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SYSTEMATIC PREVENTION AND REPAIR OF POTHOLES IN FLEXIBLE PAVEMENT

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Abstract - *Now-a-days India faces a major problem of road deterioration which ultimately results in total failure of road. The contribution of potholes is far more as compared to other types of road deterioration. It's now time to find engineering solution to this major problem. Potholes must not only be repaired but also prevented to avoid further incurring costs on maintenance and repairs. Repairs should not only be durable but also be cost effective. In this paper, we will find out the major reasons of occurrence of potholes and try finding cost effective solution. Suitability of various materials like polythene and fly ash will be found out by mixing in bitumen up to (3, 6, 9) percentage. This will ultimately reduce cost of repairs.*

Key Words: **Pothole causes, Fog seal, Spray injection, Overlay, Throw and roll technique.**

1. INTRODUCTION

Potholes are bowl-shaped holes similar to depressions. They are a progressive failure. First, small fragments of the top layer are dislodged. Over time, the distress will progress downward into the lower layers of the pavement. Potholes are often located in areas of poor drainage. Potholes are formed when the pavement disintegrates under traffic loading, due to inadequate strength in one or more layers of the pavement, usually accompanied by the presence of water. Most potholes would not occur if the root cause was repaired before development of the pothole. Repair by excavating and rebuilding. Area repairs or reconstruction may be required for extensive potholes. Since 2008, Brihanmumbai Municipal Corporation has spent Rs. 3,800 crores in recent years. The road hence, gets deteriorated and may cause the following problems:

1) Accidents.

2) Reduction in traffic handling capacity.

3) Increase in travel time.

4) Increase in vehicle operating costs.

5) Discomfort in driving.

6) Damage to vehicles.

7) Reduces aesthetical aspect.

8) Logs water in it.

9) Increases maintenance cost of road during its total life span.

1.2 PREVENTION

Now, our focus should be to avoid potholes to avoid future costs incurring on repairs. The above-mentioned factors should be controlled in order to prevent potholes from happening. Some of the factors are beyond the control of engineers hence, preventive maintenance is necessary to be carried out. This helps us to avoid catastrophic distresses in pavement. The major factor of formation of potholes is water seeping in the pavement hence, usually surface treatments are used for preventive maintenance. It has been observed that preventive maintenance is six times cost effective than actual repairs.

One of the prevention techniques are 'Fog Seal method'. The Asphalt Emulsion Manufacturers Association (AEMA) defines fog seal as "Fog seal is a light spray application of dilute asphalt emulsion used primarily to seal an existing asphalt surface to reduce raveling and enrich dry and weathered surfaces". The merits of this treatment are:

1. This treatment is thinner.
2. Cost effective.
3. Placed faster.
4. Less disruptive.
5. Involve less contract administration.
6. Produce less gas emissions.

2. REPAIR

After the formation of pothole there is an urgent need for its repair or else there may be increase in size of existing size of pothole or cracks may develop around it. The method of repair of There is four methods of repair of potholes:

1. Throw and roll technique.
2. Semi-permanent technique.

3. Spray injection technique.
4. Overlay.

1. Throw and roll technique:

This technique is the most commonly used technique used in India as it gives high rate of production, but this technique, as observed, does not give good results. This technique includes the following steps:

i. Clear the pothole from water, debris, dust and/ or loose soil.
ii. Apply tack coat on the inner edges and on the sides.
iii. Place the already prepared material in the pothole.
iv. Compact the material using any kind of roller till the top surface fully flushes with the road surface.
v. Ensure that the fully compacted surface has crown as of the road.

2. Semi-permanent technique:

This technique is considered one of the best techniques for fixing potholes. This technique provides sound area of patches and results into very tightly compacted patches. However, this technique has less productivity and time consuming than Throw and roll technique. This technique is carried out in following steps:

i. Remove water, debris and loose soil from pothole.
ii. Square up the sides of the patch until the sides are vertical. Keeping sufficient space between the cut and side of actual pothole.
iii. Place the mix in the well-prepared patch.
iv. Compact with the help of any kind of roller ensuring smooth surface.

3. Spray injection technique:

Spray injection is a one-person one-truck patching operation because it includes a special kind 'spray injection patcher truck. This technique is carried out very rapidly hence, time saving than those mentioned above, but it includes bulky machines and includes high initial cost, though it may be cost effective in long term. The procedure of this technique is as follows:

i. Clear off the debris present in the pothole to be patched.
ii. The operator applies a blast of air from the nozzle to remove the water and other loose soil.
iii. Use the same nozzle to apply a tack coat emulsion.
iv. Using the joystick, combine the aggregate with asphalt with compressed air to force it in the hole.
v. The mix gets self-compacted due to the air pressure.
vi. Apply tack coat.

4. Overlay:

This technique is also popularly used in India. In this technique, simply a layer of asphalt is layed over the existing pavement layer using a paver. Overlay technique is generally used when the area to be patched is too large to be economically repaired. This method ultimately give good results but the thickness of wearing course goes on increasing as the number of overlays increase.

1.1. METHODOLOGY

The problem of potholes may arise due to one factor or combination of factors leading to further damage to whole section of pavement. To effectively and systematically repair potholes in flexible pavement plastics and fly ash is added by:

1. Plastic waste like bags, bottles made out of PE and PP cut into a size between 2.36 mm and 4.75 mm shredding machine and shredded upto 60 microns. Care should be taken that PVC waste should be eliminated before it proceeds into next process and stored in silos at hot mix plant.

2. Fly ash collected from supplier is also stored in silos. The aggregate mix (Size 20mm, 10mm, 6mm, crush sand) is heated to 1650 degree Celsius and then it is transferred to mixing chamber. Similarly, the bitumen is to be heated up to a maximum of 1600 degree Celsius. This is done so as to obtain a good binding between plastics and aggregates. Monitoring the temperature is important.

3. At the chamber, the shredded plastics waste and fly ash is added over the hot aggregate as per the requirement from client. It gets coated uniformly over the aggregate within 30 to 45 seconds.

4. After adding suitable amount of plastic and fly ash as per requirement then mix is transported to the site for patching.

5. Remove water from pothole, debris and loose soil from potholes.

6. Square up the sides of the patch until the sides are vertical keeping sufficient space between the cut and side of actual pothole.

7. Place the mix in the well prepared patch

8. Compact with the help of any kind of roller ensuring smooth surface.

9. Apply fog seal and any other suitable preventive measure to increase life.

Picture taken at Site Visit to Hot Mix Plant at Yerawada

3. CONCLUSION

The total cost of patching includes cost of material, labour and equipment. If necessary efforts are made to reduce the cost of materials by using proper proportion of polythene or any other cheaper material, the overall cost of patching is ultimately reduced.

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