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Experimental Study on Permeable Pavement Pervious Asphalt with Drainage Channel

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Abstract:
Pavement plays a vital role in transportation which enhances the trade and also promotes country's development. The major issue in maintain the pavement in good condition is stagnant of rainwater on the pavement surface. To eliminate this permeable pavement is adopted. By providing this kind of pavement runoff water will be easily seeps into the successive layers of pavement and collected through a drainage channel. This collected water may be utilized for future purposes. The complete pavement is provided with different layers of aggregates of different grades and macadam layer. These layers help to filter the polluted runoff water which eliminates the process of treatment of runoff water.

I. INTRODUCTION

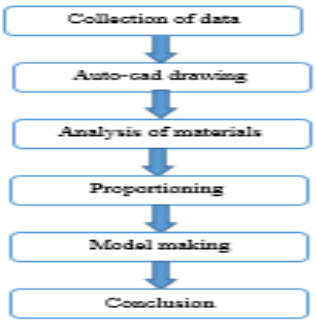
Permeable pavement also known as pervious or porous pavement is surfaces that allow water to pass through voids in the paving material or between pavers. There are different kinds of permeable pavements. Here, pervious asphalt is adopted. Pervious asphalt is a typical porous pavement has an open graded surface over an underlying stone beds. The layers consist of different grades of coarse aggregate and macadam wet mix. Under the stone beds a drainage channel is constructed to discharge the collected water to the corresponding storage tank. If contaminants were on the surface at the time of the storm, they are swept along with the rainfall through the stone bed. From there they infiltrate into the sub-base so that they are subjected to the natural processes that cleanse water.

ADVANTAGES: The need for this kind of permeable pavement is so beneficial as follows:

- Porous asphalt is used in place of traditional impervious paving material decreases the total amount of runoff leaving a site.
- Reduction in runoff velocity and volume.
- Promotes infiltration.
- Encourages usage of rain water into a usable manner.

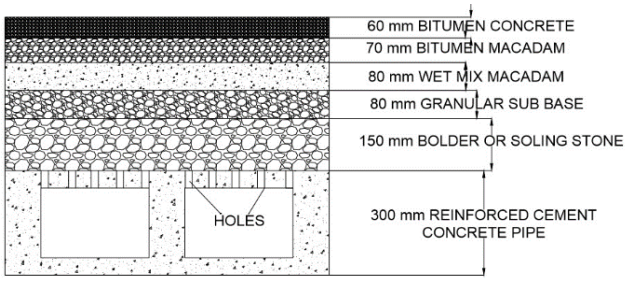
CASE STUDY

METHODOLOGY:



AUTO-CAD DRAWING:

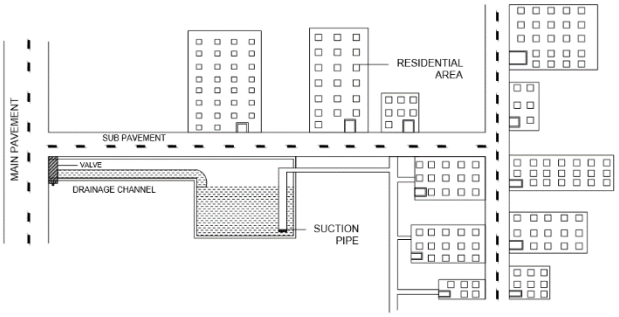
DRAWING -1:



ROAD CROSS SECTION

DESCRIPTION: The cross section shows the stone beds provided in the pavement. The top layer is the smooth pervious asphalt layer which absorbs water. The second layer is bituminous macadam and third layer is the wet mix macadam which dries sooner and allows water to successive layer. Two layers of 1.5 inch granular sub base and 2 inch bolder are provided below the macadam layer. This layer acts as cleanser of polluted water. At bottom a drainage channel is constructed to discharge the collected runoff to the corresponding storage tank. The water is collected through holes provided on the concrete pipe.

DRAWING – 2:



FLOW OF FLOOD WATER THROUGH DRAINAGE CHANNEL

DESCRIPTION:
This drawing represents the working of installation of pervious asphalt pavement. The water stagnant on the pavement is collected over the drainage channel. A valve helps to control the movement of collected water. Once the water in the storage tank is fully filled the valve is closed so that the excess water is passes to the next drainage section and stored in the corresponding storage tank. The water collected on the storage tank can be utilized for during any water crisis.

II. MATERIALS USED:

The whole pavement structure consists of following materials:

- Top layer – Bitumen, chips of grade 6mm, sand and quarry dust.
- Bitumen macadam – Bitumen, 12mm aggregate, sand and quarry dust.
- Macadam wet mix – Cement, 1 inch aggregate, sand, quarry dust and water.
- Sub-base – 1.5 inch aggregate.
- Bottom layer – 2 inch aggregate.
- Concrete pipe section – Cement, sand, aggregate and water.

PROPORTIONING:
Proportioning is an important factor to be considered. The model is designed in size of 900mmx600mm.
BITUMEN CONCRETE: Total weight of concrete = 80kg
Weight of bitumen = 30kg
Weight of aggregate = 45kg
Weight of sand &Q.D = 5kg
BITUMEN MACADAM: Total weight of concrete = 90kg
Weight of bitumen = 25kg
Weight of aggregate = 60kg
Weight of sand &Q.D = 5kg
MACADAM WET MIX: Mix ratio = 1:7:12 = 20
Water ratio =0.25
Unit weight =2400kg
Total weight of mix = 0.9xo.6x0.08x2400 = 103.6kg
Weight of bitumen = 103.6/20 = 5.184kg
Weight of aggregate = 7x 5.184 = 36.28kg
Weight of sand &Q.D = 12x5.184 = 62.21kg
SUB-BASE:
Total weight = 0.9x0.6x0.08x2400 = 103.68kg
BOTTOM LAYER:
Total weight = 0.9x0.6x0.15x2400 = 194.4kg
CONCRETE PIPE:
Mix ratio of M25 grade = 1:1:2 = 4
Total weight of top& bottom slab = 0.9x0.6x0.05x2500 = 67.5kg
Weight of cement = 67.5/4 = 16.875kg
Weight of sand = 67.5/4 =16.875kg
Weight of aggregate = 2x1.875 = 33.75kg
Total weight of side vertical slab = 0.2x0.6x0.1x2500 = 30kg
Weight of cement = 30/4 = 7.5kg
Weight of sand = 30/4 = 7.5kg
Weight of aggregate = 2x7.5 = 15kg

MODEL:

Figure.1. Concrete pipe construction

Figure.2. Concrete pipe construction top slab

Figure.3.Sub-base layer

Figure.4. Macadam wet mix:

Figure.5. Bitumen macadam:

Figure.6. Pervious asphalt pavement:

III. CONCLUSION

This study concludes that the permeable pavementis an alternate for traditional pavement which is economical and also promotes the development in the transportation sector. This pervious asphalt can absorbs water upto the 18 gallons of water in 60 minutes. The adaptation of permeable pavement will enhance the country's growth.

IV. ACKNOWLEDGEMENT

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V. REFERRNCE

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