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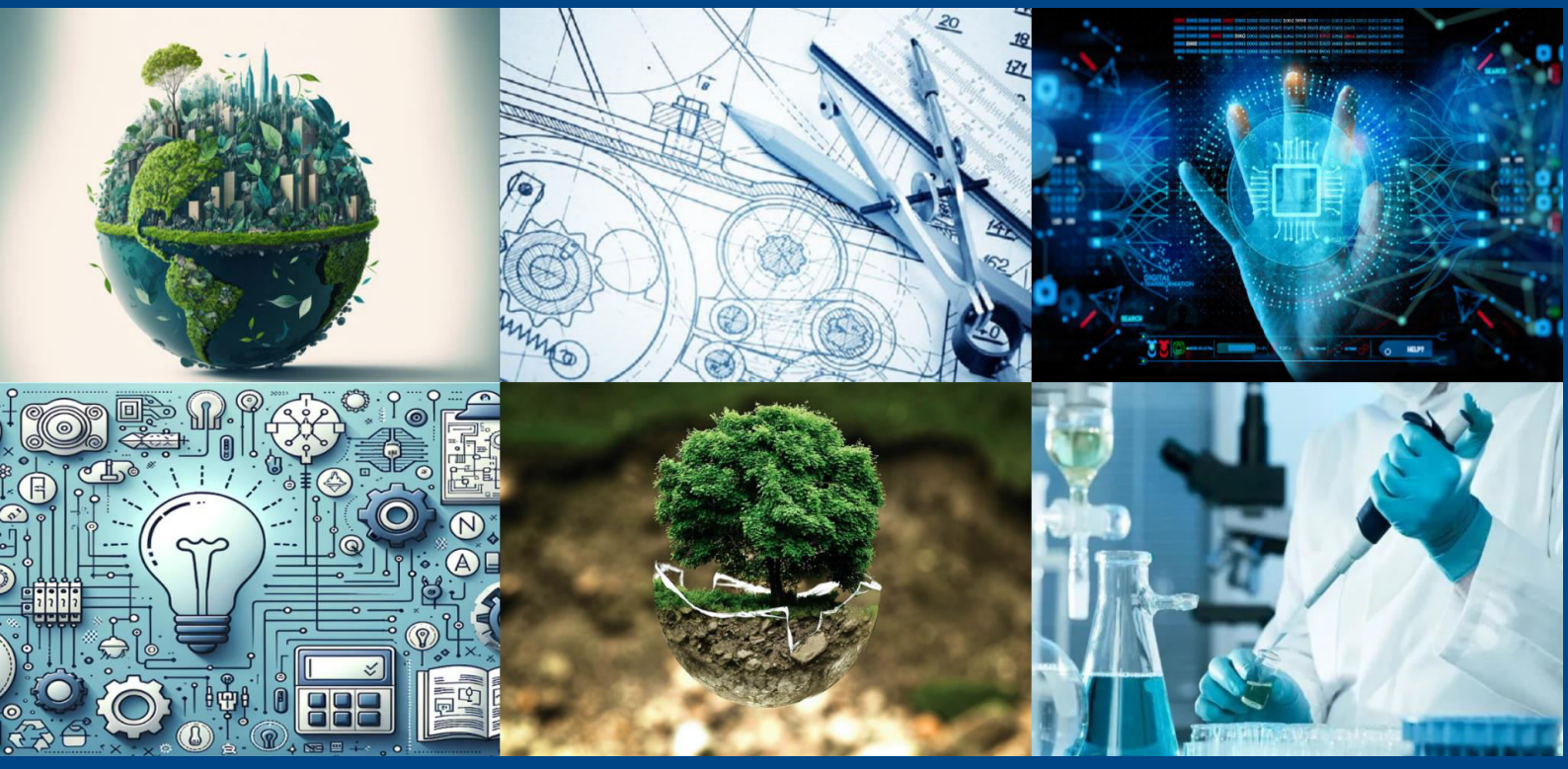

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Study of Flexible Concrete

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ABSTRACT: The correct decision of building materials assumes a pivotal part once arranging a structure to fall among the meanings of sustainable development. One in everything about premier normally utilized development materials is concrete. Concrete is the most utilized material inside world with solid applications and expanding requests. Regardless of critical progression in concrete and cementitious materials in the course of the most recent hundreds of years, framework inbuilt the current world with these materials, similar to dams, roads, bridges, tunnels, and buildings need intensive repair and maintenance throughout its life because the brittleness of concrete rises with the increase in strength. The strain capability of typical concrete is 0.1% creating it unbendable and brittle.The brittle nature of concrete may be a major explanation for failure beneath strain. Cement primarily based strain hardening ductile building material composite is termed designed cementitious composite (ECC) or flexible concrete. The strain capability of ECC varies from 3 to 8% and acts as a ductile material. This paper is an attempt to outline bendable concrete, advantages, and downsides of bendable concrete and applications by literature review.

I. INTRODUCTION

Engineered cementitious composites (ECC) have been in the beginning evolved by Li on the University of Michigan in 1993.A bendable concrete is strong with micro mechanically designed polymer fibers. It's a widely familiar incontrovertible fact that the addition of very little, separate, and uniformly distributed fibers in concrete acts as a barrier to crack propagation and improves its mechanical properties. Such a range of concrete consisting of the concrete mix (cement, sand, coarse aggregates, water, and typically admixtures) containing uniformly distributed separate fibers is assumed as Fiber concrete abbreviated as FRC. The conventional fiber-reinforced concrete is prepared by exploiting totally different material fibers, the important ones being steel, plastic, asbestos, glass, and carbon fibers. ECC is created from primary substances as concrete but, with the addition of a high-range water-reducing (HRWR) agent is needed to impart workability. However, coarse aggregates are not used in ECCs. Cementitious substances, like Silica fume, blast Furnace, fly ash, etc. can be applied similarly to cement to increase the paste content. ECC makes use of low quantities of round 2% by volume, short, discontinuous fibers.ECC contains little Polyvinyl Alcohol-fibers coated with a thin (nanometer thick), slick coating and fine silica sand. This surface coating allows the fiber to start slithering as soon as it may be complete so they are not fracturing. It prevents the fiber from rupturing that can cause big cracking. Therefore, an ECC deforms as an alternative greater than a popular concrete. The energy captivating properties of ECC make it in particular appropriate for critical additives in Earthquake zones.

II.LITERATURE REVIEW

[1]Abdulaziz Alsaif, a* , Lampros Koutasa , Susan A. Bernala , Maurizio Guadagninia 4 Kypros Pilakoutasa Study on Mechanical Performance of Steel Fibre Reinforced Rubberised Concrete for Flexible Concrete Pavements.
This work aims to develop materials for flexible concrete pavements as an alternative to asphalt concrete or polymer-bound rubber surfaces and presents a study on steel fibre reinforced rubberised concrete (SFRRuC). The main objective of this study is to investigate the effect of 16 steel fibres (manufactured and/or recycled fibres) on the fresh and mechanical properties of rubberised concrete (RuC) comprising waste tyre rubber (WTR). Free shrinkage is also examined. The main parameters investigated through ten different mixes are WTR and fibre contents. The results show that the addition of fibres in RuC mixes with WTR replacement substantially mitigates the loss in flexural strength due to the rubber content (from 50% to 9.6% loss, compared to conventional concrete).

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[2]Chidozie Maduabuchukwu Nwakaire a, b , Soon Poh Yap a, b, * , ChoonWah Yuen a, b , Chiu ChuenOnn a, b , SuhanaKoting a, b, Ali Mohammed Babalghaith. Study on Laboratory study on recycled concrete aggregate based asphalt mixtures for sustainable flexible pavement surfacing.
Utilisation of recycled concrete aggregates (RCA) for highway pavement construction has been a sustainable attempt towards conservation of the natural resource base as well as mitigation against the environmental problems associated with harmful solid waste disposal. The performances of asphalt mixtures with 20%, 40%, 60%, 80% and 100% of coarse granite as well as 100% of coarse and fine granite replaced by RCA, for flexible pavement surfacing, have been evaluated in this paper. The mixture containing 100% granite was used as control. Marshal stability, flow, volumetric properties, resilient modulus, indirect tensile strength, moisture susceptibility, fatigue resistance, rutting resistance, impact strength, skid resistance, and abrasion resistance were tested for the mixes. With respect to resilient modulus and indirect tensile strength tests, the control mixture performed better than the RCA mixtures but the RCA mixtures generally performed better than the control in the other tests. The control recorded 9496 MPa and 1058 kPa for resilient modulus and indirect tensile strength respectively. These were comparable to the mix with 40% RCA with 9339 MPa and 1051.7 kPa resilient modulus and indirect tensile strength, respectively. It was concluded that RCA can be effectively utilised in asphalt mixtures but 40% RCA replacement is recommended for optimal pavement performance.

[3] Damien Grellet, Guy Doré, and Jean-Pascal Bilodeau. Study on Comparative study on the impact of wide base tires and dual tires on the strains occurring within flexible pavements asphalt concrete surface course.
Complex and variable solicitations from climate and traffic greatly impact pavements performance and therefore user's safety and comfort. As the effect of traffic is related to the strains induced in the pavement structures, this study objective is to determine if changing conventional dual tires to wide base single tires may impact significantly strains in flexible pavements. This paper documents an experimental investigation of strain induced close to the edge of the tire and under the tire. Two pavement structures and two climate conditions have been tested. For each test section, optical fiber strain gauges fixed on asphalt concrete cores are installed within the asphalt concrete pavement layer. This is a retrofit technique that allows measuring strains in the upper and lower part of the asphalt layer. The experiment led to the following observations: wide base single tires cause a 14 to 30% increase of the tensile strains at the bottom of the asphalt concrete layer but cause a 20% decrease of the tensile strains at shallow depth near the edge of the tire. A complex extension–contraction phenomenon has been observed at that level. This phenomenon should be taken into account in the analysis of complex strain patterns occurring within the pavement bounded layers.

[4] Donghoon Lee, Won-Kee Hong, Jeong Tai Kim, and Sunkuk Kim. Study onConceptual Study of Production Technology of Free-Form Concrete Segments .
Free-form designs are increasing which is beyond a simple design form to meet the requirements of clients wishing to improve the building value and of the government for symbolic buildings. Furthermore, development of construction technologies, materials and equipment has led to production and installation of free-form concrete. However, unlike the fixed form, free-form concrete requires more time and manpower. In particular, mold for production of free-form materials can be used only once, which implies that excessive resources are input for mold manufacturing. This may result in reduced productivity, increased cost and extended construction duration. It is necessary to develop technologies that can solve the limitation in relation to cost, time, quality and safety so as to ensure economic feasibility and constructability of the free-form buildings. In this regard, the study intends to analyze the problems of producing free-form concrete and construction using such concrete, and to conduct a conceptual study on the technology that is capable of solving the problems. The study draws the requirements of production technology of free-form concrete, and proposes the production technology that can solve the existing problems.

[5] M.K. Gupta, Brajesh Mishra. Study on A Study on Use of Plastic Coated Aggregates (PCA) in Bituminous Concrete Mixes of Flexible Pavement.
The continuous increase in road traffic and heavy loading in combination with insufficient maintenance due to paucity of funds has resulted in deterioration of road network in India. To improve this proper maintenance, effective and improved roadway design, use of better quality materials and use of effective and modern construction techniques should be put into practice. During last three decades in many countries around the world it has been tested that modification of the bituminous binder with plastic/polymer additives enhances the properties and life of bituminous concrete pavements. The present investigation was carried out to propose the use of plastic coated aggregate (PCA) in bituminous mix of flexible pavements in order to improve their performance and also to give a way for safe disposal of plastic wastes in

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order to counter environmental pollution as well. There are mainly two processes available for incorporation of waste plastic in bituminous concrete mixes namely wet and dry process. In this study the dry process was used for bituminous concrete mixes as it being simple and economical. Physical properties of conventional and plastic coated aggregates were compared. The Marshall method of mix design was adopted using VG-10 grade bitumen for conventional aggregates and plastic coated aggregates (PCA). Marshall Specimens were prepared at bitumen content ranging from 4% to 6% with a increment of 0.5% by weight of aggregates and with waste plastic content of 5%, 7%, 9%, 11%, 13% and 15% by weight of optimum bitumen content. Marshal stability, Flow value, Air voids (Vv), Voids in mineral aggregates (VMA), and Voids filled with bitumen(VFB) were determined and compared with conventional aggregates (without plastic) bituminous concrete mixes. It was found that there was a reduction in consumption of bitumen in bituminous concrete mix by use of plastic coated aggregates also a considerable improvement in the properties of aggregates and bituminous concrete mix leading to provide longer life and improved pavement performance.

[6] Roham Behzadian* and Hamzeh Shahrajabian. Study on Experimental Study of the Effect of Nano-silica on the Mechanical Properties of Concrete/PET Composites.
In this study, the mechanical properties of concrete composites containing waste PET (polyethylene terephthalate) and nano-silica were investigated to produce the lighter, more flexible and high-strength concrete. For this purpose, the different content of nanosilica was added to concrete containing 10 wt.% of waste PET aggregates. The mechanical properties and the morphology of the samples were investigated. The mechanical properties such as flexural, tensile and compressive strength of the composites declined with the PET aggregates, but the mechanical properties were significantly improved by incorporating the nano-silica. Optimum composition containing 10 wt.% of PET and 3 wt.% of nano silica was obtained, in which the tensile strength, compressive strength, and flexural strength were increased 27%, 30%, and 9% respectively compared to the neat concrete.

III.METHODOLOGY OF PROPOSED SURVEY

A cube size of 150 x 150 x 150 mm and slab sizes of 600 x 100 x 100 mm, 600 x 100 x 100 mm is used to make cube and slabs of various mixes respectively. Mix ratio for different mixes is taken and calculated. Material was collected by properties are observed by various tests. Material are batched for mixing as per mix design and mixed uniformly. Fresh concrete tests are done by slum test. It is then casted in cube of 150 x 150 x 150 mm mould and compacted with a tamping rod. Slabs are casted as per above mentioned dimensions and compacted with tamping rod. The specimens allowed for curing and tested periodically 21th day. The compressive strength and flexural strength of the specimens is tested.

MATERIALS
1) Cement (53 grade of OPC)
2) Glass fibre
3) PVA fibre (length is 12mm and diameter is 40μm).
4) Sand
5) Water

In the mix, coarse aggregates are deliberately not used because property of ECC Concrete is formation of micro cracks with large deflection. Coarse aggregates increases crack width which contradicts the property of ECC Concrete.
Preliminary Testing:
We have tested all the materials that we collected i.e cement, coarse aggregate, fine aggregate
etc in a correct manner without any errors.

Cement:
Cement must develop the appropriate strength. It must represent the appropriate rheological
behaviour. Generally some types of cement have quite different rheological and strength.

Fine Aggregate:
Clean and dry river sand available locally will be used. Sand passing through IS 4.75mm sieve will be used for casting al the specimens.
Flyash:

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Fly ash is a by product from burning pulverized coal in electric power generating plants. During combustion, mineral impurities in the coal (clay, feldspar, quartz, and shale) fuse in suspension and float out of the combustion chamber with the exhaust gases. As the fused material rises, it cools and solidifies into spherical glassy particles called fly ash. Fly ash is collected from the exhaust gases by electrostatic precipitators or bag filters. The fine powder does resemble portland cement but it is chemically different. Fly ash chemically reacts with the by product calcium hydroxide released by the chemical reaction between cement and water to form additional cementitious products that improve many desirable properties of concrete. All fly ashes exhibit cementitious properties to varying degrees depending on the chemical and physical properties of both the fly ash and cement. Compared to cement and water, the chemical reaction between fly ash and calcium hydroxide typically is slower resulting in delayed hardening of the concrete.

IV. CONCLUSION AND FUTURE WORK

This experimental study was carried out to determine the mechanical properties of adding poly vinyl alcoholic fiber in concrete. In this regards, comparison of This experimental study was carried out to determine the mechanical properties compression strength and flexural strength of the flexible concrete is higher than the conventional cubes and slabs. The mix proportion of flexible is derived in this experimental study. The reason behind the strengths of flexible concrete is due to the presence of PVA fiber as reinforcement. The strength of conventional cubes and slabs is low, since it is not reinforced. Therefore it is proved that the flexible concrete is more strength than the conventional concrete and it is more flexible so that it resists cracks and acts as more efficiency in seismic regions.

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