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ADVANCE CONSTRUCTION IN PAVEMENT OF NATIONAL HIGHWAY -31 (BARHI TO KODERMA, JHARKHAND)

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Abstract: For the development of any state, transport facility is an accelerator admixture in economy. Past days material would be transported on the animals and other time taking facilities. After that done some new innovation like water facility, air facility for the transport and then road transport facility were started. The main property of pavement for its long life durability will be its material property. The main material are used in making pavement is depends on the type of pavement. For the rigid pavement aggregate, sand and cement are the main material with admixture. And the flexible pavement the binding material is asphalt, aggregate and filler material will be sand and cement.

There are many types of waste material are used in the flexible pavement to reduce the percentage of asphalt and aggregate therefore cost of construction will reduced. Waste plastics are used in this study in the replacement of bitumen content. The total reduction of asphalt is 7% with waste plastic (WP). The waste plastic is converted into fine particles and covers the aggregate with hot waste plastic before applying the bitumen coating. The percentage of bitumen content (BC) is 4.5%, 5%, 5.5% and 6% is used for the experiment. The gradation of aggregate (13.2mm -6mm), aggregate (6mm-0mm) is done with 7% waste plastic. The optimum bitumen content (OBC) is used 5.48% with 7% WP. Water absorption test is carried out of CA and FA is 0.54% and 0.85% respectively.

Loss angels' aggregate value test and specific gravity of bitumen is observed 20.05 % and 3.05. The water absorption of dry bitumen mix material is carried out 0.81% which is nominal value, is should me not more than 2%. The aggregate impact value (AIV) is calculated as 14.63% of aggregate (13.2mm -6mm) which 7% of waste plastic.

Waste plastics is good adhesive material for construction work, it can be also used in other types of construction work as replacement of asphalt and other building material. It also reduces the percentage of waste plastics and makes environment pollution free.

KEYWORDS: Waste plastic materials, bitumen concrete mix, Optimum bitumen content, specific gravity, gradation of aggregate, impact value.

Introduction: Paving industry is broadly used bituminous binder .In general pavement is classified into two group and these are flexible pavement & rigid pavement [1].

Flexible pavement

In flexible Pavement bituminous binder is used, which on the whole have little flexural strength and relatively flexible in their structure action under different loads [2]. These types of road layers reflect the deformation of down layers on to the surface of the layer.

Rigid Pavement

If any pavement are made up of different types of material i.e. cement , aggregate , sand etc. (cement concrete) such pavement are known as rigid pavement since the total road structure can't bent or deflect due to load coming from external source[3].

There are two main consideration in pavement engineering which are pavement desing and mix design. The present research work is live project is going on in Jharkhand state for flexible pavement consideration[4]. The design of tar paving mixture is a multi-steps process of selecting binder and aggregate material and proportioning them to provide an several variable that affect the mixture behavior, due to external factors such as vehicle loading and various climatic condition.

Location of the site for road construction

- "4-Laning of Barhi - Koderma Section of NH-31 from Km 0.000 to Km 27.500 in the state of Jharkhand under NHDP Phase-IV on EPC Mode"
- The project consists of "Four laning of Barhi (km 0.000) to Koderma (27.500) Road section of NH-31; (Existing length 27.665 km; Design length 27.500 km)" in State of Jharkhand under NHDP Phase-IV on Engineering, Procurement, Construction ("EPC") basis. Total length of project is 55.000 km (2 Lane Length) from [0.000] to [27.500] with total cost 276.17 Cr. The NHAI has awarded the contract to M/s Ram Kripal Singh Construction Pvt. Ltd. and the contract signed on 26/02/2019 between National Highway Authority of India, New Delhi and M/s. Ram Kripal Singh Construction Pvt. Ltd[6].
- There are three different stages (viz. Development Stage, Construction Stage and Operation & Maintenance Stage) of the Project. The Appointed Date of the Project has been fixed as 18-11-2019 by the NHAI. The Defect Liability Period of 4 years commencing from the date of Provisional certificate and not less than 42 months from the date of completion certificate. The construction period of 730 days will be completed on 16-02-2022. Maintenance Period of 4 Years[5].

Literature Review-

1. Partial additional of bitumen by using plastic waste in bitumen concrete; ghalayan prince, rana sumit; 2017: use of waste plastic in concrete to enhance the property of bitumen concrete mixture. Firstly they are collecting the waste plastic from garbage and clean that waste plastic. After the cleaning process cut it by 2-3 mm size , then provide it a regular temperature then aggregate mix in this hot waste plastic liquid. Aggregate becomes coated with waste plastic then this aggregate mix in hot bitumen. After the mixing in bitumen applying in pavement construction. Coated aggregate are resist the moisture content and enhance the long life property of aggregate. This research enhances the property of aggregate and bitumen also. After the modification it also shows the standard results. It also help the minimizing the waste plastic decomposition problem.

2. Application of waste plastic waste material in bitumen mixes pavement for increasing the strength of pavement material; pallavi latlitha, dey subhashis, veerendra G.T.N; 2022: for

minimizing the environmental problem regarding waste plastic are done in this research work. They are collect the waste plastic and doing some test on that waste plastic about it properties.

3. Materials and Methodology:

To design a pavement there are many types of raw materials are required. For rigid pavement design, binding material (cement) used as a filler material, aggregate (coarse aggregate and fine aggregate) and sand are necessary in a definite ratio. For flexible pavement design there are mix proportions the required [7].

3.2 Constituent of a flexible pavement mixture For design of flexible pavement bitumen mix consist of a combination of aggregate graded from maximum size, less than 25 mm and for fine filler is smaller than 0.075 mm. here sufficient amount of asphalt is added for properly mix and get a impervious property and also get an [9] elastic property. The main purpose of bituminous mix is to determine the property and proportion of bitumen, filler, fine aggregate (FA) and coarse aggregate (CA) to produced its workability property and also know about durability, strong and economic property.

3.3 Material used in this study or investigation-

- Aggregate (FA and CA)
- Fly ash
- Slag
- Asphalt binder of bituminous binder

Waste plastics (polyethylene).

3.3.1 Aggregate

For the manufacturing of bituminous concrete mixture aggregate are used and these aggregate are occurred from different natural source such as mines and can be used with or without further processing. After getting the aggregate it should be finished to achieve well performance property. There are many industrial waste are used in manufacturing for concrete such as fly ash, slag, cupola slag, blast furnace slag, etc. as a form of aggregate or admixture. There are some times we used natural aggregate for enhancing the property of mixture. In any mix aggregate contribute 85-95 % of the mixture by its weight and also contribute to most of the load bearing and characteristics' strength of the concrete mixture [13].

- Coarse aggregates (CA)

Those aggregate which is retained from 4.75 mm IS sieve is known as coarse aggregate. It is made up of crushed rocks; it should be angular in shape, free from dust articles, vegetation matter, clay and organic matter. This aggregate offers the compressive strength and shear strength for better interlocking properties between materials. In this investigation, small stone chips are used as a coarse aggregate (CA) with specific gravity 2.75[8].

Aggregate which is passed from the IS sieve no. 4.75 mm is known as fine aggregate. Fine aggregate (FA) should be free from impurity, clay, loam, vegetation and organic matter[10]. These fine aggregate used in mixture as a stone dust in mixture which is passed from 4.75 mm

and retained from 0.075 mm IS sieve. The main function of FA is to fill the voids in mixture. In this investigation fine stone or slag are used as fine aggregate whose specific gravity has to be found 2.60 and 2.40[12].

3.3.2 Filler material

That material which is passing from 0.075 mm IS sieve is known as filler material. In this mix stone dust and fly ash are used as filler. It fills the voids space, stiffens the binder material and most important it offer the permeability property to the material. In this study specific gravity of filler has to be found 2.7 and 2.3[11].

- **Fly Ash**

Fly ash is a waste material, which is obtained from industries like power plant and cement factory etc. According to fly ash utilization programme (FAUP) only 35%-40% fly ash can be used in commercial applications like mass concreting, pavement construction, used as a filler materials, for making light weight aggregate, admixture for concrete etc. the rest of the waste material are totally disposed in large disposal area and it occur huge capital loss to power plant. Due to this disposal it occur environmental imbalance. In this study fly ash used as a filler material.

Results and Discussion:-

Average grading of aggregate (13.2 mm – 6 mm) five sample of coarse aggregate, fine aggregate and filler material were taken in this experiment which is sieved in IS 13.2mm-6mm, 6mm-0mm and 75 mic respectively. The results are shown in table 4.2(a), 4.2(b) and 4.2(c). The result indices the average gradation of materials [14].

Blending of Bitumen concrete

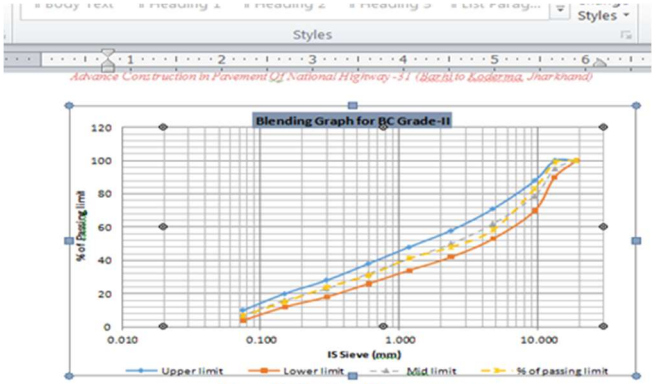

Figure 4.2: blending of bitumen concrete

CONCLUSION

This project report is currently in progress on Jharkhand state, kodarma district.

A flexible pavement is designing with mixture of waste plastic material [15]. The plastic waste material were not easy to decompose, it takes lots of time to decompose therefore we were try to minimize the percentage of waste plastic in society for better healthy life and minimizing the environmental pollution[16]. After the adding 7% of waste plastic with bitumen concrete BC-2, aggregate (13.2mm-6mm) have water absorption 0.54%, aggregate (6mm-0mm) observed 0.85%. The maximum limit for water absorption is for BC is 2% [17].

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