

INVESTIGATIVE STUDY OF PAVEMENT FAILURES ON RURAL ROADS

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in
Civil Engineering
By

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**DEPARTMENT OF CIVIL ENGINEERING
SCHOOL OF BUILDING AND ENVIRONMENT**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade "A" by NAAC
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119**

APRIL - 2021



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DEPARTMENT OF CIVIL ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **AMBATI VENKATA BHARATH (Reg.No. 37200003)** and **SHAIK NAZMUDDIN (Reg.No.37200069)** who carried out the project entitled **“INVESTIGATIVE STUDY OF PAVEMENT FAILURES ON RURAL ROADS”** under our supervision from January 2021 to April 2021.

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Submitted for Viva voce Examination held on_____

Internal Examiner

External Examiner

DECLARATION

We **AMBATI VENKATA BHARATH (Reg.No.37200003)** and **SHAIK NAZMUDDIN (Reg.No.37200069)** hereby declare that the Project Report entitled “**INVESTIGATIVE STUDY OF PAVEMENT FAILURES ON RURAL ROADS**” done by us under the guidance of **Mrs. M. Praba** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Civil Engineering.

1.

2.

SIGNATURE OF THE CANDIDATES

DATE:

PLACE:

ACKNOWLEDGEMENT

We are pleased to acknowledge our sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

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ABSTRACT

Although the industry has advanced phenomenally since Independence, India is still mainly a rural country, with only a slight 31,1% of its total urban population (as per census 2011). Rural connectivity is a vital component of rural socio-economic growth through access to services such as education, healthcare, urban connectivity and other. In India almost all the rural regions are connected to urban regions through means like roads etc. These rural roads connect villages or a cluster of villages with each other and with the nearest road of a higher category roads or areas. The conditions of rural roads are pathetic and are in deplorable condition, which is due to inadequate and timely maintenance of the road and the failure area is gradually increased. Pavement maintenance is very necessary to extend the pavement life and to retain the road functionality so that all traffic can drive safely, easily and efficiently. This study is carried out to assess the pavement condition of NH 167A to Kanaparru village rural road, at first the conventional road maintenance procedure is discussed and the objective of this study is to find suitable measures for the maintenance of the road and giving suggestions for repair using AUTOCAD Software.

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CHAPTER 1

INTRODUCTION

Roads are communications and transportation arteries that are built to provide security and a comfortable degree of serviceability in accordance with traffic volumes, loads, and speeds. In terms of operation and structural requirements required to achieve good service quality, the road function and the form of traffic that should be used play a significant role. Maintenance operations are responsible for maintaining the lowest possible standards of serviceability for traffic demands at all times.

In India, the need was understood very early on for a proper road network for the country's growth. The Nagpur Plan (1943-61) considered long-term road needs in the country, classifying the road system into functional hierarchy of the National Highways (NH), the State Highways (SH), Major District Roads (MDR), Other District Roads (ODR) and Village Roads. The plan was established to include the Nagpur Plan (VR). Rural road networks are the last two groups.

Rural roads, as specified in Indian national content, are roads that serve or are designed to serve rural areas and communities. The tertiary scheme, Other District Roads, and Village Roads are among them (VRs). Since India is predominantly a rural country with 69.9% of the population living in rural areas, the value of properly developed and maintained rural roads in terms of national economic and growth is self-evident (as per census 2011). A network of roads that is not urban is classified as rural roads. These are low-traffic routes that connect different communities, provide market access to farms and agricultural lands, and are built in a slower manner. Rural roads play an important role in the region's overall growth.

The route's long-term service life is the target of the maintenance. Maintenance is important because it extends the life of the road by lowering the rate of deterioration, protects previous investments in construction and reconstruction, lowers road costs by maintaining a smooth-running surface, maintains traffic access, resulting in a more effective transportation service, and promotes the economic and social benefits of immobilization.

CHAPTER 2

LITERATURE SURVEY

2.1 GENERAL

In this the review is done about the journals, books based on maintenance of flexible pavement, Maintenance of Rural Roads, failures of flexible pavement, and factors affecting pavement failures, That contributes to an overall view of the issues that are interfaced during the research and also to an evaluation of how the study is to be carried out.

2.2 LITERATURE REVIEW

Al Harthy. S, (2017) The floor is made up of several layers of different materials, according to the author. Material selection is based on wheel loads as well as local design and material availability criteria. Maintenance must be done on a daily basis. The reliability of flexible flooring is determined by external loads, environmental conditions, and the engineering characteristics of the materials.

Abubakar.S, (2016) The basic specifications of a block have been identified; structurally enough it should be sufficiently sound to resist strain. The pavement thickness should be adequate to spread the stresses and load over the subgrade terrain to a safe value.

Defame. A. & Ibrahim. A, (2015) Conclusion: Insufficient drainage, poor design and construction, a poor maintenance culture, and other factors can contribute to failure. The rehabilitation was proposed to be fully rehabilitated after restoration and

refurbishment, as well as the corresponding payment of the local government, which must be made with retained concrete, and the asphalted mass was later increased.

Nega. A., Nikraz. H., Herath. S. & Ghadimi. B, (2015) It is concluded that the degree of Asphalt tensile stress is temperature-dependent and this effect on mix hardness can be regarded as regards the temperature effect.

Zumrawi. M, (2015) Water, it was suggested, is a major factor in shortened life and the need for pavement or bottom-up recovery. The cracks allow moisture to enter the flooring, speeding up the degradation of the paving, which is the main problem. The concrete base in the cracks gradually deteriorates as a result of this. The cracks' origins differ in terms of shape, structure, loading ability, motion, and deformation. To decide the best maintenance solution, a range of solutions that may be feasible as a result of an initial analysis of the conditions must be included. For these potential alternatives, the economic, design, and stress variables can be examined in greater depth.

Sorum,N., Guite,T.& Martina,N, (2014) A study on "pavement distress" was conducted. Ground construction is the most cost-effective method of combining pavement layers. It focuses on the quality of material mixtures and the thickness of different paving layers. Pavement architecture is mainly divided into two categories: I the paving structure design; (ii) the mixing material design to be used in each paving layer Air conditioning, road geometry, traffic and location, soil and drainage are the most important factors to consider when building a pavement.

Tarawneh. S. & Sarireh. M, (2013) Floods caused by road loads and climatic effects have pavement, according to the study. This impact is influenced by road building technology and materials, but it also depends on traffic volumes and loads. The most important results are. Pavement power is reduced by increased humidity, and paving failure is caused by inadequate drainage. On the other hand, the pavement seems to crack at some point in its existence due to the cumulative action of the atmosphere, traffic, and environment conditions. Educating the public about the degradation of road

transportation involves recognizing vehicle uses and applications (industrial transportation). Knowing the volume and size of traffic (especially in the event of an overload) helps to improve road safety and reduces road damage. The author discovered that the most common road flaws are holes, edge flaws, boiling, and slowing. He said at the time that the design of a good pavement must consider transportation, age, engineering, road structures, the climate, drainage, and the quality of the materials used in road construction. Road maintenance policy is also relevant in terms of road degradation.

Collop and Cebon (1995) The capacity for fatigue cracking longitudinal surface in asphalt paves has been investigated using various analytical and numerical solutions. An elastic half-space solution derived from the 2D plane tension that uniqueness in the surface load is required at both ends of the contact. High tension around the edge of the contact patch is caused by the twine-to-plot tractions, resulting in longitudinal splits on the surface that can spread due to thermal fatigue.

Khaing.H. & Htwe.T, (2014) Explain that the factors causing road deterioration should be taken into consideration for the good road system. For traffic management, road maintenance is very critical. When the maintenance system is poor, road defects occur and the key causes of accidents are defects and the road is uncertain. So, a man should not only be able to plan the road, but also to maintain the road, to be a good engineer. Flexible paving fails because of a failure of the subgrade, sub-base or base route and a failure in the course. The pavement degradation is not only caused by Weak designs or structures, as well as years of natural wear and tear, environmental changes, increased multi-axle vehicles, and heavy traffic, are all contributing factors. Routine operations and regular activities include the repair of asphalt pavements. Routine operations include sanding, local dressing, crack sealing, surface patching and bass patching for filling depression. Daily operations include dressing of surfaces, fog spraying and slurry seal, pavement restoration and asphalt covering. Consideration is given to the structural maintenance of the road indicated in this report. Deflation and stress on the road are then measured using the structural features of the road.

Gerritsen et al. (1987) Field research on the presence of asphalt surface cracking and the possible causes of surface cracking in the Netherlands has been performed. On core samples collected, static indirect tensile tests were performed and showed that the asphalted concrete outside the tracks appeared to exhibit low strength at low temperatures.

Matsuno and Nishizawa (1992) Examined asphalt pavements with a longitudinal surface crack in Japan. Visual observations revealed that cracking usually occurred in the passing lane from 1 to 5 years after completion of the route. The cracks were also located inside or near the wheel paths. Moreover, in shadowed places, including around an overpass bridge, cracks did not appear.

Khaing and Htwe (2014) A study was conducted on the failures and preservation of flexible pavements for a country's transportation system, which is particularly important for economic development. A proper transportation system will allow people to communicate in a safe, fast, affordable, and convenient manner, which is also required for the delivery of various goods around the world. This is critical for economic, social, and environmental growth. They also claimed that in a developing world, a good road infrastructure is essential to the growth of contemporary society. Road maintenance is important for the overall traffic control. With a weak maintenance scheme, various road faults are the leading causes of accidents. To be a good engineer, an individual must be capable of not only building the road but also maintaining it.

Magdi Zumrawi (2015) The pavement failure to decrease serviceability caused by surface distress innovations such as cracks, potholes and ruts has been determined. This study has shown that road engineers must examine the causes of oil-based floor failures for several reasons or combination of reasons before they go through maintenance strategies. Only three criteria, i.e. index of unevenness, cracking and

routing of pavements, have been considered when other difficulties were omitted in operations for maintenance.

A Ahmed (2008) The conclusion was that creating cracks in the floor surface causes various issues, including discomfort of the customer, reduction of protection etc. Furthermore, the infiltration of water which further reduces the strength of the lower layer, as a major part of the pavements is lowering the subgrade soil carrying ability through pumping soil particles by cracks.

S. Jain, P. Kumar (1998) Cracking is described as visible discontinuities in the asphalt that can indicate Structural and grave state of the pavement. The key issue with cracks is that moisture will reach the pavement, hastening pavement degradation. Cracks may appear in a variety of patterns. They can be caused by a variety of factors, but the most common are surface aging and breakdown, environmental factors, paving structural or fatigue failure, and other factors.

2.3 TYPES OF FAILURE ON FLEXIBLE PAVEMENT

General

The types of defects in bituminous surfacing are grouped under four categories.

- i) **Surface Defects:** These include fatty surface, smooth surface, streaking, and hungry surface.
- ii) **Cracks:** These include all types of cracks, viz, hair-line cracks, alligator cracks, longitudinal cracks, edge cracks, shrinkage cracks, and reflection cracks.
- iii) **Deformation:** These include rutting, corrugations, shoving including those caused by layer slippage, shallow depressions, settlements and upheavals etc.

- iv) **Disintegration:** These include stripping, loss of aggregates, ravelling, potholes, and edge breaking.

2.3.1 Surface Defects

These are confined to surfacing and may be due to inappropriate quality and quantity of bitumen. They are

- i) Bleeding or Fatty Surface
- ii) Smooth Surface
- iii) Hungry Surface

2.3.2 Cracks:

Cracking of bituminous surfacing is a common distress seen on majority of roads in India (with the passage of time). Cracks in bituminous surface are classified into various types depending upon severity. Immediate attention must be given for sealing of cracks, and prevention of their further widening as ingress of water through cracks is detrimental to pavement structure and performance of bituminous surfacing. They are

- i) Hairline Cracks
- ii) Longitudinal Cracking
- iii) Transverse Cracks
- iv) Reflection Cracking
- v) Edge Cracking
- vi) Alligator/crocodile Cracking
- vii) Crescent Cracking

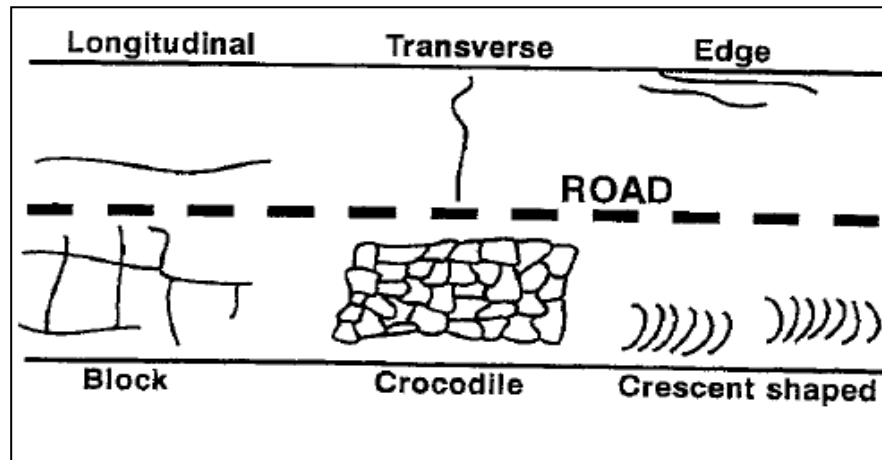


Fig: 2.1: Types of Cracks on Flexible Pavement

2.3.3 Deformation:

Deformation may be restricted to one or more layers of bituminous courses or may extend to entire pavement and sub-grade. A change in the original shape of the pavement surface is known as deformation. It may be reflected in the form of slippage, rutting, corrugation, shoving, shallow depression and settlement. They are

- i) Slippage
- ii) Rutting
- iii) Corrugation
- iv) Shoving
- v) Shallow Depression
- vi) Settlements and Upheaval

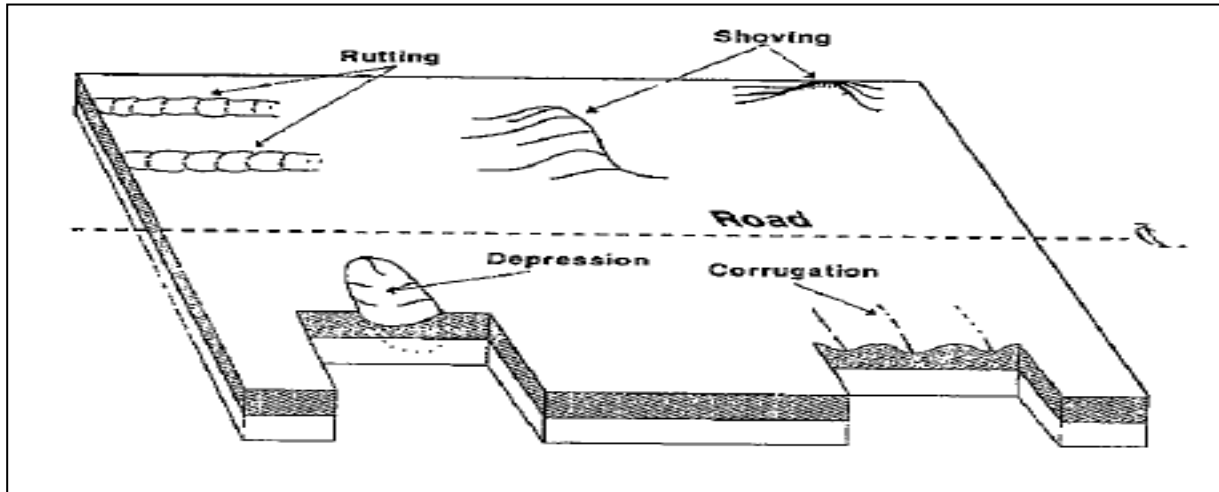


Fig: 2.2: Types of Surface Deformation

2.3.4 Disintegration

There are some defects which, if not rectified immediately, result in the disintegration of the pavement into small and, loose fragments. Disintegration, if not arrested in the early stages, may necessitate complete reconstruction of the pavement. They are

- i) Patches
- ii) Potholes
- iii) Edge –Breaking

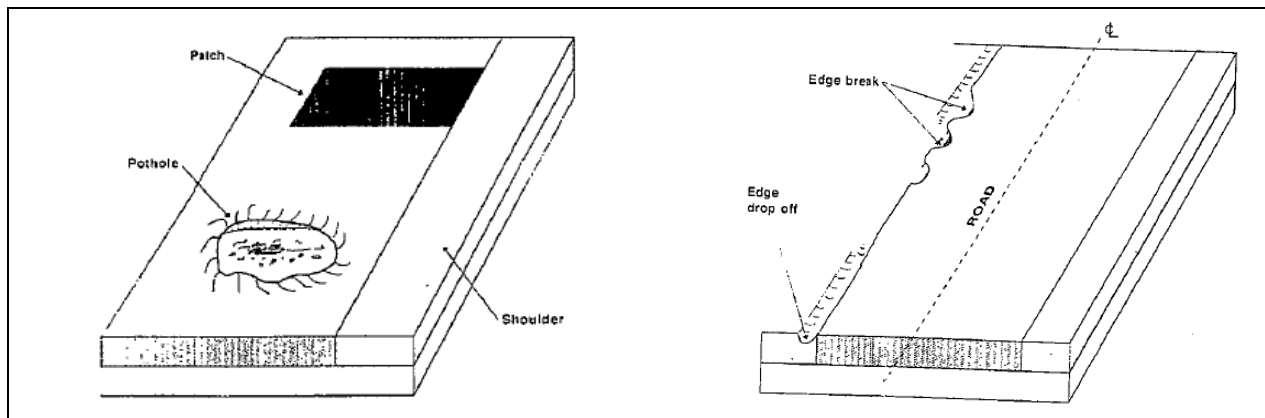


Fig: 2.3: Types of Disintegrations

2.4 OBJECTIVE OF THE STUDY

1. To measure the prevailing failures in rural roads due to vehicle flow in the study area.
2. To carry out a correlation study of pavement failure with various traffic flow as well as road parameters.
3. To find suitable measures for the maintenance of the road and giving suggestions for repair using AUTOCAD software.

CHAPTER 3

METHODOLOGY AND STUDY AREA

3.1 METHODOLOGY

The main objective to carry out this study is to identify various types of flexible pavement failures along the National highway 167A to Kanaparru village rural road and its possible causes contributed to the failure.

The methodology for this study was prepared and properly planned to ensure the above objective of the project are achieved. The overall methodology and the preparation of this study are illustrated below as flow chart.

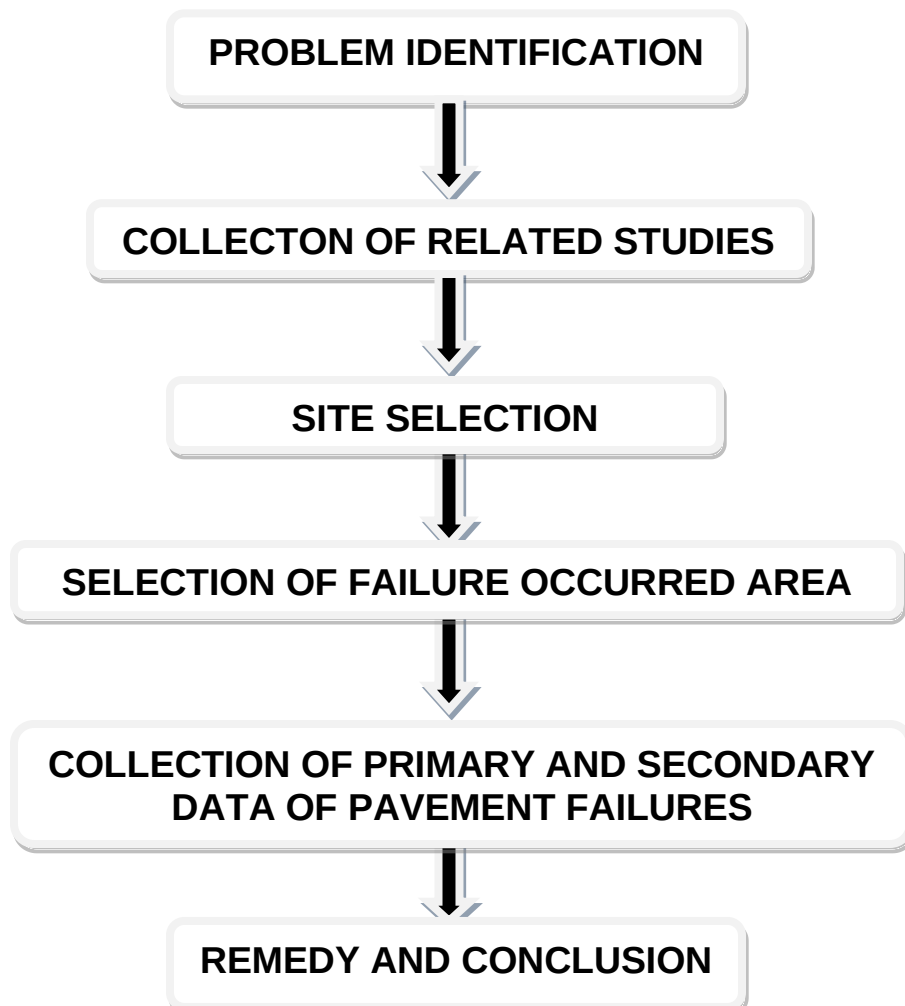


Fig: 3.1: Methodological frame work

3.2 STUDY AREA

The selected study area is a village road which starts from Kanaparru village and ends at National Highway 167A. Kanaparru is a village in Andhra Pradesh Indian District, Guntur. It is situated at Nadendla mandal of the income division of Narasaraopet. The total population of this village is 4105. And the daily road users are 1500-2000. This road passes through Mynampadu village the latitudes and longitudes of the above landmarks are given below

Table 3.1 LOCATION DETAILS

Serial no.	Latitude	Longitude
Kanaparru village	16°12'27.1"N	80°06'31.0"E
National Highway 167A	16°11'51.0"N	80°05'30.8"E
Mynampadu village	16°12'01.1"N	80°06'01.0"E

3.2.1 FAILURES ON RURAL ROAD IN STUDY AREA:

Visually the research area will be tested for a physical state of the pavement. The evaluation includes all the details related to the type and potential causes of pavement failure. the failures on the flexible pavement in study area are recorded along with their chainage as bellow

Table 3.2: TYPES OF FAILURES

SL.NO.	CHAINAGE IN (KM)	TYPE OF FAILURE/REMARKS
1	0	STARTING OF ROAD
2	0.07	Edge Cracking
3	0.095	Edge break
4	0.1	Edge break
5	0.105 - 0.121	Curve/ Edge cracking
6	0.135 - 0.138	Edge break
7	0.205	Pothole
8	0.215	Consolidation

9	0.222	Pothole
10	0.304	Square shape damage
11	0.58	Shallow depression
12	0.7	Alligator cracking
13	0.75 - 0.94	Alligator cracking
14	0.97	Pothole
15	1.09	Alligator cracking
16	1.2	Alligator cracking & Pothole
17	1.405	Alligator cracking
18	1.465	Alligator cracking, pothole & corruga
19	1.485	longitudinal crack
20	1.495	Pothole
21	1.515	Transverse Break
22	1.555	Pothole
23	1.558	Edge break
24	1.585	Alligator cracking
25	1.6	Edge break
26	1.68	Edge break
27	1.72	Pothole
28	1.76	Alligator cracking
29	1.85	Alligator cracking
30	1.96	Pothole
31	2.2	Pothole
32	2.34	Alligator cracking
33	2.38	overlay to approach from NH 167A

1. The failures that were found in the reconnaissance are listed in the above tables.
2. The road is in very poor condition with a lot of pot-holes, alligator cracking, edge cracking, edge breaks, corrugation and manmade damages.



Fig: 3.2: Pothole at chainage @1.495 KMS

As shown in figure 3.2 the pothole seems to have very severe intense and can cause accident to road users.



Fig: 3.3: Alligator cracking at chainage @1.092 KMS

As shown in figure 3.3 the alligator cracking seems to have maximum intense cracking it is observed to cause more effect and strength of pavement.



Fig: 3.4: Shallow depression at chainage @ 0.581- 0.595 KMS

As shown in figure 3.4 the shallow depression at chainage 0.581kms is very severe in regards to the rural roads.



Fig: 3.5: Edge cracking at chainage @ 1.682 KMS

As shown in figure 3.5 the edge cracking at chainage 1.682kms is having maximum crack



Fig: 3.6: Edge breaking at chainage @ 0.095 KMS

As shown in figure 3.6 the edge breaking at chainage 0.095kms is seem to be severe and can cause adverse accidents to road users.

CHAPTER 4

RESULTS AND SUGGESTIONS FOR MAINTENANCE

4.1 SUGGESTIONS FOR MAINTENANCE

4.1.1 POTHOLE

Potholes are bowl-shaped cavities of different sizes with a bituminous surface or reaching into the binder/base course due to localized material breakdown. They may occur in any part of road surface.

CAUSES

1. The most common cause of pothole formation is loss of adhesion in bituminous wearing coat due to the ingress of water into the pavement or due to higher voids in surface.
2. Lack of proper bond between the bituminous surfacing and the underlying water bound macadam base layer can also cause formation of potholes.
3. Insufficient bitumen content in localized areas of the surfacing layer can also cause formation of potholes.

TREATMENT

The rectification consists of filling pot-holes with open graded or dense graded premix. Potholes can be repaired by various methods.

1. Mixes (cold mixed/hot mixed) for immediate use
2. Storable cold mixes (cutback IRC: 116/emulsion IRC: 100)
3. Readymade mixes
4. Cold mixes by patching machines

The above maintenance treatment suggestions are as per IRC 82- 2015

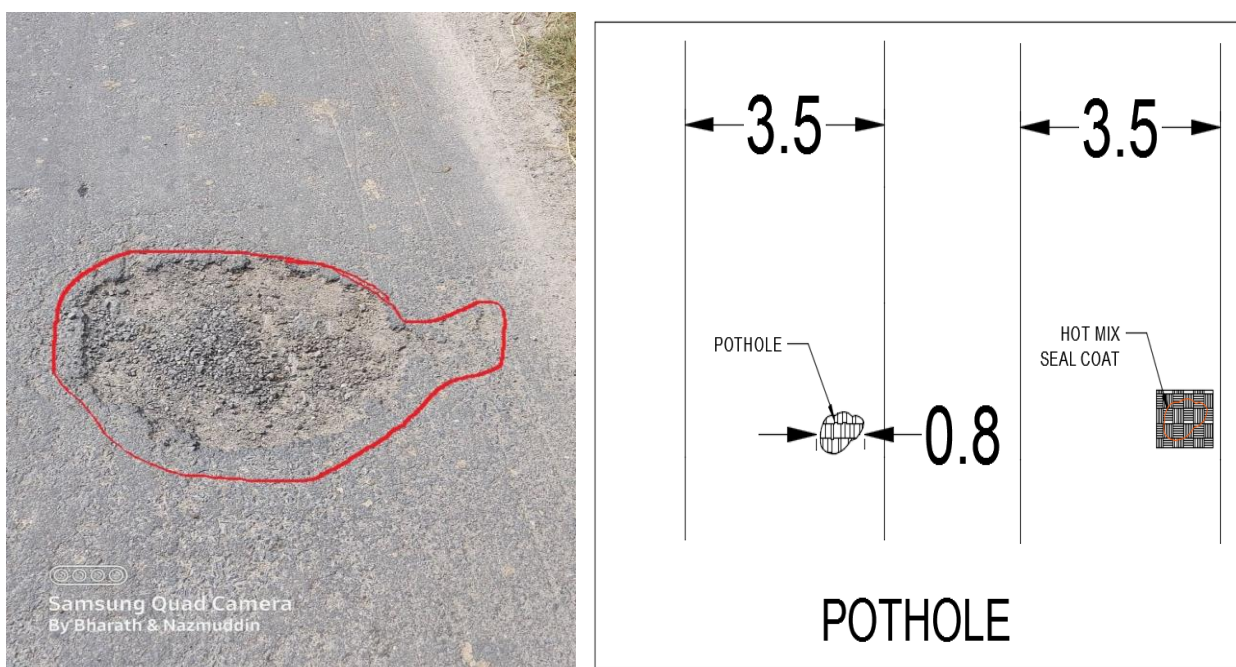


Fig: 4.1: POTHOLE AT CHAINAGE @ 1.495KMS (all dimensions are in meter)

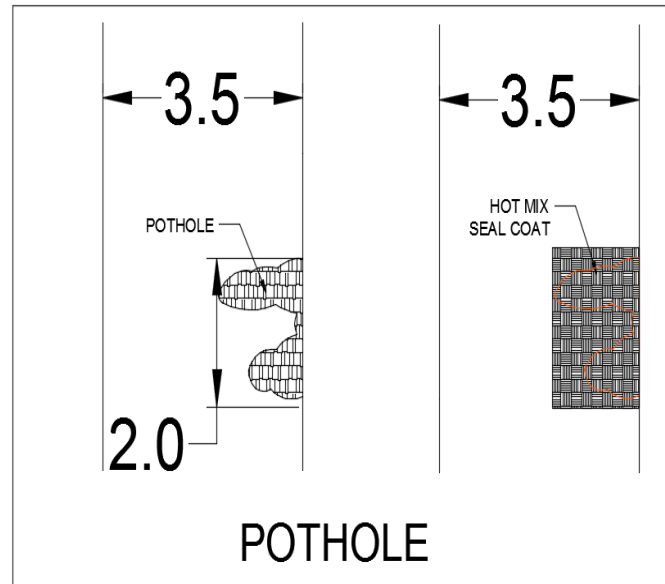


Fig: 4.2: POTHOLE AT CHAINAGE @ 1.721 KMS (all dimensions are in meter)

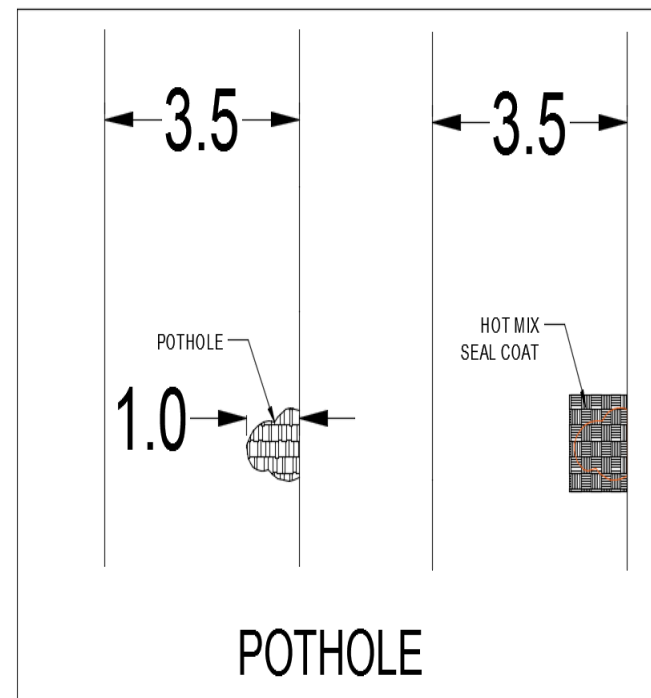


Fig: 4.3: POTHOLE AT CHAINAGE @ 0.973 KMS(All Dimensions Are In Meter)

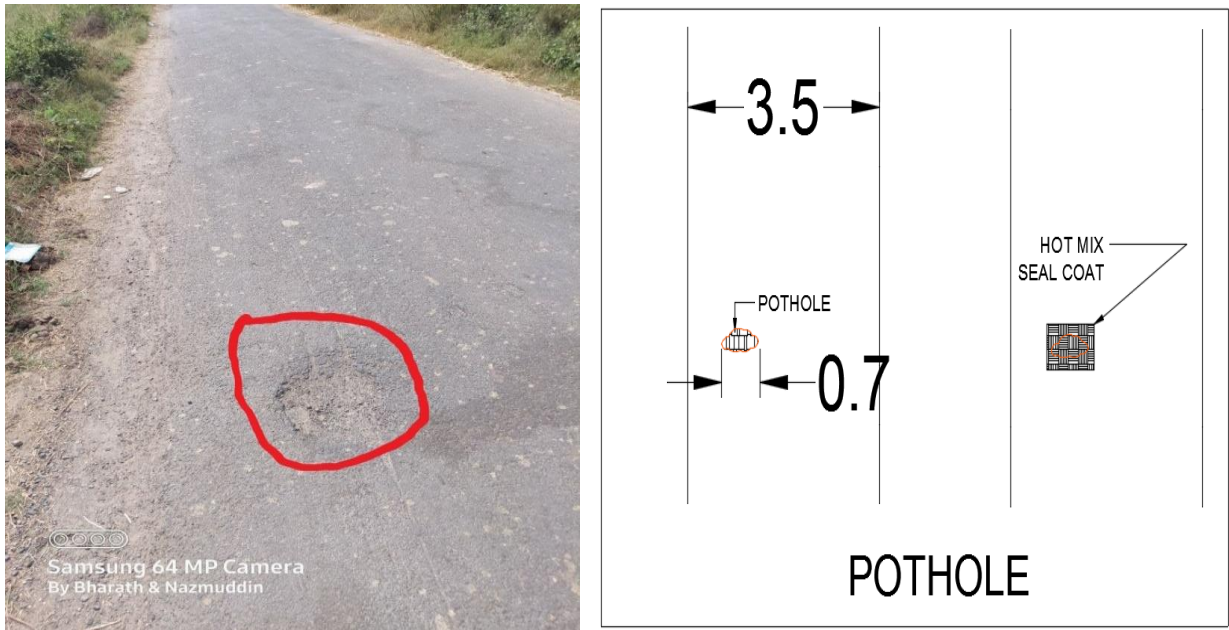


Fig: 4.4: POTHOLE AT CHAINAGE @ 1.555 KMS (All Dimensions Are In Meter)

4.1.2 EDGE CRACKING

Edge cracking is defined as cracks which develop parallel to outer edge of the pavement. Edge cracking is normally 0.3 to 0.5 m inside of pavement edge. The severity levels of edge cracks are low, medium and high. Low severity is with no breakup or loss of material, medium severity is with some breakup and loss of material, while high severity is with considerable breakup and loss of material.

CAUSES

The causes of edge cracking are many. Lack of lateral support from shoulder, settlement underlying the bituminous layers, inadequate surface drainage, shrinkage in sub-grade soil, inadequate pavement width near curves, inferior quality material in shoulders and thinner bituminous surface at edge of the pavement and wet sub-grade are some of the reasons for edge cracking

TREATMENT

The following procedure/techniques are used for prevention or treatment of edge cracking:

1. Encourage proper roadside drainage. Make sure the surface water drains away from the edge of the floor and does not pond there.
2. Remove and replace the dirty bad drying shoulder with a more permeable material.
3. If truck traffic is substantial, place the substantially thick structural surfaces on the road surface provide sufficient protection for heavier car loads by ordering a 75-100 mm hot mix.

The above maintenance treatment suggestions are as per IRC 82- 2015

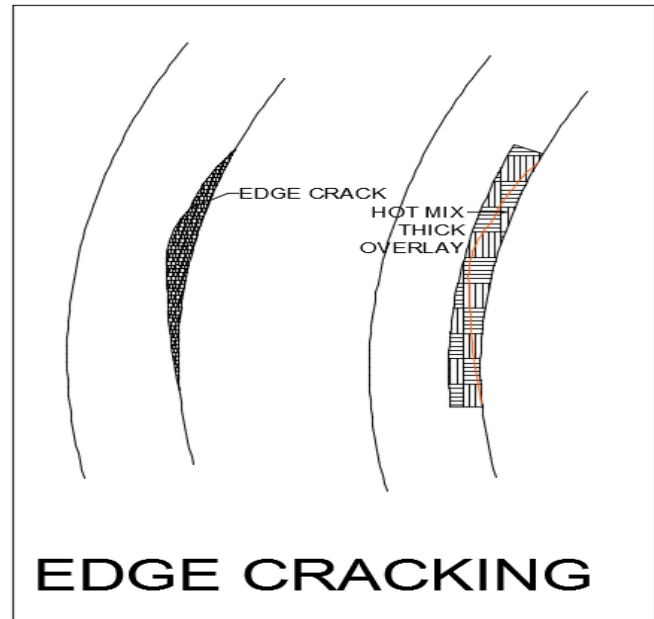


Fig: 4.5: EDGE CRACKING AT CHAINAGE@ 0.105KMS(All dimensions are in meter)

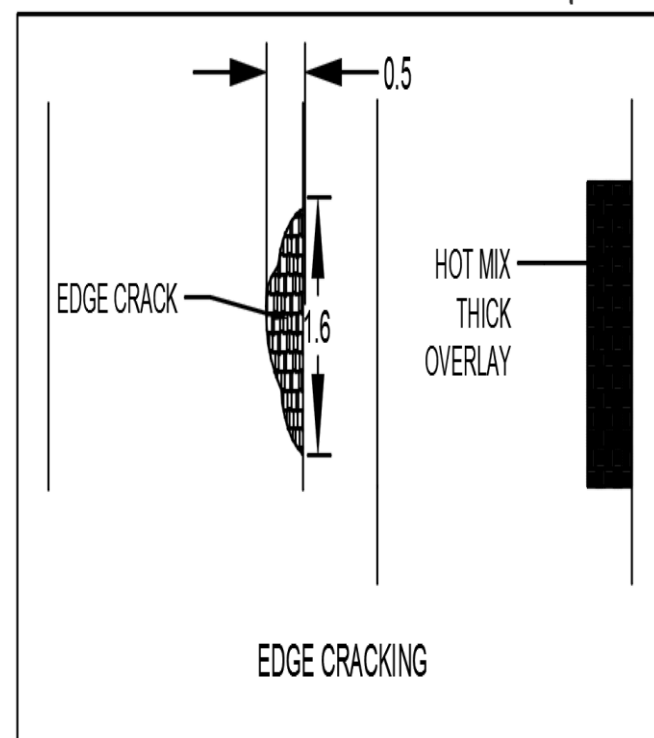


Fig: 4.6: HIGH SEVERITY EDGE CRACKING AT CHAINAGE@0.095KMS

(All dimensions are in meter)

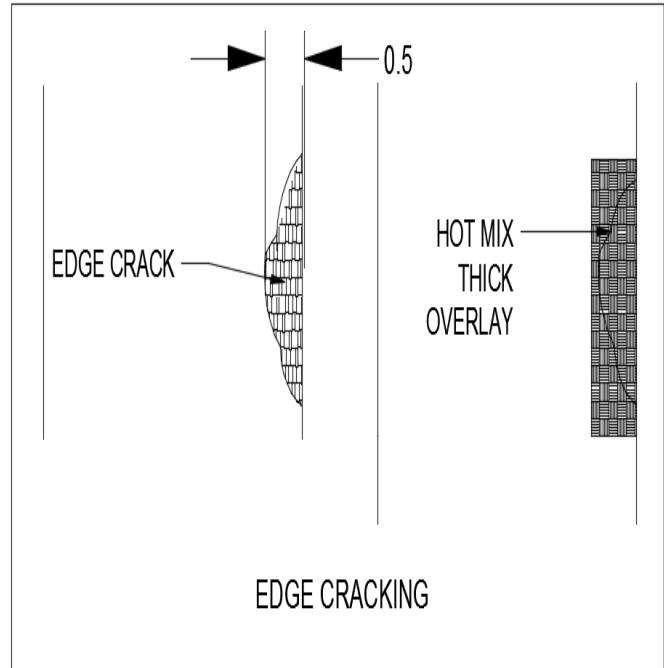


Fig: 4.7: HIGH SEVERITY EDGE CRACKING AT CHAINAGE@0.100KMS

(All dimensions are in meter)

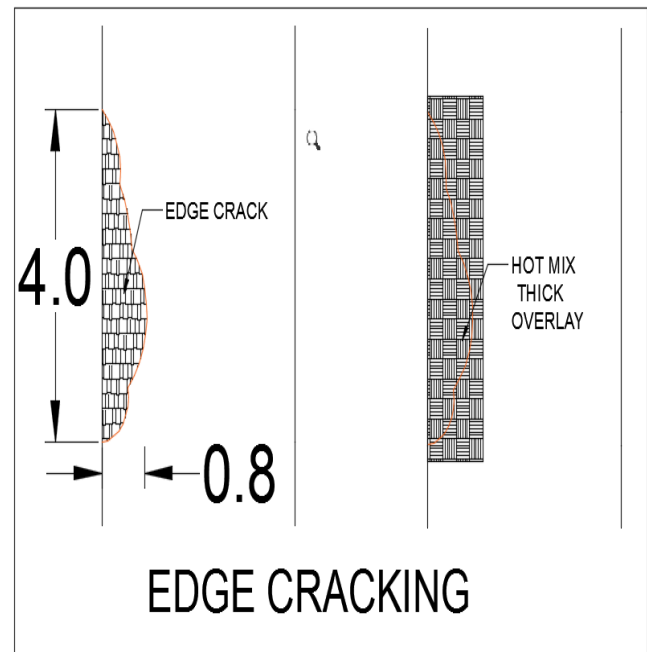


Fig: 4.8: HIGH SEVERITY EDGE CRACKING AT CHAINAGE@1.684KMS

(All dimensions are in meter)

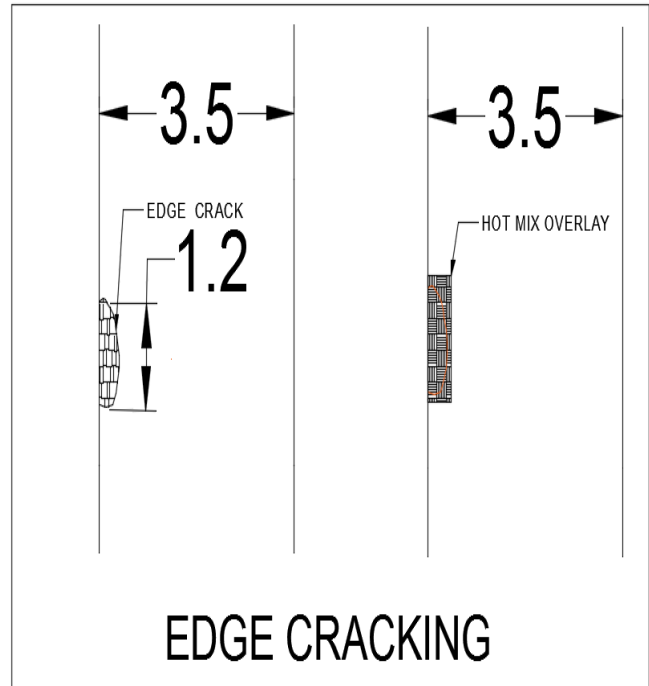


Fig: 4.9: EDGE CRACKING AT CHAINAGE@1.558KMS (All dimensions are in meter)

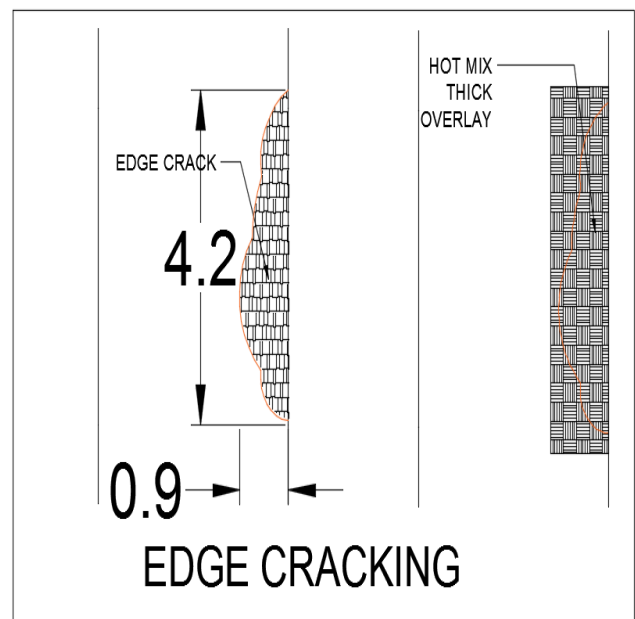


Fig: 4.10: HIGH SEVERITY EDGE CRACKING AT CHAINAGE@0.135KMS
(All dimensions are in meter)

4.1.3 EDGE BREAKING

A common defect in bituminous surface is edge breaking wherein the edge of the bituminous surface gets broken in an irregular way. In case distress is not attended to in time, the surfacing may peel off in chunks at the edges.

CAUSES

The following are the causes for edge breaking:

1. Infiltration of water which makes the foundation layers weak causing the pavement edges to break.
2. Worn out shoulders resulting in insufficient side support to the pavement.
3. Inadequate strength at the edge of the pavement due to inadequate compaction.
4. Lower layer of pavement being wider than upper layers.
5. Too narrow width of road.

TREATMENT

1. The shoulder and the pavement materials in the affected area should be fully removed to a regular section with vertical sides.
2. The pavement and the shoulders should be built up simultaneously with thorough compaction. A bituminous surface similar to that in the adjacent reach should be laid. The shoulder should have adequate slope to drain away to water.

3. A slope one per cent steeper than the camber of the bituminous for earthen shoulders, the surface should normally be considered necessary. In order to avoid a rupture of the edges, regular checks should be made on the shoulder condition and the worn-out shoulder material replaced with appropriate compaction.

4. Surface and field drainage should be strengthened in any inadequate areas

The above maintenance treatment suggestions are as per IRC 82- 2015

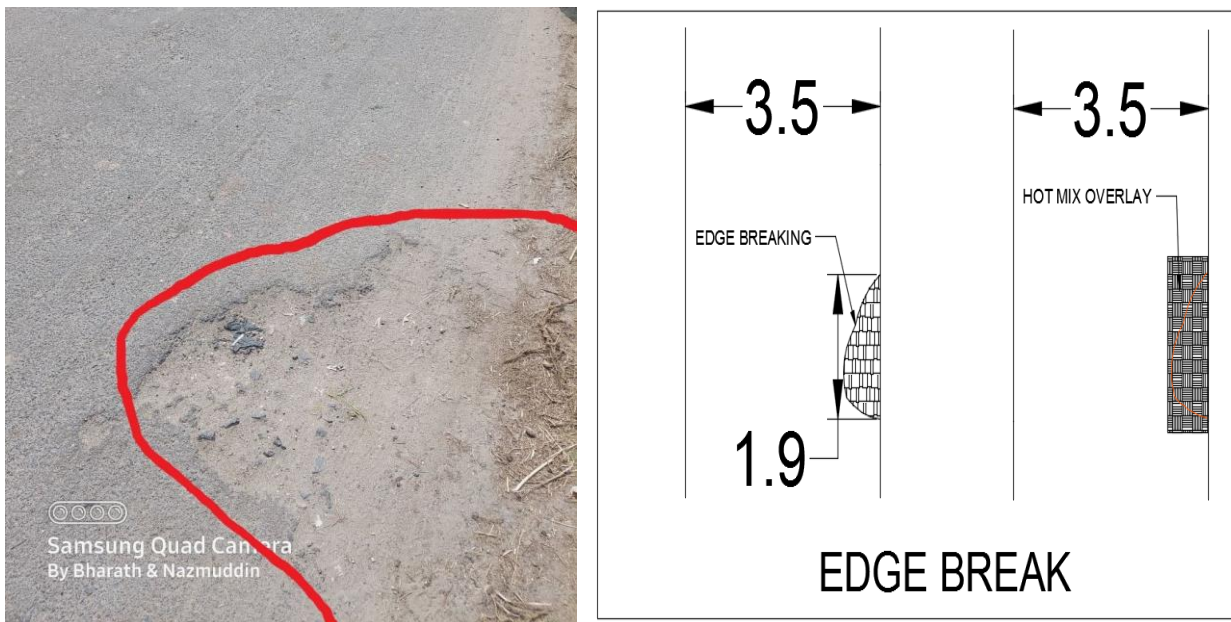


Fig: 4.11: EDGE BREAKING AT CHAINAGE @1.600KMS

(All dimensions are in meter)

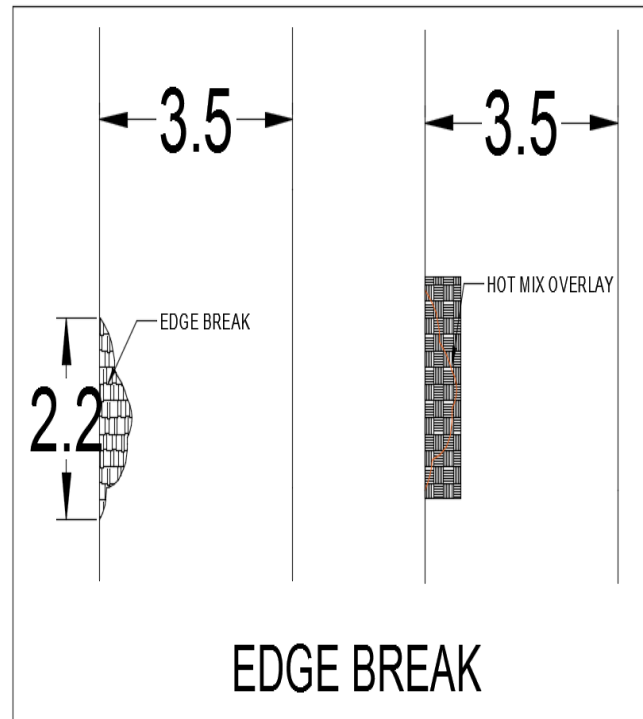


Fig: 4.12: EDGE BREAKING AT CHAINAGE @1.587KMS

(All dimensions are in meter)

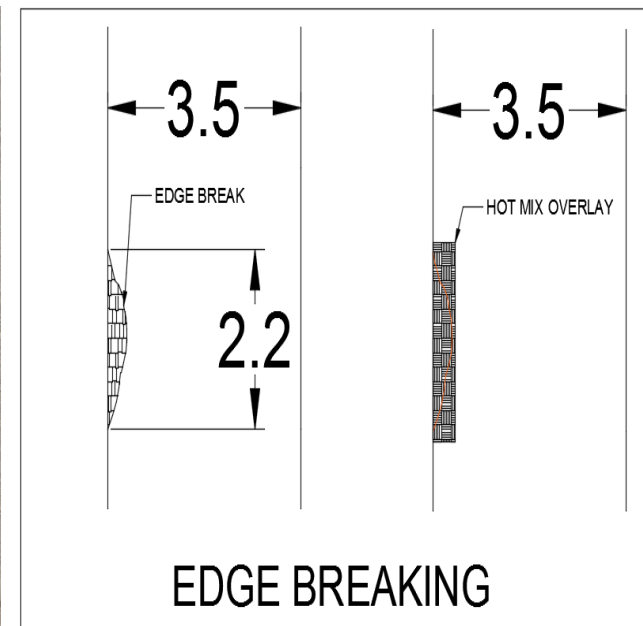
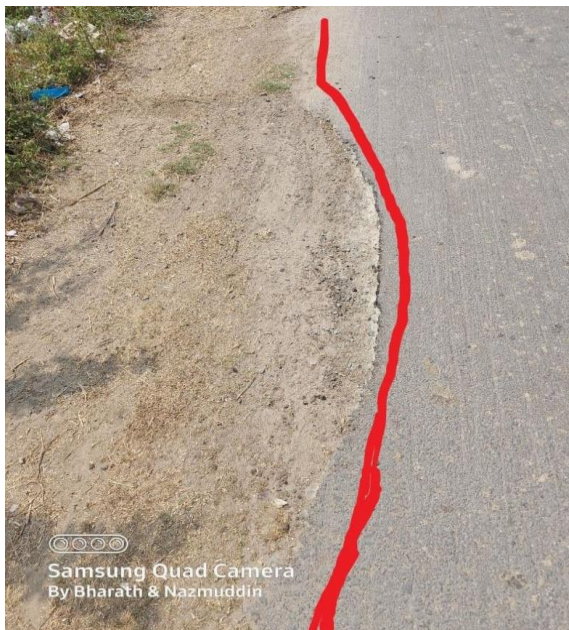


Fig: 4.13: EDGE BREAKING AT CHAINAGE @0.070KMS

(All dimensions are in meter)

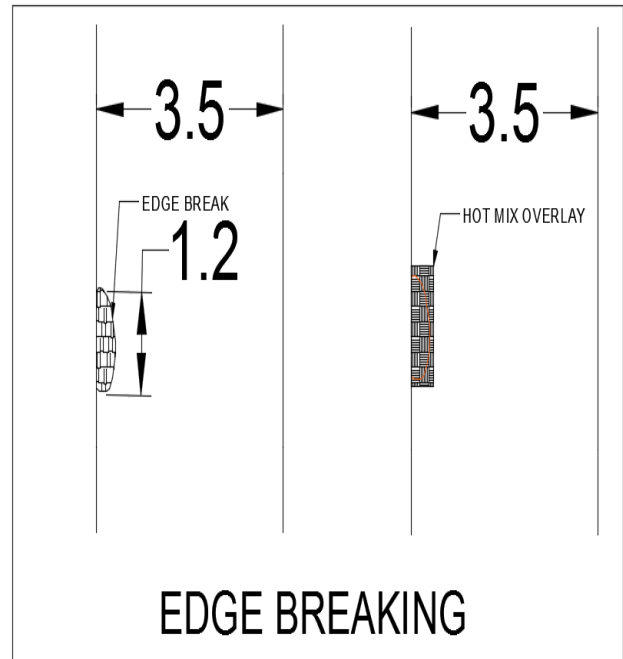
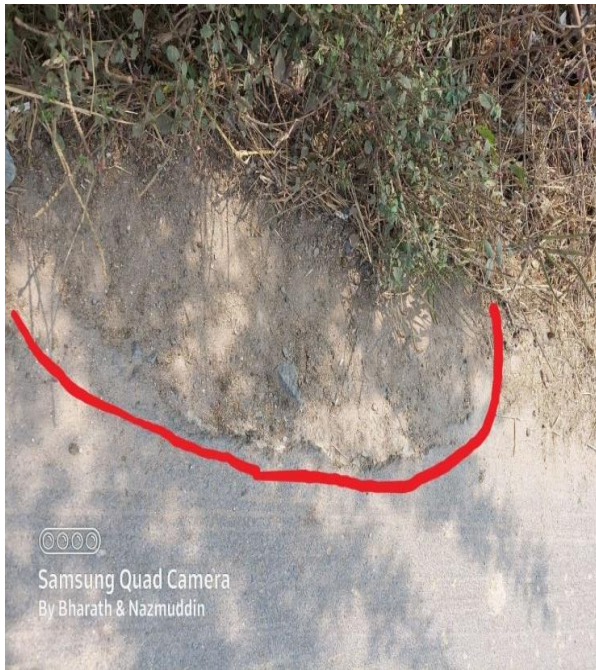


Fig: 4.14: EDGE BREAKING AT CHAINAGE @0.095KMS

(All dimensions are in meter)

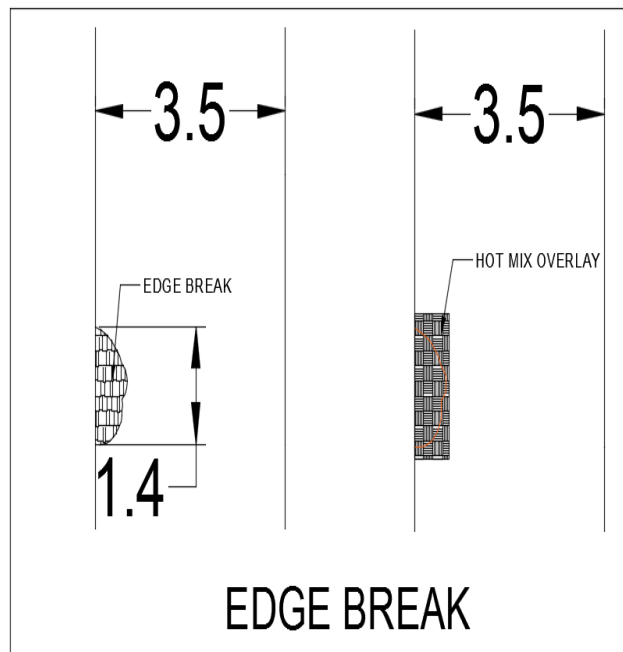


Fig: 4.15: EDGE BREAKING AT CHAINAGE @1.558KMS

(All dimensions are in meter)

4.1.4 ALLIGATOR CRACKING

Alligator/map cracking is a sequence of interconnected cracks with small irregular blocks on the surface of the floor, which resemble the skin of an alligator. These cracks may be of different types depending upon extent and severity. The size of irregular shape blocks of cracks vary from less than 30 cm to more. Alligator or map cracks normally appear along the wheel path.

CAUSES

The causes of alligator cracking are many. These are developed due to one or more of the following reasons.

1. Excessive deflection of pavement surface normally in wheel paths.
2. Inadequate pavement thickness.
3. Weakening of sub-grade or lower layers of the pavement due to ingress of excessive moisture to pavement and saturation.
4. Overloading of heavy commercial vehicles.
5. Brittleness of binder due to ageing of binder and lowering of surface temperature due to weather conditions.
6. Stripping of underlying bituminous courses

TREATMENT

In order to repair a pavement that has been weakened by alligator cracking, the root cause of the cracking must be found. The true purpose, on the other hand, is always very deep. Any inquiry will involve digging the pit or coring the floor in order to assess the structural adequacy capability of the floorings to determine whether surface moisture is a contributing factor. The severity and scope of the crack are also factors in the necessary repair. Treatment of alligator cracking may be done by following the methods depending upon the severity.

- a) Crack sealing by bitumen emulsions
- b) Crack sealing by rubberized and modified bitumen
- c) Milling and surface recycling

The above maintenance treatment suggestions are as per IRC 82- 2015

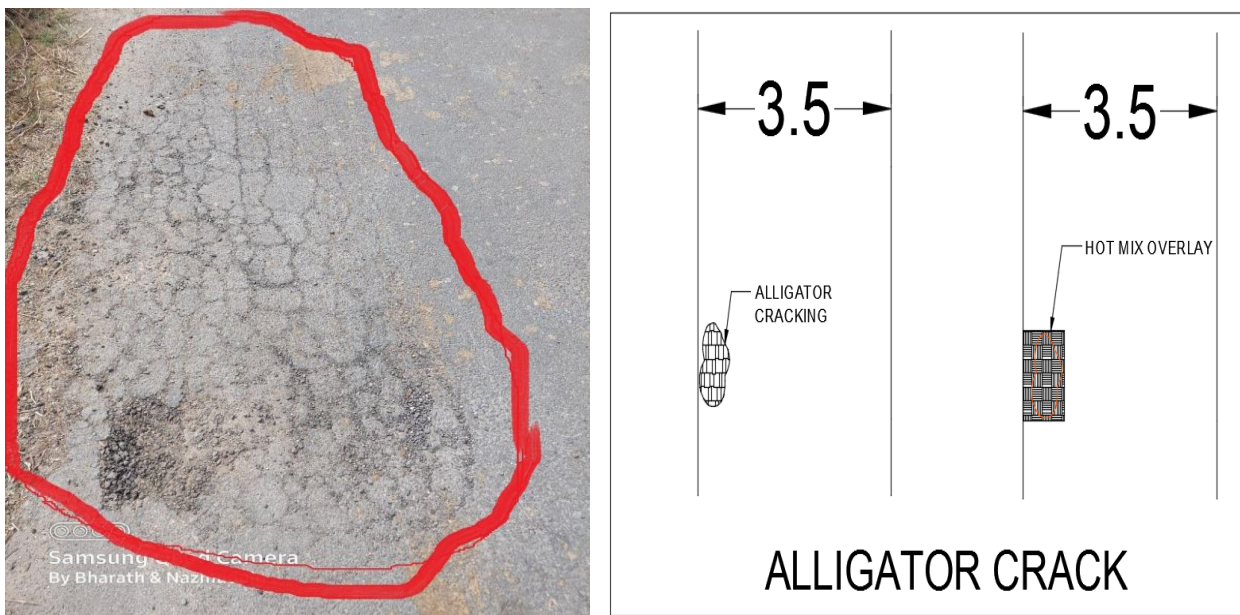


Fig: 4.16: ALLIGATOR CRACKING AT CHAINAGE @0.750KMS

(All dimensions are in meter)

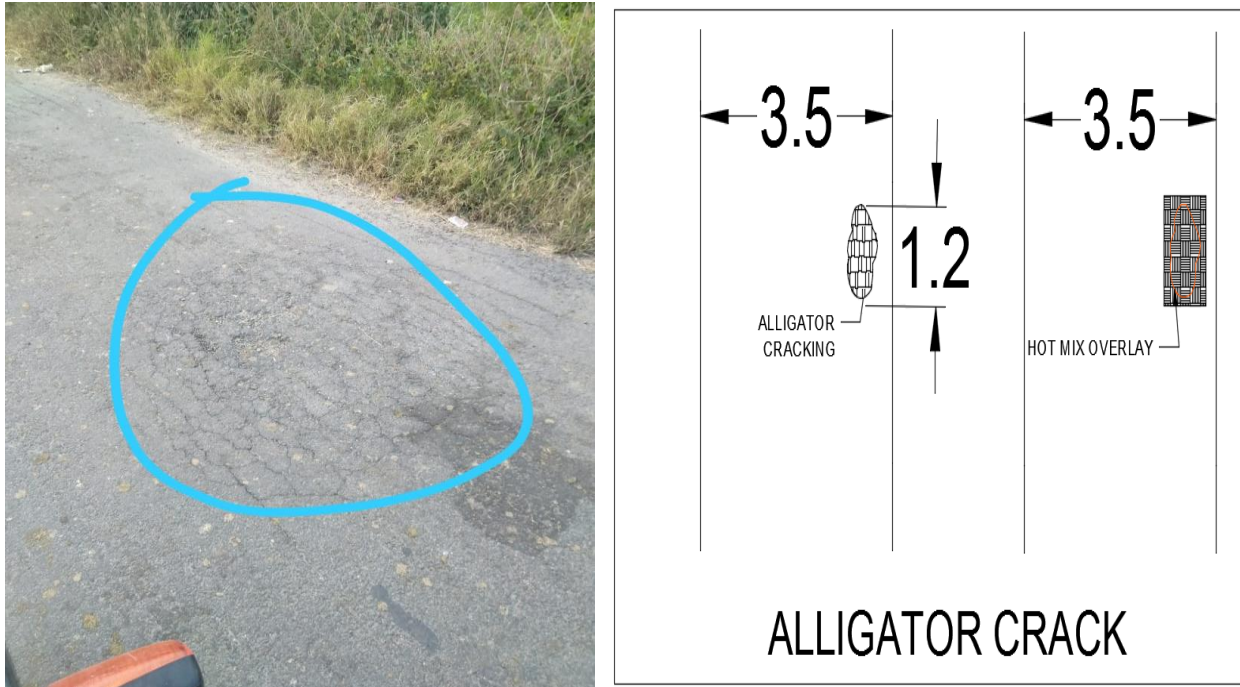


Fig: 4.17: ALLIGATOR CRACKING AT CHAINAGE @1.090KMS

(All dimensions are in meter)

4.1.5 SHALLOW DEPRESSION

Shallow depressions are isolated low areas of limited size, dipping about 25 mm or more below the profile, where water will normally become stagnant. The shallow depressions may or may not be eventually accompanied by cracking of surface. These may also lead to further deterioration of the surface and cause discomfort and unsafe surface to traffic. Shallow depressions are generally restricted to wheel path/heavy traffic lanes.

CAUSES

Shallow depressions are caused by isolated settlement of lower pavement layers due to pockets of inadequately compacted sub grade or subsequent pavement layers.

TREATMENT

The shallow depressions consist of fillings, open graded or densely graded, and compact as the surrounding pavement with the required profile.

The above maintenance treatment suggestions are as per IRC 82- 2015



SHALLOW DEPRESSION

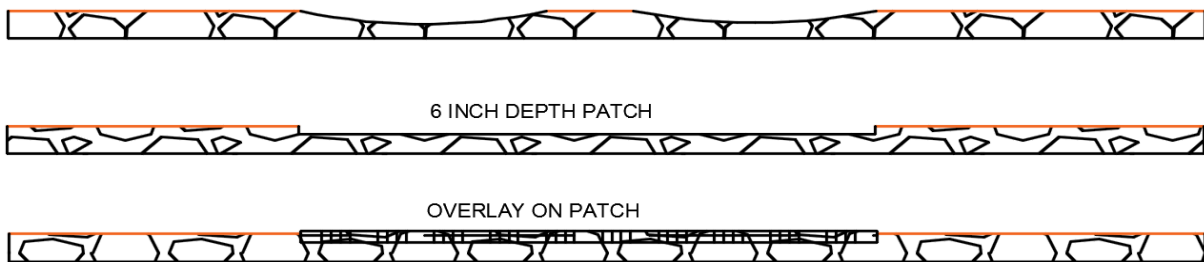


Fig: 4.18: SHALLOW DEPRESSION AT CHAINAGE@0.580 KMS

(All dimensions are in meter)

4.1.6 TRANSVERSE BREAK

These breaks appear in the transverse directions or as interconnected break forming series of large blocks perpendicular to the direction of the road.

CAUSES

This transverse break failure is a manmade damage to the flexible pavement made for laying drainage pipe line across the road.

TREATMENT

The rectification consists of filling transverse break with open graded or dense graded premix.

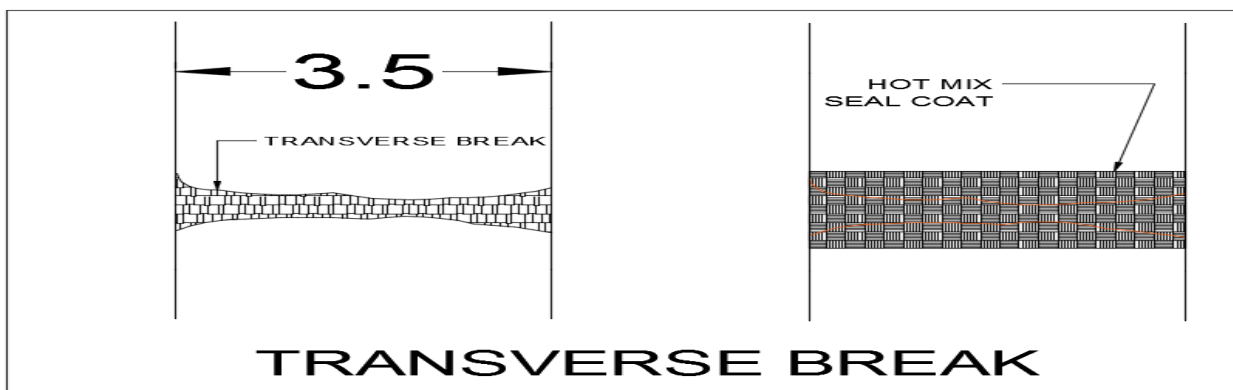


Fig: 4.19: TRANSVERSE BREAK AT CHAINAGE@ 1.515KMS

(All dimensions are in meter)

4.1.7 ADDITIONAL REPAIRS

4.1.7.1 SQUARE PATCH

This is a manmade square patch dig to erect a pole in between road a
Just after the major high-level bridge

TREATMENT

The rectification consists of filling of Square patch with open graded or dense graded premix.

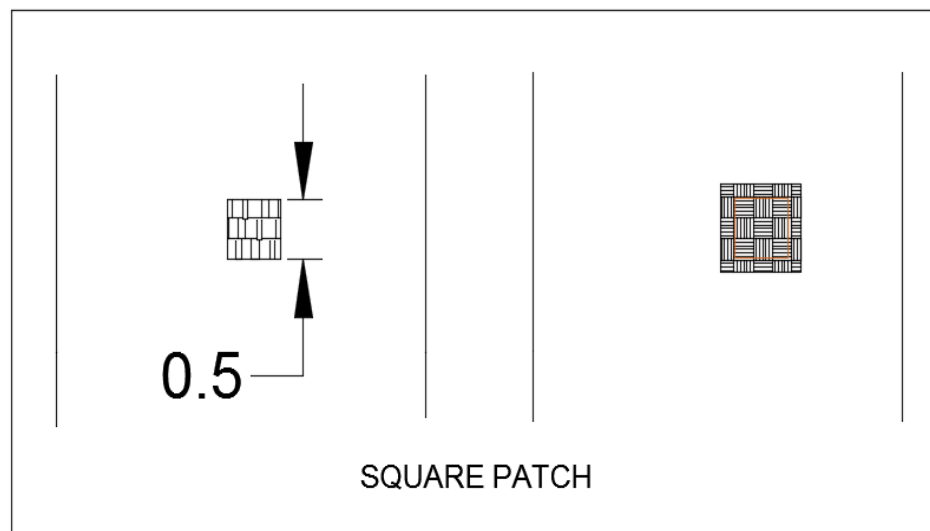


Fig: 4.20: SQUARE PATCH AT CHAINAGE @0.304KMS

(All dimensions are in meter)

4.1.7.2 OVERLAY OF APPROACH ROAD

As NATIONAL HIGHWAY 167A is newly laid flexible pavement it is 5 inch above than the rural road level towards Kanaparru village.

TREATMENT

5-inch bituminous overlay has to be constructed as below

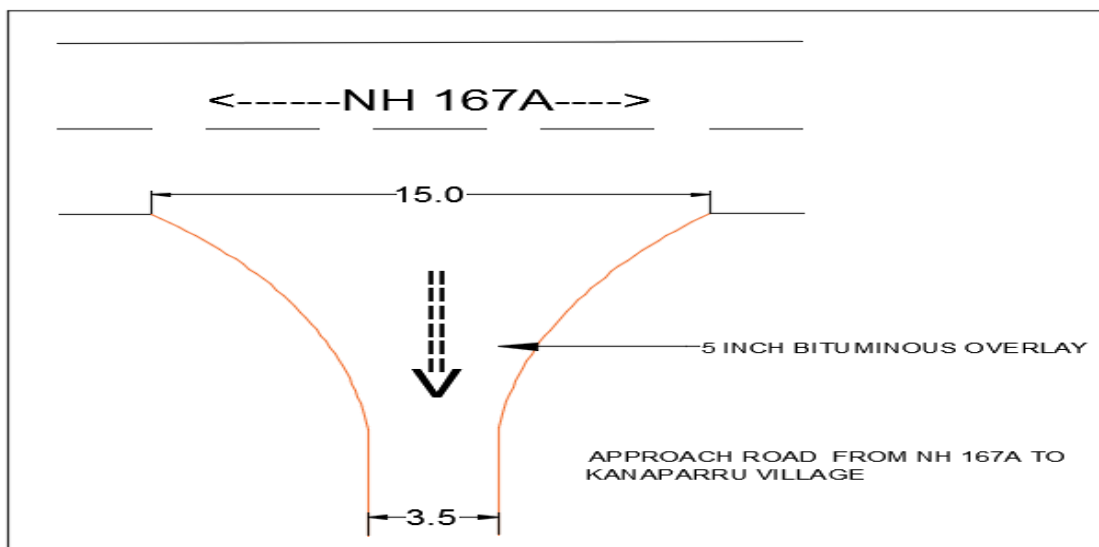


Fig: 4.21: OVERLAY OF APPROACH ROAD at chainage @ 2.38KMS

(All dimensions are in meter)

CHAPTER 5

SUMMARY AND CONCLUSION

The conclusions are taken to summarize the findings of the study. Several conclusions could be drawn from the data-driven analysis, all of which were in line with the study's objectives. The following conclusion can be drawn based on the findings. Results of the study indicates that edge breaks and alligator cracks are the most common type of failures followed by edge cracks, potholes, shallow depression along Kanaparru village to National Highway 167A. Some of the causes of road cracks and degradation and defects include poor building efficiency, building collapse, poor road infrastructure, poor maintenance policy, and poor monitoring.

Since pavement deterioration begins slowly and cannot be identified and accelerated at a faster rate, the required maintenance and repair work must be completed within a reasonable time frame and kept in a safe and appropriate operating state, reducing maintenance costs. Road maintenance is an integral aspect of the overall road system. Even if the roads are well-designed and constructed, maintenance can be required. Restoration and repair will not be able to fix bad design issues, but they will be able to prevent degradation.

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