Planning And Design Implementation of A Vidisha City Road Using Mx Road And Google Earth

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Abstract- *Mathematical plan includes the foundation of a street arrangement that sticks as far as possible and guidelines of the site. The primary objectives are cost reduction, environmental minimization, and achieving maximum efficiency and safety. The next step in increasing a road/highway engineer's value is learning software that can be used to apply their knowledge of road geometric design.*

The objective of this study is to find out how to make an interpretation of street mathematical plan into programming and how it connects with the plan guidelines used in the program.Bentley MX ROAD is a powerful string-based modeling tool for quickly and accurately designing various kinds of roads.

Keywords- Geometric design, road alignment, design standards, MXROAD software

I. INTRODUCTION

Transportation is critical in our everyday existence. We travel almost every day, whether to get to work or school, shop, or have fun. Besides, essentially all that we eat or utilize has been moved at some point. There are different methods of transportation accessible, however we will zero in on street travel in this text. The infrastructure, society's economy, and our daily lives are all dependent on highways.

The construction of a high-quality road network boosts a nation's economic production and makes a location more appealing to businesses by reducing transit times and costs. The society's capabilities can be utilized faster, more effectively, and for less money if the structure is improved.

Bentley MX Road

Bentley MXROAD Suite integrates CAD, mapping, GIS, and business tools like PDFs, i-models, and hypermodels for information-rich modeling. An innovative approach to designing civil components within the context of a total project is incorporated into the software's immersive, 3D parametric modeling. Leading engineering design firms and global transportation agencies rely on MXROAD Suite for their design needs.Bentley Systems, a company based in the UK, developed MXROAD in 1996.

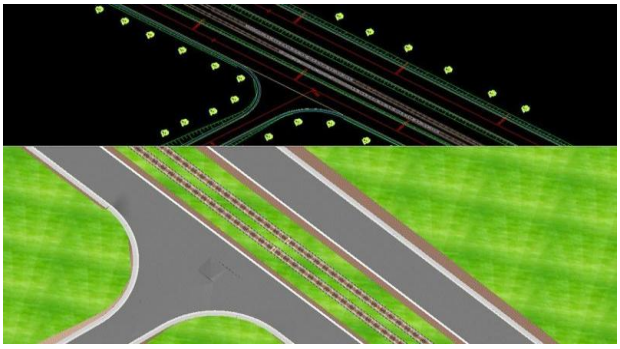

Fig1. MX Road

Google Earth

High-resolution free images from Google Earth (GE) can be used for regional land use and cover mapping, particularly in areas with a lot of different landscapes. Within excess of 200 million clients since its delivery in June 2005, Google Earth (GE) has as of late been perceived for its capability to work on the representation and dispersal of logical information altogether.

Fig 2. Google Earth

Road Safety

Street traffic security alludes to techniques and measures for decreasing the gamble of an individual utilizing the street network being killed or truly harmed. The clients of a street incorporate walkers, cyclists, drivers, their travelers,

and travelers of on-street public vehicle, fundamentally transports and cable cars.

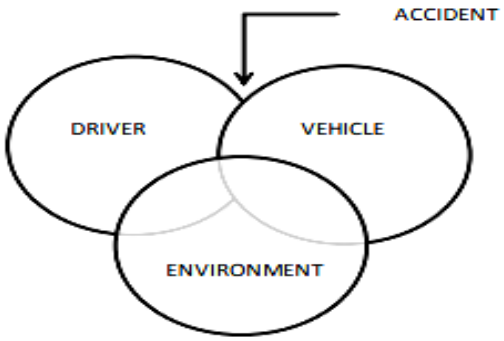

Fig 3. Causes of Accident

Black Spot

In street wellbeing the board, a mishap black spot or dark spot is where street car crashes have generally been concentrated. It could have happened because of a sharp drop or corner in a straight road that hides oncoming traffic, a hidden junction on a fast road, or inadequate or hidden warning signs at a crossroads.

Fig 4. Black Spot

II. LITERATURE REVIEW

HemantChakole (2022), this review paper uses AutoCAD Civil 3D and the manual method to show how a roadway is typically designed. Modeling can be completed with ease and convenience thanks to modeling software. Building alignment with civil 3D modeling is quick and simple to comprehend.

It was discovered that the expectations for highways are to ensure the comfort and safety of users, facilitate efficient traffic operations, and draw the lowest possible cost for construction and upkeep. In addition, highways should, when completed, have a minimal negative environmental impact and be aesthetically pleasing. These requirements are satisfied through the use of geometric design. "Geometric design focuses on the specific measures that provide for efficient and appropriate operation of the road, as well as provide for all the specific details that make roads safe and compatible with social and environmental circumstances surrounding the road," according to the American Association of State Highway and Transportation Officials.

Nishameena (2022), with a particular emphasis on highlighting the significance of careful planning and designing of these geometric features, this paper attempts to provide an extensive overview of previous research efforts in the field of highway geometric design. Although there are many factors that affect highway design, this study emphasizes how important it is to choose a geometric design that is appropriate and supports the goal of reaching maximum efficiency in traffic operation, guaranteeing satisfaction and safety precautions, and doing so at a reasonable cost.

Based on the findings of previous studies and a variety of sources, a roadmap that emphasizes the most important goals and factors needed to achieve the best possible geometric highway design is presented. Prioritizing safety over anything else and moving traffic as efficiently as possible within the bounds of reasonable cost are at the forefront of these goals. Maintaining the efficacy and sustainability of highway infrastructure requires striking this careful balance.

III. DESIGN METHODOLOGY

Approach took on for the review

Mishap records are known by enquiring local people and with the assistance of police. The survey is now completed by leveling the road's center line at intervals of ten meters. The interval can be changed up to 5 meters for curves. the overview should be possible by utilizing GPS or reference focuses from the information accessible in the area.

Data Collection and Extraction

The research road at Vidisha, which is close to SATI College and falls under the category of plain and rolling terrain, was chosen. It connects the Durganagar and Ahmedpura Squares and is 0.760 meters long.

Deflection Angle

The angle that the tangents subtend is the deflection angle, as shown in the above figure.

Horizontal Arc Data

Arc length is calculated from the curve's starting point for one tangent to the starting point for the other tangent

using the figure. This is measured in meters and is referred to as the horizontal arc length.

Super Elevation

A digital terrain model has been created using the MX Road software, and it is from this that we can determine the road's super elevation. Normally, it is higher at the road's edge where it is not curved.

Rate of change of Superelevation

The super elevation and the change in super elevation for every 10 m interval are calculated from the digital terrain model created with MX Road software. This allows for the calculation of the super elevation change rate. One inch equals n meters.

Vertical Gradient

The software provides a section of the road's center line based on the model created with MX Road, and the location's existing section is used to measure the vertical grade.

Vertical Curve Length

The software generates a model from which the vertical curve length (VCL) is determined. This can be found as a parabola by calculating the length of the arc connecting the two grades. The unit of measurement is meters.

K-Value

It is also referred to as the vertical curve's equivalent radius. It provides information about how flat the vertical curve is. The vertical curve length to the vertical grade change is the ratio. The distance needed to change the gradient by 1% is known as the K-value. The formula for it is

$K=VCL/\Delta g.$

Visibility

The software along the road provides visibility or sight distance at intervals of 10 meters. It is the distance that a driver can stop their car before it collides with an object on the road, or it is the distance that the driver can safely view the road without any obstacles.

Extra Widening

Additional widening is also included in horizontal alignment along curves. Tom V. Mathew's transportation engineering book examines this. It is the additional length of road that is provided for turnings and curves in addition to the carriageway that is provided for straight alignment. It is done on the grounds that the back tires of a vehicle for the most part travel a more limited way than those of the front wheels.

IV. PROBLEM STATEMENT

Vidisha (previously referred to as Bhelsa and known as Besnagar in old times) is a city in focal Madhya Pradesh, India. It is found 62.5 km upper east of the state capital, Bhopal.

Geometrical Factors of Road Terrain

Table 1. Classification of Terrain

Terrain Classification	Slope of location (%)
Plain	Less than 10
Rolling	Greater than 10 up to 25
Mountainous	Greater than 25 up to 60
Steep	Greater than 60

Horizontal Alignment

The placement of a road using a set of straight lines called tangents joined by circular curves is known as horizontal alignment, and it is depicted in the plan view. Tangents and horizontal curves define this. The Indian Road Congress (IRC) guidelines for the horizontal curve are displayed below.

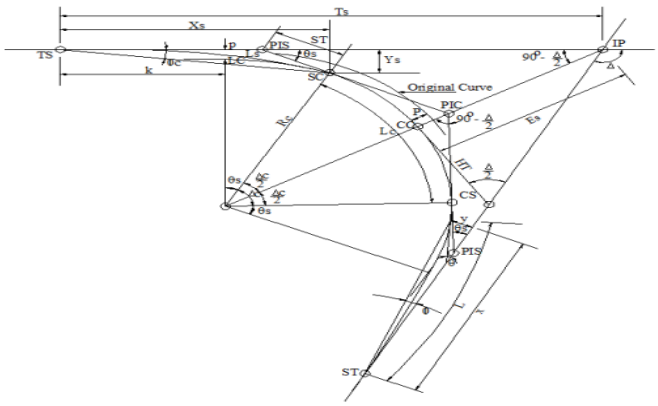

Fig 5. Horizontal Alignment

Vertical Alignment

The existence of heights and depths in the vertical axis relative to the horizontal axis of alignment is the general definition of the vertical alignment of a highway. Roads may have these depths and heights in the form of vertical curves or gradients, which are simply straight lines in a vertical plane. This is the portion of the road where the gradient changes longitudinally. Gradients and vertical curves characterize it. Gradient, which is expressed as a percentage or ratio expressed in degrees, is the rate of rise relative to the horizontal over the length of the road.

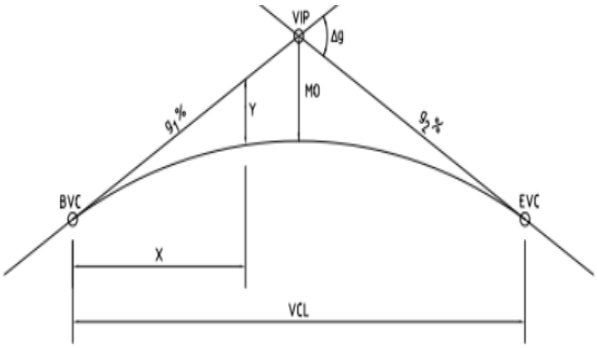

Fig 6. Vertical Alignment

Super Elevation

In roadway curves, superelevation is a construction technique in which the outer edge of the pavement is raised above the inner edge. A part of the upward arrangement or "profile" of a street saw in cross-segment, it's a significant wellbeing component in the plan measures of any street with bends.

Sight Distance

The distance along the middle line of the street at which a driver has perceivability of an item, fixed or moving at a predetermined level over the carriage way is known as sight distance.

Cross section of Road

Cross section of roads is the number of segments the road is divided into such as lanes, side walk, earth slope, etc.

Annual Average Daily Traffic (AADT)

Yearly Normal Day to day Traffic is the quantity of vehicles crossing a place of the street in the two bearings in a single year and afterward determined each day in the year. Divide the number of days in that year by this number.

Road Map of the Layout

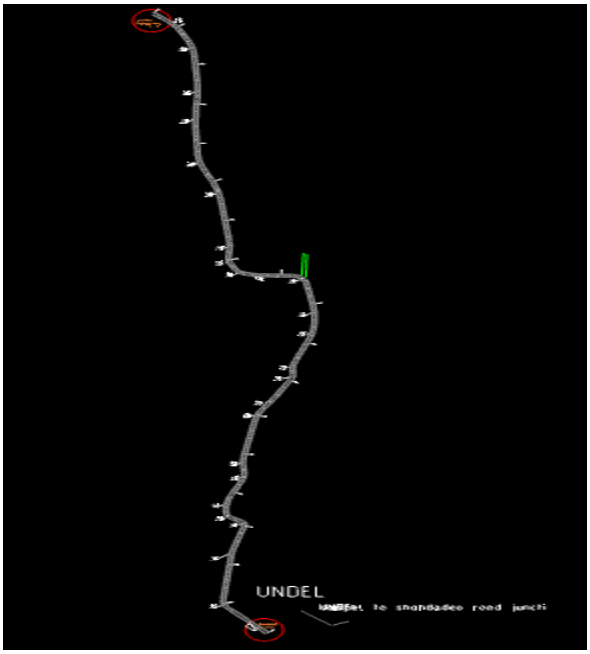

Fig 7. Points Collected using Total Station

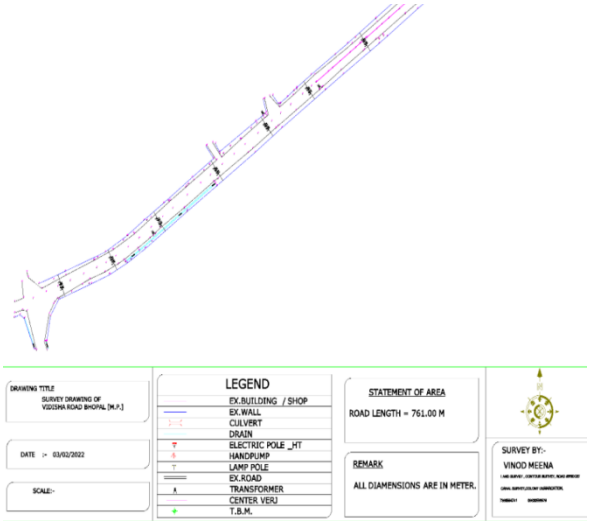

Fig 8. Road Profile

Fig 9. Profile Path

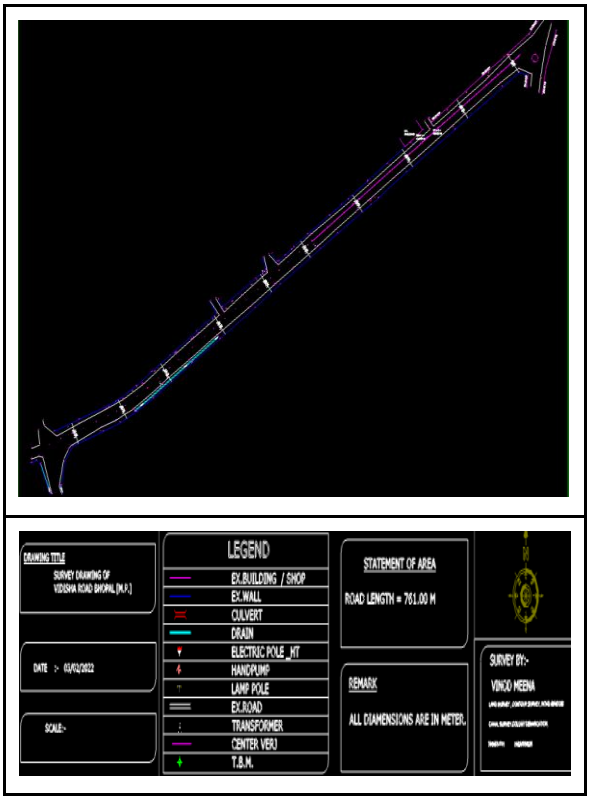

Fig 10. Road Alignment using MX Road

V. RESULTS AND DISCUSSION

Accident Rate

It is the ratio between number of accidents in a year and number of vehicles with length of study corridor in that year. It is expressed as crashes per million vehicle kms of travel.

AR= C x 100,000,000/Vx 365 x N x L

Horizontal Radius

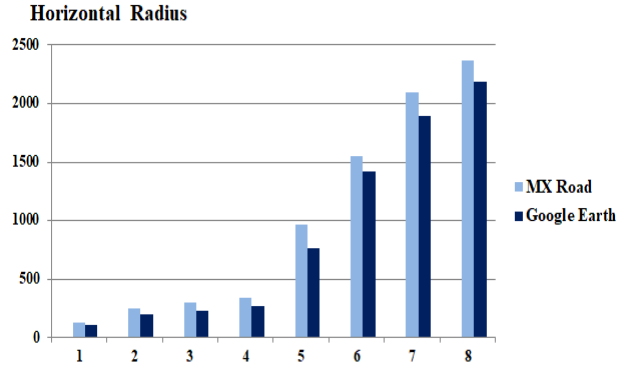

Fig 11. Horizontal Radius

Angle of Deflection

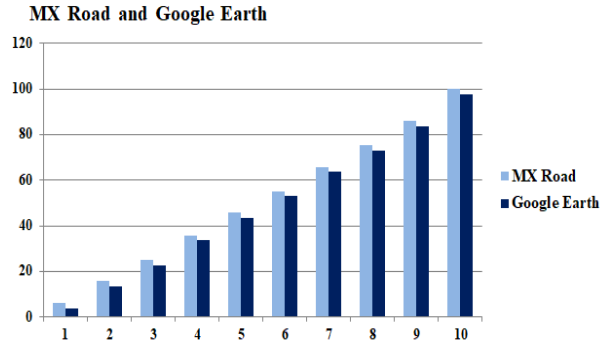

Fig 12. Deflection Angle

Horizontal Arc Length

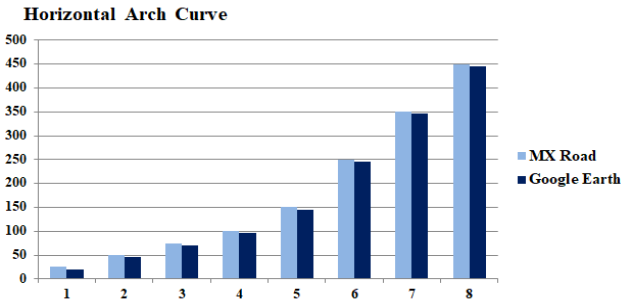

Fig 13. Horizontal Arc Curve

Super Elevation

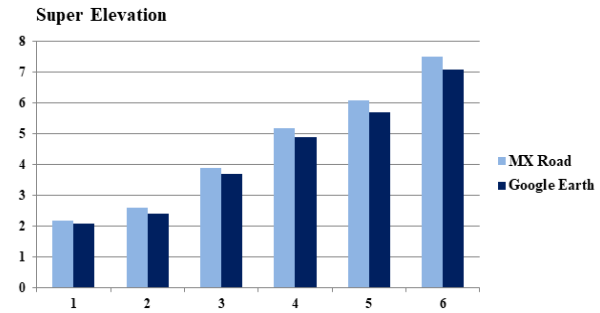

Fig 14. Super Elevation

Rate of change of super Elevation

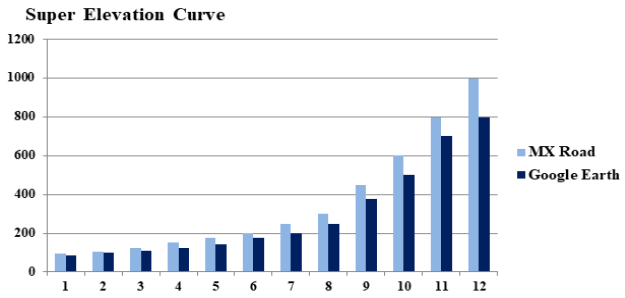

Fig 15. Super Elevation Curve

VI. CONCLUSION

- The regression has been carried out, and the result is that the horizontal radius has a R2 value of 0.82, which is closer to one.
- The results show that the R2 value for Super elevation is 0.89, which is closer to 1 and is therefore a significant factor. In the case of a highway in plain or rolling terrain, the R2 values for visibility and K-value were found to be 0.87 and 0.89, respectively.
- The P esteem is <0.005 for 95% degree of importance which is the likelihood and subsequently the qualities got above are critical.
- The different in upsides of Google earth and Mx road is found in series of test with holes of 15%.

Consequently while planning a street in plain and moving territory these mathematical elements to be specific Even range, K-worth, Superelevation and perceivability must be given more significance.

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