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STUDY ON STRENGTHENING OF CORROSION DAMAGED RCC BEAM BY FERROCEMENT

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Abstract - *Reinforced concrete structures are important elements of infrastructure and buildings, now many buildings are found to be distressed or damaged. Replacement of such deteriorated structure takes plenty of money and time, strengthening by ferrocement has become an acceptable way of improving the performance of the structures and extending their service with less cost and time.*

In this experimental study, ferrocement (with connectors) were used to externally strengthen reinforced concrete beam. This work present result of 10 beams strengthened with using ferrocement. The result of this experimental work pointed out a general improvement in terms of load carrying capacity and deflection for the strengthened beam.

From the study it is seen that increasing volume fraction contributes to strengthening in increasing order and also the beam retrofitted by 2 layer mesh at orientation of 45 degree with connectors reinforced ferrocement are the most efficient than 1 layer and 2 layer mesh at orientation of 45 degree with connectors reinforced ferrocement. Therefore we can strengthen the corrosion damaged RCC beam in terms of its cracking load and failure load as well as cracking deflection and failure deflection.

Key Words: *Control beam with normal steel (CB- NS), Control beam with corrosion steel(CB- CS), Ordinary Portland Cement(OPC), High Performance Ferrocement Laminate(HPFL), Reinforced Cement Concrete(RCC).*

1. INTRODUCTION

Reinforced concrete structures are important elements of infrastructure and buildings. Now a day's building are found to be distressed or damaged. Such a building requires immediate attention and need of strengthening, retrofitting to bring them back to their functional use again. Today deteriorations of RC structures are one of the major problems in civil industry as large number of building are constructed according to older design course. Since replacement of such deteriorated structure takes plenty of money and time, strengthening has become an acceptable way of improving the performance of the structures and extending their service. Many modern techniques are involved in proper effective strengthening and retrofitting methods. In this project we have studied on strengthening of corrosion damaged RCC beam by "FERROCEMENT".

1.1 Ferrocement

Ferrocement is a composite material consisting of rich cement mortar matrix uniformly reinforced with one or more layers of very thin wire mesh with or without supporting skeletal steel.

The thickness of ferrocement elements normally ranges from 10mm to 40mm whereas in reinforced concrete elements the minimum thickness used for shell or plate element is around 75mm. Low self-weight and high tensile strength make ferrocement a favourable material for fabrication.

2. MATERIALS AND METHODOLOGY

2.1 Materials

Cement - OPC 53 grade cement from a single lot is used for the study.
Water - Fresh and clean water is used for casting and curing the specimens. The water is relatively free from organic matter, silt, oil, sugar, chloride and acidic material as per requirements of Indian standard.
Fine aggregate - Locally available sand is used as fine aggregate in the concrete mix and cement mortar.
Coarse aggregate - Crushed stone aggregate of 20mm nominal size.
Steel - TMT steel of grade Fe-500 of 10mm diameter was used as main reinforcement and nominal reinforcement, 8mm bars are used as stirrups.
Mesh - Welded steel wire mesh of 1.286mm diameter with square grids was used in ferrocement jacket. The grid size of mesh was 16mm x 16mm.
Connector - Connectors made by binding wire in two threads, binding wire of 20 gauge annealed wire conforming to IS 280. It shall be free from rust, oil, paint, grease, loose mill scale or any type. It shall be free from corrosion and abrasion.

2.2 Methodology

2.2.1 Casting of composite beams

The casting of beams is done in a single stage. The beams are casted in a mould of size 100 x 150 x 700mm. First of all the entire beam mould is oiled. Spacers of size 35 mm are used to provide uniform cover to the reinforcement. When the bars have been placed in position as per the design, concrete mix is poured in the mould and compactions are given with the help of tamping rod. The compaction is done until the

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Determination of variability of properties of bituminous mixes on variation of shape of the particles

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Abstract - *A pavement is a structure constructed with an object of providing safe, durable and good riding surface over a desirable period with minimum maintenance .This obviously makes the pavement to meet certain functional and structural requirements during its lifetime. The ability to characterize asphalt pavement materials in terms of fundamental properties is becoming increasingly more important.*

The need of accurate, consistent volumetric of HMA has become increasingly important in few years. This change has come about because more and more states are utilizing volumetric measurements to design the HMA mixtures and then to evaluate them during constructions. Since volumetric measurements are now widely used for quality assurance, hence it has become the major concern for the contractor to measure these properties with accuracy and reliability.

In the HMA mix it is also important to assure the quality of bitumen and aggregates in the mixture. The shape and surface texture of aggregates in the mixture must be of suitable quality with angular shaped and rough textured. The physical properties of coarse aggregates are more significant in new generation bituminous mixtures. The strength and serviceability requirements of bituminous mixture such as Stability, Flow, Voids in Mineral Aggregate (VMA), Voids Filled with Bitumen (VFB), Air Voids (Va) highly depend on the physical properties of aggregates.

Combined Index is an important physical property of mineral aggregates which affects the quality of bituminous mixes. In this study, the influence of Combined Index aggregates on the properties of most commonly used bituminous mixes in India such as Dense Bituminous Macadam (DBM) mixes are analysed with different proportions of Combined Index aggregate and conclusions are drawn.

Key Words: Stability, Flow, Voids in Mineral Aggregate (VMA), Voids Filled with Bitumen (VFB), Air Voids (Va), Ministry of Road Transport and Highways (MoRTH).

1. INTRODUCTION

The design of bituminous mixture by Marshall Method involves the proportioning of the aggregates and bitumen to produce a mix that will have the optimum qualities and properties. The purpose is to develop a design, by trial mean, which will contain optimum amount of bitumen, having adequate voids, satisfactory flow properties and possess a planned combination of stability, durability and flexibility, based on the climatic condition, traffic density and loads it is intended to carry.

HMA is one type of premix widely used in road construction worldwide. It is considered by many highway engineers as premier material. Term of "hot mix "comes from aggregate and bitumen dried and heated for proper mixing and workability and mix together with desired temperature.

The aggregate and asphalt will be combined in an asphalt mixing plant in which it will be proportioned , heated , and mixed to a desired paving mixture. This mixture must consist of minimum combined index aggregates so as to with stand the preliminary compacter load and also for future upcoming heavy loads of traffic. After the plant mixing is complete, the mix is transported to site and spread with paving machine in loosely compacted layer to uniform, Smooth surface then the mix will be compacted by heavy roller to produce smooth and well consolidated course.

Compaction is one of major issues in HMA and important criteria in process to produce good quality of hot mix asphalt. Temperature controls asphalt cement viscosity which affect its ability to coat and provide adequate lubrication for aggregates and slides with each other and pack into dense mass compaction.

2. PRESENT INVESTIGATION

In the present study, the mix type chosen is Dense Bituminous Macadam. The Mix Design is done based on Marshall Method to meet the requirements as specified in MoRTH (IV revision) Specification.

2.1 Main Constituents of HMA Mix

Mixture stiffness can be varied by the temperature, speed of loading, level of compaction and type of bitumen.

- Coarse Aggregates: Offers compressive and shear strength and shows good interlocking properties. Material retained on 2.36mm IS sieve is taken as coarse aggregates.

- Fine Aggregates: Fills the voids in the coarse aggregates stiffens the binder. Material passing 2.36mm IS sieve and retained on 0.075mm IS sieve is taken as fine aggregates.

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Experimental Study on Stabilization of Black Cotton Soil Using Steel Slag

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ABSTRACT: Expansive nature of black cotton soil generates lot many problems in pavement construction. It drastically affects the performance and life of the pavement. Thus for good performance and long life of road it is important to improve the properties of black cotton soil. This study deals with improving the properties of black cotton soil through addition of locally available industrial wastes as Foundry Sand, Steel Slag. Laboratory tests were conducted on various proportions of mixes of black cotton soil and industrial wastes 0% to 40% at the interval of 8%. The soaked CBR value untreated soil is 2.44%. The soaked CBR value of mix soil: Foundry sand in the proportion of 40:60 is 5.663% which is increased by 43.087% in comparison with untreated soil.

KEYWORDS: Stabilization, Black cotton soil, Index properties, CBR value

I.INTRODUCTION

Expansive soils also called as Black soils or Black cotton soils and Regur soils . In India expansive soils cover about $0.8X10^6$ km² area approximately 20% of surface are. These soils are mainly found over the Deccan lava tract (Deccan Trap) including Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh, Northern Karnataka. But in Karnataka these soils are widely prevalent in many parts of northern Karnataka, particularly Belgaum, Bijapur, Bagalkot and Gadag Districts of Karnataka.

Expansive soils expand due to the clay content. Expansive soils have a relatively high percentage of clay minerals and are subject to changes in volume with changing moisture conditions. The mineral for most expansive clay soil damage includes steatite and montmorillonite (along with Betonies and elite) which can swell up to 40 times its own size. The soil under a house swells and shrinks with the seasons. This movement is not a problem as long as it is uniform or not great enough to damage the foundation and/or house. Damage to the house may appear and disappear on a regular basis as the seasons change. Significant defects occur when the movement is uneven or localized.Expansive soils contain clay or other minerals that cause them to expand when absorbing water. These soils often expand by 10 per cent or more during a rainfall. When the soils dry out, they shrink back to their original size.

II.LITERATURE SURVEY

Sanjeev tanaji jadhav,Sushma shekhar kulkarni(2014) carried laboratory investigations on the charecterstics of black cotton soil by using foundry sand.

The addition of foundry sand decreases the liquid limit upto 40% by 33.82%,and the maximum dry density of soil increases upto 40% and then decreases.The CBR value also increases upto 40% by addition of foundry sand.From this investigation they conclude that the addition of foundry sand improoves the drainage properties of s oil by reducing liquid limit,and MDD increment helps us to provide good stable working platform mainly during rainy seasons,CBR value helps to increase the stability of the soil.So from this study theutilization of foundry sand is economical for stabilisation of subgrade soil.

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