

# A Pneumatic Corridor-An Alternative for Conventional Pavements and Potholes

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**Abstract:** The study relates to pneumatic mating for road pavement adapted for use as transportation pavement. Pneumatic pavement mattress will form primarily of two relatively large sheets of fabrics which have been treated with rubber or other coating material to render the fabric impervious to air or water. The Pneumatic pavement mattress preferably divided longitudinally so as to form a tubular section. Pneumatic mattress preferably will be large enough to form a Comfortable carriage way according to numbers of traffic lanes. These techniques will be a good alternative in consideration with safety, serviceability, durability, strength and cost effectiveness within an instant of time. An alternative study will be perform in this project based on the suitable finite element software to find its suitability and performance improvement over conventional rigid pavements.

**Keywords:** Pneumatics Pavements, Rubber fabrics, Air pressure, Water pressure, Potholes.

## 1. Introduction

The advent of hard Surfaced roads, the traveling public has been plagued with the problem of potholes. However, most Stem from moisture or water Seeping through cracks in pavement down into the soil beneath. This water either freezes, thus creating expansion and forces the Substrata upward or washes away the Substrata leaving Voids beneath the paving Surface. Traffic exerts pressure on this weakened area and the Surface crumbles thereby creating a pothole. The pothole problem is worsening. Potholes can cause instant damage to vehicle. Due to the pothole various vehicle accidents happened. In this, we are producing a pneumatic mattress which is directly to be used as a pavement. This mattress is laid on the pavement having potholes and cracks for easy movement of vehicles so that water is no percolated or stagnant on the pavement and is directly drained out of the pavement surface.

It is related to pneumatic mating for road pavement adapted for use as transportation pavement. Pneumatic pavement mattress will form primarily of two relatively large sheets of fabrics which have been treated with rubber or other coating material to render the fabric impervious to air or water. The Pneumatic pavement mattress preferably divided longitudinally so as to form a tubular section. Pneumatic mattress preferably will be large enough to form a Comfortable carriage way according to numbers of traffic lanes. This technique will be a good alternative in consideration with safety, serviceability,

durability, strength and cost effectiveness within an instant of time. As after the repair work is accomplished, there is again and again formation of potholes on the same place and this increases the maintenance cost. So to avoid this, pneumatic mattress can be used for comfortable ride of the driver.

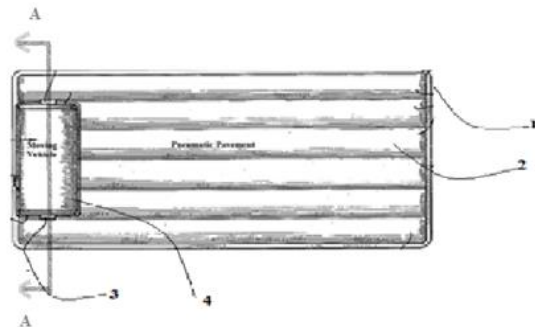


Fig. 1. Plan view

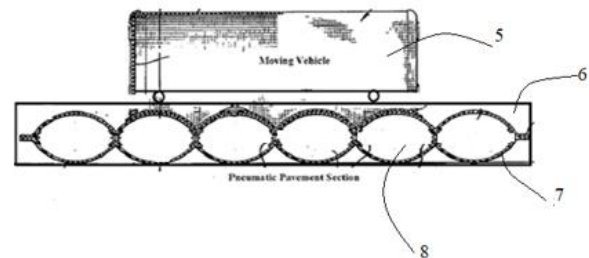


Fig. 2. Sectional A-A

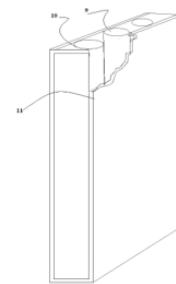


Fig. 3. Pneumatic pavement

## 2. Field of study

The present study relates to a pavement technology for the effective road service. In the present paper, rubber mattresses are used as a pavement.

### 3. Background of the study

Currently India's annual expenditure on the road sector is around Rs. 20,000-30,000 crore. One of the major reasons behind this huge expenditure on maintaining roads is due to the problems of overloading and poor maintenance. One of the major reasons for the damage of roads in India is overloading. It is said that about 70 percent of funds meant to be spent for the maintenance of roads actually goes behind paying laborers. The magnanimity of the expenditure incurred in order to repair roads is alarming and hence the government is stressing on building large scale concrete roads instead of the common bituminous roads. Although building concrete roads is a little expensive.

There are number of ways to construct the roads, number of techniques are used now a days in the road construction, but still these roads are not giving effective service and they required regular maintenance for their serviceability. And there many road related problems arising due to poor practices of road construction like potholes, cracks, seepage problems, etc.

Various methods are available for the repairing of the roads. Potholes are the major issue now a days and these potholes causing many accidents and hence this is more important to avoid formation of potholes. There are many techniques used in the maintenance of road surfaces such as sealing and paving, Throw and roll pothole repair, Semi-permanent pothole, : Spray-injection pothole repair, Edge seal pothole repair, Full-depth roadway pothole replacement, Patching, Health monitoring of pavement systems using smart sensing technologies, which gives the temporary effect on the serviceability of road. But it is necessary to construct or develop a technology which can give the 100% pothole free road and no possibility of formation of pothole.

### 4. Summary of the study

The present paper provides a rubber pneumatic mattress which is directly to be used as a pavement. It is related to pneumatic mating for road pavement adapted for use as transportation pavement. The Pneumatic pavement mattress preferably divided longitudinally so as to form a tubular section. Pneumatic mattress preferably will be large enough to form a Comfortable carriage way according to numbers of traffic lanes. This technique will be a good alternative in consideration with safety, serviceability, durability, strength and cost effectiveness within an instant of time.

#### A. Brief description of drawings

- Fig. 1 Typical plan view of pneumatic pavement
- Fig. 2 Typical section view of pneumatic pavement
- Fig. 3 Typical cutting of pneumatic pavement

#### B. Detailed description of the invention

In Fig. 1 is a top plan view, mark 1 denotes the Pneumatic pavement. Mark 2 denotes surface of pneumatic pavement. Mark 3 denotes the wheel of the moving vehicle on the

pavement. Mark 4 denotes moving vehicle on pavement.

In fig. 2 is a sectional view, mark 5 denotes moving vehicle. Mark 6 denotes the solid rubber. Mark 7 denotes inner rubber tube. Mark 8 denotes space which is filled with air/ water pressure.

In fig. 3 is a detail description of pneumatic pavement, mark 9 denotes space which is filled with air/water under pressure. Mark 10 denotes inner tube for pressured air. Mark 11 denotes surface of pneumatic pavement.

### 5. Results

Performing analysis on a model of 6m length, 4m width, 0.2m thickness under different loading of 3675N & 4000N are the weights of vehicles running on road on Ansys software. According to the results of Ansys we derived the following graphs.

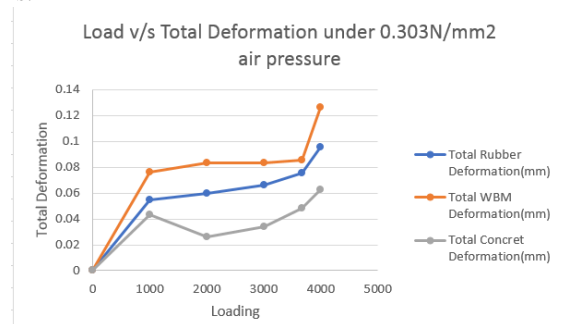


Fig. 4. Load vs. Total deformation under 0.303N/mm<sup>2</sup> air pressure

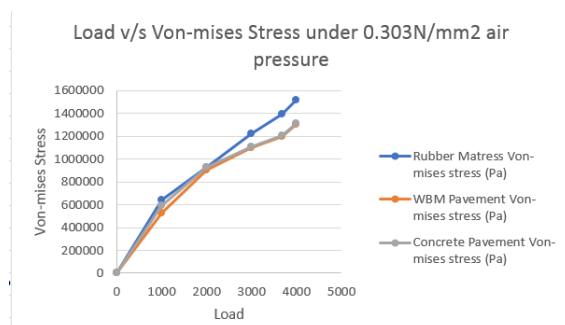


Fig. 5. Load vs. Von-mises stress under 0.303N/mm<sup>2</sup> air pressure

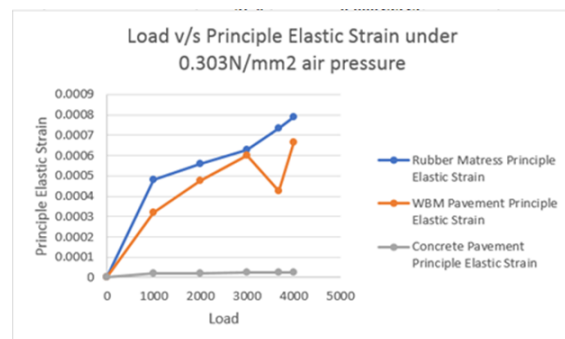


Fig. 6. Load vs. Principle Elastic Strain under 0.303N/mm<sup>2</sup> air pressure

### 6. Conclusion

*General:* Based on the investigations carried out in the

preceding chapters on the behavior of Pneumatic Corridor-An Alternative for Conventional Pavement and Potholes and relation between the graphs on pneumatic pavement, WBM and concrete pavement following conclusions are derived.

- The response of Pneumatic pavement is significantly influenced by the vehicle static load
- It is observed that there is 30% more deformation in pneumatic mattress than concrete pavement under static loading
- which is an added advantage to maintain the flexibility in the pavement mattress
- helps to prevent potholes and provide smooth surface
- 13.3% increment in von-mises stress in pneumatic mattress than concrete highlights the strength of the pneumatic pavement which considerably equivalent to the concrete pavement.
- The increased strain rate of 66% more strain in pneumatic mattress than concrete requires to be control by designing special fixtures and fastenings

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