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USE OF COCONUT CHARCOAL AS A PAVEMENT FILLER

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Abstract - Waste materials are used as an alternative to mineral filler, for reducing cost and increasing the efficiency of roads. Some of the waste materials are coconut shell charcoal ash, iron steel slag, scrap tire, plastic waste and fly ash. Among those coconut shell charcoal powder is referred as study. Coconut shell contributes solid waste approximately 1.2 million tonnes in India, these coconut shells are generally disposed out and burnt, and these are locally available especially in southern India. In this investigation composition of bituminous concrete, Grade 1 for surface course was implemented. Here coconut shell charcoal powder was partially replaced with stone dust at 2%, 4%, 6%, and 8% by the weight of aggregates, the bitumen content varied as performance of stone dust and coconut shell charcoal powder in bituminous concrete mix (BC) was tested by Marshall Stability test.

Key Words: Road pavement , Coconut charcoal shell ash, Filler, Marshal stability, Bitumen, Aggregate, Void ratio, Asphalt.

1. INTRODUCTION

Bituminous paved roads are mostly preferred in developing countries like India, to increase the road network with fewer funds. In bituminous mix filler plays an important role in filling voids which increases toughness, stability and density of a conventional design mix. In past few years most of the countries experiencing increase in the truck pressure, traffic volumes and axle loads, if this may happen rigorously the upper layer of the pavement is exposed to higher stresses. These stresses are responsible for distress like ravelling, cracking, rutting, shoving etc. To counteract these problems Bituminous concrete mix is best to handle the high axle loads and traffic volumes and this mix is easy to refinish. In India flexible pavements are more when compared to rigid pavements. The things which comes into consideration while constructing these flexible pavements are construction cost, economical, less maintenance cost, less repair cost, sustainability. Using waste materials as a replacement of aggregate, bitumen and filler help to reduce the cost, increase the strength to some extent

[1]. There are lots of waste materials producing due to increase in industries, population, urbanization, development activities and changes in lifestyle

[2]. some of the waste materials are coconut shell charcoal ash, fly ash, steel slag and plastic waste

[3]. Coconut shell charcoal ash possess properties like resistance to crushing, absorption, surface moisture, heating etc. Concrete pavement suffers from the fact that they add a significant amount of Co2 to the environment because of the use

Of CSC powder which binds the aggregates

[4]. these wastes contribute in low cost, low density, low pollution and high toughness properties.

And also Coconut shell categorized as MMC (Metal matrix composites) which has properties like good weather resistance, precise modulus, strength and good damping capacity. Coconut shell is considered as a waste by product, this CSC produces activated carbon, these can be seen in coal, rice hush ash etc. The coconut shell is burnt at 450°C for 5-10 min to obtain coconut shell charcoal. This type of charcoal is used in oil industry, fillers in pavement, refineries. The activated charcoal is appeared when charcoal

is treated in presence of oxygen. The activated charcoal is used in bleaching process of edible oil preparation, water purification filters, air purification etc. Granulated activated charcoal is used in medical treatments, deodorizing, Gold refining etc.SMA is gap graded mixture consisting of 70-80% coarse aggregate of total mass, 6-7% of binder, 8-12% of filler, and about 0.3-0.5% of fiber or stabilizer or additives. It provides a deformation resistant, durable surfacing material, suitable for heavily trafficked roads. SMA is used as a durable asphalt surfacing option for residential streets and highways. SMA forms an interlocks between coarse aggregate to form a stone skeleton which can sustain permanent deformation. The stone skeleton is fully filled with bitumen and filler along with fiber so that it can bind them properly so as to prevent drainage of binder and not to cause any problem while transportation and while placing. As the Coarse aggregate content is high in SMA Mix, it forms a skeleton- type structure which provide good resistance for rutting. Brown & Manglorkar (1993) reported that traffic loads for SMA are mainly carried by the coarse aggregate instead of the fine aggregate asphalt-mortar. The higher content of binder makes the mix durable. The fibers or stabilizer holds the binder in the mix even at a high temperature; this helps prevent factors like drainage during operations such as production, transportation and laying.

1.2 Problem Statement-

1. Investigate the effect of coconut charcoal in the pavement as filler are properly designed to satisfy the design requirement of stability and durability.

2. In this study an attempt is made to find the effect of coconut charcoal on a behavior of bituminous mixed.

2. METHODOLOGY

Based on the total weight of the aggregates the percentage of the CSC powder as filler is partially replaced with stone dust as following percentages (2%, 4%, 6%, 8% and 10%) in Bitumen percentages of 4%, 4.5% and 5%. The schematic representation of the project. The below Fig-2 describes about workflow procedure of this project. Fig-2 workflow procedure V. RESULT AND ANALYSIS The results depict that the optimum binder content (OBC) for the specimens of 4%, 4.5% and 5% was at 4.33%.%. Here VA, Volume filled by bitumen, VMA, Bulk Density of all specimens was determined. Marshall Stability values are highest at 4.5% bitumen content. The flow values for 4%, 4.5%, 5% bitumen mixes are within the limits. The bulk density attained is almost same of 2.33 g/cc, at 4.5% the value was at maximum and later on it decreased.

Experimental Investigation

2.1Test on aggregate.

1. Aggregate Crushing Strength Test
2. Aggregate Impact Value Test
3. Flakiness Index,Elongation Index
4. Specific Gravity and Water Absorption Test
5. Los Angeles Abrasion Test

2.2 Test on Bitumen.

1. Specific Gravity Test

2. Penetration Test
3. Softening Point Test
4. Ductility Test
5. Bitumen Extraction Test

Test on Aggregate-

2. Crushing Value Test

The aggregate crushing value gives a relative measure resistance of an aggregate to crushing under a gradually applied compressive load. It is the percentage by weight of the crushed (or finer) material obtained when the test aggregate are subjected to specified load under standardized conditions, and is a numerical index of the strength if the aggregate used in road construction. Aggregates with lower crushing value indicates a lower crushed fraction under load and would give a longer weaker aggregate if used would get crushed under traffic loads, would produce smaller pieces not coated with binder and this would be easily displaced or loosened out resulting in loss of the surface/layer. In short the aggregate used in road construction must strong enough to withstand crushing under roller and traffic.

2.3. Water absorption Test-

Water absorption gives an idea on the internal structure of aggregate. Aggregates having more absorption are more porous

in nature and are generally considered unsuitable, unless found to be acceptable based on strength, impact and hardness tests. Hence, 0.5 -1 percent is the water absorption capacity of coarse aggregates by weight of total aggregates. Results of the test is 0.5%

2.4. Aggregate Impact Test

The apparatus of the aggregate impact value test as per IS: 2386 (Part IV) - 1963 consists of a metal base with a plane lower surface supported well on a firm floor, without rocking. A detachable cylindrical steel cup of internal diameter 10.2 cm and depth 5cm is rigidly fastened centrally to the base plate. A metal hammer of weight between 13.5 and 14 Kg having the lower end cylindrical in shape, 10 cm in diameter and 5 cm long, with 2 mm chamber at the lower edge is capable of sliding freely between vertical guides from a height of 38 cm on the test sample in the cup, the height of fall being adjustable up to 0.5 cm. A key is provided for supporting the hammer while fastening or removing the cup.

2.5. Specific Gravity Test

In pavement constructions density property of binder is in great use to classify a binder and its quality. In general use the weight of the bitumen is converted into volume using density values when it is used with aggregates. The density of bitumen indirectly conveys the quality of bitumen as it is greatly influenced by its chemical composition. Increase in aromatic type mineral impurities cause an increase in specific gravity. Therefore it is important to know the specific gravity of run and cut-back bitumen to understand the rate of spread, volumetric conversion of mix design etc. Specific gravity of bitumen is expressed as the ratio of the mass of a given volume of the material at 25°C to that of an equal volume of water at the same temperature. The specific gravity of pure bitumen ranges from 0.97 to 1.02 according to Indian standard (BIS) minimum specific gravity of paving bitumen at 27°C shall be 0.99 for grades A25, A35, A45, A65, S35, S45 and S65, 0.98 for A90 and S90 and 0.97 for A200. The higher specific gravity will be obtained if the bitumen contains mineral impurities.

2.6. Penetration Test

Penetration is a measure of consistency. It quantifies the hardness or softness of bitumen by measuring the depth in tenths of a millimeter to which a standard loaded needle will penetrate vertically in 5 seconds under specified temperature, load and duration of loading. BIS had standardized the equipment and test procedure. The penetrometer consists of a needle assembly with weight of 100g and a device for releasing and locking in any position. The bitumen is softened to a pouring consistency, stirred thoroughly and poured into containers at a depth at least 15 mm in excess of the expected penetration. The test should be conducted at a specified temperature of 25°C. It may be noted that penetration value is largely influenced by any inaccuracy with regards to pouring temperature, size of the needle, weight placed on the needle and the test temperature. A grade of 40/50 bitumen represents the penetration value is in the range 40 to 50 at standard test conditions. Higher is the penetration of bitumen softer is the consistency. This is one of the most widely used test for classifying bituminous materials into different grades.

2.6. Softening Point Test

The softening point of materials like asphalt, bitumen have no definite melting point, but when heated it gradually changes from brittle or very thick and slow-flowing materials to more mobile liquid material. The softening point of bitumen or tar is the temperature at which the substance attains particular degree of softening under specified conditions of test. The test is conducted by using Ring and Ball apparatus. A brass ring containing test sample of bitumen is suspended in liquid like water or glycerine at a given temperature. A steel ball is placed upon the bitumen sample and the liquid medium is heated at a rate of 5 degree per minute.

2.7. Ductility Test-

Ductility is one such property of bitumen which is dependent on the purpose of construction. Ductility is the property that permits the material to undergo great deformation or elongation. Indirectly, ductility measures the adhesive property of bitumen and its ability to stretch. It is necessary that binder should form a thin ductile film around aggregates to improve the interlocking of the aggregates in flexible pavements. It is important in pavement to resist crack due to temperature or traffic stresses to avoid damage the pavement structure. Specifically, the ductility of a bituminous material is defined as the distance in centimeters, to which it will elongate before breaking when two ends of a briquette specimen of the material are pulled apart at a specified speed and a specified temperature. A temperature of 25 ± 0.5 °C and pulling speed of 5 cm/min ± 5.0 % is to be maintained while carrying out the experiment. The ductility of

a bitumen specimen mainly gives information about the tensile strength and ductility grade of bitumen.

2.8. Bitumen Extraction Test-

The test are in indication regarding the quantity of bitumen that has been used in a bituminous mix. By performing this fill test a substantial saving in the cost of bitumen can be had by ensuring that the optimum quantity of bitumen has been provided. Also the performance of the road be affected if lesser or more quantity of bitumen is used.

2.9. MARSHAL STABILITY TEST

Strength is measured in terms of the Marshall's Stability of the mix which is defined as the maximum load carried by a compacted specimen at a standard test temperature of 60C. This temperature represents the weakest condition for a bituminous pavement in use. The flexibility is measured in terms of the "flow value" which is measured by the change in diameter of the sample in the direction of load application between the start of loading and the time of maximum load. In this test an attempt is made to obtain optimum binder content for the aggregate mix type and traffic intensity.

3. LITERATURE REVIEW

1. S.S. Ramzi et al / have evaluated the use of cement bypass dust (CBPD) as filler in asphalt mixtures. They have both investigated the effect of adding either lime or CBPD in different proportion on binder and Marshal Properties.
2. Brown and Mallick (1994) /studied the properties of SMA related to mix design by using Marshall Mix design method. A compactive effort of 50 blows of the mechanical fixed base Marshall Hammer was given to the mix for preparing the mix and proper compaction. They showed an increase in the density of the mix prepared, if higher compactive effort was used, but this may result in crushing of the coarse aggregate due to which stone to stone contact may be lost. Hence they recommended that SMA mixtures be designed with 50 blows rather than blows as high as 75 and they suggested that drain-down of binder in the mix gets significantly affected by the types of fillers used. Presence of higher percentage of filler in the mix lowers the drain-down of the binder.
3. Mogawer and Stuart (1996) /studied the effect of mineral fillers on properties of SMA mixtures. They chose eight mineral fillers on the basis of their performance, gradation etc. They evaluated the properties of SMA mixtures in terms of drain down of the mastic, rutting, low temperature cracking, workability, and moisture susceptibility
4. Brown and Haddock (1997) has remarked that, due to the fact that the strength of SMA relies mostly on the stone-on-stone aggregate skeleton, steps should be taken as to design the mix and place it with a strong coarse aggregate skeleton that would provide the desired strength and stability to the mix.
5. Punith V.S., Sridhar R., Bose Sunil, Kumar K.K., Veera ragavan A (2004) /ad M m g C, using 50 blows of compaction per side and did a comparative study of SMA with asphalt concrete mix utilizing reclaimed polythene in the form of LDPE carry bags as stabilizing agent (3 mm size and 0.4%) .The test results indicated that the mix properties of both SMA and AC mixture are getting enhanced by the addition of reclaimed polythene as stabilizer showing better rut resistance, resistance to moisture damage, rutting, creep, aging and better drain-down properties as well.
6. Neubauer and Partl (2004)/ investigated the nature of SMA mixes with different filler/binder combination to do a comparative study in between Marshall and Gyratory Methods. They found out and observed that the optimum binder content (OBC) value determined using Marshall compactor were bit higher than those found using the Gyratory compactor. They also used two different binders, one of penetration grade bitumen 50/70 and another was the polymer modified bitumen with SBS modifiers. And from the experiments they observed that the polymer modified bitumen gives better performance in terms of deformation and stability than the other unmodified bitumen.
7. Putman et al. (2004) / followed a Super-pave mix design guide-lines to design the SMA mixes using PG 76-22 binder and stabilizers like waste fibers such as waste tires as additives. They were compacted the specimen with the 50 gyrations of Super-pave Gyratory Compactor as per SC DOT procedures.
8. Karasahin and Terzi (2004) /conducted an investigation on marble waste as filler material in asphalt mixtures. Samples

were prepared having marble dust and limestone dust filler. The optimum binder content was then determined by Marshall Test procedure. They have also carried out dynamic plastic deformation tests on both mixes using marble waste and limestone dust. The study indicated that both Marshal and plastic deformation test results for mixes using both limestone and marble waste are almost the same. Hence, conclusion was made that those marble wastes which are in dust form can be considered as an alternative filler material to other materials. However, some care should be taken into account for mixes with marble dust since they have higher values of plastic deformation and hence, they should be used on low volume roads.

9. Yongjie Xue, Shaopeng Wu, Haobo HouaJin, Zha (2006) / Conducted Experimental investigation of basic oxygen furnace slag used as aggregate in asphalt mixture. By testing and analyzing, BOF steel slag was found to be able to be used as asphalt mixture aggregate in expressway construction. Mustafa
10. Karasahin et al. (2006) / used waste marble dust obtained from shaping process of marble blocks and lime stone as filler and optimum binder content was determined by Marshall Test and showed good result.
11. M. Jovanovich, A. Mujkanovic and A. Seper (2011) in their study devolved samples of bituminous aggregate mixtures having fly ash, cement and lime as a filler with varying percentage of bitumen. After preparing various samples, laboratory investigation was done. The following results were observed: Fly ash as a filler can be used in asphalt mixtures successfully. With the addition of filler, optimum bitumen content was observed to be lower in mixtures for flexible pavements, lower proportion of optimum moisture content is considered better. It leads to fewer voids in sub grade. Thus with the usage of pavement, there will be less settlement.
12. Konstantin Sobolev, Ismael Flores and Justin David Bohler (2013) determined the feasibility of fillers in asphalt concrete was determined. Two different binders were used. These binders were fully blended with filler materials i.e. fly ash, lime and cement .The study result demonstrated that: Rheological properties of the asphalt were greatly improved with the addition of these fillers. Fly ash also appears in improving the aging resistance of mastics with the addition of fillers, compatibility of mixtures was not affected.
13. Abbaas Inaayah Kareem investigated the effect of using recycled aggregate filler rather than ordinary Portland cement filler for Marshall Mix design. Constituent materials used for this study was: coarse aggregate (19mm max), well graded fine aggregate (according to SCRB specification 2003), OPC & recycled CC (RCCF) filler and 40-50 penetration grade asphalt. From this study he concluded that for the optimum asphalt content recycled concrete filler performs better than the OPC filler. RCCF results in higher Marshall Stability, density, stiffness and %VFA as well as lower flow and %VMA the OPC filler. Investigating the chemical content he found lower calcite (CaCO3) and higher quartz (SiO2) content in cement concrete than OPC which results in improvement of rutting resistance and stiffness modulus simultaneously reduces permanent strain.
14. Afifa Rahman et al. conducted an experiment on replacement of mineral filler of Marshall bituminous mix design by a non-convention material (Brick dust). They prepared total 15 set of specimen using controlled grade aggregate, and 80-100 penetration grade bitumen and cement, stone dust & brick dust as filler according to AASHTO specification for Marshall Mix design. Authors found higher Marshall Stability for brick dust filler than others but the OBC was found higher than other two also. More or less the brick dust filler yields the same result as conventional filler and satisfy the specifications with a high %VTM (voids in total mix). Researchers concluded it as a low cost solution.
15. Dipu Sutradhar et al. evaluated the applicability of crushed waste concrete dust (WCD) (0.075mm sieve passing) and brick dust as a filler material from the point of view of economy than fine sand stone dust. Specimen were prepared using coarse sand, basalt rock and 80-100 penetration grade bitumen accompanied by the mineral filler mentioned above according to AASHTO specification. The authors conclude the study by mentioning it as a economical and environment friendly filler with over all same Marshall characteristics as globally

accepted filler. Bick dust and WCD results more stability and unit weight than stone dust. But the %Va and the OBC is higher than that.

16. Electricwala Fatima et al. conducted a study to evaluated the effect of using different percentage (3% and 5%) of non-conventional (ceramic dust) mineral filler instead of conventional one (lime) as it is cost free and will help to keep environment clean. Quartzite of 10-20mm used as coarse aggregate, 50-60 grade bitumen as binder and lime & ceramic waste (according to MORT&H 2012) as filler for the preparation of the specimen required to work out the research And the authors found that stability increased by 3.96% with the increment in percentage of ceramic dust filler from 3% to 5%. For overall characteristics ceramic dust performs better than lime as a filler and hence satisfy the standards. But from the value of flow for both 3% & 5% ceramic dust filler it's evident that it supports more deformation of surface under traffic load than lime.
17. Yongjie Xue et al. carried out a comparative of the performance of the super pave mix design and Marshall Mix design. In this study municipal solid waste incinerator (MSWI) fly ash was used as a partial replacement of mineral filler in stone matrix asphalt mixtures. Although, the conclusion emphasized on the design method but the result for the filler was good for Marshall Mix design.
18. Debashish Kar et al. this study focused to the use of fly ash (by product from coal based thermal power plant) as a mineral filler for Marshall bituminous mix design to solve the disposal problem and also for cost efficiency of bituminous mix design. Coarse & fine aggregate (according to MORTH (2013)), 60-70 penetration grade bitumen used accompanied by fly ash, stone dust and cement used for this study. Marshall Stability value and the unit weight values are determined for cement followed by stone dust and fly ash simultaneously follows reverse trend for flow values satisfying requirements of standards. Fly ash results higher values than stone and cement for the value of voids filled with bitumen (%VFB).
19. A. A Muaran and L Sani. partially replaced cement by Bagasse Ash (BA) as a mineral filler material for this study to find the influence on the Marshall characteristics. Tests were carried out for different percentage of BA with different percentage of bitumen content to find the optimum one. In this study the mix with 10% BA and 90% OPC satisfy the standard specified by Asphalt institute. 10% of BA yields a good result for all characteristic. They concluded that 10% BA will be optimum to partially replace the OPC.
20. Mustafa Karasahin et al. used marble dust as a filler material. They obtained a result closed to the lime and cement.
21. Dr. Hasan Hamodi Joni and Hussein Hamel Zghair. Analyzed the Marshall characteristics after using foundry sand as a filler material instead of lime and cement and they compared these three side by side. They used aggregates according to SCRB, R/9 2003 specification, 40-50 grade bitumen accompanied by this three mineral filler and found it's suitability as a filler material. Although the characteristics not more preferable than cement and lime but they are satisfactory enough to be used. The stability for cement, lime and foundry sand is 13.6 KN, 12.5 KN, and 11.25 KN which close to these conventional filler.
22. Jony Hassan et al. carried out an experiment of stone mix asphalt using glass powder as a filler. They varied the bitumen content 4 to 7%. As reference filler material Limestone and Ordinary Portland cement were used and overall results were satisfactory.
23. Tuba Kütük-Sert; and Sezai Kütük. conducted an experiment on the use of bio gypsum as filler material which is harmful for environment as a waste. They carried out this study for lime stone and bio gypsum filler and found a satisfactory result. It reduces the OBC content and %VFA, %VMA and specific gravity it yields is nearly same. Mix with bio gypsum shows more rigid behavior. Authors found its crucial importance for heavy traffic road hot climate region for it excessive %VFA value.
24. Marta Wasilewska, et al. have carried out an advanced experiment on five types of rock that can be used as a filler material. In this study the researchers considered limestone as a reference material to evaluate the results. In this study they had emphasized on the characteristics of the filler set by ASSHTO, ASTM. And they have compared the obtained results with the polish code requirements. They have tested gradation, water content, particle density, Delta

R&B temperature, and surface area and Bitumen Number of Five types of rocks that were used as a source of the mineral fillers: gabbro, granite, trashy basalt, quartz sandstone and rocks from postglacial deposits. Performing Scanning Electron Microscopy (SEM) analysis of grain shape and size they observed a significant difference in grain size and shape. They have concluded the study by reporting that binder type plays important role to improve performance not the filler type. And they found all this filler comparable to the limestone are satisfactory.

25. Wu S. and et al. experimented on properties of asphalt mastic in which they used recycled red brick powder (RBP) as a filler. This study emphasized on the effect of temperature on the asphalt mix prepared. They concluded the study saying, RBP may have some positive effect on the performance of the mix but it affects properties in low temperature.
26. Zebene Abebu Dejen. Flexible asphalt pavement layers consist of mineral filler, coarse and fine aggregates all cemented by the asphalt binder and blended at pre-specified weight proportions determined from the mix design method. Mineral fillers are fine particles or part of the aggregate skeleton of the pavement which passes on No.200 (75µm) standard sieve size that is added or naturally present in the mineral aggregate.
27. K.Kiruthiha, G.Loshini, M.Thivya.Construction of pavement involves huge outlay of investment. Addition of certain materials like limestone, coconut shell, egg shell, saw dust etc. It may save considerable investment as well as gives reliable performance. This project describes the use egg shell as filler in bituminous pavements in order to fill the air voids. It involves identification of proper mix by obtaining optimum bitumen content (OBC)

3.1. Outcome Of Literature Review

1. The effect of adding either lime or CBPD in different proportion on binder and Marshal Properties.
2. Studied the properties of SMA related to mix design by using Marshall Mix design method.
3. Evaluated the properties of SMA mixtures in terms of drain down of the mastic, rutting, low temperature cracking, workability, and moisture susceptibility.
4. Design the mix and place it with a strong coarse aggregate skeleton that would provide the desired strength and stability to the mix.
5. The polymer modified bitumen gives better performance in terms of deformation and stability than the other unmodified bitumen.
6. Fly ash as a filler can be used in asphalt mixtures successfully. With the addition of filler, optimum bitumen content was observed to be lower in mixtures for flexible pavements, lower proportion of optimum moisture content is considered better.
7. Fly ash as a filler can be used in asphalt mixtures successfully. With the addition of filler, optimum bitumen content was observed to be lower in mixtures for flexible pavements, lower proportion of optimum moisture content is considered better.
8. Fly ash results higher values than stone and cement for the value of voids filled with bitumen (%VFB).
9. The study saying, RBP may have some positive effect on the performance of the mix but it affects properties in low temperature.

4. OBJECTIVES

1. To improve the Life time of the road pavement is increased
2. To Improving the quality and durability of road pavement
3. To use the waste material an Alternative to filler for increasing the efficiency of road pavement
4. To reduce the surface moisture, temperature.
5. To Determine The Crushing Of A Given Road Aggregate
6. To Asses Suitability Of Aggregate For Use In Different Type Of Road Pavement
7. To determine the density – voids analysis for the given bituminous mixture.
8. To determine the strength (Marshall's Stability Value) and flexibility (flow value) for the given bituminous mixture.

5. CONCLUSION

From the material test results, it is concluded that by using coconut shell charcoal ash as a filler material in bitumen for the road construction shall be 2%, 4%, 6% and 8%, Laboratory tests were conducted for the modified bitumen. I consider the addition of coconut shell ash in the bitumen improves the properties of bitumen in all aspects, which helps to improve the lifespan of the bitumen. After analyzing the tests, it has been inference that the results of modified bitumen have more workability than 100 percent bitumen. From the properties of all modified bitumen, we conclude that the values are increasing and giving better strength and has better to be used in highway construction. Coconut shell charcoal powder which passes through 1.18mm sieve is used. Maximum value of stability is obtained at 8% coconut shell charcoal powder and 4.5% binder content. Stability of 2%, 4%, 6%, and 8% of filler material. Percentage of air voids keeps on decreasing by increasing bitumen content. As the percentage of bitumen increase the flow value increases.

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