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Road Safety Audit of SH-26 Section from Khandwa to Chhegaon Makhan - A Case Study (M.P.) India

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Abstract: ***Transportation plays a key role in the development of an area, but it happens only when the transportation is safe, rapid, comfortable and economy. A road is considered safe when only a few, or no accidents occur. Road users and vehicles are the elements contributing to road accidents. Pedestrians, bicyclists and two-wheeler motorized riders are the vulnerable road users. In the world, India has world's largest heavy traffic and accidents also. It is necessary to provide the safety to roads. Road safety audit (RSA) is a formal procedure for assessing accident potential and safety performance in the provision of new road schemes and schemes for the improvement and maintenance of existing roads***

The primary role of auditing identifying the potential problems of a highway project by conducting the site inspection and collecting data. The objective of the study in the identification of accident prone areas on the road from FIR, to study the traffic conditions on the road. Road having considerable traffic during day time and some black spots on the road where accidents take place continuously. The selected area is from khandwa (Bhairaw mandir square) to Chhegaon Makhan. The road length is of 11.7 Kilo meters. A detailed analysis of road from "Khandwa to Chhegaon Makhan" is carried out on the basis of data collection like Year wise data, age wise data, Type of vehicle accident data etc. The present study aimed to evaluate the Road Safety deficiencies and improvements on existing road network. The road safety deficiencies such as improper intersection designing's width of carriage way low maintenance of road markings, road sign, unauthorized median openings, unavailability of Bus-Stops, confusing behaviour of Pedestrian etc. were observed at identified location. It was found that the public transport system including bus and trucks shared a major part of carriageway width and creating the traffic hazards to the other fast moving vehicles. Further, Improper vehicle tuning movements and unauthorized median openings at road intersections, were also responsible for accidental crash. As it is a busy road connecting the industrial, commercial, educational areas, and tourism place, has a mixed traffic which leading to the accidents. The identification of the critical section has been taken place on it. The study will be identifying the defects of the roads and will give the better idea about the defects.

Keywords: Road accidents, First Investigation Report (FIR), Accidents analysis, Severity Index, Road safety audit, Fatality rate, Road safety improvement.

I. INTRODUCTION

The number of persons killed in road crashes in India touched all time high in 2018 registering over 1.51 lakh fatalities, an increase of nearly 3,500 more people losing their lives as compared to 2017. It will be noted that in 2018 a total of 4,67,044 road accidents were reported by States and Union Territories (UTs) killing 1,51,417 people and causing injury to 4,69,418 persons. Road accidents in 2018 compared to the previous year i.e. 2017, increased by 0.46 percent, the number of persons killed increased by 2.37 percent and the number injured decreased by 0.33 percent. The number of 4,67,044 accidents and 1,51,417 deaths in 2018 translates into an average of 1,280 accidents and 415 deaths every day and nearly 53 accidents and 17 deaths every hour.

	Total Number of Road Accidents(In numbers)	%Change	Total Number of Person Killed(In numbers)	%Change	Total Number of Person Injured(In numbers)	%Change
2014	4,89,400		1,39,671		4,93,474	
2015	5,01,423	2.46	1,46,133	4.63	5,00,279	1.38
2016	4,80,652	-4.14	1,50,785	3.18	4,94,624	-1.13
2017	4,64,910	-3.8	1,47,913	-1.9	4,70,975	-4.78
2018	4,67,044	0.46	1,51,417	2.37	4,69,418	-0.33

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II. OBJECTIVE OF THE STUDY

A. To minimize the accident risk on the road network.
B. This research was to identify the safety deficiencies and accident potential and recommend the cost effective appropriate remedial measures for the overall safety improvement of highway
C. Identification of accident prone areas on the khandwa to Chhegaon makhan road from First Investigation Report.
D. To study the effect of roadway geometrics and traffic conditions on this road stretch.
E. To examine safety features adopted in the selected section of two lane state Highway-26 and find out deficiencies in the road network which led to accident and safety hazards to road users.
F. The major purpose of this report is to minimizing the occurrence of crashes.
G. To minimize the number and severity of accidents that will occur on the new or modified road;
H. To develop a methodology for Road Safety Audit for Two-Lane State Highways.

III. NEED OF THE STUDY

A. The State Highway-26 is two –lane highway but with the requirement of time and increasing in the capacity of traffic it should be converted into Four-lane or Six-lane Highway.
B. On this stretch between khandwa to Chhegaon makhan many private school (Vidhyakunj international school, Sophia convent school etc.) the government school is also situated and college (shree dadaji institute of technology & science and AISECT college) from this the road becomes more sensitive near 6:30 am to 9:00 am in morning, near 12:30 pm to 2:00 pm in afternoon and near 3-5 O' clock in evening.
C. Stretch between khandwa to Chhegaon makhan where the industries, factory and mills has been in working condition where the in the peak hours the people working in Industries gets off their duties at that time this path becomes sensitive and also at the time of loading and un-loading of goods like cotten,soyabean, wheat etc. this highway became more dangerous . The workers of the industries mainly used the two wheelers to reach to homes from industries.
D. Railway track between Indore and khandwa has been converted from meter gauge to broad gauge. Then khandwa route face trouble as the railway connectivity is blocked for more than four years for gauge conversion because of blocked railway the capacity of traffic increases on highway and it becomes more sensitive.
E. The study is carried on Khandwa to Chhegaon makhan (Madhya Pradesh) which covers the length 11.7 km. The section was chosen for Road Safety Audit (RSA) as it already existed just like other road networks in India which already exist. The study mainly focused on the identification of existing and potential safety hazards and various types of conflict point and thereby making necessary road safety recommendations.
F. Between Indore and Khandwa say rash driving by bus drivers was the main reason behind the mishaps. Bus drivers raced with each other to reach their destination before the scheduled time. Taking cue from a fatal head-on collision, the Khandwa traffic police have decided to install speed radar guns at strategic and accident prone points on the Indore-Khandwa highway to monitor speed of buses and heavy vehicles plying on the route. The 130-km journey between Indore and Khandwa normally takes about four hours to cover, but the bus drivers usually pick up passengers between the highway and to make up for the lost time, they race their vehicles.

IV. STUDY AREA

The State Highway 26 originates from Chipli (Chhattisgarh) passes through Khandwa (Madhya Pradesh) and ends at Baroda (Gujarat) and covers the length of 692.20 km. The road selected for this study is existing road from Khandwa (Bhairaw mandir square) to Chhegaon makhan (Madhya Pradesh) which covers the length 11.7 km. Khandwa is located at 21.83°N 76.33°E. It has an average elevation of 313 metres (1026 feet) and for Chhegaon makhan geographical coordinates are 21° 50' 0" North, 76° 13' 0" East and its original name (with diacritics) is Chhegaon Mākhan. The road serves an enormous number of heavy vehicles, lorries for the transport of wheat, sugarcane, fly ash and cement materials to the other parts of state and the country. This national highway is maintained and operated by National.This national highway is maintained and operated by National Highway Authority of India (NHAI) and Madhya Pradesh Road Development Corporation (MPRDC).

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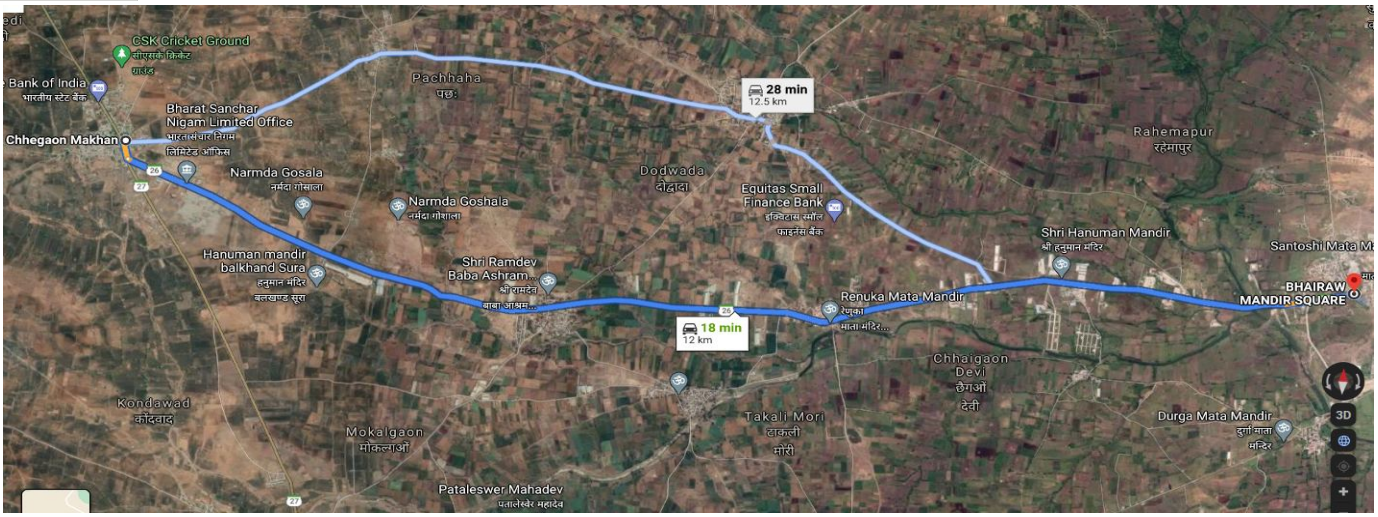
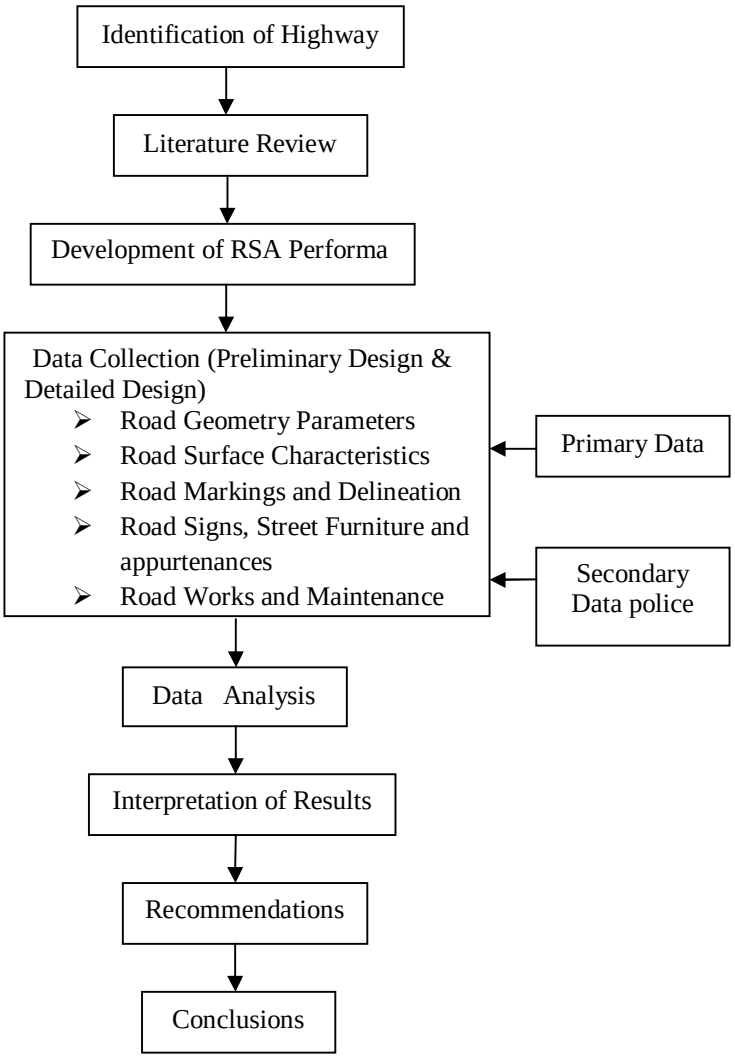


Figure 1:- khandwa to Chhegaon makhan

V. METHODOLOGY FOR ROAD SAFETY AUDIT

Methodology has been developed for road safety audit of state highway which is shown:-



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VI. DATA COLLECTION AND GENERAL OBSERVATIONS & SAFETY RECOMMENDATIONS

The accident data collected of the selected highway from respective police stations. The accident data collected for a period of four years from 2016 to Aug-2020 of Madhya Pradesh .The accident should be reported to police authorities who would take legal actions especially in more serious accidents involving injuries, casualties or severe damage to property. The data has been collected from Padam nagar Police Station and Chhegaon makhan police station of the section from khandwa (Bhairaw mandir square) to Chhegaon makhan this section is consisting of the Universities, Colleges, schools, factories, mills etc. on it.

*Note-The accidents collected from respective police station it also includes some places and accidents which are nearby place of bhairaw mandir square/Indore Naka, Roshnai gaon, dondwada gaon, Chhegaon Devi (Chhoti Chhegaon), Mokalgaon, Chhegaon makhan and T-intersection of SH-26 & SH-27.and in some FIR reports some data is not written/mention then according to peak time, age, type of vehicle, month etc. are adjust in this thesis.

Road Deficiencies Analysis As per the guidelines given in the standard checklist (IRC: SP: 80:2010) the following major road deficiencies were observed at the identified road stretch.



Figure 2:- Passenger boarding and alighting, Drainage problem, road side activity, non-engineered speed breaker at intersection.at bhairaw mandir square

Figure 2 showed that in this intersection Road markings missing, lack of pedestrian facilities and Passenger boarding and alighting at this junction. Road markings should be there to guide the traffic and lane division. Zebra crossings should be there for the safety of pedestrians. Bus stops causes' traffic jams on the highway and even accidents. It was not covered properly and the drainage water flooded at this junction which directly turned in to a major accidental creating situation among pedestrians. At bhairaw mandir square speed-breaker are not marked or poorly marked and contributing to accidents of different natures.



Figure 3:- steep embankments at near dondwada village.

Figure 3 showed that highway as constructed on high (10 to 15 feet) and steep embankments, batter slopes are quite dangerous for run off vehicles. According to Transport Research Laboratory (as cited in Handbook of Highway Safety Design and Operating Practices (1978), Federal Highway Administration, Department of Transportation, USA), standard/ safe batter slope should be between 1:4- 1:6 which is almost absent to the highway. According to locals, many accidents on this highway involve vehicles leaving the road and being in collision with hazardous obstacles such as trees or simply rolling down the high embankment.

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Figure 4:- School is very close to highway at Dondwada village (SH-26)

Figure 4 showed that there is a school on the left side of the highway at Dondwada village. It is approximately nearby village, and it appears most of the young children attending the school walk along the edge of the highway from the village. With an unpaved shoulder, children sometimes walk on the road pavement. This exposes them to a risk of a collision with fast-moving traffic and at Dondwada Village School is very close to highway (SH-26) this place is hazardous and contributing to accident. And the Boundary wall of school is on the shoulder this place is hazardous and contributing to accident .Posing surprise situations to drivers at night.



Figure 5:- No independent parking space was provided on road side at In Front of and approx near to Shree Dadaji Institute of technology & science (SH26)

Figure 5 showed The industries has been in working condition where in the peak hours the people working in Industries gets off their duties at that time this path becomes sensitive. The workers of the industries mainly used the two wheelers to reach to homes from industries. On the left side the turn of village it helps to that village. Along this highway the provisions for or restrictions on parking is not satisfactory in relation to traffic safety. There exist no signs or markings allowing or prohibiting parking. Parking manoeuvre is not well-suited with the safety of the highway. Parking on the carriageway/ shoulder creates congestion and compels through vehicles to use opposite lane on the highway. Illegal parking/ stoppage makes movement of through vehicles unsafe. Pedestrians are compelled to use shoulder and carriageway for walking and have to wait for vehicles at shoulder. Pedestrian crossing of the road becomes unsafe and pedestrians are unable to use walkway.

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No independent parking space was provided on road side therefore, the vehicles parked randomly on road side and covered a very wide area of the road way. The trucks are waiting for their turn to load the material. Unlit Parked vehicles were observed which were posing surprise situations for running vehicles.



Figure 6:- Required junction improvement and Parking/ stoppage of vehicle on the intersection at SH 26 connects to SH 27 (T-intersection)

Figure 6 showed along this highway the provisions for or restrictions on parking are not satisfactory in relation to traffic safety. The sight distance at intersections and along the route is affected by parked vehicles. Parking/stoppage/ passenger boarding and alighting on the T-intersection congestion and compels through vehicles to use opposite lane on the highway. Illegal parking/ stoppage at junctions makes turning movements to/from highway unsafe. Illegal parking/ stoppage makes movement of through vehicles unsafe. Temporary shop on the carriageway at T-junction posing surprise situations for drivers Signboards, billboards, banners, posters etc on T-junction restricting sight distance.

A. Collection Of Accident Data

Accident related data for five years was collected from two police station namely Padam nagar police station and Chhegaon makhan police station. To get the FIR (First Information Report) numbers. Later on year-wise FIR Books were consulted to get accident statistics. Data on total 570 reported accidents related to the highway under study over the period of five years were collected.

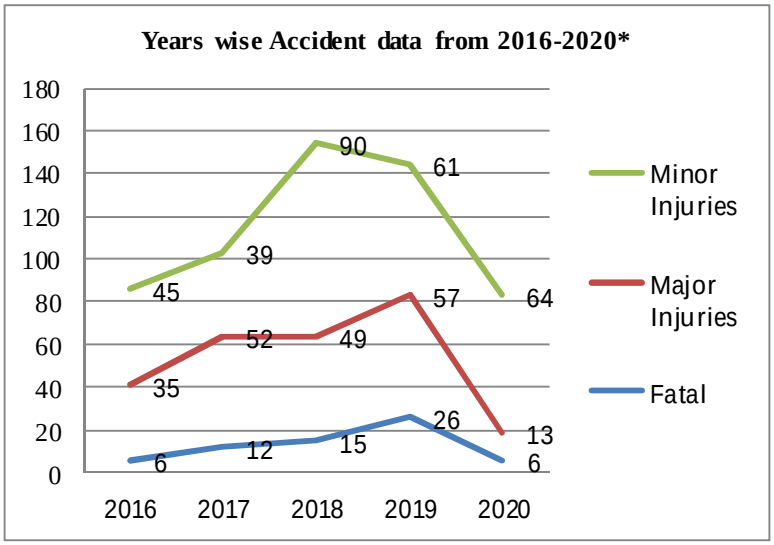
Years wise Accident data from 2016-2020*

Years	Fatal	Major Injuries	Minor Injuries	TOTAL
2016	6	35	45	86
2017	12	52	39	103
2018	15	49	90	154
2019	26	57	61	144
AUG-2020*	6	13	64	83

Table 1 Years wise Accident data from 2016-2020*

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From the above table is that of the total number of accidents from 2016-2020*, Minor injuries accounted for the largest share of about 52.46%, followed by Major injuries accidents of about 36.14% with Fatal injuries accounting for another 11.40% of the total accidents underline the need for provision of Good Samaritan laws and provision of free health care during the golden hour to save lives which has now been made a part of the MV Amendment Act 2019.It will be noted that from 2016-2020* a total of 570 road accidents were reported by respective police station which came under study area killing 65 people, major injury 206 and minor injury to 299 persons.



Line Chart 1 - Years wise Accident data from 2016-2020

B. Severity Index

Accident severity index is defined as the number of persons killed per 100 accidents. But in this study accident severity index (ASI) is calculated based on the number of accidents.

S No.	Year	Severity Index
1	2016	6.97
2	2017	11.65
3	2018	9.74
4	2019	18.05
5	2020	7.22

Table 2 Severity index

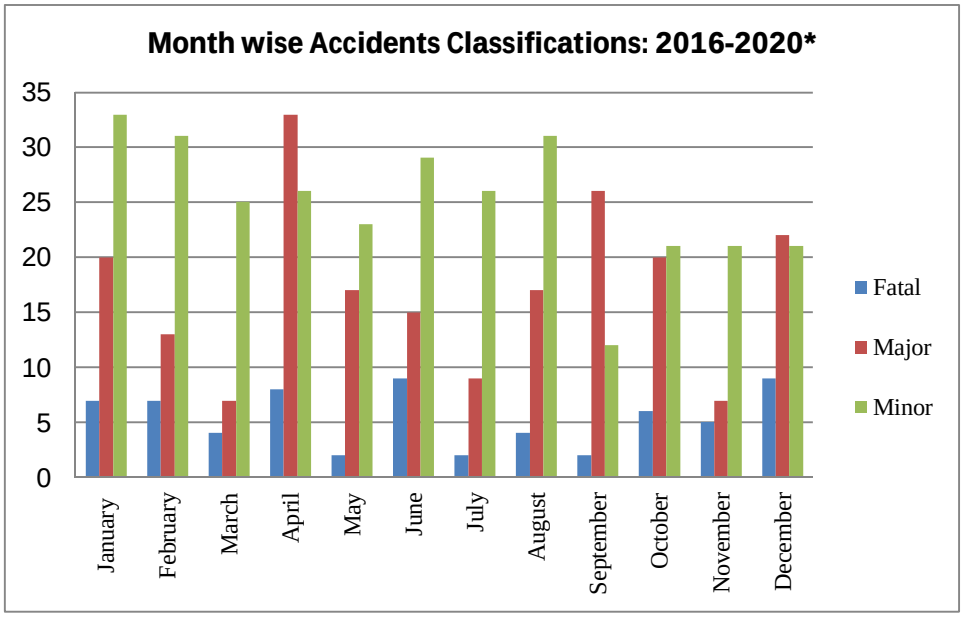
Severity index: - The ratio of Crashes involving an injury or fatality to the total crashes.

*C. Month wise Accidents Classifications: 2016-2020**

Month	Fatal	Major	Minor
January	7	20	33
February	7	13	31
March	4	7	25
April	8	33	26
May	2	17	23
June	9	15	29
July	2	9	26
August	4	17	31
September	2	26	12
October	6	20	21
November	5	7	21
December	9	22	21
Total	65	206	299

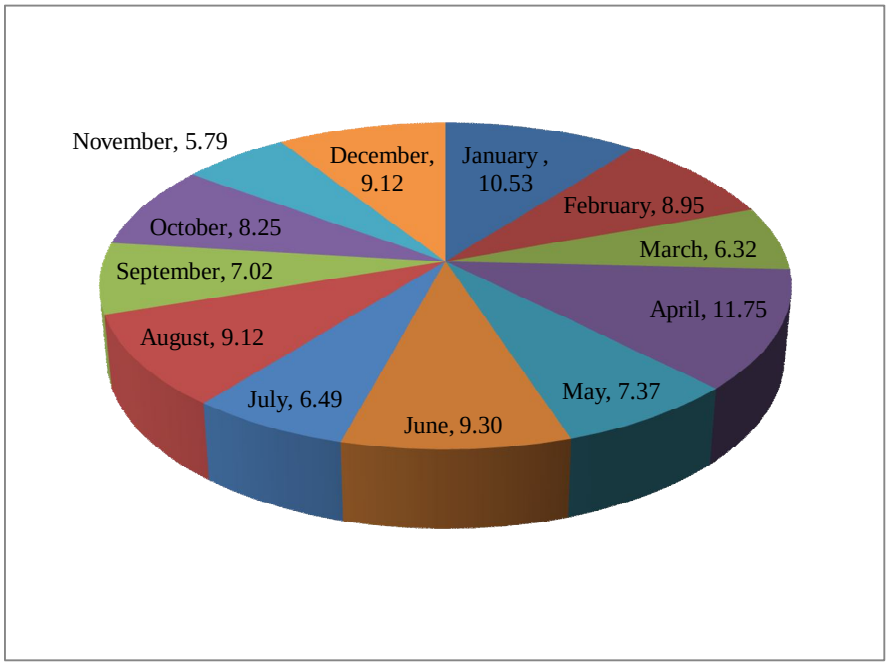
Table 3 Month wise Accidents Classifications: 2016-2020**

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Graph 1 Month wise Accidents Classifications: 2016-2020*

The month wise data on road accidents presented in Table reveals that over the period of five years (2016 to 2020) the months in which the maximum number of accidents and maximum number of road accident deaths occur are April, June, August, January and December. The data on month wise distribution of road accidents and number for person killed during the year 2016-2020 as plotted in Graph reveals that peak month is April followed by June, August, January and December. The period September to November has lesser number of accidents and road accident deaths. Chart shows that more number of accidents has been occurred during the month of April consisting of 11.75% of total road accidents which are the summer season and driver's do move at excessive speeds and are also inattentive. During month of April to July, in this summer duration lots of festival and marriage season on pick so that the traffic volume is high.



Pie Chart 1 Month wise Accidents Classifications: 2016-2020*

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D. Accidents Classified As Per Time

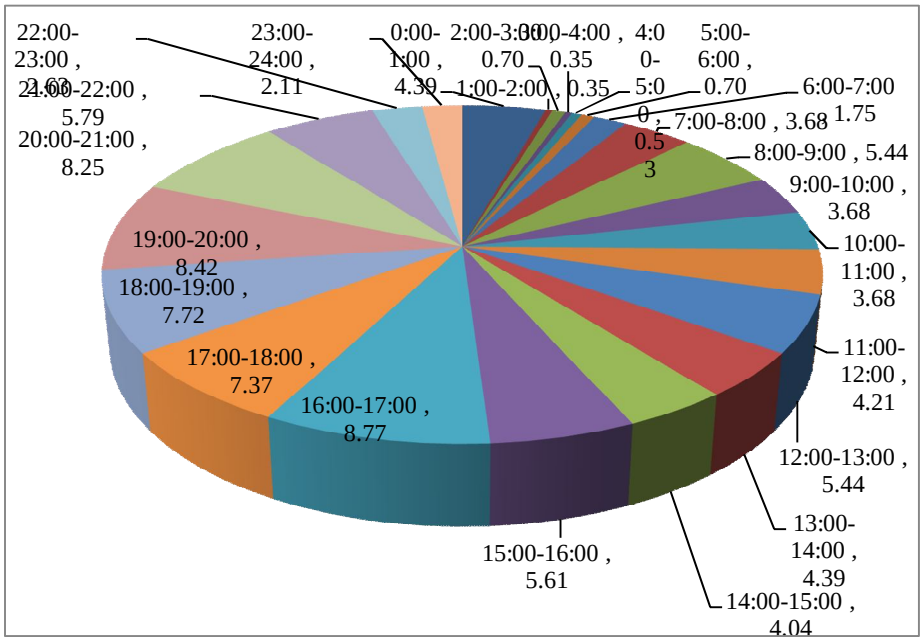
Time	Fatal	Major	Minor
0:00- 1:00	0	20	5
1:00-2:00	0	0	2
2:00-3:00	0	0	4
3:00-4:00	0	0	2
4:00-5:00	0	0	3
5:00-6:00	1	3	0
6:00-7:00	1	2	7
7:00-8:00	3	13	5
8:00-9:00	4	10	17
9:00-10:00	2	8	11
10:00-11:00	3	7	11
11:00-12:00	2	4	18
12:00-13:00	2	4	25
13:00-14:00	1	4	20
14:00-15:00	2	9	12
15:00-16:00	5	17	10
16:00-17:00	9	19	22
17:00-18:00	2	28	12
18:00-19:00	5	9	30
19:00-20:00	6	15	27
20:00-21:00	7	17	23
21:00-22:00	6	9	18
22:00-23:00	3	6	6
23:00-24:00	1	2	9
Total	65	206	299

Table 4 Accidents Classified As Per Time

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Table shows that 68.77% of accidents occurred during day time between 8:00 am to 8:00pm and 31.23% of accidents have been occurred between 8:00pm to 8:00am. Accidents are more during day time compared to night time. During day time visibility is more and numbers of trips are also more. Driver's have a tendency to take more risk during visibility hours. Also, it is seen that Students going for school and persons going for working place (morning 8:00 to 9:00, 10:00 am to 12:00 noon) and leaving working(17:00 pm to 20:00 pm hours) place shows the rise in accidents.

In 2016-2020, the time interval between 6:00 PM and 9:00 PM recorded maximum number of road accidents, accounting for 24.39 per cent of the total accidents in the study area. The second highest time interval of a day was between 3:00 PM and 6:00 PM constituting 21.75 per cent of road accidents. As per the data, afternoon and evening times are the most dangerous times to be on the road. The time interval of 0.00 hrs to 6:00 AM has the least number of accidents



Pie Chart 2 Accidents classified as per time 2016 to Aug-2020*

E. Road Accidents By Type Of Vehicles

Types of Vehicle	2016	2017	2018	2019	Aug-2020*	**2016-2020***	**% wise**
Motorcycle without Gear	4	0	5	2	5	16	2.81
Motorcycle with Gear	25	27	38	40	29	159	27.89
Light Motor Vehicle-Non-Transport	21	22	48	23	23	137	24.04
Light Motor Vehicle-Transport	9	13	33	25	10	90	15.79
Heavy Goods Vehicle	27	41	30	54	16	168	29.47
TOTAL	86	103	154	144	83	570	100.00

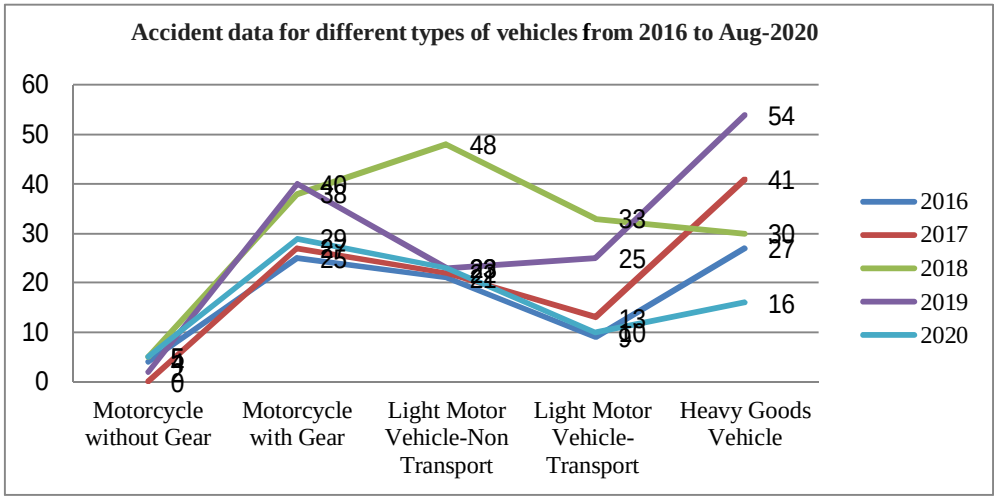
Table 5 Road Accidents by Type of Vehicles Year Wise Data

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It will be seen from above that during the five years 2016-2020*, amongst the motorized vehicles, two wheelers (Motorcycle with Gear or without Gear) accounted for the highest share of 30.7 percent of the total road accidents followed by Heavy Goods Vehicle (Bus/truck/lorry){29.47%} and Light Motor Vehicle-Non-Transport (car/jeep/van/taxi){24.04 %}.Unspecified vehicles under the category others/ Light Motor Vehicle-Transport accounted for about 15.79 percent of road accidents.

The largest percentage increase in terms of accidents and persons killed was observed in the category of two wheelers and Heavy Articulated Vehicles. Even in terms of vehicular composition, two wheelers account for a significant share of about 30.7% the total road accidents and hence there is a need to focus on safety related interventions in this segment. Accordingly, helmet wearing has been made mandatory and increased penalties imposed for violation of this provision in the Amended Motor Vehicle Act passed by the Parliament in 2019

Table shows that 30.70 of total accidents are occurred due to motor-cyclists which is a personalized mode of transport and is highly vulnerable to accidents. Rash and negligent driving has proved to be cause of the serious and fatal accidents. Similarly, poor road geometry increases the incidents of accidents on roads. Fatalities due to rickshaw, cars and nearly consist of 24.04% of total road fatalities. Motor cycle consists of nearly 50% of traffic on study stretch as the people residing nearby prefer motor cycle for their daily use. Heavy vehicles pass through this stretch to transport goods as there are various Factories, Mills nearby the study area. Pedestrians and motor cyclists are vulnerable road user on the road. As the land use pattern nearby study stretch is agricultural land, the people working in farms uses motor cycles and scooters for moving from one place to other and students also use this road for going school and colleges.



Line Chart 2 Accident data for different types of vehicles from 2016 to Aug-2020

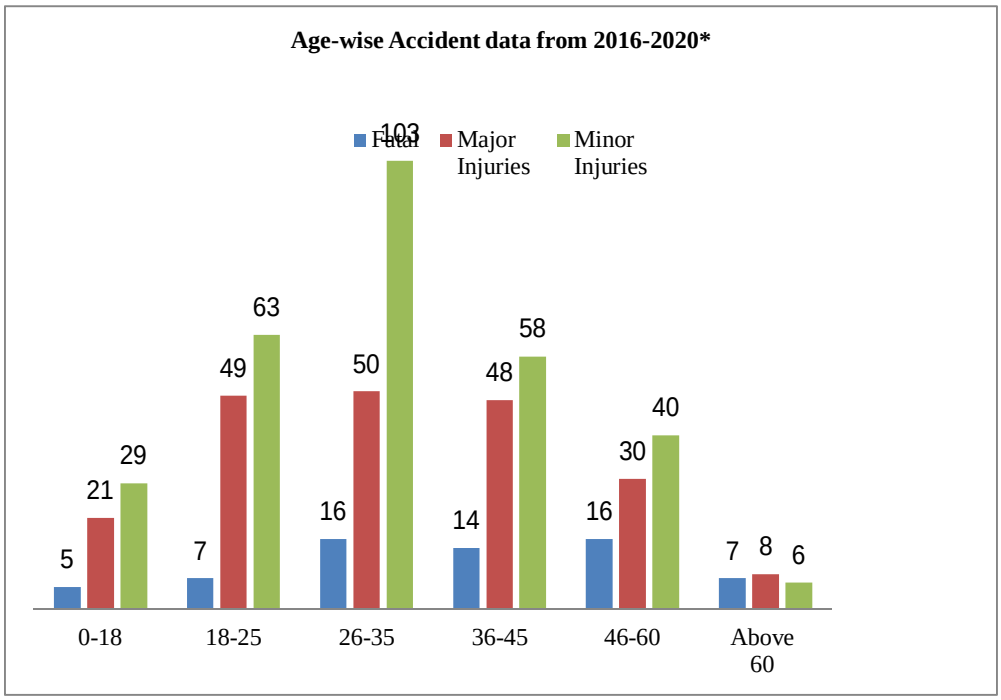
F. Collection Of Age Data

Age in years	Fatal	Major	Minor	Total	% Share Total
0-18	5	21	29	55	9.65
18-25	7	49	63	119	20.88
26-35	16	50	103	169	29.65
36-45	14	48	58	120	21.05
46-60	16	30	40	86	15.09
Above 60	7	8	6	21	3.68
Total	65	206	299	570	100.00

Table 6 Collection of Age Data

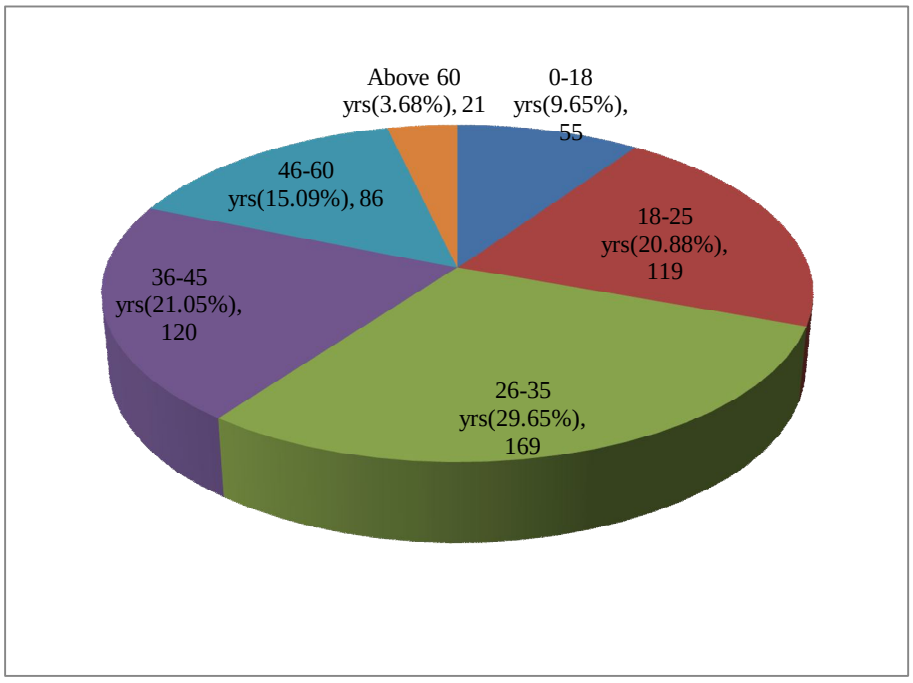
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The young adults in the age group of 18 - 45 years accounted for nearly 71.58 percent of road accident victims. The working age group of 18 - 60 accounted for a share of 86.67 percent in the total road accident deaths. Graphical presentation of age profile wise share in road accidents victims is presented in Chart.



Graph 2 Graphically represent of Age Data

The data in Table reveals that road accident victims largely constitute young people in the age groups of 18 - 25, 25 - 35 and 35 - 45 and this age profile has remained the same in all the Five years i.e. 2016, 2017,2018,2019,2020* underscoring major implications on economic cost of road accidents, apart from their emotional and psychological impact.



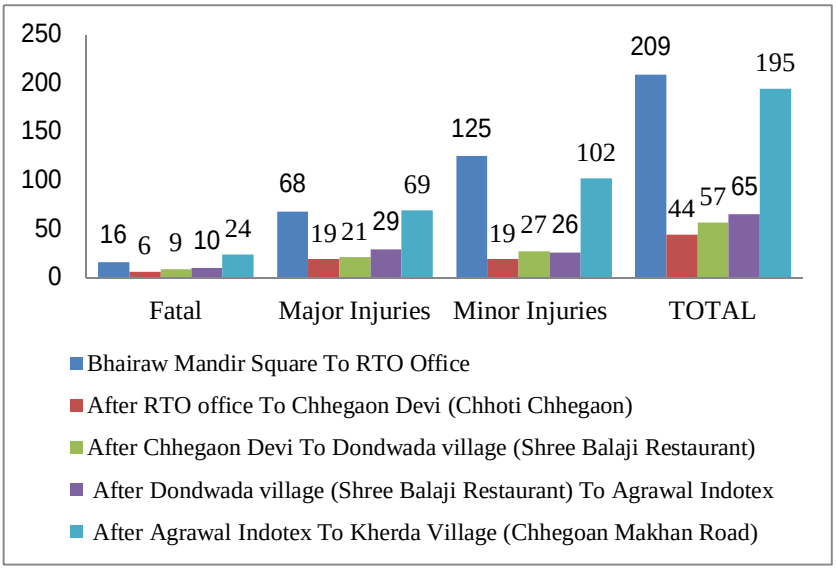
Pie Chart 3 Percentage wise Age Data

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G. Numbers Of Persons Killed (Area Wise) In Road Accidents

Year	Affected types	Bhairaw Mandir Square To RTO Office	After RTO office To Chhegaon Devi (Chhoti Chhegaon)	After Chhegaon Devi To Dondwada village (Shree Ram Mandir)	After Dondwada village (Shree Ram Mandir) To Agrawal Indotex	After Agrawal Indotex To chhegaon Makhan
No. of Accidents 2016-2020*	Fatal	16	6	9	10	24
	Major Injuries	68	19	21	29	69
	Minor Injuries	125	19	27	26	102
	TOTAL	209	44	57	65	195

Table 7 Area Wise Road Accidents



Graph 3 Area Wise Road Accidents

H. Calculation of Fatality Rate

From the accident data the Fatality Rate (FR) is computed at different sections of the highway. The Fatality Rate (FR) is calculated by following formula:

FR = F/T x 1000

Where,

F = No, of fatal accidents

T = No. of total accidents

The Fatality Rates at different sections on State Highway 26 are shown in Tables.

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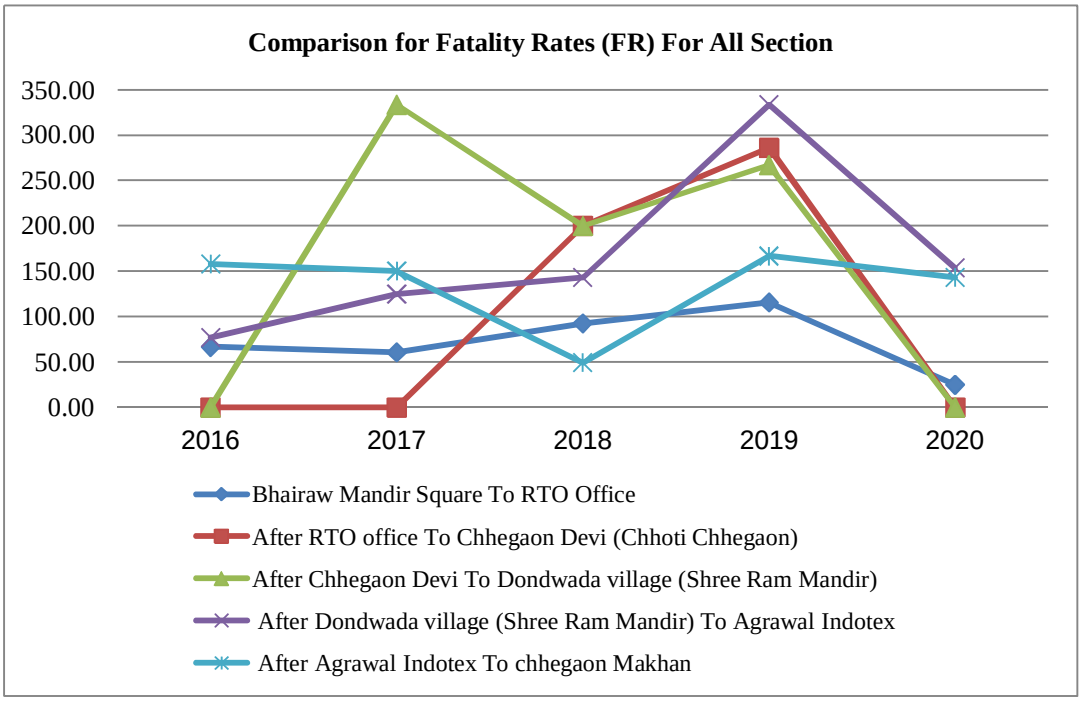
Years wise Accident data from 2016-2020*					
Years	Fatal	Major Injuries	Minor Injuries	TOTAL	Fatality Rate = F/T X 1000
2016	6	35	45	86	69.77
2017	12	52	39	103	116.50
2018	15	49	90	154	97.40
2019	26	57	61	144	180.56
AUG-2020*	6	13	64	83	72.29

I. Accident Density

During Five year period, total 570 accidents occurred on 11.7 Km long road stretch. Accident density was found to 9.743 accidents/Km/ Year.

$$\text{Accident density} = \frac{\text{Average no. of accidents/year}}{\text{Length of road}}$$

J. Comparison for Fatality Rates (FR) For Study area



Line chart 3 Comparison for Fatality Rates (FR) for All Section

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VII. RECOMMENDATIONS

A. At Bhairaw mandir square bus stops should be 60 meters away from the junction and Passenger boarding and alighting at junction should be avoided and Various roadside activities like temporary shops, tea-stalls, shops, advertising boards and private construction materials should be removed from the shoulder at junction, Retro-reflective materials or paintings to be used at all speed reducing devices, necessary regulatory and warning signs with clear visibility and retro-reflective markings on pavement, Properly marking on speed breaker with sign board.

B. At near dondwada village the highway being constructed on high embankments, provision of safe batter slopes is costly. The risk of accidents can be significantly reduced by the use of guard rails or barriers. The purpose of the barrier is to absorb the impact with as little overall severity as possible.

C. At dondwada village appropriate signs should be erected to warn through traffics about school zones. In school zone area, raised sidewalks/ separated sidewalks should be provided. It is not possible to remove boundary of school but if we provide Retro-reflective materials or paintings to be used at boundary wall and Sign board for warning also provided.

D. In Front of and approx near to Shree Dadaji Institute of technology & science (SH26) Parking of vehicles at on the highway should be banned. In unavoidable circumstances (vehicle under repair), appropriate lighting should be arranged to make these vehicles visible

E. Pedestrian crossing markings, speed breaker on both side (enter& exist of school zone) with markings should be provided and speed limit sign board to control the speed of the vehicle. Appropriate speed reducing devices prior to the locations are to be provided. Crosswalks with appropriate marking and delineations should be placed. Appropriate signs should be erected to warn through traffics about school zones.

VIII. CONCLUSIONS

This paper presented a Road Safety Audit that highlighted issues in safety management .The major objective of the RSA is to minimize the risk of accidents occurring in the future. The present study focused on the investigation of road safety deficiencies identified road stretch khandwa to sanawad. It suggested the various recommendations which are easy to do and at low cost. The traffic flow is goes on increasing year to year in the present study corridor. The maximum number of Fatalities and severity index is in year 2019 is registered and in 2020 the accidents are minimum because of lockdown (Covid 19) in country). This may due to heavy goods traffic coming from villages and transport from one city to another in early hours towards city The data on month wise distribution of road accidents and number for person killed during the year 2016-2020 as plotted in Graph reveals that peak month is April followed by June, August, January and December. The period September to November has lesser number of accidents and road accident deaths and that more number of accidents has been occurred during the month of April consisting of 11.75% of total road accidents which are the summer season and driver's do move at excessive speeds and are also inattentive also in this summer duration lots of festival and marriage season on pick so that the traffic volume is high. In accidents as per time it shows that 68.77% of accidents occurred during day time between 8:00 am to 8:00pm and 31.23% of accidents have been occurred between 8:00pm to 8:00am. Accidents are more during day time compared to night time. During day time visibility is more and numbers of trips are also more. Driver's have a tendency to take more risk during visibility hours. Also, it is seen that Students going for school and persons going for working place (morning 8:00 to 9:00, 10:00 am to 12:00 noon) and leaving working(17:00 pm to 20:00 pm hours) place shows the rise in accidents. In type vehicle shows that 30.70 of total accidents are occurred due to motor-cyclists which is a personalized mode of transport and is highly vulnerable to accidents. Rash and negligent driving has proved to be cause of the serious and fatal accidents. Similarly, poor road geometry increases the incidents of accidents on roads. Fatalities due to rickshaw, cars and nearly consist of 24.04% of total road fatalities. Motor cycle consists of nearly 50% of traffic on study stretch as the people residing nearby prefer motor cycle for their daily use. Heavy vehicles pass through this stretch to transport goods as there are various Factories, Mills nearby the study area. Pedestrians and motor cyclists are vulnerable road user on the road. As the land use pattern nearby study stretch is agricultural land, the people working in farms uses motor cycles and scooters for moving from one place to other and students also use this road for going school and colleges. Maximum accidents observed are of Truck/ Eicher accidents in the study corridor followed by buses and Non transport vehicles. It is inferred that SH's mainly meant for trucks. Bhairaw mandir square to RTO office area stands first among all the places in the study area in the number of accidents. More number of industries, schools, colleges and cold storages present in that area may account for this. In age wise the young adults in the age group of 18 - 45 years accounted for nearly 71.58 percent of road accident victims. The working age group of 18 - 60 accounted for a share of 86.67 percent in the total road accident deaths. The accidents Accident density was found to 9.743 accidents are occurring per km per year in the study area.

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From the accident analysis, it can be concluded that during day time the accidents are occurring more in number compared to night hours. This may be attributed due to poor road geometry and environment, lack of traffic sense and enforcement measures. Policies during rush hours need to be there. There should be new licensing system incorporating the points allotted for the penalties to driver's for violation and the limit of points should be there after which the license should be cancelled and the driver should again appeared for driver testing for new license. This will reduce the accidents on black spots considerably.

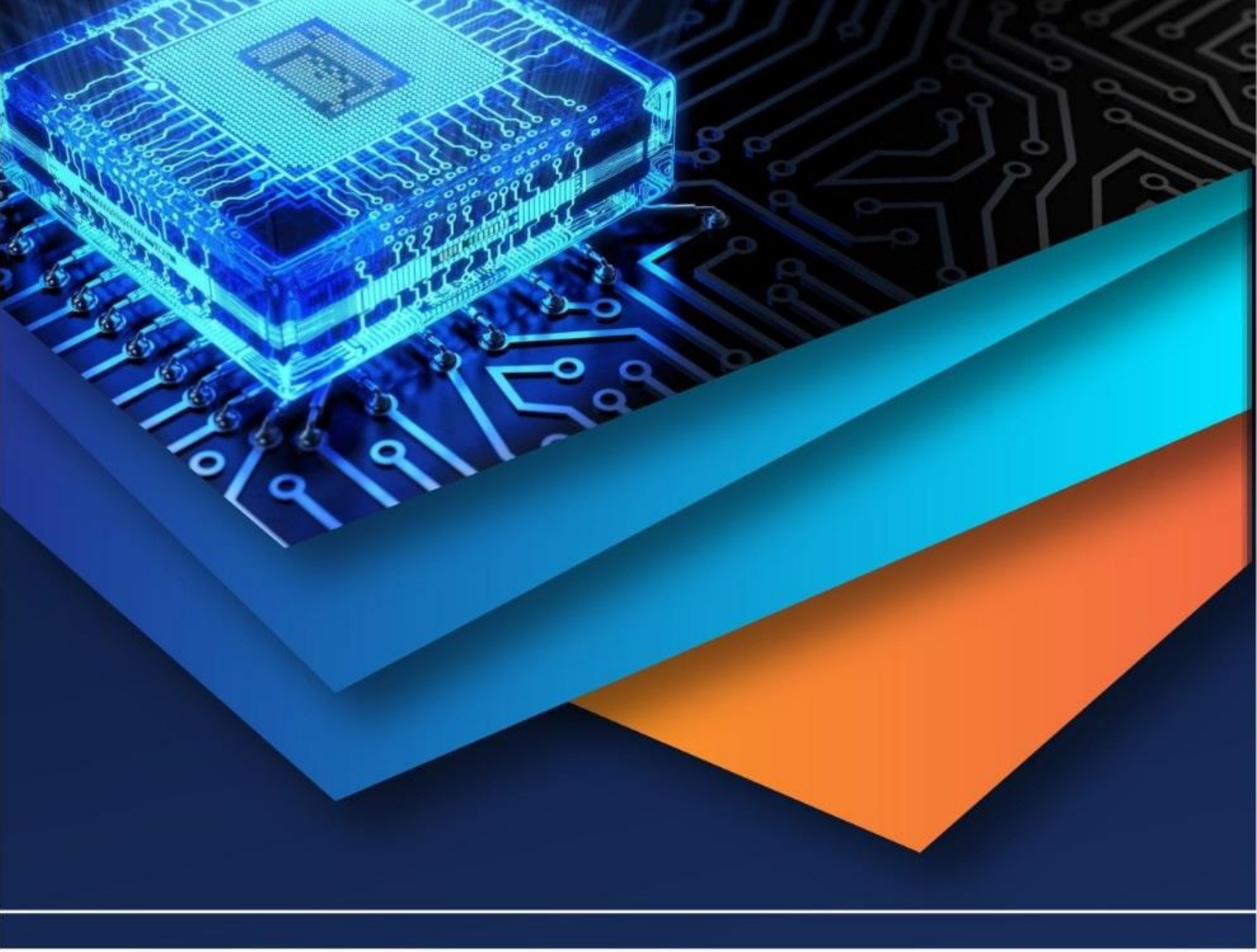
IX. ACKNOWLEDGE

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