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Comparative Study of Manual and Software-Aided Rotary Intersection Design Using AutoCAD Civil 3D

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Abstract—The rapid increase in vehicular traffic on highways has led to rising concerns regarding congestion, delays, and road safety, especially at intersections. Rotary intersections, which allow vehicles to circulate around a central island, provide an efficient solution to reduce conflicts, improve traffic flow, and enhance pedestrian safety. This study presents a comparative analysis between manual and software-aided methods for designing rotary intersections, with a specific focus on the application of AutoCAD Civil 3D software. The primary objective is to assess the efficiency, accuracy, and cost-effectiveness of using AutoCAD Civil 3D compared to traditional manual design approaches. The selected site for this study is the rotary intersection at Santoshi Nagar Chowk in Raipur. The design was first developed using manual methods based on IRC standards and then replicated using AutoCAD Civil 3D to evaluate differences in time consumption, design accuracy, earthwork estimation, and visualization capabilities. The results demonstrate that AutoCAD Civil 3D significantly improves design efficiency by automating complex tasks such as corridor modeling, surface creation, and earthwork quantity calculation. It also offers enhanced 3D visualization, dynamic editing capabilities, and better documentation. While manual methods are still relevant for basic design understanding and calculations, they are more time-consuming and prone to human error. This comparative study concludes that software-aided design using Civil 3D not only saves time and resources but also ensures greater precision, making it a preferred tool for modern transportation engineering projects.

***Index Terms*—AutoCAD Civil 3D, Rotary Intersection, Manual Design, 3D Visualization, Earthwork Report, Comparative Analysis.**

1. Introduction

A. General

Road transport is one of the most common modes of transport. Roads in the form of track ways, human pathways etc. were used even from the pre-historic times. Since then, many experiments were going on to make the riding safe and comfort. Thus, road construction became an inseparable part of many civilizations and empires. In this chapter we will see the rotary intersection and their characteristic features.

B. About Highway

Highways play an important role in making travel easier and more expedient. This is of great assistance whether travelling for work or play as well as travel involved transporting goods. Highway systems have made expansion possible, provided a convenient means to travel for more lucrative career opportunities, and allowed businesses to expand and grow nationwide. Highway transportation is especially important when it comes to the economy. A large number of companies and corporations rely on the expedience of delivery of their goods and services over the road in order to compete in the fast-paced business world. Highway provide the quickest route from point A to point B, meaning that those who must use this method of delivery will need to utilize the fastest and most direct means of road travel. The highway system becomes very important. Since time equals money the shortest, most direct route will prove to be the most lucrative.

C. About AutoCAD Civil 3D

AutoCAD Civil 3D software is a design and documentation solution for civil engineering that supports building information modeling (BIM) workflows. By learning to use AutoCAD Civil 3D, you can improve project performance, maintain consistent data, follow standard processes, and respond faster to change. Civil 3D is an engineering software application used by civil engineers and other professionals to plan, design, and manage civil engineering projects. These projects fall under the three main categories of land development, water, and transportation projects; and can include construction area development, road engineering, river development, port construction, canals, dams, embankments, and many others. Civil 3D allows is used to create three-dimensional (3D) models of land, water, or transportation features while maintaining dynamic relationships to source data such as grading objects, break lines, contours, and corridors. As industry-leading building information modeling (BIM) solution, civil 3D is well known in the civil engineering community and widely used on a variety of infrastructure projects both large and small.

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D. Scope of the Study

The study for evolving various design features of an intersection project has been undertaken using AutoCAD Civil 3D software. AutoCAD Civil 3D version 2016 has been used in the study. Though the study has been undertaken using above mentioned versions of the software and for the given category of road located in plain terrain. The contents of the study are quite general in nature and can be easily applied using other versions of the software and for other type of road terrain conditions.

E. Objectives

The study will be undertaken with the following objectives.

- To study traffic volume of located area.
- To study application of the AutoCAD Civil 3D.
- To decide road alignment using ground data for a rotary intersection design.
- To estimate earthwork using AutoCAD Civil 3D.

2. Literature Review

Matthew et al (2001) studying on relationship between rural road geometric characteristics, accident rates and their prediction, using a rigorous non-parametric statistical methodology known as hierarchical tree based regression. Their goal is twofold; first, it develops a methodology that quantitatively assesses the effects of various highway geometric characteristics on accident rates and second, it provides a straightforward, yet fundamentally and mathematically sound way of predicting accident rates on rural roads. The results show that although the importance of isolated variables differs between two lane and multilane roads, 'geometric design' variables and 'pavement condition' variables are the two most important factors affecting accident rates.

Bhatt (2003) studied that increasing trends of traffic in urban area is a major concern in all the cities in India. The heterogeneous traffic are more diverse in nature due to lane changing and lack of lane discipline characteristics of driver's in India. The rotary intersections are of the most vital components of urban roadway network. Intersection is one when either three or more road meets or intersects each other.

Arora et al (2005) studied that Rapid urbanization and industrialization has led to substantial increase in urban traffic. Thus, congestion on urban road is a common phenomenon in cities. India is also facing the problem. Chandigarh, a Union Territory of India was planned by Le Croupier's and the city also known for its beautiful roundabouts. But these roundabouts become place of slow moving traffic during peak hours. Traffic flow occurs at these intersections especially during the peak hours. This heavy traffic leads to congestion at both these intersections and also the flow of traffic is not smooth between these two intersections.

Shrirame et al (2007) studied that Traffic Rotary at road intersections is special form of grade change of lanes to channelize movement of vehicles in one direction around a central traffic island. With rapid growth of traffic, it was experienced by them that widening of roads and providing flyovers have become imperative to overcome major conflicts at intersections such as collision between through and right turn movements. In this way, major conflicts are converted into milder conflicts like merging and diverging. The vehicles entering the rotary are gently forced to move in a clockwise direction. They then weave out of the rotary to the desired direction.

3. Study of Area and Location

The study of area is "Santoshi Nagar Chowk" located in Raipur district of Chhattisgarh. Existing study area considers of flexible pavement road. This intersection connects two important roads Mahatma Gandhi Marg and Lowther Road. Mahatma Gandhi Marg runs towards the northern direction and links areas such as Tikrapara, Shankar Nagar, and continues toward GE Road (NH-30) and Raipur Railway Station. Lowther Road extends southward, passing through Santoshi Nagar and connects further to Bhatagaon, Dhamtari Road, and Ring Road No. 2.

Apart from these main roads, the rotary also connects to local internal roads from the east and west sides. The eastern road links to nearby residential areas like Devendra Nagar and Sundar Nagar, while the western road provides access to local colonies and institutions within Santoshi Nagar. This rotary experiences moderate to heavy traffic, especially during office and school hours. The traffic mainly consists of private vehicles, auto-rickshaws, city buses, and some commercial vehicles. The surrounding area includes residential colonies, local markets, schools, and health centers. Although functional, the rotary could benefit from improvements such as better road signage, corrected geometry, and safer pedestrian crossings to enhance traffic flow and safety.

Fig. 1. Map of study of located area

A. Data Collection

The ground surface data are required for designing the geometry of highways and Intersection. The Point Cloud Surface, surface file was obtained from the firm handling the development of the road. The survey information is in the form of point cloud file having the file extension as point cloud.

B. Traffic Volume Study of Located Area

To decide the number of lanes and roadway width, pavement design, rotary volume, economic analysis traffic surveys are conducted. The main focus of traffic survey is to determine of vehicle composition in traffic stream which helps to design

rotary intersection. Traffic volume is the number of vehicles crossing a section of road per unit time at any selected period. Traffic volume is used as a quantity measure of flow. The commonly used units are vehicles per day and vehicle per hours. A complete traffic volume study may include the classified volume study by recording the volume of various types and classes of traffic, the distribution by direction and turning movement and the distribution on different lanes per unit time.

There is a lot of traffic at the Santoshi Nagar Chowk. Here the traffic condition in the peak horse is very bad. There is variation in traffic flow from time to time. Hourly traffic volume varies considerably during a day the peak hourly volume may be much higher than average hourly volume. Daily traffic volumes vary considerably in a week and there are variations with season. In classified traffic volume study, the traffic is classified and the volume of each class of traffic buses, truck, passenger-cars, other light vehicles, rickshaws, cycles and pedestrians is found separately. The direction of each class of traffic flow is also noted. At intersection the traffic flow in each direction of flow including turning movement are recorded.

C. Importance of Traffic Volume Study

- Increase the efficiency and life of roads.
- Reduces traffic volume at a particular section.
- Provide better means for development of infrastructures.
- Provide better means to utilize other roads in case of special events in the city.
- Provide estimate of no vehicles against no of persons.
- Traffic volume studies are conducted to determine the number, movements, and classifications of roadway vehicles at a given location.
- The traffic volume data can identify critical flow time periods, determine the influence of large vehicles or

Table 1
PCU of Santoshi Nagar chowk

Time	Bike/Cycle	Car/Auto	Heavy Vehicle	Total	PCU
8:00-9:00 AM	138	149	14	1131	934
	139	169	16		
	119	123	0		
	122	141	1		
9:00-10:00 AM	146	155	12	1234	1002
	141	163	14		
	148	138	3		
	149	164	1		
	155	141	24	1214	992
10:00-11:00 AM	171	99	21		
	149	162	1		
	112	149	0		
11:00-12:00 PM	161	147	19	1077	848
	179	68	23		
	145	139	1		
	149	45	1		
	155	50	21	829	630
12:00-01:00 PM	159	61	26		
	143	41	2		
	141	29	1		
	167	141	23	1155	971
01:00-02:00 PM	122	144	23		
	119	133	0		
	160	119	1		
	148	122	16	1095	911
02:00-03:00 PM	122	148	22		
	128	138	0		
	123	128	0		
	155	121	28	1228	987
03:00-04:00 PM	240	138	11		
	133	144	1		
	118	138	1		
	139	168	13	1550	1117
04:00-05:00 PM	268	144	29		
	171	141	0		
	179	156	1		
	189	190	23	1320	1063
05:00-06:00 PM	170	13	11		
	149	147	2		
	155	144	1		
	191	196	17	1323	1056
06:00-07:00 PM	183	122	19		
	168	140	2		
	144	141	0		
	290	291	21	1745	1380
07:00-08:00 PM	268	249	14		
	166	148	1		
	155	141	1		

pedestrians on vehicular traffic flow, or document traffic volume trends.

- The length of the sampling period depends on the type of count being taken and the intended use of the data recorded.

About Approach Roads for Roundabouts

Before you can create a roundabout, you must create at least one alignment to represent an approach road. This is the alignment to which an approach will be dynamically connected. If you change or move this base approach alignment, the roundabout approach is dynamically updated.

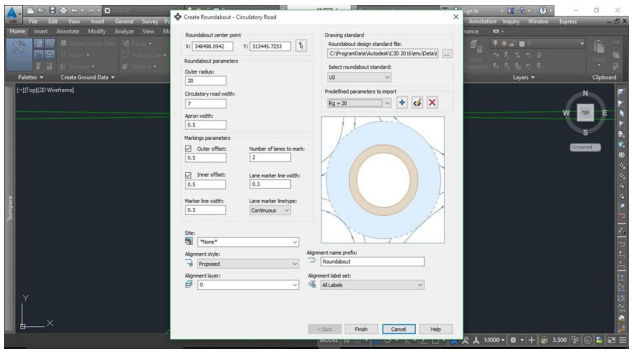

Fig. 2. Creating roundabout

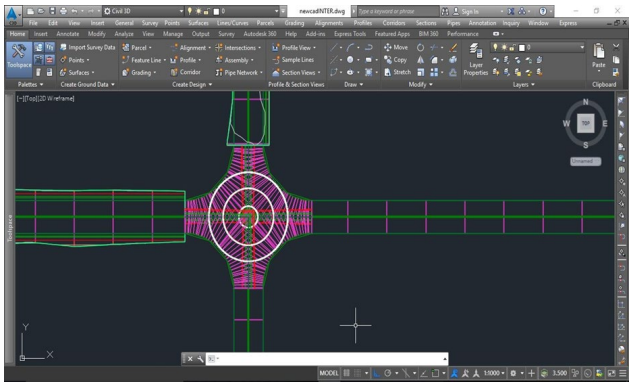

Fig. 3. Roundabout

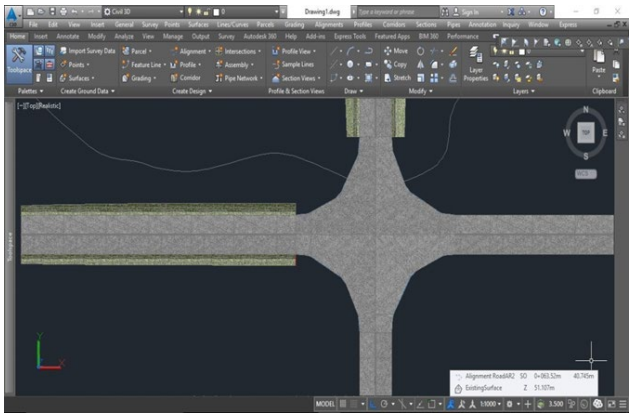

Fig. 4. Top view of the intersection

1) Creating Sample Lines

Terrain elevation that cut across surface including corridor surfaces which are associated with a specified sample line group. Elevation are sampled at each of the sample line XY vertices and also at locations where the vertical plane defined by the sample line intersection with surface edges.

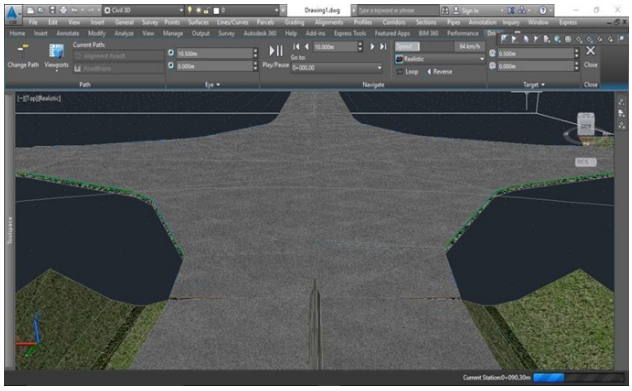

Fig. 5. Perspective view of intersection

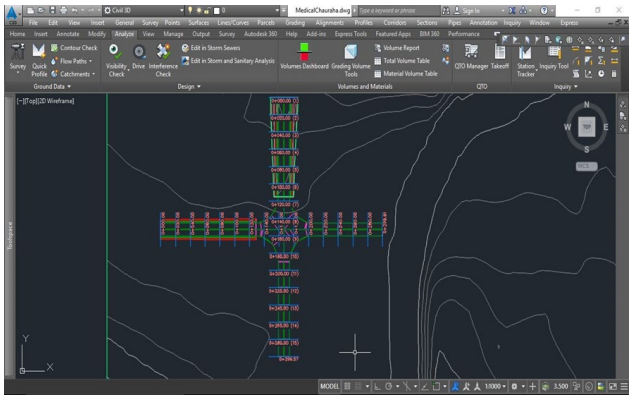

Fig. 6. Sample line

4. Result and Discussion

A. Total Volume Report

- A Total Volume Report table 2 and 3 contains cut, fill, and cumulative volume information (for example, earthworks or cut/fill report)
- Cut (Cubic meter) – As the volume of material generally expands after it is removed, the cut factor is usually set to greater than 1.0, indicating swell or expansion.
- Fill (Cubic meter) – As the material generally compacts when used as fill, the fill factor is usually set to greater than 1.0, to indicate compaction or shrinkage of the material when it is used as fill.

The alignment incremental station report lists northing, easting and tangential information for the selected horizontal alignments. This information displays according to the entered station increment value.

Alignment: Alignment Road A
Sample Line Group: SL A
Start Station: 0+000.00
End Station: 0+299.91

Table 2
Volume report of alignment road

Station	Cut Area (Sq.M.)	Cut Volume (Cu.M.)	Reusable Volume (Cu.M.)	Fill Area (Sq.M.)	Fill Volume (Cu.M.)	Cum. Cut Vol. (Cu.M.)	Cum. Reusable Vol. (Cu.M.)	Cum. Fill Vol. (Cu.M.)	Cum. Net Vol. (Cu.M.)
0+020.00	1,185.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0+040.00	1,217.91	24,035.54	24,035.54	0.00	0.00	24,035.54	0.00	0.00	24,035.54
0+060.00	1,225.99	24,439.05	24,439.05	0.00	0.00	48,474.60	0.00	0.00	48,474.60
0+080.00	1,233.31	24,593.09	24,593.09	0.00	0.00	73,067.69	0.00	0.00	73,067.69
0+100.00	1,245.81	24,791.29	24,791.29	0.00	0.00	97,858.98	0.00	0.00	97,858.98
0+120.00	1,252.21	24,980.20	24,980.20	0.00	0.00	122,839.18	0.00	0.00	122,839.18
0+140.00	1,181.88	24,340.81	24,340.81	0.00	0.00	147,179.98	0.00	0.00	147,179.98
0+160.00	1,061.05	22,429.22	22,429.22	0.00	0.00	169,609.20	0.00	0.00	169,609.20
0+180.00	938.51	19,995.59	19,995.59	0.00	0.00	189,604.79	0.00	0.00	189,604.79
0+200.00	810.48	17,489.90	17,489.90	0.00	0.00	207,094.68	0.00	0.00	207,094.68
0+220.00	783.85	15,943.27	15,943.27	0.00	0.00	223,037.95	0.00	0.00	223,037.95
0+240.00	779.62	15,634.72	15,634.72	0.00	0.00	238,672.67	0.00	0.00	238,672.67
0+260.00	781.20	15,608.18	15,608.18	0.00	0.00	254,280.85	0.00	0.00	254,280.85
0+280.00	782.58	15,637.75	15,637.75	0.00	0.00	269,918.60	0.00	0.00	269,918.60

Alignment: Alignment Road B
Sample Line Group: SL B
Start Station: 0+000.00
End Station: 0+299.57

Table 3
Volume report of alignment Road B

Station	Cut Area (Sq.M.)	Cut Volume (Cu.M.)	Reusable Volume (Cu.M.)	Fill Area (Sq.M.)	Fill Volume (Cu.M.)	Cum. Cut Vol. (Cu.M.)	Cum. Reusable Vol. (Cu.M.)	Cum. Fill Vol. (Cu.M.)	Cum. Net Vol. (Cu.M.)
0+020.00	111.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0+040.00	95.06	2063.62	2063.62	0.00	0.00	2,063.62	0.00	0.00	2,063.62
0+060.00	75.23	1702.90	1702.90	0.00	0.00	3,766.52	0.00	0.00	3,766.52
0+080.00	56.39	1316.24	1316.24	0.00	0.00	5,082.76	0.00	0.00	5,082.76
0+100.00	48.80	1051.92	1051.92	0.00	0.00	6,134.68	0.00	0.00	6,134.68
0+120.00	38.17	869.72	869.72	0.00	0.00	7,004.40	0.00	0.00	7,004.40
0+140.00	27.14	653.15	653.15	0.00	0.00	7,657.55	0.00	0.00	7,657.55
0+160.00	18.07	452.17	452.17	0.00	0.00	8,109.72	0.00	0.00	8,109.72
0+180.00	16.28	343.50	343.50	0.00	0.00	8,453.22	0.00	0.00	8,453.22
0+200.00	15.12	314.00	314.00	0.00	0.00	8,767.22	0.00	0.00	8,767.22
0+220.00	15.35	304.73	304.73	0.00	0.00	9,071.95	0.00	0.00	9,071.95
0+240.00	17.26	326.05	326.05	0.00	0.00	9,398.00	0.00	0.00	9,398.00
0+260.00	19.93	371.87	371.87	0.00	0.00	9,769.87	0.00	0.00	9,769.87
0+280.00	21.20	411.33	411.33	0.00	0.00	10,181.20	0.00	0.00	10,181.20

Table 4
Alignment PI report of alignment Curve A

PI Station	Nothing	Easting	Distance	Direction
0.000.00	313,590.2084m	347,234.1826m		
			30.000m	N90° 00' 00"E
0.030.00	313,590.2084m	347,264.1826m		
			30.000m	N0° 00' 00"E
0+047.12	313,620.2084m	347,264.1826m		

Alignment Name: Alignment Curve B
Station Range: Start: 0+000.00, End: 0+047.12m

Table 5
Alignment PI report of alignment Curve B

PI Station	Nothing	Easting	Distance	Direction
0.000.00	313,620.2084m	347,234.1826m		
			30.000m	S0° 00' 00"E
0.030.00	313,590.2084m	347,264.1826m		
			30.000m	N90° 00' 00"E
0+047.12	313,590.2084m	347,264.1826m		

Alignment Name: Alignment Curve C
Station Range: Start: 0+000.00, End: 0+047.12m

Table 6
Alignment PI report of alignment Curve C

PI Station	Nothing	Easting	Distance	Direction
0.000.00	313,575.2084m	347,309.1826m		
			30.000m	N90° 00' 00"W
0.030.00	313,575.2084m	347,279.1826m		
			30.000m	S0° 00' 00"E
0+047.12	313,545.2084m	347,279.1826m		

B. Alignment Incremental Station Report

Alignment Name: Alignment Curve A
Description:
Station Range: Start: 0+000.00, End: 0+047.12m
Station Increment: 20.00m

Table 7

Station	Northing	Easting	Tangential Direction
0+000.00	313,590.2084m	347,234.1826m	N90° 00' 00"E
0+020.00	313,596.6318m	347,252.7337m	N51° 48' 10"E
0+040.00	313,613.1513m	347,263.3408m	N13° 36' 20"E
0+047.12	313,620.2045m	347,264.1826m	N0° 00' 27"E

Alignment Name: Alignment Curve B
Description:
Station Range: Start: 0+000.00, End: 0+047.12m
Station Increment: 20.00m

Table 8

Station	Northing	Easting	Tangential Direction
0+000.00	313,620.2084m	347,279.1826m	S0° 00' 00"E
0+020.00	313,601.6573m	347,285.6060m	S38° 11' 50"E
0+040.00	313,591.0503m	347,302.1255m	S76° 23' 40"E
0+047.12	313,590.2084m	347,309.1787m	S89° 59' 33"E

Alignment Name: Alignment Curve C
Description:
Station Range: Start: 0+000.00, End: 0+047.12m
Station Increment: 20.00m

Table 9

Station	Northing	Easting	Tangential Direction
0+000.00	313,575.2084m	347,309.1826m	N90° 00' 00"W
0+020.00	313,568.7850m	347,290.6315m	S51° 48' 10"W
0+040.00	313,552.2655m	347,280.0245m	S13° 36' 20"W
0+047.12	313,545.2123m	347,279.1826m	S0° 00' 27"W

Alignment Name: Alignment Curve D
Description:
Station Range: Start: 0+000.00, End: 0+047.12m
Station Increment: 20.00m

Table 10

Station	Northing	Easting	Tangential Direction
0+000.00	313,545.2084m	347,264.1826m	N0° 00' 00"E
0+020.00	313,563.7595m	347,257.7593m	N38° 11' 50"W
0+040.00	313,574.3665m	347,241.2398m	N76° 23' 40"W
0+047.12	313,575.2084m	347,234.1865m	N89° 59' 33"W

Alignment Name: Alignment Road A
Description:
Station Range: Start: 0+000.00, End: 0+299.91m
Station Increment: 20.00m

Table 11

Station	Northing	Easting	Tangential Direction
0+000.00	313,582.7084m	347,105.2818m	N90° 00' 00"E
0+020.00	313,582.7084m	347,125.2818m	N90° 00' 00"E
0+040.00	313,582.7084m	347,145.2818m	N90° 00' 00"E
0+060.00	313,582.7084m	347,165.2818m	N90° 00' 00"E
0+080.00	313,582.7084m	347,185.2818m	N90° 00' 00"E
0+100.00	313,582.7084m	347,205.2818m	N90° 00' 00"E
0+120.00	313,582.7084m	347,225.2818m	N90° 00' 00"E
0+140.00	313,582.7084m	347,245.2818m	N90° 00' 00"E
0+160.00	313,582.7084m	347,265.2818m	N90° 00' 00"E
0+180.00	313,582.7084m	347,285.2818m	N90° 00' 00"E
0+200.00	313,582.7084m	347,305.2818m	N90° 00' 00"E
0+220.00	313,582.7084m	347,325.2818m	N90° 00' 00"E
0+240.00	313,582.7084m	347,345.2818m	N90° 00' 00"E
0+260.00	313,582.7084m	347,365.2818m	N90° 00' 00"E
0+280.00	313,582.7084m	347,385.2818m	N90° 00' 00"E
0+299.91	313,582.7084m	347,405.2818m	N90° 00' 00"E

Alignment Name: Alignment Road AL
Description:
Station Range: Start: 0+000.00, End: 0+128.90m
Station Increment: 20.00m

Table 12

Station	Northing	Easting	Tangential Direction
0+000.00	313,590.2084m	347,105.2818m	N90° 00' 00"E
0+020.00	313,590.2084m	347,125.2818m	N90° 00' 00"E
0+040.00	313,590.2084m	347,145.2818m	N90° 00' 00"E
0+060.00	313,590.2084m	347,165.2818m	N90° 00' 00"E
0+080.00	313,590.2084m	347,185.2818m	N90° 00' 00"E
0+100.00	313,590.2084m	347,205.2818m	N90° 00' 00"E
0+120.00	313,590.2084m	347,225.2818m	N90° 00' 00"E
0+128.90	313,590.2084m	347,234.1818m	N90° 00' 00"E

Alignment Name: Alignment Road AL2
Description:
Station Range: Start: 0+000.00, End: 0+096.01m
Station Increment: 20.00m

Table 13

Station	Northing	Easting	Tangential Direction
0+000.00	313,590.2084m	347,309.1826m	N90° 00' 00"E
0+020.00	313,590.2084m	347,329.1826m	N90° 00' 00"E
0+040.00	313,590.2084m	347,349.1826m	N90° 00' 00"E
0+060.00	313,590.2084m	347,369.1826m	N90° 00' 00"E
0+080.00	313,590.2084m	347,389.1826m	N90° 00' 00"E
0+096.01	313,590.2084m	347,405.1902m	N90° 00' 00"E

Alignment Name: Alignment Road AR
Description:
Station Range: Start: 0+000.00, End: 0+128.90m
Station Increment: 20.00m

Table 14

Station	Northing	Easting	Tangential Direction
0+000.00	313,575.2084m	347,105.2818m	N90° 00' 00"E
0+020.00	313,575.2084m	347,125.2818m	N90° 00' 00"E
0+040.00	313,575.2084m	347,145.2818m	N90° 00' 00"E
0+060.00	313,575.2084m	347,165.2818m	N90° 00' 00"E
0+080.00	313,575.2084m	347,185.2818m	N90° 00' 00"E
0+100.00	313,575.2084m	347,205.2818m	N90° 00' 00"E
0+120.00	313,575.2084m	347,225.2818m	N90° 00' 00"E
0+128.90	313,575.2084m	347,234.1818m	N90° 00' 00"E

Alignment Name: Alignment Road AR2
Description:
Station Range: Start: 0+000.00, End: 0+096.01m
Station Increment: 20.00m

Table 15

Station	Northing	Easting	Tangential Direction
0+000.00	313,575.2084m	347,309.1826m	N90° 00' 00"E
0+020.00	313,575.2084m	347,329.1826m	N90° 00' 00"E
0+040.00	313,575.2084m	347,349.1826m	N90° 00' 00"E
0+060.00	313,575.2084m	347,369.1826m	N90° 00' 00"E
0+080.00	313,575.2084m	347,389.1826m	N90° 00' 00"E
0+096.01	313,575.2084m	347,405.1902m	N90° 00' 00"E

Alignment Name: Alignment Road B
Description:
Station Range: Start: 0+000.00, End: 0+299.57m
Station Increment: 20.00m

Table 16

Station	Northing	Easting	Tangential Direction
0+000.00	313,735.3943m	347,271.6826m	S0° 00' 00"E
0+020.00	313,715.3943m	347,271.6826m	S0° 00' 00"E
0+040.00	313,695.3943m	347,271.6826m	S0° 00' 00"E
0+060.00	313,675.3943m	347,271.6826m	S0° 00' 00"E
0+080.00	313,655.3943m	347,271.6826m	S0° 00' 00"E
0+100.00	313,635.3943m	347,271.6826m	S0° 00' 00"E
0+120.00	313,615.3943m	347,271.6826m	S0° 00' 00"E
0+140.00	313,595.3943m	347,271.6826m	S0° 00' 00"E
0+160.00	313,575.3943m	347,271.6826m	S0° 00' 00"E
0+180.00	313,555.3943m	347,271.6826m	S0° 00' 00"E
0+200.00	313,535.3943m	347,271.6826m	S0° 00' 00"E
0+220.00	313,515.3943m	347,271.6826m	S0° 00' 00"E
0+240.00	313,495.3943m	347,271.6826m	S0° 00' 00"E
0+260.00	313,475.3943m	347,271.6826m	S0° 00' 00"E
0+280.00	313,455.3943m	347,271.6826m	S0° 00' 00"E
0+299.91	313,435.8243m	347,271.6826m	S0° 00' 00"E

Alignment Name: Alignment Road BL
Description:
Station Range: Start: 0+000.00, End: 0+115.19m
Station Increment: 20.00m

Table 17

Station	Northing	Easting	Tangential Direction
0+000.00	313,735.3943m	347,279.1826m	S0° 00' 00"E
0+020.00	313,715.3943m	347,279.1826m	S0° 00' 00"E
0+040.00	313,695.3943m	347,279.1826m	S0° 00' 00"E
0+060.00	313,675.3943m	347,279.1826m	S0° 00' 00"E
0+080.00	313,655.3943m	347,279.1826m	S0° 00' 00"E
0+100.00	313,635.3943m	347,279.1826m	S0° 00' 00"E
0+115.19	313,620.2084m	347,279.1826m	S0° 00' 00"E

Alignment Name: Alignment Road BL2
Description:
Station Range: Start: 0+000.00, End: 0+109.39m
Station Increment: 20.00m

Table 18

Station	Northing	Easting	Tangential Direction
0+000.00	313,545.2084m	347,279.1826m	S0° 00' 00"E
0+020.00	313,525.2084m	347,279.1826m	S0° 00' 00"E
0+040.00	313,505.2084m	347,279.1826m	S0° 00' 00"E
0+060.00	313,485.2084m	347,279.1826m	S0° 00' 00"E
0+080.00	313,465.2084m	347,279.1826m	S0° 00' 00"E
0+100.00	313,445.2084m	347,279.1826m	S0° 00' 00"E
0+109.39	313,435.8207m	347,279.1826m	S0° 00' 00"E

Alignment Name: Alignment Road BR
Description:
Station Range: Start: 0+000.00, End: 0+115.19m
Station Increment: 20.00m

Table 19

Station	Northing	Easting	Tangential Direction
0+000.00	313,735.3943m	347,264.1826m	S0° 00' 00"E
0+020.00	313,715.3943m	347,264.1826m	S0° 00' 00"E
0+040.00	313,695.3943m	347,264.1826m	S0° 00' 00"E
0+060.00	313,675.3943m	347,264.1826m	S0° 00' 00"E
0+080.00	313,655.3943m	347,264.1826m	S0° 00' 00"E
0+100.00	313,635.3943m	347,264.1826m	S0° 00' 00"E
0+115.19	313,620.2084m	347,264.1826m	S0° 00' 00"E

Alignment Name: Alignment Road BR2
Description:
Station Range: Start: 0+000.00, End: 0+109.39m
Station Increment: 20.00m

Table 20

Station	Northing	Easting	Tangential Direction
0+000.00	313,545.2084m	347,264.1826m	S0° 00' 00"E
0+020.00	313,525.2084m	347,264.1826m	S0° 00' 00"E
0+040.00	313,505.2084m	347,264.1826m	S0° 00' 00"E
0+060.00	313,485.2084m	347,264.1826m	S0° 00' 00"E
0+080.00	313,465.2084m	347,264.1826m	S0° 00' 00"E
0+100.00	313,445.2084m	347,264.1826m	S0° 00' 00"E
0+109.39	313,435.8207m	347,264.1826m	S0° 00' 00"E

5. Summary and Conclusion

A. Conclusion

a) AutoCAD Civil 3D helps to complete the design process in a relaxed and comfortable way within time and also it preserves a lot of time and effort. All curves are the plot in IRC Standard in the project.

b) For every highway design, Intersection Design one can follow AASHTO and IRC guidelines primarily. A state highway specification comes secondary.

c) AutoCAD Civil 3D software is the preferable and optimistic one for designing Intersection. So that it has default values for classification of factors influencing design of Intersection.

d) Optimization of alignment could be done by AutoCAD Civil 3D. So that cost of construction would be less.

e) The use of AutoCAD Civil 3D for rotary intersection design makes the design process to be completed within a very short time and with much ease and amazing precision. These capabilities of AutoCAD Civil 3D eliminate the major disadvantages of the manual design approach that is cumbersome, time consuming and highly prone to costly errors.

f) AutoCAD civil 3D software is helpful, It has a large set of parts and features that choose for designs, It offers powerful and quick dimensions, we use the simplified tools, generate the dimensions to control and expand only the important variables for manufacturing easily.

g) An easy-to-use process that is well integrated into the Autodesk Civil 3D user interface helps to keep you focused on your design.

h) Easily share DWG files created in Autodesk Civil 3D 2016. The software includes an object enabler to ensure that you can manipulate Autodesk Civil 3D objects in any AutoCAD 2016 based application.

i) Define sample lines first by station range, by corridor sections, by selecting multiple points, by existing poly lines, and by points, and then specify their left and right offsets.
j) Proper sight distance and vertical alignment can consume less propulsive force leads to low fuel consumption.
k) Rotary have the potential to transform an area. Not only is rotary a radical improvement to a roadway, but rotary can be used as a visual enhancement to an area as a gateway. Rotary are a tool that increases safety along the street, enhances driver attentiveness, reduces automobile idling, and efficiently streams traffic through an area.
l) Traffic rotaries reduce the complexity of crossing traffic by forcing them into weaving operations. The shape and size of the rotary are determined by the traffic volume and share of turning movements.
m) Rotary are cost effective and safe lots of money that traditional intersections require for the electricity of signals.
n) This crossing area is also lacking with any type of intersection, signs, medians, and other basics safety devices, so I am trying to sort out this problem with design of Intersection.
o) Reduce points of conflict between pedestrians and motor vehicles and are therefore considered to be safer for them.
p) There would be reduction in accidents due to crossing conflict, notably the right angled collisions.
q) The Pedestrians can cross the road safely at this intersection.
r) Based on the calculations done on the PCU values obtained from the traffic survey.
s) Reducing the approach speeds of vehicles at the intersection and increasing the exit speeds from the intersection
t) Providing separate storage pockets for right turning traffic at the time of leaving or crossing the main traffic flow.

B. Scope for Future Study

a) Only three formats of survey data are analyzed in the study i.e. total station, auto level and GPS data. Other formats like Topo Maps, Aerial Photograph and Satellite Imagery Remote Sensing may be considered for the future study.
b) More complex problems like interchange design, and flyovers etc. may be studied to check the capabilities of software in handling complex situations.
c) Other software like Inroads, Auto Civil 3D and other road designing software available in the market may also be incorporated in future study to recommend the most suitable software in the market.
d) Fictitious data used can be tested on the actual data.

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