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# A Review-Geometric Design of Highway with the Help of Autocad Civil 3D

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***Abstract:*** ***Roads make a crucial contribution to the development and economic growth, bringing considerable social benefits. Roads are paramount for growing and developing a country. Roads are opening up more areas and improving social and economic development. The location of design for highway's centerline on a surface is called alignment. Alignment's primary requirement is to be short, easy, safe, and economical. Horizontal alignment, vertical alignment, and cross-section are the three main parts of geometric design.***

***This paper shows a typical design of roadway with the support of AutoCAD Civil 3D.AutoCAD Civil 3D design software helps in a comfortable and relaxed way to achieve design. Civil 3D design is simple and easy to grasp to build alignment, AUTOCAD civil 3D uses the topography and survey data collected from LIDAR or similar technology. Once the alignment has been demarcated, the geometry can be tested and evaluated using the IRC standard and requirements using The civil 3D built-up software. Once horizontal geometry has been achieved, vertical geometry can also be optimized. Civil 3D uses integrated checks for transition length & sight distance to analyze horizontal geometry and vertical geometry, thus avoiding tired calculations Also civil 3D also helps make use of catchment and contours in drainage design. Hence, software is very useful and also user-friendly for a three-dimensional roadway design***

***Keywords:*** ***AutoCAD Civil 3D, LIDAR, Civil 3D.***

## I. INTRODUCTION

Highways are required to make certain to assure users consolation and safety, to allow effective traffic movement. Highways are also predicted to reason the least harm to the environment and be aesthetically desirable in their finished form. The geometric layout of roads has three fundamental parts which is horizontal and vertical alignment, and cross-sections, that once combined give a 3-dimensional format for a road.

Geometric design suggests that through these demands met. Horizontal alignment has three geometric components, including curves, tangents, and transition.

Vertical alignment is a longitudinal section, together with such geometric additives as crest curves, sag curves, the gradients interfacing them. Highway geometry additives depend upon chosen, estimated and in a manner that fulfils such design standards like sight distance, driver consolation, drainage, economy, vehicle stability and aesthetics. In design process includes drafting, numerous analyses and calculations.

The undertakings performed by highway design engineer incorporate making the alignment and plotting profile of roads consisting of coordinates and elevations, horizontal curves radii, vertical curve length, sight distances calculation and earthwork quantity computation, and various calculations and analyses planned for the optimum alignment while fulfilling design standards and limitations. In early

Years of auto cad, the design was performed separately from the drafting and production of final drawings. Civil 3D update has changed this paradigm so that design as well production is performed simultaneously. When executed manually, geometric design may be very cumbersome, tedious and quite helpless to costly blunders, the traditional technique is also based especially on a two-dimensional analysis that doesn't make certain a pleasant layout.

Current trends depend on using a very advanced computer te-chnology for roadway geometry design that offers amazing exactness and saves lots of time and exertion. Highway design poses enormous challenges without 3D mod-eling. It takes a lot of time to cut and fill the Computations.

The volume computation method can be accomplished with an objectoriented approach automatic and accurately. The goal is to demonstrate how geometrical design can be done very quickly and accurate in a short time to enable civil engineering professionals from the developing world to use road design. In This paper shows a typical design of roadway with the support of AutoCAD Civil 3D.

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## II. LITERATURE REVIEW

Matthew G. Karlaftis and Ioannis Golias. They considered connections between road geometric qualities, mishap rates and their forecast dependent on regression technique. The principal objective is to build up a method that quantitatively surveys the impacts of different interstate geometric attributes on pavement condition, accident rates, and geometric design factors.

Ali Aram . Author contemplated, higher accident rates on horizontal curve. Roadway and geometric highlights that impact well being at even curve segments are:

Traffic volume, Curve highlights, for example level of curve, curve length, super elevation, and nearness of progress curve, Cross sectional curve component, Roadside hazard features like rigidity, clear slope, and types of obstacles on curve section, SSD at curve, Vertical alignment on horizontal curve, Distance to contiguous curves, Distance of curve to the closest convergence, driveway, so forth, Pavement friction.

Anitha Jacoba1, Dhanya Rb, Anjaneyulu,M.V.L.Rc .They Present geometry control speed of vehicles. Instant change in alignment causes crash. Inconsistency in alignment causes unnecessary speed variation leads crashes. Technique used for modelling is multiple linear regressions.

Hameed aswad mohammed. Lane and shoulder conditions legitimately influence run-off roads and accidents. Median deals to reducing specific accidents, for example head-on collisions.

A median, barriers, reduces the accidents. Accident on two-lane rural roads has high probability at horizontal curves, intersections and bridges.

Asok kumar et.Al . They present Mx-road has geometric design with excessive precision.

Vikas Golakoti . They study geometric factor role on the road to rate of accident for plain terrain also aims to know impact of horizontal curve, vertical curve, extra widening, sight distance, horizontal radius, super elevation, vertical gradient, value of k at the accident rate.

S.A.RAJI .They present typical highway design with the help of civil 3D which makes the process of design short and easy with amazing precision as compares to manually.

Nisargak .They studied of rural highways design using civil 3d. Illustrate the proposed alignment comfortably generates a volume report sheet with curves such as tabular form.

Manoj Mandal .Presenting geometric layout of road the usage of AutoCAD civil 3D.

## III. AUTOCAD CIVIL 3D

### *A. Summary of the Workflows*

This is a summary of the workflows for basic road construction with the help of AutoCAD Civil 3D.

*1)* Creation of existing surface using a notepad files which includes Northing, Easting, and Levels CO-ordinates.
*2)* Model Alignment- Alignment is the primary horizontal route usually reflecting the road's baseline. Alignments designed using polylines.
*3)* Apply design criteria-This includes variables of speed, superelevation etc. Warning alerts when planning a conforming alignment.
*4)* Produce existing profile and design grades-display existing surface data and create finished levels for design alignment. Using profile evolution tools finished profiles can be created graphically.
*5)* Create assemblies
*6)* Design the horizontal geometry, vertical geometry and cross-sectional design features in the corridor-combination.
*7)* Analysis of corridors used to calculate embankments, cutting and filling volumes, conduct visual study, extract information for site.

### *B. Design Methodology*

*1)* Survey data collection- Available surface data collected like coordinates and elevation.
*2)* Technical Criteria
*3)* Horizontal Alignment Model
*4)* Vertical Alignment Model
*5)* Necessity for Cutting & Filling

## IV. DESIGN PROCEDURE

*A.* Import survey data from PNEZD file.
*B.* Create existing surface
*C.* Mark Polyline on exiting center line of road
*D.* Designed according to design proposed alignment in design based criteria selected in civil 3d similarly manually checked from IRC: 38-1988 for transition length for different speed, speed curve radii.
*E.* Generate existing profile by surface
*F.* Create road top level considering hydraulic calculation at structures by profile creation tools, primarily by Polyline.
*G.* Create assembly is an arrangement of cross-section features found on a roadway. It represents a typical section of the corridor that positions an alignment and a profile.
*H.* Create an assembly using subassembly for cross-section elements such as lanes, kerbs, sidewalks, shoulders, and side slopes.
*I.* Generate a corridor which in itself is a cross-sectional, horizontal design element of the 3D model used for cutting and filling calculations.
*J.* Generate quantity report.

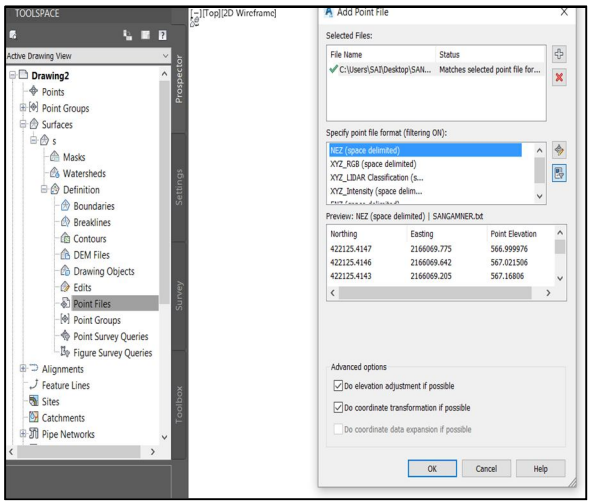


Fig.1. Import survey data

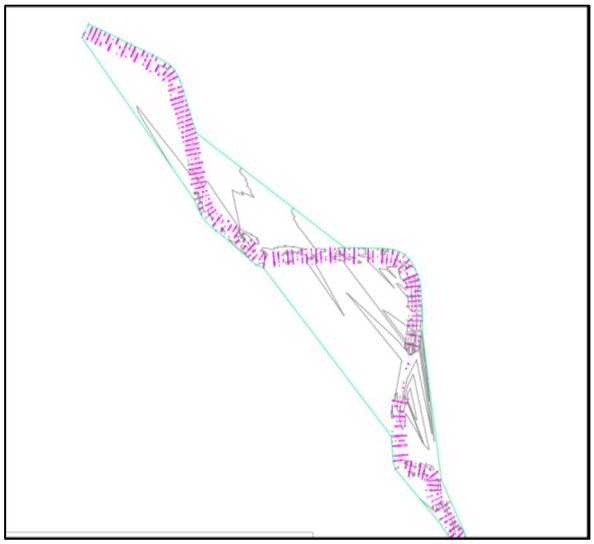

Fig.2. Create Existing Surface

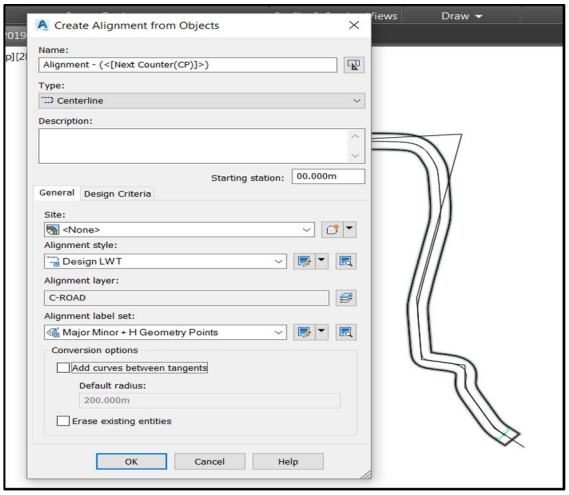


Fig.3 Create Alignment from object

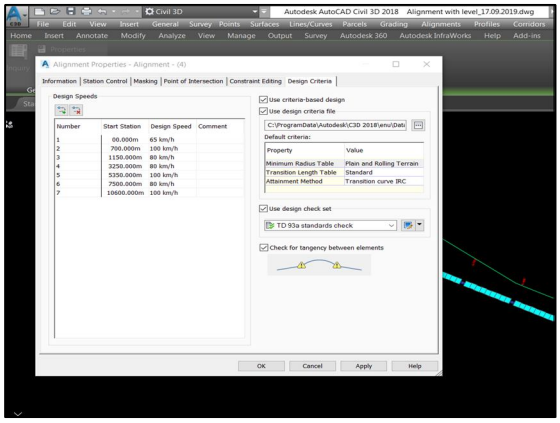


Fig.4 Check Design Based Criteria

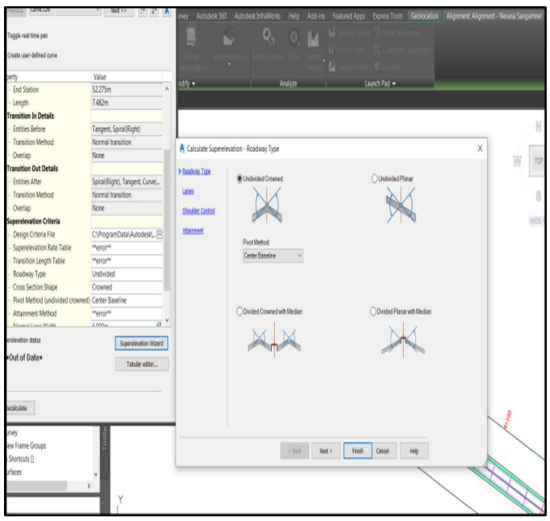


Fig.5 Calculate super elevation

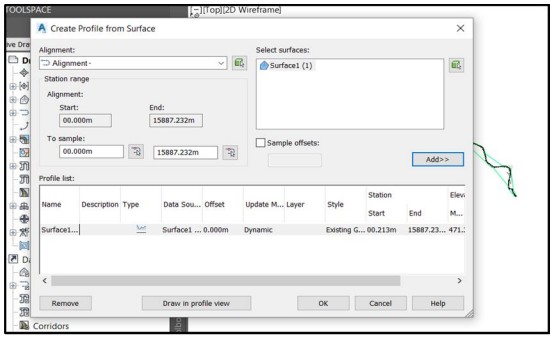


Fig.6 Create Profile from surface

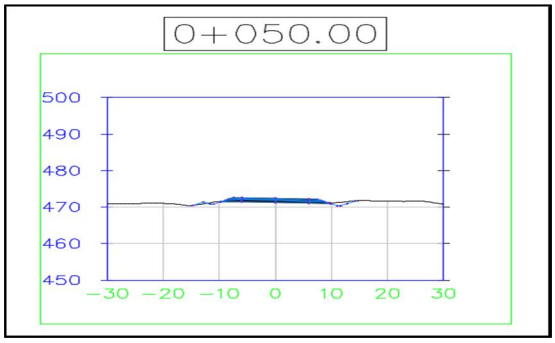


Fig.09 Create Section view

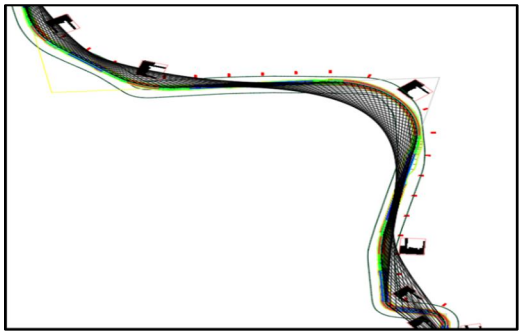

Fig.10 Create Sight Distance view

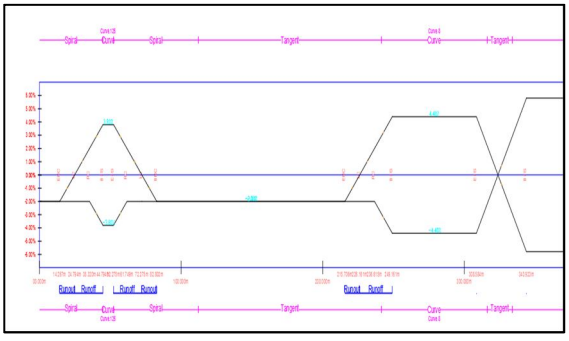

Fig.11 Create Super elevation view

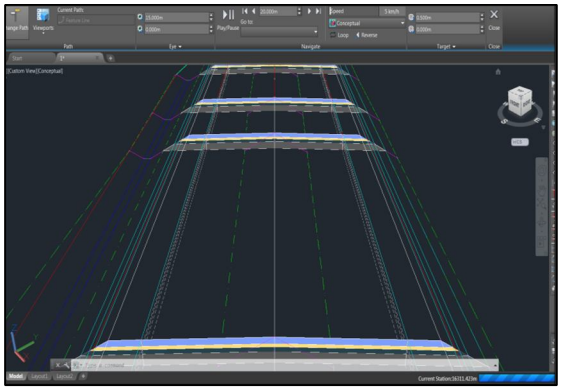

Fig.12 Drive View

## V. CONCLUSION

The outcomes of geometric design given here should be mentioned after reviewing different sources and past work

*A.* Highways Geometric design with the help of AutoCAD civil 3D can be said to be extremely useful and also user-friendly for a three-dimensional roadway design.
*B.* According to IRC, the geometrics of the highways and AASHTO were also considered as all safety measure
*C.* It provided horizontal alignment, it drafted vertical profile, and Cross-segment can be established.
*D.* Super Elevation was applied and determined.
*E.* Geometric design must at reduced cost offer maximum traffic flow efficiency and safety intent.
*F.* Super elevation and road widening at horizontal geometry should take extra care while planning.
*G.* Sight distance and vertical alignment will result in less propulsive force resulting in less fuel consumption.

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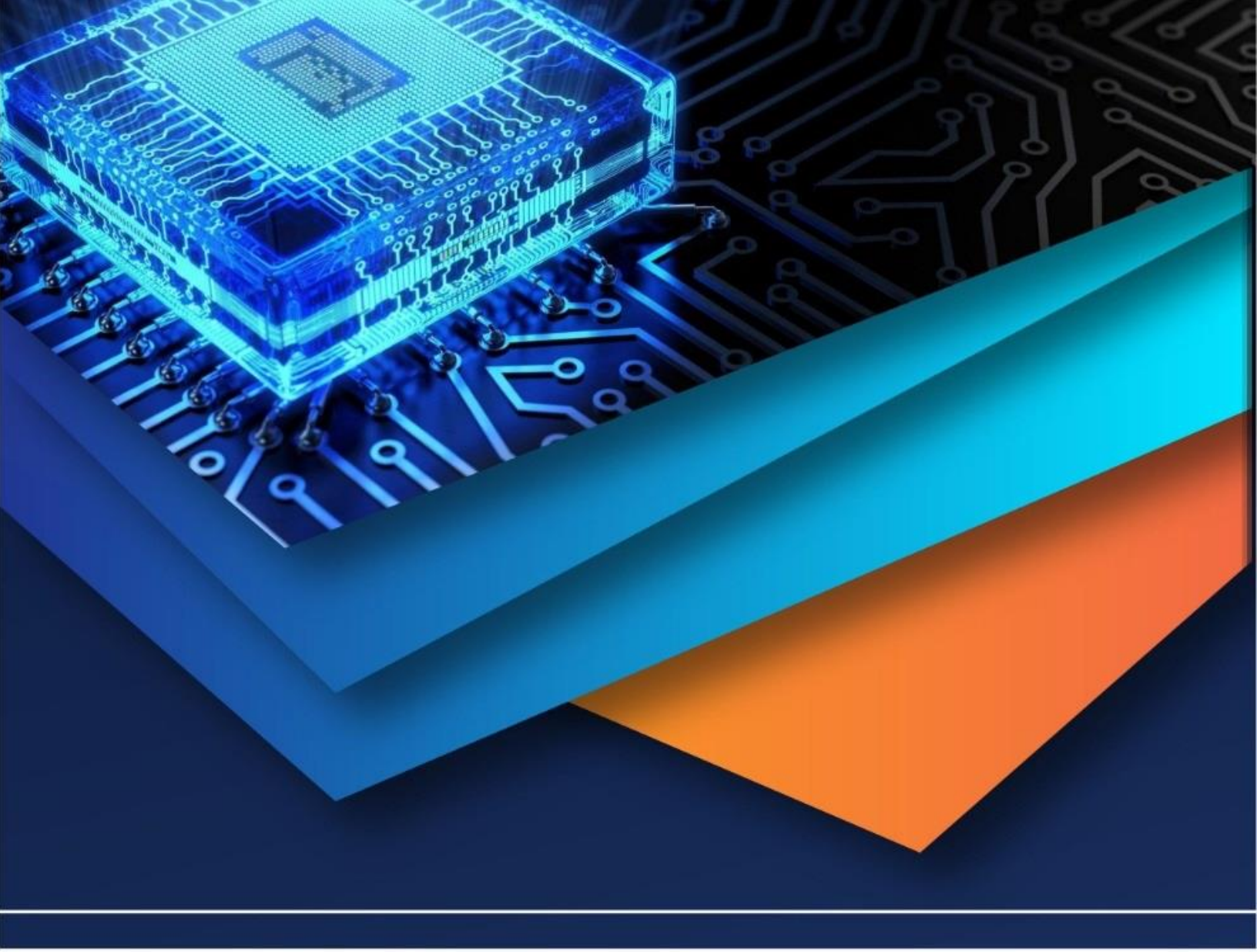

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