

An Analytical Study Of Delhi – Mathura Road Safety

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Abstract :

Street security review is formal method for surveying mishap limit and wellbeing execution inside the arrangement of most recent road conspires, the improvement and restoration of present road and in redesign of streets. The job of evaluator is to give impartial guidance inside the state of composed proposals. The creator or buyer at that point considers the counsel and formal choice is made through them on whether or now not to embrace everything about suggested wellbeing changes. The essential job of review team is to get mindful of the potential issues of a double carriageway task by utilizing achieving the site investigation and gathering data from various organizations. The objective of the look at is the distinguishing proof of clumsy regions in the city from FIR, to consider the impact of roadway geometrics and traffic conditions out and about stretch and improvement of measurable connection between bit of destiny costs and various variables causing mishaps.

This paper investigates the deformities in the plan and distinctive wellbeing abilities. This examine features even the mental components stressed in data the conduct of people on foot and vehicular guests. The primary device is Road Safety Audit. The road chose for this investigation is Delhi to Mathura road close CRRI, development website page at Mewala Maharajpur Station and Okhala Interchange. This review is a piece of CRRI Road Safety Audit Training Program. Taking everything into account, we contend that sizable estimates should be taken on Road Safety parts to alleviate the mishaps and make certain the wellbeing to walkers and vehicular guests.

Key words: First Investigation Report (FIR), Road Geometrics, Accidents, CRRI, Pedestrians

I. INTRODUCTION

1.1 Background

Street casualty cites in India are potentially the different most extreme and out of 1.25 million passings worldwide every yr, eight-10 in sync with penny of all road passings are in India. The street machine and the site guests tasks in India are poor in wellbeing the board. One reason for this circumstance is that there's next to no likelihood to explore from the past errors. The mishap data are intended to give the insight around insufficiency in the street, vehicle and client structures to clarify the reasons of mishaps and to create healing measures. This road wellbeing control gadget is poor in India, with undeveloped cops gathering handiest fragmented data of deadly mishaps and ceaselessly expressing the street client's flaw as the reason for the happenstance. In a road situation wherein the street structures, know-how of site guests rules, site guests oversee and policing (implementation) are chargeable for the spot of destiny. In a poor road and traffic environmental factors, reasons are identified with awful road geometry and poor guests control exasperated by methods for negative traffic sense.

The Road Safety Audit (RSA) framework began in 1980's inside the UK, moved to Australia and New Zealand in 1990s, and transformed into acquired USA in mid - 1990s. A abundance of appreciate of review has been picked up on account that 1990 in the UK. Street Safety Audit has been taken up in basic way in Australia and New Zealand where Austroads Guidelines have been distributed and in Denmark in which road assurance reviews are required to every single countrywide street. Presently, World Bank has

made it compulsory that all World Bank helped double carriageway undertakings may be inspected from the street wellbeing perspective.

1.2 Road Safety In India [3]In India, at present there might be no conventional necessity for road assurance reviews to be attempted. Be that as it may, India has additionally started understanding the significance of road security reviews. It is a result of Ministry of Road Transport and Highways supported the assignment on "Improvement of Safety Audit Methodology for Existing Roadway Sections" to Central Road Research Institute in April 2002. The National Highway Authority of India endowed CRRRI to perform RSA of building structure for creation programs underneath TNHP(8 applications) and GNTRIP (7 projects) on NH-2 . The complete length of these 15 projects changed into about 900km which was the longest road undertaking for which RSA has been done on the planet. Likewise, first RSA transformed into did again by method of CRRRI in 2000 on Indore Bypass. It is imagined that the total NHDP will be exposed to RSA as a piece of its usage. Anyway it's miles to be analyzed that RSA are to be under taken all styles of streets.

1.3 Decade of Action for Road Safety[7] On eleven May 2011, the Decade of Action for Road Safety 2011-2020 transformed into discharged in excess of a hundred nations which incorporate India, with one objective: to spare you 5 million road site guests passings all around by 2020. Moving from the Global Plan for the Decade to countrywide move, numerous nations have taken measures toward improving road security, both by creating national designs for the Decade (e.G. Australia, Mexico, the Philippines); presenting new laws (e.G. Chile, China, France, Honduras); or expanding requirement of present enactment (e.G. Brazil, Cambodia, the Russian Federation), among other solid activities. The most recent UN General Assembly choice on worldwide road insurance supported through more noteworthy than 80 countries gives further driving force to the Decade by utilizing approaching universal areas to uphold road security exercises in everything about 5 mainstays of the Global Plan.

1.4 Problem Definition:

In India, 4,00,000 wounds emerge yearly with roughly 1,00,000 people losing their lives. Other than fatalities, about four,00,000 individuals endure mishaps in road wounds which lead to long lasting tragedies for the people in question and their families. Mishaps are achieved by methods for various thought processes which incorporates human mistake, gadget disappointment, or climate condition. A portion of those factors can not be handled anyway the ones which might be handled should be tended to. To diminish those misfortunes (human just as property), exertion wants to be made towards careful examination and ensuing remedial activity.

1.5 Objectives of the investigate

Every mishap calls for precise gander at in a logical manner and definite research of the occurrence spot. This sort of research will assist with seeing some of the causative components chargeable for wounds and to give relative importance. The results of the investigate can be utilized favorably to assimilate preventive measures to diminish the wounds The objectives of the current examination are

- Identification of bit of destiny inclined territories at the Delhi – Mathura Road from First Investigation Report.
- To inspect the effect of roadway geometrics and traffic conditions on this road stretch.
- Development of measurable connection between spot of destiny costs and different variables causing mishaps

1.6 Scope of the view

- The wounds on road system might be decreased.

- The seriousness of mishaps might be decreased.
- The requirement for expensive therapeutic work is decreased.

II. REVIEW OF LITERATURE

Street Accidents: (NCRB - 2015) Traffic Accidents" have been accounted for the term of the yr 2015 become four,64,674 at some phase in India. Greatest scope of site guests wounds happened in the period of May (45,215) and as per time insightful investigation, most extreme assortment of site guests mishaps (eighty,113) have been accounted for over the span of 1500 hrs to 1800 hrs(day) of day. 29.three% victims of road mishaps have been riders of „Two Wheelers“. „Trucks/Lorries“, „Cars“ and „Buses“ have represented 19.4%, 12.four% and 8.three% of road unintended passings individually. A large portion of road wounds have been expected to over speeding representing 43.7% of general mishaps which hastened 60,969 passings and 2,12,815 people harmed.

ZarulazamEusofe et al. Appraisal of Road Safety Management at Institutional Level in Malaysia, IATSS Research This paper had tried the current day institutional arrangements for the administration of street wellbeing in Malaysia in a deliberate way. It focused on road insurance financing and appeared to offer an observation into how speculation variables may influence each the viability and the presentation or road security control. The investigate watched an exploratory technique dependent on semi-put together meetings centered with respect to enter partners in street security the executives which incorporate approach creators from different government offices, non-open quarter delegates and the scholarly world. The assessment uncovered that the exhibition and viability of the road assurance the executives machine in Malaysia can be economically ventured forward by tending to the contemporary reliance of speculation exclusively on specialists sources, the fracture of the dynamic strategy of this true multi-disciplinary region, the street security authoritative structure, open mindfulness, neighborhood wants and institutional limit. An institutional model dependent on second time road value go is provisional encouraged with this impact. The paper gave a precise examination to the appraisal of street security the executives material in nations wherein financial assets are compelled or diminished, concentrating on street wellbeing speculation and looking for to give a knowledge into how suitably demarked venture components may affect each the viability and the exhibition of street assurance the executives.

Francis John Gichaga, The Impact of Road Improvements on Road Safety and Related Characteristics. IATSS Research (2016), University of Nairobi, Kenya. This paper offered the notable and social foundation alluding to road improvement and road security attributes in Kenya. It examined contextual analyses: one on the socio-money related impact following improvements to a 50-km, high-class, high-traffic-amount road and the option at the following and assessment of road security factors close by the Northern Corridor in Kenya additionally following fundamental street upgrades. The results of observing and evaluation brandishing exercises on the Northern Corridor have indicated that drivers are the most significant individuals in causing mishaps, with a thing proportion of 49.4%; people on foot are ensuing at 21.7%. Information additionally affirmed that 24% of the wounds close by the Northern Corridor are lethal, which is of fundamental concern. The view additionally showed that most extreme road clients have now not been revealed to tutoring or preparing on street security.

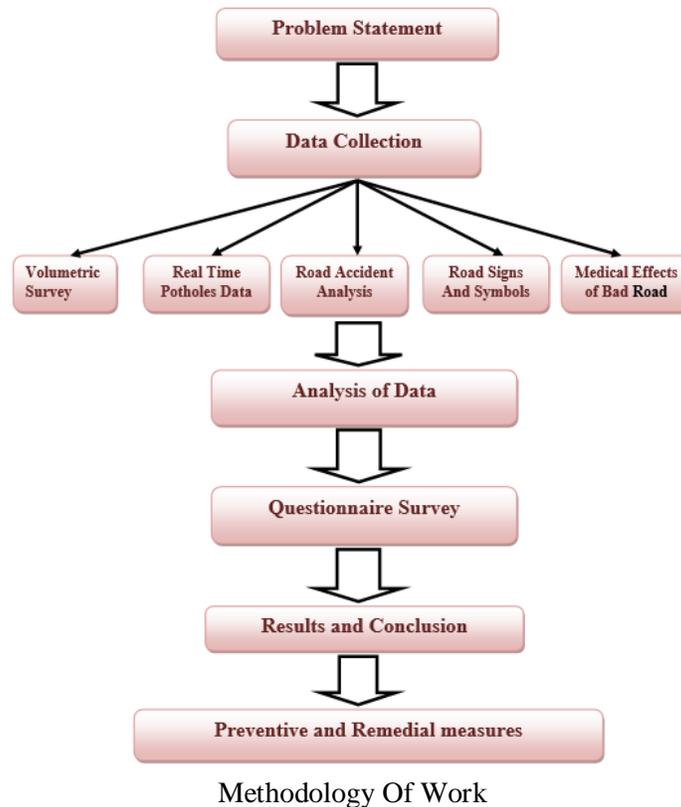
Francis John Gichaga etal. Road Safety and Road Safety Audit in India: A Review. ISSN: 2347 - 4718This paper had surveyed the idea of the road wellbeing review and its stages. Target of the RSA is to survey adventures for capacity incidents end/diminishing on the reason of road customer learning, qualities and aptitudes, day/night, wet/dry street circumstances. It recommended on diagram and before arranging of understanding chronicles, to survey separated convergence structure, markings, signs, signals, lighting focal points, Detail Design of intersections, Design of geometrics, Cross-fall Marking and Signs, Side channels, Embankment slants, Presence of clean zone, **Traffic Signals Lighting. Arun S**

Bagietal. Street Safety Audit (IOSRJMCE) ISSN:2278 - 1684 This investigate had perceived happenstance inclined territories in the city from FIR, it considered the impact of roadway geometrics and site guests circumstances out and about stretch and improvement of factual relationship among spot of destiny costs and various components causing wounds. The extent of the examine was to lessen wounds on road arrange, diminishing seriousness of mishaps and the need for extravagant medicinal work is decreased. The road chose for the investigate is Delhi – Mathura Road (12 km). The spot of destiny assessment got cultivated from 4 years insights. The V.F.Babkov's assessment is completed by methods for social event geometric elements of the road. Person on foot security investigation transformed into furthermore wrapped up. Clumsy spots are perceived by methods for the all assessment. eight hours degree tally was performed at 2 spots of the stretch on a weekday covering each pinnacle and off-top hours of a day.

Xuchun S. Tu, Application of Risc For Road Safety Program Development. World Conference on Transport Research - WCTR 2016 Shanghai. 2016 A diagram of the accident history has analyzed that the run-off-road crash is one in everything about accident sorts in Queensland, Australia. Risks on the two sides of a carriageway are distinguished a capacity danger presented to road clients. This investigation says that, a legitimate side of the road configuration plays a basic capacity to make certain a more noteworthy pardoning road condition to decrease the opportunity and seriousness of run-off-road crashes. To help road building specialists in side of the road format, the Queensland Department of Transport and Main Roads (TMR) propelled a product application - the Roadside Impact Severity Calculator (RISC), however the materialness of RISC for developing the road wellbeing improvement program wishes to be assessed by means of increasing a more prominent expertise of the relationship between's the seriousness file and the accident markdown factor. The current notable accident insights shows that run - rough terrain and head-on kind accidents represent the majority of the extreme accidents occurring on the streets in Queensland. Risks on both shoulder and middle perspectives are analyzed as a basic peril to drivers concerning run-off-road crashes. Overseeing street feature chances in a correct way is critical to diminish the likelihood as well as seriousness of run-off-road crashes. The adequacy of a road wellbeing cure might be communicated as both an accident markdown factor (CRF) or an accident change factor (CMF). Athanasios Galanis et al. Walker Road Safety in Relation to **Urban Road Type and Traffic Flow. third Conference on Sustainable Urban Mobility, third CSUM 2016, May 2016, Volos, Greece.** The paper gave an examination of the connection between passerby street wellbeing, city road type and motorists' traffic skim. The analysts tried six city roads of a few sorts in the city of Volos (a medium-sized Greek city, 130,000 occupants). They gathered records of the person on foot site guests float and their lawful offense or unlawful strolling conduct for every road segment of the tried boulevards. Besides, they gathered data of motorists' traffic coast inside the indistinguishable street portions of the avenues in the examination region. The blend of the ones realities with the managerial positioning of every street can recommend a walkability level of a tried road or a particular way and screen pedestrians' portability and security issues.

III. RESEARCH METHODOLOGY

Every work has a specified methodology. Safety Audit can be taken on new roads, existing or constructed roads. For carrying out Road Safety audit of the given section of road following methodology is adopted- Variations of vehicles flow on different parts of a road junction.



3.1 General[1]

3.8 Stages In RSA

There are five stages at which a street protection audit may be performed, no matter the scale and nature of a undertaking. They are:

- a) The feasibility degree.
- B) The draft design level.
- C) The detailed design stage.
- D) The pre-establishing level and
- e) An audit of an existing road.

The earlier a street is audited within the layout and improvement system the better. If the perfect idea or treatment (i.E. One with inherent safety issues inside the unique context) is selected at the feasibility degree, it's miles very hard and, often impossible to cast off protection troubles at later layout stages or once the site visitors is the usage of it, early auditing can also cause early removal of issues and, consequently, minimization of wasted design time at later stages.

3.9 Joint Influence of Road Conditions on Traffic Safety[2]

Road related factors are the maximum vital factors which determine twist of fate risk. Elements of avenue geometry require cautious design and take longer time to implement. The maximum crucial detail of the roadway which affects protection is cross-sectional factors, sight distance considerations, horizontal curve radius, grade and pavement surface characteristics. Every road consists of a mixture of separate sections differing in these factors. The relative possibility of a avenue twist of fate on any segment can be appraised by means of a precis twist of fate price calculated as the made of the separate relative coincidence costs characterizing the worsening of site visitors situations in evaluation with a -lane street

having a roadway width of 7.5m, paved (or stabilized) shoulders and a non-skid pavement because of their affect of separate factors of the horizontal alignment, profile, cross-phase and roadside strip

$K_{ac} = K_1 K_2 K_3 \dots K_{14}$

Where

K1 = Volume of visitors, vehicles/day

K2 = Roadway width, m

K3 = Shoulder width, m

K4 = Radius of horizontal curve, m

K5 = Radius of horizontal curve, m

K6 = Sight distance, m

K7 = Difference among width of roadway on bridge and on method avenue, m

K8 = Length of straights, KM

K9 = Kind of street intersection

K10 = At-grade intersection with minor street at quantity of traffic on main street, vehicle/day

K11 = Sight distance ensured at an intersection from the minor street, m

K12 = Number of traffic lanes

K13 = Distance from buildings to roadways, m

K14 = Characteristics of pavement /Co-green of friction.

3.10 Present Investigation

3.10.1 General

The target of the watch is to set up a quantifiable connection between fortuitous event charge and a few components impacting mishaps. To increment such relationship, it is important to procure the touch of destiny realities and insights regarding the components influencing the spot of destiny expense, comprehensive of roadway geometrics site guests conditions and so forth. The bit of destiny records for a long time were accumulated and utilized for the assessment. Studies have been done to accumulate the data like road geometrics, traffic volume, pace and defer and so forth. At chose places.

3.10.2 Location

The Delhi – Mathura Road (SH 87) got settled on for examination. The investigation is completed for 12km stretch from Mico design transport forestall to Bannerhatta town (Vijaya Bank transport stop). The current examination is restricted to assessment of mishaps sooner or later of the years 2008 to 2010.

3.10.3 Road Inventory Data

Chosen road stretch got separated into number of sub extends estimating around 1000 meters. At each sub-stretch information of following road geometrics have been additionally accumulated.

3.10.4 Traffic Studies

a) 8 hours volume check was directed at 2 spots of the stretch on a weekday covering every stature and stale pinnacle hours of a day.

B) Floating vehicle procedure study changed into completed to find the rate at every kilometer of the stretch.

3.10.5 Collection of Accident Data

The mishap points of interest relating to the examination stretch diverted into gathered from the particular police headquarters. The examination stretch of 12 Kms (from Mico position transport stop to Bannerghatta town) fell under the organization of Mico design Police Station limit. Mishap information identified with recent years transformed into collected for examination reason. The mishap records structure as recommended by utilizing IRC has been set up to assemble the fundamental measurements comprehensive of date, time, area, regardless of whether the spot of destiny got deadly, vehicle harm and harmed.

IV. ANALYSIS OF DATA

4.1 Site Selected

The area selected is at 2 places, one is the construction site and the other is the flyover or ramp. The road selected for this study is Delhi to Mathura road near CRRI, construction site at Mewala Maharajpur Station & Okhala Interchange.

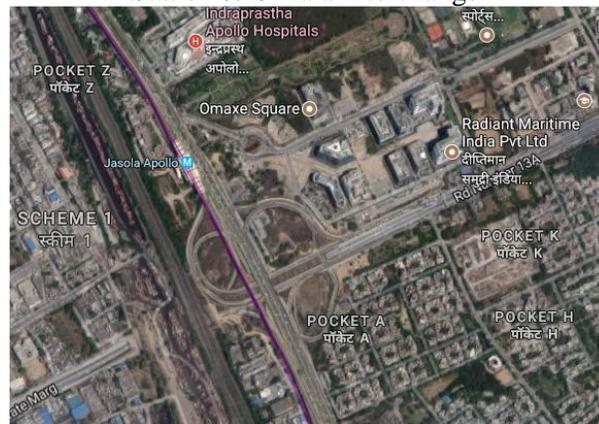


Figure 2 Image showing OKHALA Interchange

Interchange connects various roads and directions. We have noticed few issues which may be considered like structural defects and some safety issues related to vehicle traffic. Improper sign boards creating a confusion to the drivers. Some of the factors like is the layout encourage slow controlled speeds at and the approach to stop/ give way lines and other critical decision points, is the provision of night time lighting adequate, if not what are the deficiencies.

4.2. Investigations And Recommendations



Figure 3 The column of the foot over bridge near to the carriage way

4.3 Observation

Pillar of foot-over-bridge is hazardous as it is very near to the main carriageway.

Reason for Concern:

Any driver if loses control on the steering may hit the pillar which may be fatal.

Recommendation:

The foot-over-bridge should be re-designed to relocate this pillar away from the footpath.

Priority: Essential.



Figure 4 Open Entry to construction site

4.4 Observation

Open Entry to construction site

Reason for Concern:

Traffic from the main carriageway is entering to the construction site, they must come back after realizing the mistake.

Recommendation:

A flagman shall be deployed at the entrance to guide the traffic to use the diversion.

Priority: Highly Essential.



Figure 5 Sign boards without retro-refractory background& Men at Work is faded not visible clearly

4.5 Observation

Sign boards without retro-refractory background and reused old ones.

Reason for Concern:

Visibility in night is not clear as there is not reflection of the background yellow color. Vehicle users directly enters the construction site and may hit any objects. Road user do not get the clear information about the work site. To get alert while driving.

Recommendation:

The diversion signage and men at work signage shall be replaced with the new retro-reflective signs to avoid the accidents in night.

Priority: Highly Essential.



Figure 6 Barricading of working area causing hazard

4.6 Observation

Barricading of working area of the retaining wall (Approach to the flyover) with the help of wire mesh along with angleposts not placed properly. Some of the wire mesh & angle posts are damaged and exposed towards the carriageway.

Reason for Concern:

It is exposed to the direct road users may cause accidents in night as it is not visible in dark hours.

Recommendation:

The barricading provided to the working area with the MS sheets properly welded to the angle posts and with the retro-reflective signs should also be provided.

Priority: Essential.



Figure 7 Vehicles climbing over the median due to damaged median.

4.7 Observation

Vehicles climbing over the median due to damaged median.

Reason for Concern:

Major obstruction to the traffic coming on the other side of the road and this may be the hazard to the oncoming traffic.

Recommendation:

Median shall be restrained/repared and proper U turn shall be provided

Priority: Essential.



Figure 8 zebra crossing on the flyover.

4.8 Observation

Zebra crossing on the flyover

Reason for Concern:

Zebra crossing is not necessary on the flyovers or ramps, as pedestrians are not allowed on it. This creates the unnecessary disturbance to the riders. This also encourages the pedestrians to use the flyover, which is a great harm to them.

Recommendation:

Pedestrian should not be allowed on the flyovers and the zebra crossing marks need to be removed

Priority: Essential



Figure 9 median without sign board and no acceleration lane

4.9 Observation

Sign boards were not provided at the opening of the median & acceleration lane is not provided.

Reason for Concern:

It is a dangerous threat to the vehicular during night. Acceleration lane is not provided for climbing the ramps, this had been a very difficult to the heavy vehicles and this is causing the traffic slow movement

Recommendation:

Proper sign board need to be provided and acceleration lane need be provided for the smooth flow

Priority: Highly essential



Figure 10 Heavy truck parked on the acceleration ramp & tress, bushes causing the blind spots during acceleration operation and it has a sharp curve

4.10 Observation

Heavy truck parked on the acceleration ramp & tress, bushes causing the blind spots during acceleration operation and it has a sharp curve

Reason for Concern:

Parking vehicles can create a blind spot and they will be as an accident causing elements on roads. Sharp curve is not good in terms of sight distance

Recommendation:

Strict provision should be there to avoid the stopping or parking of vehicles on ramps. Direction signs need to be provided to indicate the turning direction

Priority: Essential



Figure 11 Chevron sign are not reflective

4.11 Observation

Chevron signs are not retro reflecting materials

Reason for Concern:

It can be seen clearly during night times. Vehicular don't get a clear idea about the curve of the flyover during nights

Recommendation:

The sign should be replaced with the new retro reflection sign boards. Here the retroreflective signs should be placed so that they are clearly visible during nights which can guide the turning operation on ramps

Priority: High Essential

V. CONCLUSIONS

This paper presented a Road Safety Audit that highlighted issues in safety management. It examined the defects in the road safety in relation to motorized traffic. It suggested the various recommendations which are easy to do and at low cost. The audit is applied to the risks outside the framework of standards and codes. User friendly considering the human psychology on a par with laws of physics and mechanics, which will ensure higher traffic safety level due to prevention of errors in road users behavior making it more predictable and safe.

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