken to complete the project can be reduced in comparison with the time taken in manual methods.

REFERENCE

1. Autodesk, "Civil Engineering Design/AutoCAD Civil 3D", Available from <http://www.autodesk.com/products/autocad-civil-3d/features/all>. Accessed February 2017
2. Auttakorn SALA, Assesment of traffic flow benefits of flyovers: A case study, Journal of Society for Transportation and Traffic Studies (JSTS) Vol.4 No.3
3. Raghu Veer, S., Gupte, S., and Juremalani, J. (2018). "A Review of Literature on Geometric Design of Highway." IRJET, Vol 05, 138-141.
4. S.A. Raji, A. Zava, K. Jirgba, A.B. Osunkunle. "Geometric Design of a Highway Using AutoCAD Civil 3d", Journal of Multidisciplinary Engineering Science and Technology (JMEST), Volume 4, Issue 6, June 2017.
5. Neeraj and Kazal, S (2015) "Geometric Design of Highway" IJERIA, Vol.14, Issue 01.
6. IRC: 38-1988. "Guidelines for design of horizontal curve"
7. IRC-SP: 23-1993. "Vertical Curves for Highway"
8. IRC: SP: 84- 2014 Manual of specifications and standards for four laning of highways