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# Design and Safety Evaluation of Highway Intersection Using Vehicle Simulation Model

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**Abstract –** *Transportation infrastructure especially concerning to highway facilities includes the geometric components like horizontal alignment, vertical profile, cross section of the road, intersection etc. The intersection is key geometric component of road as the maximum conflict points of transport operations falls within the intersection area. Considering the importance of intersection as geometric components of road, it is proposed to design the intersection near Patoda city falls on NH548D with utmost accuracy within stipulated timeframe. The project namely "Design and Safety Evaluation of Highway Intersection Using Vehicle Simulation Model" includes the complete geometric design and development of highway intersection and its safety evaluation using computer-aided program such as AutoTURN as vehicle simulation model.*

***Key Words***: Geometric Design, Intersection, Safety, Accuracy, Vehicle, AutoTURN.

## 1.INTRODUCTION

Geometric Design of transportation facilities includes the design of cross sections, horizontal alignment, vertical alignment, intersections and various design details. The goal of the geometric design is to maximize the comfort, safety and economy of facility while minimizing their environmental impacts. The efficiency and level of service of traffic operations are largely depend upon the traffic movement over an intersection area. The paper includes the design of intersection located at Patoda city of Beed district, which consequently falls on NH48D. The further work includes the safety assessment of the designed intersection using vehicle simulation model and validation with respect Indian Road Congress provisions.

### 1.1 OBJECTIVE

1) Design and Development of Intersection of NH548D located at Patoda Village.
2) Safety Evaluation of Designed Intersection Using Vehicle Simulation Model.
3) Validation of Designed Parameters with IRC provisions.

### 1.2 METHODOLOGY

A simplified methodology adopted for the completion of work is as follows,

1) Engineering Survey and Investigation-The initial step includes the detailed survey of intersection and adjoining arms.
2) Survey Analysis- The step includes analysis of survey data to have clear idea about traffic pattern, deficiencies in existing layout etc.
3) Detailed Design and Development-The step includes the detailed design and development of intersection by adopting suitable traffic control devices.
4) Safety Evaluation Using Vehicle Simulation Model-The step includes the selection of design vehicle, carrying out swept path analysis over designed intersection.
5) Validation with IRC provisions- The step includes the validation of designed parameters with IRC provisions.

## 2. SITE ASSESSMENT AND DATA COLLECTION


1) The intersection is located in Beed district on NH548D.
2) The intersection is coordinated at Latitude of 18°48'29.20''N and Longitude of 75°28'54.18''E.
3) The intersection is of T-type.
4) Traffic survey assesses that the magnitude of tridem and tandem axles are more at the intersection.
5) The approaching arms of the intersection are leading to NH-211 which is crucial connectivity to Nagpur Mumbai Super Express Way Corridor.

## 3) DESIGN PROCEDURE

The intersection is developed by incorporating suitable traffic control devices. It is observed that the incorporation of Rotary Island is more effective in increasing the efficiency of traffic operation.

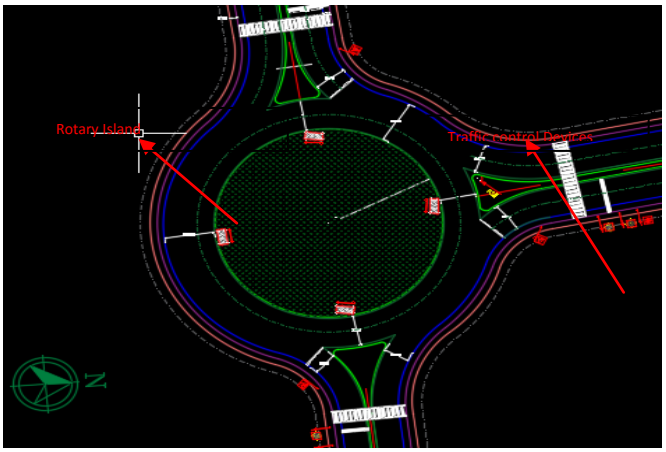



**Figure -1**: Designed Intersection

Following are the designed parameters of the Intersection.

| Intersection Parameters | | | |
|---|---|---|---|
| Sr No | Particulars | Designed Provision of Rotary Intersection | Remark |
| 1 | Designed Speed | 30kmph | - |
| 2 | Entry Width & Exit Width | 7.0m | - |
| 3 | Weaving and Non weaving width | 10.5m and 7.0m | - |
| 4 | Entry Radius, Exit Radius & Rotary Radius | 18m, 27m and 24m | - |

## 4) SAFETY EVALUATION

Considering the magnitude of traffic and importance of road semi-trailer is selected as Design Vehicle.

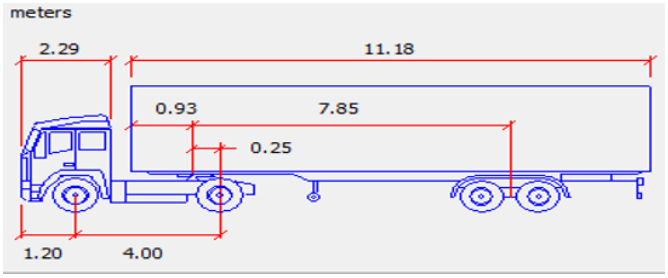



**Fig -2**: Semi-Trailer

The swept path analysis of designed intersection is carried out using semitrailer vehicle (WB-12) and feasibility of provided geometry is assessed for the traffic maneuvers.

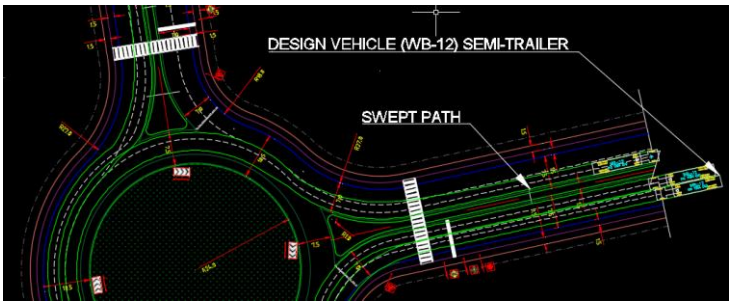
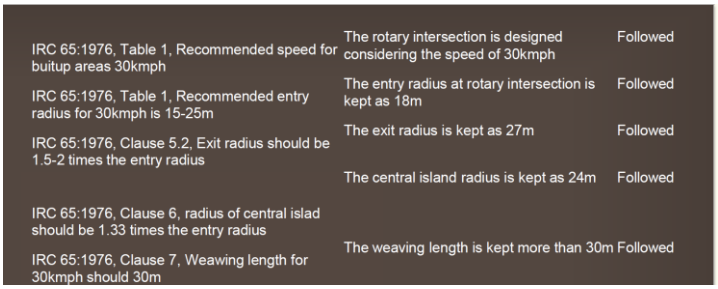



**Figure -3**: Swept path analysis

The swept path is marked to identify the conflict points and reconcile the design.

## 5) VALIDATION WITH IRC

The provided parameters are cross checked with Indian Road Congress provision in order to validate the design. Following image represents the validation.




## 3. CONCLUSIONS

The intersection is designed by incorporating Rotary Island. The safety of intersection is evaluated by swept path analysis with WB-12 (Semi-Trailer) as design vehicle with utmost accuracy within stipulated time. The provided geometrical parameters are found sufficient for better traffic maneuvers. The designed intersection resulted in well-shaped intersection helpful for the easy traffic operations. The designed parameters are checked with the IRC provisions and found in order.

## REFERENCES

[1] IRC 65:1976 "Recommended Practice for Traffic Rotaries".

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