# Effectiveness of Traffic Management Measures at Swaraj Round, Thrissur

Sofia George, Sangeetha T R, Gokul P Nandhanan, Jiffin Majo, Archana S*

Department of Civil Engineering, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India

* Corresponding author

doi: https://doi.org/10.21467/proceedings.179.35

## ABSTRACT

A road safety audit at Thrissur Swaraj Round identified critical concerns such as poor visibility, confusing road markings, deteriorating footpaths, and suboptimal traffic signals. Recommendations, informed by user perspectives, particularly from pedestrians, aimed to enhance safety and efficiency by adjusting signal timings, installing clearer signage, and improving pedestrian infrastructure. Anticipated benefits include reduced accident rates, smoother traffic flow, and overall enhanced safety and functionality. Furthermore, a traffic signal redesign project using the Webster technique is ongoing at Thrissur Swaraj Round to alleviate congestion and bolster pedestrian safety. Webster's method optimizes signal timings based on peak hour traffic patterns to minimize delays and queuing at intersections. This comprehensive strategy prioritizes safety, efficiency, and environmental sustainability, ultimately improving the traffic experience and mobility in the area. Continuous monitoring and evaluation are integral to ensuring the sustained effectiveness of these initiatives, which also involve a road safety audit focusing on improving road infrastructure, footpaths, and signboard installations, with a specific emphasis on pedestrian safety concerns.

**Keywords:** Road safety, Traffic flow, Pedestrian, Signal, Webster's method

## INTRODUCTION

Road safety auditing involves a proactive assessment of potential hazards associated with road infrastructure projects, aiming to improve safety and functionality by identifying and addressing factors contributing to accidents for all road users. At Thrissur Swaraj Round, a central hub for vehicular and pedestrian activity, a thorough audit analyzed intersection geometry, signage, signalization, and overall road design. This collaborative effort between traffic engineers, urban planners, and safety experts assessed visibility, signage clarity, pedestrian facilities, and traffic signal coordination. Recommendations for the Thrissur Swaraj Round included adjusting signal timings, adding signage, and improving pedestrian infrastructure to enhance safety and efficiency, prioritizing community wellbeing. Similarly, the signal redesign at Shoranur road in Thrissur focused on improving traffic flow efficiency and pedestrian safety. The redesign addressed issues of vehicle delays and congestion linked to deficiencies in the existing timing system. By analyzing traffic patterns and flow, the redesigned signal aimed to minimize delays, optimize green and red signal times based on traffic volume, and improve overall traffic management and safety at the junction.

## OBJECTIVES

Road safety auditing is aimed at identifying and mitigating potential safety hazards on roads between intersections or other major access points. It typically involves a comprehensive assessment of road infrastructure, traffic conditions and other factors to improve safety. It involves studying factors such as

© 2025 Copyright held by the author(s). Published by AIJR Publisher in "Proceedings of the Second International Conference in Civil Engineering for a Sustainable Planet: ICCESP 2024". Organized on 6-8 December 2024, by Habilete Learning Solutions, Kollam, Kerala, India in collaboration with. Marian Engineering College, Trivandrum, Kerala; American Society of Civil Engineers (ASCE); and ASCE India Section southern Region.

Proceedings DOI: 10.21467/proceedings.179; Series: AIJR Proceedings; ISSN: 2582-3922; ISBN: 978-81-984081-7-4

traffic volume, speed, pedestrian behaviour, and road design to identify potential issues and propose improvements. The main objectives are

1. To conduct road safety audit of the selected study stretch for the safety assessment
2. To evaluate the efficiency of the traffic signal at three legged intersection
3. To suggest improvement measures

## METHODOLOGY

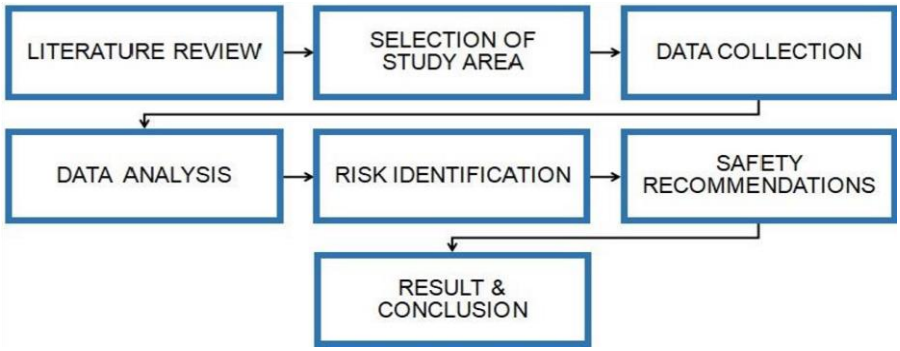



**Figure 1. Methodology**

### STUDY AREA

Thrissur Round in Kerala, India, was chosen for road safety auditing due to its circular layout, which presents unique challenges and opportunities for assessing traffic flow, intersection design, and pedestrian safety. Being a high traffic area prone to congestion and potential accident spots made it a priority for safety evaluation. The diverse mix of road users, including vehicles, pedestrians, and cyclists, adds complexity to safety considerations. By conducting audits here, authorities can pinpoint areas for improvement and implement targeted interventions to mitigate risks and enhance overall safety. Evaluating the existing signal at Shoranur road in Thrissur reflects a proactive approach to optimizing traffic management and enhancing road safety, ensuring signals meet community needs effectively.

**Figure 2. Study area (Thrissur Swaraj round from Google map)**

## DATA COLLECTION

### Geometric Features of Swaraj Round

The accidents are more reported at Thrissur East. The East Fort Junction in Thrissur district is characterized by two lanes in the carriageway. It includes essential features such as a center line, carriageway, shoulder, footpath, traffic police presence, and a zebra crossing. It's worth noting that the footpath is uneven, and there is an absence of a kerb. Geometric data are shown in Table 1.

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

**Table 1. Geometric data collected from the study area**

| Sl. No. | Description | Yes/No | Specification | Values |
|---|---|---|---|---|
| 1 | Carriageway | Yes | Number of lane in carriageway | 1No. |
| 2 | Centre line | Yes | - | - |
| 3 | Median | No | - | - |
| 4 | Kerb | Yes | - | - |
| 5 | Shoulder | Yes | Shoulder length | 2.1m |
| 6 | Footpath | Yes | Footpath width | Not uniform |
| | - | - | Footpath height | 0.25m |
| 7 | Zebra line | Yes | Not clearly visible | - |
| 8 | Subway | Yes | - | 2 Nos. |

### Accident Data

This presents a compilation of diverse accidents that took place within a 2 km radius of Swaraj Round, detailing the occurrence date, time, and category head. The accident data, acquired as secondary information, was collected internally from the District Crime Record Bureau (DCRB). Subsequently, the gathered data underwent sorting and analysis to determine the overall frequency of accidents. A graphical representation highlighted major accident details for further analysis in this study. A sample screenshot of accident data is shown in Figure 3.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Sl. N | Police Station | Date of Report | Time of Repo | Section of Law | Date of Occ | Time of Occ | Type of Road | Place of Occurrence | Died Perso | Grievous Injured Persons | Minor Injured Perso |
| 2 | 1 | Thrissur East | 01-01-2019 | 20:09 | 279, 338 IPC | 18-12-2018 | 09:15 | Other Road | I/o Nirmala matha, Lourdh Puram | | 1 | |
| 3 | 2 | Thrissur East | 01-01-2019 | 22:18 | 279, 338 IPC | 21-12-2018 | 13:30 | Other Road | Nr Bala Bhavan, Chembukkav | | 2 | |
| 4 | 3 | Thrissur West | 01-01-2019 | 18:45 | 279, 338 IPC | 28-12-2018 | 11:30 | Other Road | Kaiyattukara | | 1 | |
| 5 | 4 | Ollur | 01-01-2019 | 02:51 | 279, 337, 338 IPC | 28-12-2018 | 08:55 | Other Road | Nr Curve, Cheerachi | | 1 | 1 |
| 6 | 5 | Ollur | 01-01-2019 | 19:26 | 279, 338 IPC | 22-12-2018 | 16:45 | Other Road | Kavitha Road Jn, Kuttanellur | | 1 | |
| 7 | 6 | Peechi | 01-01-2019 | 18:58 | 279, 338 IPC | 30-12-2018 | 11:00 | Other Road | Nr Milk Society, Chembootra | | 1 | |
| 8 | 7 | Pavaratty | 01-01-2019 | 16:59 | 279, 338 IPC | 23-12-2018 | 16:00 | Other Road | Mullassery | | 1 | |
| 9 | 8 | Gvt Temple | 01-01-2019 | 19:01 | 279, 338 IPC | 20-12-2018 | 20:00 | Other Road | Nr Panthayil Temple | | 1 | |
| 10 | 9 | Peramangalam | 01-01-2019 | 15:20 | 279 IPC | 19-11-2018 | 20:00 | State Highway | I/f Petrol Pump, Manapady | | | |
| 11 | 10 | Peramangalam | 01-01-2019 | 18:35 | 279, 338 IPC | 27-12-2018 | 19:00 | State Highway | Bus Stop, Kaipparambu | | 1 | |
| 12 | 11 | Peramangalam | 01-01-2019 | 19:46 | 279, 337, 338 IPC | 29-12-2018 | 08:45 | Other Road | Vyasapeedam, Chittilapilly | | 1 | 1 |
| 13 | 12 | Viyyur | 01-01-2019 | 17:54 | 279, 338 IPC | 29-12-2018 | 10:30 | Other Road | Karuvankad | | 1 | |
| 14 | 13 | Viyyur | 01-01-2019 | 19:06 | 279, 338 IPC | 27-12-2018 | 10:35 | Other Road | Pambur | | 1 | |
| 15 | 14 | Medical College | 01-01-2019 | 17:54 | 279 IPC | 22-12-2018 | 19:30 | State Highway | Koncheri Road | | | |
| 16 | 15 | Kunnamkulam | 01-01-2019 | 18:36 | 279, 338 IPC | 28-12-2018 | 06:15 | State Highway | Kechery Jn | | 1 | |
| 17 | 16 | Wadakkancherry | 01-01-2019 | 12:56 | 279, 338 IPC | 30-12-2018 | 06:40 | State Highway | Ottupara | | 1 | |
| 18 | 17 | Wadakkancherry | 01-01-2019 | 13:15 | 279 IPC | 01-01-2019 | 04:30 | State Highway | Kumaranellur | | | |

**Figure 3. Accident data (Accident data collected from the DCRB Thrissur)**

### Videographic Data

Videography data from CCTV footage collected at the Thrissur Police Control Room during morning peak hours (7:30 - 9:30 AM) and evening peak hours (4:00 - 6:00 PM) is being used to determine traffic volume at Shoranur Road in Thrissur. The highest traffic volume counts identified from this data driven approach will inform the redesign of traffic signals at the junction, aiming to optimize signal timings and enhance overall efficiency and safety.

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

**Figure 4. Videographic data collection (Screenshot of morning and evening CCTV footage collected from the Thrissur Police control room).**

### Questionnaire Survey

The user has created an online Google Form in Malayalam and English to survey pedestrian safety perceptions and experiences comprehensively. The questionnaire covers various aspects including pedestrian infrastructure, traffic behavior, safety measures, zebra line awareness, road crossing behaviors, usage of subways or pedestrian underpasses, and understanding of traffic rules and regulations. Through this questionnaire, the user seeks detailed insights into the safety challenges pedestrians encounter in urban areas.

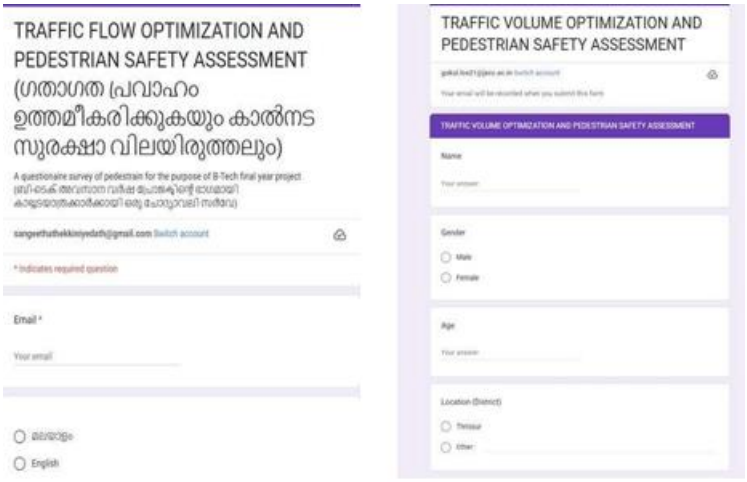



**Figure 5. Google Form (Google form for the questionnaire survey conducted in English and Malayalam languages)**

### Road Safety Audit (RSA)

**Table 2. Findings obtaining by conducting road safety auditing**

| Findings | |
|---|---|
|  | - Gap between footpath and drain<br>- It is not in good condition<br>- Accumulation of waste |
|  | - Presence of obstacle in footpath<br>- Presence of street vendors |

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

| | |
|---|---|
|  | • The sign boards are not be clearly visible |
|  | • Improper working of Cooperation drinking water tank<br>• Soil over footpath<br>• Footpath usage by temporary shop owners |

## DATA ANALYSIS

*Accident data analysis*

**Year Wise**

The past 5 year's accident data analysis of the study area as shown in Figure 6. Accidents occurred in the year 2020 is 27%. Accidents reported on 2022 and 2023 22%. Then 15 percent and 14 percent on 2019 and 2021 respectively.

Reason:

Reduced Traffic Enforcement: With lockdowns and restrictions in place, there was a decrease in traffic enforcement activities such as speed checks and DUI patrols.

Changed Traffic Patterns: During lockdowns, traffic patterns changed significantly. While overall traffic volume decreased due to people staying home, there was an increase in speeding and risky driving behaviors on less congested roads.

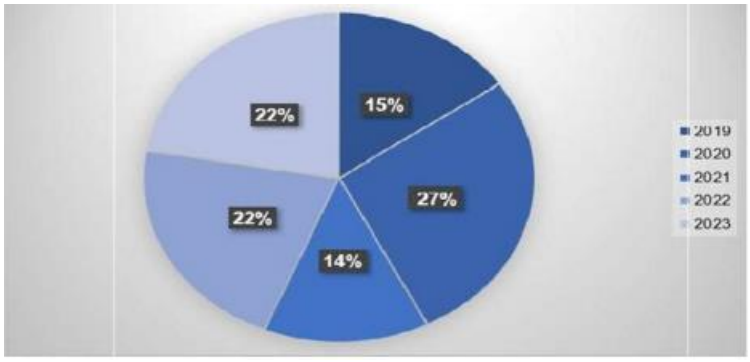



**Figure 6. Year wise accident data analysis**

**Daily Wise**

The details are depicted in Figure 7, a bar chart illustrating the fluctuating percentages of daytime and night time accidents from 2019 to 2023.

Reason:

Higher Traffic Volume: Daytime typically sees more vehicles on the road due to commuting, commercial activities, and other daily routines. With more vehicles, the probability of accidents increases.

Pedestrian Activity: Daytime is when pedestrians are more active, crossing roads, using crosswalks, and walking near traffic. This increases the complexity of driving and raises the risk of accidents involving pedestrians.

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922


**Figure 7. Daily wise data analysis. Day and night wise percentage of accidents based on the accident data collected**

**Age wise**

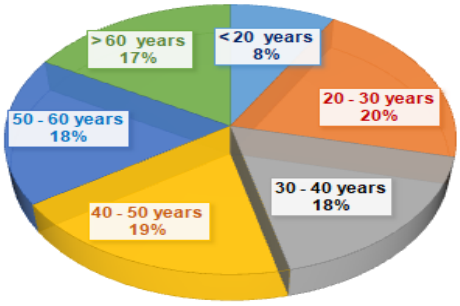
In age wise accident data analysis 20 percent of accidents occurred on 20 - 30 aged people, 19 percent on 40- 50 aged people, 50 - 60 and 30 - 40 aged people are of 18 percent and least accident occurred on above 60 aged people. All this details shown in Figure 8.

Reason:

Distractions: The use of mobile phones, social media, and other electronic devices while driving is more prevalent among younger drivers. These distractions can divert attention from the road and impair reaction times.

Inexperience: Many individuals in this age group are relatively new drivers or have limited experience compared to older drivers. Lack of experience can lead to errors in judgment, improper handling of vehicles, and difficulty in responding to unexpected situations on the road.

**Figure 8. Age wise data analysis. It is the age wise percentage of accidents reported based on the accident data collected**




**Mode Wise**

The data, illustrated in Figure 6.4, shows cars as the most involved vehicle type in accidents, followed by two-wheelers, heavy vehicles, LMVs (Light Motor Vehicles), and auto rickshaws in decreasing order of accident frequency.

Reason:

Popularity and Exposure: Light motor vehicles are often the most common vehicles on the road, which means they have higher exposure to potential accidents simply because there are more of them.

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

Road Design and Infrastructure: Road designs and infrastructure may not always accommodate light motor vehicles effectively, leading to challenges such as narrow lanes, inadequate signage, and insufficient separation between different types of vehicles.

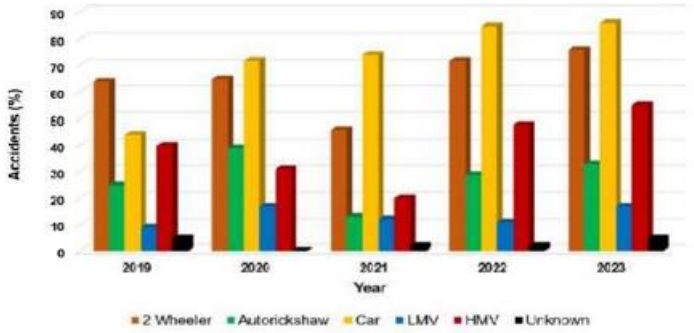



**Figure 9. Mode wise data analysis (Percentage of mode of vehicles involved in the accidents)**

*Videographic data analysis*

A videographic survey is conducted by collecting CCTV data from the traffic police control room in Thrissur. The CCTV data is collected during morning peak hours from 7:30 to 9:30 and evening peak hours from 4:00 to 6:00.t is shown in Figure 6.9 and Figure 6.10. The objective is to determine peak traffic hours by analyzing CCTV footage for vehicle counts and movements, optimizing traffic management in Thrissur.

| TIME | Bicycle | | Two wheeler | | Auto | | Car | | LMV | | Bus | | HMV | | Phase 1 Total | Phase 2 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P1 | P2 | P1 | P2 | P1 | P2 | P1 | P2 | P1 | P2 | P1 | P2 | P1 | P2 | A,B | C |
| 7:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:35 AM | 0 | 0 | 82 | 11 | 32 | 10 | 37 | 11 | 5 | 0 | 27 | 0 | 0 | 0 | 183 | 32 |
| 7:40 AM | 0 | 0 | 91 | 16 | 32 | 6 | 32 | 2 | 6 | 2 | 22 | 0 | 0 | 0 | 183 | 26 |
| 7:45 AM | 0 | 2 | 66 | 12 | 32 | 7 | 45 | 4 | 6 | 0 | 24 | 0 | 0 | 0 | 173 | 25 |
| 7:50 AM | 0 | 0 | 60 | 19 | 45 | 11 | 38 | 9 | 4 | 1 | 20 | 1 | 0 | 0 | 167 | 41 |
| 7:55 AM | 6 | 1 | 118 | 14 | 37 | 5 | 45 | 5 | 5 | 1 | 25 | 0 | 0 | 0 | 236 | 26 |
| 8:00 AM | 0 | 0 | 65 | 6 | 35 | 9 | 57 | 7 | 6 | 0 | 25 | 1 | 0 | 0 | 188 | 23 |
| 8:05 AM | 4 | 0 | 111 | 9 | 29 | 8 | 50 | 3 | 5 | 0 | 31 | 1 | 0 | 0 | 230 | 21 |
| 8:10 AM | 1 | 0 | 94 | 15 | 35 | 5 | 40 | 4 | 7 | 1 | 26 | 0 | 0 | 0 | 203 | 25 |
| 8:15 AM | 2 | 0 | 106 | 9 | 40 | 6 | 41 | 8 | 5 | 0 | 31 | 1 | 0 | 0 | 225 | 24 |
| 8:20 AM | 0 | 0 | 91 | 10 | 51 | 9 | 48 | 7 | 8 | 0 | 22 | 1 | 0 | 0 | 220 | 27 |
| 8:25 AM | 2 | 0 | 101 | 11 | 37 | 7 | 47 | 6 | 7 | 0 | 23 | 1 | 0 | 0 | 217 | 25 |
| 8:30 AM | 0 | 0 | 102 | 16 | 35 | 8 | 81 | 3 | 3 | 0 | 22 | 0 | 0 | 0 | 243 | 27 |
| 8:35 AM | 0 | 0 | 139 | 28 | 55 | 5 | 64 | 11 | 6 | 0 | 23 | 0 | 0 | 0 | 287 | 44 |
| 8:40 AM | 0 | 0 | 123 | 7 | 50 | 6 | 54 | 7 | 8 | 0 | 21 | 0 | 0 | 0 | 256 | 20 |
| 8:45 AM | 1 | 0 | 123 | 15 | 62 | 8 | 64 | 5 | 2 | 0 | 29 | 0 | 0 | 0 | 281 | 28 |
| 8:50 AM | 1 | 0 | 143 | 18 | 68 | 12 | 43 | 7 | 7 | 1 | 19 | 0 | 0 | 0 | 281 | 38 |
| 8:55 AM | 1 | 0 | 159 | 14 | 61 | 13 | 73 | 5 | 13 | 0 | 31 | 0 | 0 | 0 | 338 | 32 |
| 9:00 AM | 0 | 0 | 174 | 14 | 64 | 13 | 63 | 8 | 8 | 3 | 24 | 0 | 0 | 0 | 333 | 38 |
| 9:05 AM | 2 | 0 | 192 | 20 | 78 | 2 | 104 | 11 | 6 | 0 | 21 | 0 | 0 | 0 | 403 | 33 |
| 9:10 AM | 1 | 0 | 172 | 26 | 65 | 14 | 70 | 10 | 6 | 0 | 30 | 0 | 0 | 0 | 344 | 50 |
| 9:15 AM | 0 | 0 | 186 | 17 | 72 | 10 | 62 | 4 | 5 | 0 | 30 | 0 | 0 | 0 | 355 | 31 |
| 9:20 AM | 0 | 0 | 177 | 16 | 76 | 14 | 68 | 7 | 6 | 1 | 29 | 0 | 0 | 0 | 356 | 38 |
| 9:25 AM | 2 | 0 | 252 | 31 | 80 | 11 | 87 | 10 | 3 | 0 | 31 | 0 | 0 | 0 | 455 | 52 |
| 9:30 AM | 1 | 0 | 173 | 15 | 88 | 11 | 60 | 5 | 6 | 0 | 29 | 0 | 0 | 0 | 357 | 31 |
| | 24 | 3 | 3100 | 369 | 1259 | 210 | 1373 | 159 | 143 | 10 | 615 | 6 | 0 | 0 | 6514 | 757 |

| TIME | Bicycle | | Two wheeler | | Auto | | Car | | LMV | | Bus | | HMV | | Phase 1 Total | Phase 2 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P1 | P2 | P1 | P2 | P1 | P2 | P1 | P2 | P1 | P2 | P1 | P2 | P1 | P2 | A,B | C |
| 4:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4:05 PM | 0 | 0 | 238 | 26 | 79 | 9 | 90 | 14 | 4 | 0 | 21 | 0 | 0 | 0 | 432 | 49 |
| 4:10 PM | 0 | 0 | 141 | 25 | 80 | 2 | 100 | 8 | 5 | 2 | 15 | 0 | 0 | 0 | 341 | 37 |
| 4:15 PM | 0 | 0 | 225 | 24 | 64 | 10 | 78 | 8 | 5 | 0 | 14 | 0 | 0 | 0 | 386 | 42 |
| 4:20 PM | 0 | 0 | 174 | 23 | 86 | 1 | 103 | 5 | 3 | 0 | 30 | 0 | 0 | 0 | 396 | 29 |
| 4:25 PM | 0 | 0 | 207 | 24 | 81 | 17 | 81 | 4 | 4 | 0 | 13 | 0 | 0 | 0 | 386 | 45 |
| 4:30 PM | 0 | 0 | 213 | 25 | 99 | 8 | 89 | 8 | 6 | 0 | 25 | 0 | 0 | 0 | 432 | 41 |
| 4:35 PM | 0 | 0 | 151 | 14 | 81 | 7 | 94 | 7 | 4 | 0 | 17 | 0 | 0 | 0 | 347 | 28 |
| 4:40 PM | 2 | 2 | 149 | 14 | 60 | 10 | 83 | 7 | 5 | 2 | 15 | 0 | 0 | 0 | 314 | 35 |
| 4:45 PM | 1 | 0 | 151 | 15 | 79 | 16 | 92 | 11 | 4 | 0 | 19 | 1 | 0 | 0 | 346 | 43 |
| 4:50 PM | 0 | 0 | 249 | 31 | 83 | 18 | 68 | 9 | 5 | 0 | 22 | 0 | 0 | 0 | 427 | 58 |
| 4:55 PM | 1 | 0 | 198 | 32 | 72 | 9 | 82 | 7 | 5 | 0 | 23 | 0 | 0 | 0 | 381 | 48 |
| 5:00 PM | 2 | 0 | 203 | 19 | 80 | 14 | 94 | 7 | 7 | 0 | 12 | 0 | 0 | 0 | 398 | 40 |
| 5:05 PM | 3 | 1 | 220 | 41 | 80 | 11 | 100 | 8 | 6 | 0 | 24 | 0 | 0 | 0 | 433 | 61 |
| 5:10 PM | 0 | 0 | 230 | 21 | 95 | 10 | 78 | 9 | 8 | 0 | 16 | 0 | 0 | 0 | 427 | 40 |
| 5:15 PM | 0 | 0 | 228 | 52 | 68 | 13 | 91 | 9 | 3 | 0 | 18 | 0 | 0 | 0 | 408 | 74 |
| 5:20 PM | 0 | 0 | 235 | 29 | 114 | 11 | 102 | 7 | 6 | 1 | 17 | 0 | 0 | 0 | 474 | 48 |
| 5:25 PM | 0 | 0 | 231 | 33 | 88 | 22 | 94 | 10 | 15 | 0 | 17 | 0 | 0 | 0 | 445 | 65 |
| 5:30 PM | 5 | 3 | 234 | 37 | 122 | 22 | 86 | 10 | 9 | 3 | 18 | 0 | 0 | 0 | 474 | 75 |
| 5:35 PM | 0 | 0 | 245 | 33 | 89 | 8 | 116 | 11 | 5 | 0 | 21 | 0 | 0 | 0 | 476 | 52 |
| 5:40 PM | 3 | 0 | 336 | 30 | 96 | 10 | 105 | 11 | 6 | 0 | 16 | 0 | 0 | 0 | 562 | 51 |
| 5:45 PM | 1 | 0 | 240 | 29 | 87 | 16 | 104 | 6 | 4 | 0 | 19 | 0 | 0 | 0 | 455 | 51 |
| 5:50 PM | 5 | 0 | 293 | 30 | 85 | 8 | 99 | 14 | 5 | 1 | 24 | 0 | 0 | 0 | 511 | 53 |
| 5:55 PM | 3 | 2 | 263 | 42 | 66 | 16 | 110 | 8 | 2 | 0 | 22 | 0 | 0 | 0 | 466 | 68 |
| 6:00 PM | 3 | 1 | 234 | 30 | 78 | 15 | 114 | 9 | 9 | 0 | 25 | 0 | 0 | 0 | 463 | 55 |
| | 29 | 9 | 5288 | 679 | 2012 | 283 | 2253 | 207 | 135 | 9 | 463 | 1 | 0 | 0 | 10180 | 1188 |

**Figure 10. Traffic volume count (Morning and evening traffic count from the CCTV)**

*Questionnaire survey analysis*

The pedestrian safety questionnaire survey is conducted to comprehensively address various aspects of pedestrian safety. The key areas focus on Zebra line awareness, road crossing behaviours and usage of subway & pedestrian underpasses. The primary goal of this questionnaire is to gain in-depth insights into the challenges pedestrian face in urban settings. Bye collecting detailed responses, the user aims to identify key issues and area for improvement.

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

1. Do you use pedestrian subway in Thrissur?

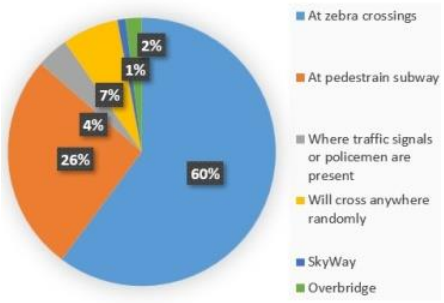



Figure 5. Pedestrian's response through google form

2. Do you use pedestrian subway in Thrissur?

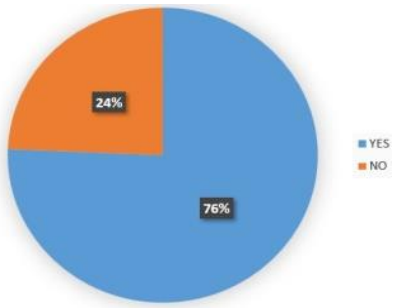



Figure 6. Pedestrian's response through google form

3. Do you think that people of all ages can use the pedestrian subway?

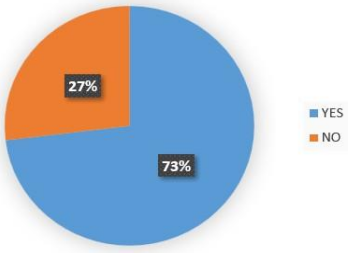



Figure 7.Pedestrian's response through google form

4. Do you think that the pedestrian subways in Thrissur are located at suitable place?

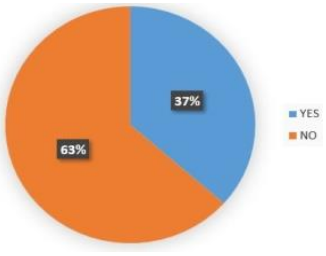



Figure 8. Pedestrian's response through google form

5. Do you think that the pedestrian Skyway in Thrissur are located at

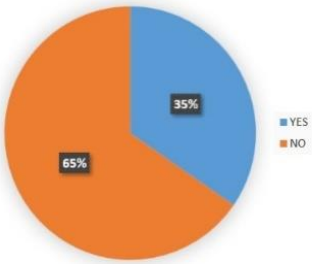



Figure 9. Pedestrian's response through google form

6. Do you use pedestrian Skyway in Thrissur?

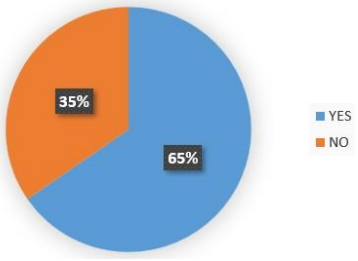



Figure 10. Pedestrian's response through google form.

7. Do you think that people of all ages can use pedestrian Sky Way?

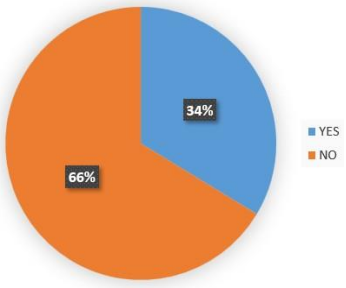



Figure 11. Pedestrian's response through google form.

8. Do you use pedestrian over bridge in Thrissur, Vadakkestand?

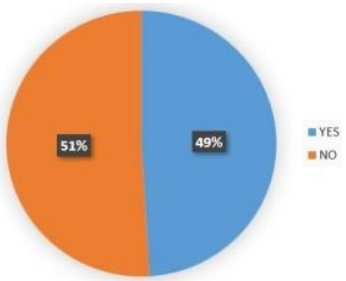



Figure 12. Pedestrian's response through google form.

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

9. Do you think that people of all ages can use pedestrian over bridge?

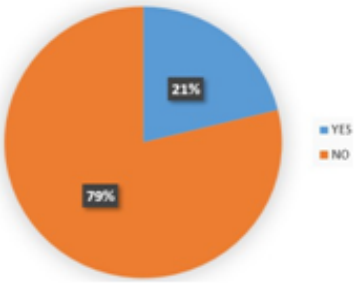



**Figure 13. Pedestrian's response through google form.**

10. Do you think that the pedestrian over bridge in Thrissur are located at suitable place?

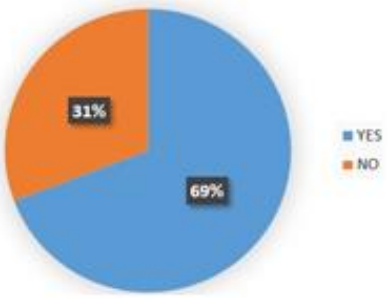



Figure 14. Pedestrian's response through google form.

## SIGNAL DESIGN

Designed a signal for comparative study at Shoranur Road intersection where an existing signal is located. Identified peak hours (8:30-9:30am, 5:00-6:00pm) using volume data retrieving method. Webster's method is used for signal designing in Thrissur round to optimize traffic flow by analyzing traffic volume and movement patterns, aiming to reduce congestion and improve intersection performance.

In Webster's method, normal flow value and saturated flow value on different roads are used for design of signal cycle time. Normal flow is highest traffic volume in PCU/hour and is denoted as "q". Saturation flow can be determined on the basis of width of road denoted as "s", w is the width from central line of road to kerb,

If the width, w is in between 5.5m -13m, then the saturation flow can be calculated by the equation

**S=525w,** PCU/hour

If the width w is in between 3-5.5m, then the saturation flow can be obtained from the Table 3. PCU value as per IRC for signal design as shown in Table 4.

**Table 3. Saturation flow for 3 - 5.5m for signal design**

| Width , w (m) | Saturation flow, S (PCU/hour) |
|---|---|
| 3.0 | 1850 |
| 3.5 | 1890 |
| 4.0 | 1950 |
| 4.5 | 2250 |
| 5.0 | 2550 |
| 5.5 | 2900 |

**Table 4. PCU value as per IRC road width**

| Types of vehicles PCU | Types of vehicles PCU |
|---|---|
| Heavy or medium goods | 1.75 |
| Light goods vehicles | 1.00 |
| Bus | 2.25 |
| Motor cycle or scooter | 0.33 |
| Pedal cycle | 0.20 |

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

**DESIGN STEPS**

Optimum cycle length, Co = (1.5L+5)/(1-Y)

**1. Critical flow ratio, Y**

$$Y=y_1+y_2+y_3+....+y_n$$

where,

$$y = \frac{q}{s}$$

**2. Total lost time, L**

$$L = 2n + R$$

OR

$$L = \varepsilon(I - a) + \varepsilon l$$

Where,

n = no. of phases

R = All red time

I = Minimum intergreen period

a = Amber time

l = Lost time per phase

**3. Optimum cycle length, Co**

$$C_O = \frac{1.5L + 5}{1 - Y}$$

**4. Green time, G**

$$G = \frac{y}{Y}(C_O - L)$$

**5. Red time, R**

$$R = C_O - G - 2a$$

Where,

Co = Optimum Cycle Time

G = Green time required

a = Amber time

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

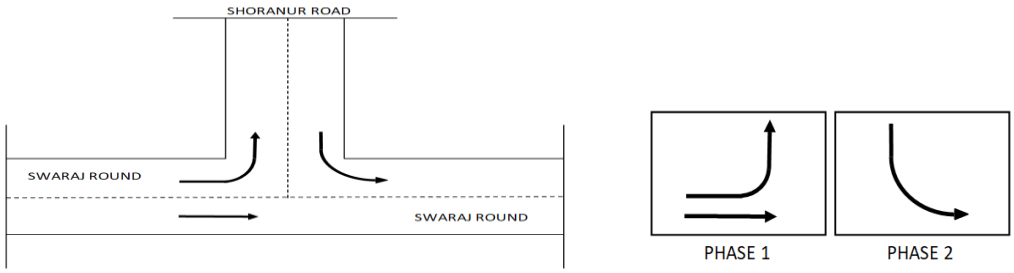



Figure 15. Phase diagram

## PRACTICAL CALCULATION

### MORNING PEAK HOUR

**1. Critical flow ratio, Y**

$$Y = y_1 + y_2$$

$$y_1 = \frac{q_1}{s_1} \qquad y_2 = \frac{q_2}{s_2}$$

Where,

$q_1$=3121PCU/hr

$q_2$ = 304 PCU/hr $\quad y_1 = \frac{3121}{5775}$ $\quad y_2 = \frac{304}{3150}$

$S_1$ = 5775 PCU/hr

$S_2$ =3150PCU/hr $\quad = 0.54 \quad = 0.1$

$$Y = 0.54 + 0.1$$

$$= \mathbf{0.64}$$

**2. Total lost time, L**

$$L = \varepsilon(I - a) + \varepsilon l$$

Where,

I = 4sec,

a = 2sec, $\quad L = 2 \times (4 - 2) + 2 \times 2$

l = 2sec

No.of phases = 2 $\quad = \mathbf{8}\ \boldsymbol{sec}$

**3. Optimum cycle length, Co**

$$C_O = \frac{1.5\,L + 5}{1 - Y}$$

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

$$C_O = \frac{1.5 \times 8 + 5}{1 - 0.64} = 48 \text{ sec}$$

**Optimum cycle length for morning peak hour = 48sec**

**4. Green time, G**

For Phase 1**,**

$$G_1 = \frac{y_1}{Y}(C_O - L)$$

$$G_1 = \frac{0.54}{0.64}(48 - 8) = \mathbf{34\ sec}$$

For Phase 2,

$$G_2 = \frac{y_2}{Y}(C_O - L)$$

$$G_2 = \frac{0.1}{0.64}(48 - 8) = \mathbf{6\ sec}$$

**5. Red time, R**

For Phase1,

$$R_1 = C_O - G_1 - 2a$$

$$R_1 = 48 - 34 - 2 \times 2$$
$$= \mathbf{10\ Sec}$$

For Phase2,

$$R_2 = C_O - G_2 - 2a$$

$$R_2 = 48 - 6 - 2 \times 2$$
$$= \mathbf{38\ sec}$$


Figure 16. Timing Diagram (Morning Peak Hour)

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

**EVENING PEAK HOUR**

**1. Critical flow ratio, Y**

$$Y = y_1 + y_2$$

$$y_1 = \frac{q_1}{s_1} \qquad y_2 = \frac{q_2}{s_2}$$

Where,

$q_1$=4015PCU/hr

$q_2$ = 388 PCU/hr $\quad y_1 = \frac{4015}{5775}$ $\quad y_2 = \frac{388}{3150}$

$S_1$ = 5775 PCU/hr

$S_2$=3150PCU/hr $\quad = 0.7 \quad = 0.12$

$$Y = 0.7 + 0.12$$

$$= \mathbf{0.82}$$

## 2. Total lost time, L

$$L = \varepsilon(I - a) + \varepsilon l$$

Where,

I = 4sec

a = 2sec, $\quad L = 2 \times (4 - 2) + 2 \times 2$

l = 2sec

No.of phases = 2 $\quad = \mathbf{8}\ \boldsymbol{sec}$

**3. Optimum cycle length, Co**

$$C_O = \frac{1.5L + 5}{1 - Y}$$

$$C_O = \frac{1.5 \times 8 + 5}{1 - 0.82} = \mathbf{95sec}$$

**Optimum cycle length for morning peak hour= 95sec**

**4. Green time, G**

For Phase 1**,**

$$G_1 = \frac{y_1}{Y}(C_O - L)$$

$$G_1 = \frac{0.7}{0.82}(95 - 8) = \mathbf{74}\ \boldsymbol{sec}$$

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

For Phase 2,

$$G_2 = \frac{y_2}{Y}(C_O - L)$$

$$G_2 = \frac{0.12}{0.82}(95 - 8) = \mathbf{13\ sec}$$

**5. Red time, R**

For Phase1,

$$R_1 = C_O - G_1 - 2a$$

$$R_1 = 95 - 74 - 2 \times 2 = \mathbf{17\ Sec}$$

For Phase2,

$$R_2 = C_O - G_2 - 2a$$

$$R_2 = 95 - 13 - 2 \times 2 = \mathbf{78\ sec}$$

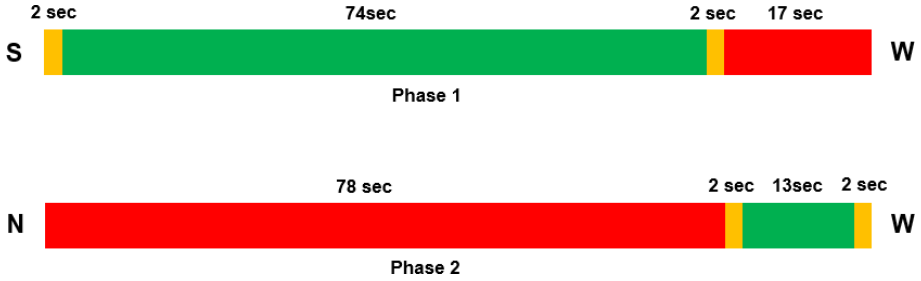



Figure 17. Timing Diagram (Evening Peak Hour).

## COMPARISON STUDY

The comparison between the existing and proposed signal design at Shoranur Road in Thrissur highlights potential improvements in traffic flow and safety. Currently, the existing design may suffer from congestion, inefficient signal timing, and inadequate pedestrian facilities, leading to delays and safety concerns. The proposed design aims to address these issues by introducing optimized signal timing, dedicated pedestrian crossings, and advanced traffic management systems. Phase 1 prioritizes south to east (S-E) and south to north (S-N) traffic, with synchronized pedestrian facilities, aiming to improve smooth movement and safety during both morning and evening hours. Proposed adjustments include reducing green times to 34 seconds and red times to 10 seconds in the morning, and increasing green times to 74 seconds and decreasing red times to 17 seconds in the evening. Phase 2 focuses on north to east (N-E) traffic, aiming to facilitate movement from the northern direction to the east, with proposed adjustments to green times and red times aiming to balance traffic flow and safety. Overall, these enhancements aim to result in smoother traffic flow, reduced congestion, shorter travel times, and improved safety for all road users.

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

**Table 5. Existing and proposed signal designs in Shoranur road, Swaraj Round, Thrissur**

| Time | Existing Signal | | Proposed Signal | |
|---|---|---|---|---|
| | Phase1 | Phase2 | Phase1 | Phase2 |
| Morning(7:30-9:30a m) | | | | |
| Amber time | 3sec | 3sec | 2sec | 2sec |
| Green time | 49sec | 10sec | 34sec | 6sec |
| Red time | 37sec | 70sec | 10sec | 38sec |
| Evening(4:00-5:00p m) | | | | |
| Amber time | 3sec | 3sec | 2sec | 2sec |
| Green time | 46sec | 12sec | 74sec | 13sec |
| Red time | 32sec | 66sec | 17sec | 78sec |

## RESULTS & DISCUSSIONS

The accident data analysis for Thrissur reveals concerning trends. Thrissur East side stands out as a hotspot for accidents, emphasizing the need for targeted interventions in infrastructure and traffic management in that area. The year wise analysis underscores the urgency, with a notable surge in accidents reported in 2020, necessitating a closer examination of contributing factors during that period. Daytime emerges as a critical period for accidents, indicating the importance of visibility and heightened awareness during daylight hours. The age group of 20 to 30 years faces a higher risk, highlighting the significance of targeted awareness campaigns and safety measures for this demographic. Moreover, the data points to a gender discrepancy, with men being more susceptible to accidents, emphasizing the need for gender-specific safety strategies. The prevalence of accidents involving Light Motor Vehicles raises questions about driver behaviour, road conditions, and enforcement. Addressing the specific challenges faced by this category of road users is crucial for overall safety improvements. The concerning rise in grievous injuries from 2019 to 2023 underscores the urgency of implementing measures to reduce the severity of accidents.

## CONCLUSIONS

The comprehensive road safety audit conducted at Thrissur Swaraj Round has brought to light critical issues impacting the safety and efficiency of transportation in the area. By incorporating user perspectives, especially from pedestrians, recommendations have been devised to address key concerns such as poor visibility, confusing road markings, and deteriorating footpaths, alongside suboptimal traffic signal conditions. These recommendations, encompassing signal timings adjustments, clearer signage installations, and pedestrian infrastructure enhancements, are anticipated to yield significant benefits, including reduced accident rates, smoother traffic flow, and overall enhanced safety and functionality. In addition, the ongoing traffic signal redesign project at Shoranur road within Thrissur Swaraj Round, employing the Webster technique, aims to tackle traffic congestion and bolster pedestrian safety by optimizing signal timings based on peak hour traffic volume patterns. This initiative underscores a commitment to safety, efficiency, and environmental sustainability. Continuous monitoring and evaluation will play a crucial role in ensuring the sustained effectiveness of these initiatives. Moreover, the project's focus on conducting a road safety audit

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922

to improve road infrastructure, footpath conditions, and proper signboard installations, specifically emphasizing pedestrian safety concerns, highlights a holistic approach towards fostering a safer and more efficient transportation environment. The inclusion of feedback from Swaraj Round users through a pedestrian questionnaire survey has provided invaluable insights for targeted improvements. Overall, this project demonstrates a dedicated effort to enhance the quality of life in the area by creating a safer, more efficient, and pedestrian-friendly transportation environment. Through collaborative efforts and ongoing evaluation, we aim to realize our vision of a thriving community with improved road safety and enhanced mobility.

## CONFLICT OF INTEREST

The authors declare that this manuscript has not been published previously and is not under consideration for publication elsewhere. Furthermore, all authors have read, reviewed, and approved the final version of the manuscript submitted to the journal, and there are no conflicts of interest or ethical concerns associated with this submission.

## REFERENCES

T. Ameen, W. Rashid, and A. Ahmad, "Estimation of vehicular delay in presence of illegally crossing pedestrians and determination of LOS using cluster analysis at midblock sections of urban roads," *Innovative Infrastructure Solutions*, vol. 8, no. 1, Nov. 2022.

A. Chaudhari, N. Gore, S. Arkatkar, G. Joshi, and S. Pulugurtha, "Exploring pedestrian surrogate safety measures by road geometry at midblock crosswalks: A perspective under mixed traffic conditions," *IATSS Research*, vol. 45, no. 1, pp. 87–101, Apr. 2021.

D. Drašković and V. Gatarić, "Contemporary methods of road safety risk management," *JTTTP - Journal of Traffic and Transport Theory and Practice*, vol. 7, no. 2, Oct. 2022.

S. Kumar Singh and K. Parbhakar, "Statistical Analysis of Traffic of Rotary Intersection," *International Journal of Engineering Sciences & Research Technology*, vol. 6, no. 2, pp. 327–334, Feb. 2017.

Md Izharul Haque, Amir Ali Khan, G. Singh, S. Dass, and Saurabh Jaglan, "Accident analysis and road safety audit: a case study on NH-76," *IOP Conference Series: Earth and Environmental Science*, vol. 1086, no. 1, Sep. 2022.

G. M. Aboud, A. M. Abdulwahab, Q. S. Banyhussan, and H. A. Zubaidi, "A Case Study on Roundabout under Congestion: Proposal to Improve Current Traffic Operation," *Civil Engineering Journal*, vol. 5, no. 9, pp. 2029–2040, Sep. 2019.

M. M. Raju, S. Chand, and J. Thomas, "Estimation of PCU and Saturation Flow for Mixed Traffic Condition at Urban Signalized Intersections," *SSRN Electronic Journal*, 2021.

B. Sudharshan. Reddy and N. Venkata. Hussain Reddy, "Signal Design for T-Intersection by Using Webster's Method in Nandyal Town, Kurnool District of Andhra Pradesh," *International Research Journal of Engineering and Technology (IRJET)*, vol. 3, no. 4, pp. 1124–1131, 2016.

K. Rambabu *et al.*, "The Design of Traffic Signals at Intersection," *International journal of innovative research in engineering and management*, vol. 9, no. 6, pp. 137–139, Dec. 2022.

Y. Sun, B. Xie, and D. Wu, "Three Methods of PCU Estimation at Signalized Intersections under Mixed Traffic with UAV Monitoring Data," *Journal of Transportation Engineering, Part A: Systems*, vol. 148, no. 3, Mar. 2022.

A. G. C George, A. K R, A. Haridas, A. Vinod, and D. K M, "Geometric Features of Road and Causes of Accident," *International Research Journal of Engineering and Technology (IRJET)* , vol. 9, no. 8, pp. 1632–1635, Aug. 2022.

P. N. Salini , A. John, S. N. Anamika , A. Radhakrishnan, C. Tom, and M. Jomon, "Adequacy of Traffic Signal at Intersection," *International Journal of Advances in Engineering and Management (IJAEM)*, vol. 5, no. 1, pp. 851–864, Jan. 2023.

Proceedings DOI: 10.21467/proceedings.179
ISBN: 978-81-984081-7-4

Series: AIJR Proceedings
ISSN: 2582-3922