

# A Study on Potholes and Its Effects on Vehicular Traffic.

<sup>1</sup>N. Naveen, <sup>2</sup>S.Mallesha Yadav, <sup>3</sup>A.Sontosh Kumar

<sup>1</sup>Assistant Professor, K G Reddy College of Engineering and Technology, Hyderabad

<sup>2,3</sup>B.Tech, K G Reddy College Of Engineering and Technology, Hyderabad

**Abstract:** The development of potholes in GHMC roads has been accelerated considerably, due to heavy rains. Many researchers have revealed different methods to detect potholes and pavement quality. Various causes of typical potholes and their repair methods were discussed. Potholes in the selected area were studied related to traffic and accident issues.

**IndexTerms-** Accidents, Heavy vehicles, Potholes, Traffic congestion, Spray patch.

## I. INTRODUCTION

Water is the primary cause of potholes, it can be caused by diesel spillages, mechanical damage by vehicle rims, accidents and fires, by falling rocks in cuttings, animal hooves on road surfaces in hot weather, poor road design over certain subgrades such as expansive, collapsible and dispersive soils. Even the little deformation is observed near the pothole, the cause is more likely to be the entry of water through surficial cracks in the road pavement. Environmental cracking can occur due to ultraviolet light from the sun, heat, oxidation or some other cause that has resulted in shrinkage of the asphalt. Reflection cracking due to the shrinkage of underlying stabilized materials as the cementitious stabilizer hydrates also leads to cracking.

Potholes not only damages vehicle but also cause serious vehicle accidents. Moisture in the pavement freezes during winter with an increase in volume and a consequent decrease in material density. As the frozen pavement layers thaw out in spring, the moisture content of the material increases. Under traffic loading, high pore water pressures develop in the wet materials with subsequent failure of the material. A lack of periodic and/or preventative maintenance of roads often leads to the development of surface cracks, which allow rapid ingress of water into the structural layers during rainfall.

An underlying weakness in the support layers usually results in high surface-deflections under traffic loading, particularly if the material becomes wet. Potholes associated with environmental and traffic cracking usually start as spalling of the asphalt adjacent to the crack, which then enlarges with time and traffic to develop a pothole.

## II. STUDY AREA

The area selected is from Gachibowli to Allwyn cross roads which is of 7.1 Kilometers distance between the areas.

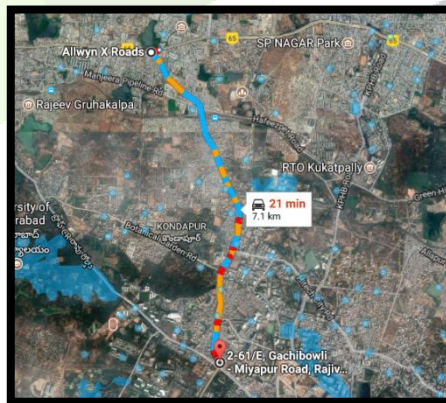


Fig 1: Map of the area selected for the study of Potholes from Gachibowli to Allwyn cross roads

To repair the roads, thin bituminous-surfacing seals such as single and double seals, Cape seals and slurry seals are the more common types of bituminous surfacing used. Routine preventative maintenance such as the periodic application of fog sprays, timeous resealing and the sealing of cracks will avoid this.

### III. RESEARCH FINDINGS & RECOMMENDATIONS

Ministry of Road Transport and Highways said that 10,876 people were killed due to potholes in 2015, 11106 people in 2014, 9699 people in 2013. Potholes accounted for 6,424 road accidents and as a result 2,324 people killed during the calendar year 2016. (Road Accidents in India, 2016 MORTH)

Accident prone area in this stretch are Gachibowli Jn. To Kothaguda, it is an internal road which comes under Raidurgam Police station limits in Madhapur. (Cyberabad Traffic Police, TS).

Some of the water logging areas in this stretch are in front of Harsha Toyota, Sri Rama dharma kanta on kothaguda – Kondapur road, at Kondapur junction, Anjayyanagar at sub register office, anjayyanagar at Traffic P.S, Khajaguda junction, at TRA office (Cyberabad Traffic Police, TS). Water logging areas are more prone to the formation of potholes.

Nearly there are 33lakh vehicles in GHMC limits and 600 new vehicles added every day. The city has 723 vehicles / Kilometer which is the second densest city in India. (HTRIMS)



Fig 2: Potholes at the intersection causes traffic congestion

The traffic congestion caused by potholes may lead to Wastage of fuel and increasing air pollution, releasing of CO (carbon monoxide) and other pollutant by congested car account for environmental and health problem which range from nose running to global warming. Wear and tear on vehicles because of idling in traffic and frequent acceleration and braking, leading to more frequent repairs and replacements. Frustration that comes from slow, stop and go condition of the traffic congestion cause discomfort and weakness of Vehicular. Congestion increases the tendency of collision which may lead to series of injuries and fatality.



Fig 3: The road totally damaged and raising the dust when heavy vehicles move on it

The actual location of potholes within the road carriageway can be a useful indication of the origin or cause of the pothole. Most potholes seem to occur in the outer wheel paths of single carriageway roads leading to extensive patching. This effect is probably exacerbated by the extra load on the outer wheels of heavy vehicles because of the road camber. On narrower roads, the inner wheel paths in the two directions may overlap, resulting in an effective doubling of the load in this area and possible development of potholes. The width of the road and whether the shoulders are sealed can also affect the location of potholes.

Once the pavement is loaded, shear failure of the material in contact or close to the loaded tyre will occur. This is caused by the applied stresses exceeding the shear strength of the material, which at this stage is usually saturated and subjected to effective stresses with high pore-water pressures. Overloading control is an essential part of preserving road functionality and reducing general pothole formation.



Fig 4: Patch work has done on the potholes, but this cannot be useful for the long life

Temporary patch works may not be beneficial. Correct cold mix should be used to repair the potholes as soon as possible. To repair the pothole, entire stretch near the pothole should be drugged and filled with good material to have a good bonding.



Fig 5: Deep pothole on the center of the road is a great hazard to the vehicular

A small pothole is defined as 25 mm deep and 200mm wide. The medium pothole is defined as 25 to 50 mm deep and 500 mm wide. The large potholes are those greater than 50 mm deep and 500 mm width. We can see number of potholes of these sizes in the area causing a greater damage to the vehicles.

Potholes have cost some precious lives, and these have a negative effect on the economy and caused traffic congestion. Motorists have claimed that they are losing a lot of money due to costs of maintaining their vehicles. The most extensive types of damage that have been caused by potholes on vehicles are alignment problems, damages to the under carriage, mufflers, shocks, axles, tyres, and rims.

At low speeds, hitting a deep pothole can cause damage to tyres, wheels and steering alignment but the cost of repair probably would not justify an insurance claim. At higher speeds, can cause severe damage and risks loss of control of the vehicle which could result in impact with other vehicles, the kerb or roadside objects.



Fig 6: Potholes at water logging areas

Potholes develop mostly at the water logging areas. Therefore, water should not be allowed to stay near the road or on the shoulder. If possible provision of small drains at the edge of the carriageway help us to prevent the formation of potholes.



Fig 7: Potholes at usual repair point like manholes

As most of the work takes place at the manholes by the municipality people, the area around it is subjected to the moisture may prone to the formation of potholes.



Fig 8: Potholes occurring at the bus stops causes a serious hazard to the passengers

The buses raise the dust at the bus stops which causes inconvenience to the passengers and it may lead to dust and eye allergies.



Fig 9: Potholes at the intersections causes the slow movement of the vehicles when the signal open.

The repair of patches using strongly-cemented materials is not recommended. The patch is usually significantly stiffer than the surrounding material, starts to ‘rock’ under traffic and results in failure of the surrounding contact areas.

Although highly undesirable, it is not uncommon for potholes to be repaired with material obtained from the roadside. This should never be done, as subsequent sealing of the pothole often involves removal of some of the upper (poor) material and replacement with asphalt. This new asphalt is directly underlain by a weak, water-sensitive material which will fail rapidly when wet. When there are excessive soluble salts in the pavement. If water evaporates through the surfacing soluble salts can be deposited between the seal and the base at these points.



Fig 10: Potholes at the turning area will make the vehicle to skid. This is a hazard to the two wheelers

Skidding chance and overturning will be more at the turning places, in addition to this the loose material and the potholes makes the situation some more worse at these places. Proper maintenance should be taken to avoid such type of accidents.



Fig 11: water logging area or the low-lying area makes the water to stagnant and leads to storing of silt or sand

This sand will not allow the vehicle wheels to stop, they make the wheels to skid and slip. Proper care need to be taken at the water logging areas and this interim causes the potholes

## IV.CONCLUSION



Fig: Sign board indicating the Potholes presence

Making use of appropriate notice or sign boards with a telephone number that is operational 24/7 will be useful in helping the road authorities and vehicular about the potholes information.

**TIPS FOR THE DRIVERS:** When safe to do so, stop and check your wheels and tyres after hitting a pothole. If a vibration is noticed, the steering wheel not at the centre or pulling to one side, it is advisable to get the car checked as steering damage can lead to later expense or even an accident.

**Keep your eyes peeled:** Protect yourself and your car by keeping an eye out for potholes, particularly in wet weather when deep potholes may be hidden beneath puddles.

**Maintain your distance:** Leave plenty of distance between your car and the vehicle in front so you can see potholes in advance.

**Stay alert:** Be aware of other traffic or pedestrians on the road before changing course to avoid a pothole.

**Watch your speed:** Striking potholes at higher speeds can cause more damage to your vehicle.

**Avoid unnecessary braking:** Try not to apply your brakes when driving over a pothole. When you brake you tilt the vehicle forward placing more stress on the front suspension.

**Drive over potholes with care:** If you must drive over a pothole, allow the wheel to roll freely into the hole.

**Hold the steering wheel correctly:** Make sure you are holding the steering wheel properly with the '10 to 2' hands position when driving on a road with potholes. Failure to do so may mean you lose control of your vehicle.

**Safety first:** If you wish to inspect any damage to your car, ensure that you stop in a safe place.

**Get checked out:** If you have hit a pothole and suspect your car has sustained damage, we recommend you get the vehicle checked out by your local garage. Verify if there could be any other issues as problems with tracking and wheel alignment, tyres or suspension.

**Check tyre pressure regularly:** Checking your tyre pressure regularly to ensure safety as a line of defence against potholes is a good practice. Recommended tyre pressures can be found in your vehicle's handbook and on the label located inside the driver's side door frame or doorpost.

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