Experimental Study on Construction and Demolition Waste Management

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Abstract:

The need to manage construction and demolition waste (CDW) hasled to environmentally-friendly actions that promote the reuse and recycling of this type of waste and other forms of waste valorization.The main priority is to foment sustainable construction work, which has the advantage of avoiding the deposit of large quantities of construction waste at landfills and greatly reducing the use of borrow material in construction projects. In this sense, the reuse of CDW materials significantly lessens the impact of construction work on the surrounding environment.

The aim of this research study is to verify the technical viability of using construction waste as material for any construction work. For this purpose, a field study was carried out, which included testing the performance of cubes composed of concrete, fly ash demolished waste aggregate etc. This was done by analyzing the characteristics ofthe recycled material on a section of an actual site. It was observed that the load-bearing capacity of the recycled artificial CDW aggregate was satisfactory.

Keywords: - Construction and Demolition waste (C&D), Recycled Coarse Aggregate (RCA) etc.

I. INTRODUCTION:

Construction and demolition waste means waste comprising of building materials, debris and rubble resulting from construction, re-modeling, repair anddemolition of any civil structure.

In recent years, significant efforts have been made to implement regulations, guidelines, and research studies with the purpose of managing construction and demolition waste. The primary objective is to foment the reuse and recycling ofthis waste and other forms of valorization with a view to contributing to the sustainable development of activities in the construction sector.

India recycles just one per cenof its construction and demolition (C&D) waste, a new report released by Delhi-based non-profit, Centre for Science and Environment (CSE) on August 25, 2020, has shown. The country generates an estimated 150 million tonnes of C&D waste every year, according to the Building Material Promotion Council. But the official recycling capacity is a 11eager 6,500 tonnes per day — just about one per cent.

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II. OBJECTIVE:

1) To solve problem of availability of material & also reduce cost of the construction.
2) To compare results & economic value by using

FLY ASH in concrete work.

3) To study the effect of varying percentage of construction demolitionwaste asreplacement to natural aggregate.
4) To find optimum percentage of replacement of natural aggregate by recycledconstruction demolition waste.

III. LITERATURE REVIEW:

Piyush K. Bhandari 2021 [1] In this paper an attempt was made for current pace of construction put behind huge amount of construction waste. Even old structures were removed while lead to demolition waste. These wastes were not handled as per municipal guidelines and treated in illegal way. The Construction and demolition waste may affect environment and social issues related to public health and economy. This waste can be a possible alternative for aggregates in pavement construction. Main aim was to acquire data regarding quality and quantity of waste and study proper management policies regarding handling this waste. Present investigation studied the geotechnical and structural properties of waste material and its suitability as construction material. Based on test results the composition of demolition waste, its source was affect the strength of prepared recycled aggregate.Even the compactive effort applied to stabilize the material was affect the strength values of California bearing ratio and Plate load test results. Test results revealed recycled construction and demolition waste (RCDW) as a suitable material for baseand sub-base construction in pavement construction.

Manuel Contreras et.al 2021[2] Recycled aggregates (RA) from construction and demolition waste (CDW) instead of natural aggregates (NA) were analyzed in the manufacture of new eco-friendly concrete. Fine (FRA) and coarse (CRA) recycledaggregates were used in different percentagesas substitutes of natural sand and gravel, respectively.

International Journal for research in Applied Science & Engineering Technology. September 2020 [3] The main objective of that research was to investigate the possibility of utilizing construction & demolition waste aggregate inrigid pavement construction. In the present study compressive strength of concrete at 7, 14, and 28 days was checked, and that concrete was prepared by mixing fly ash based cement
, sand, aggregate, and water. In a further study, coarse aggregate was replaced by aggregates obtained from C&D (Construction& Demolition) waste, and then M40 mix design concrete was prepared

Dr. Y.Ramalinga Reddy et.al 2020 [4] The study and work was conducted to understand and know the properties of recycled aggregate for pavement construction. These

days most demolitions and constructions work was on process and going on as a therefore more construction and demolition waste was also producing. The serious issue related to this was management of construction and demolition waste. This can be dumped for landfill. For solving this problem we were carrying out this study. In this study, a coarse aggregate replacement scheme concrete was investigated with four different replacement ratios including 30%, 50%, 70% and 100%.

Khan Alfiya Mashid & Dalwai Khan Arbaz Afzal et.al 2020 [5] The paper presents the actual stage of analysis and laboratory studies. Recycled aggregates under investigation are obtained by crushing of cement concrete from the demolition of buildings. The main objective of the research was to achieve ahigher economic value of the cement concrete resulted from demolitions by recycling and use in the construction of conventional cement concrete pavements (PCC – plain cementconcrete) and roller compacted concretepavements (RCC).

IV. MATERIALS USED

1. CEMENT :

Portland pozzolona cement of ultra tech brand was used and it was conforming to IS 1489-1991properties of cement are tabulated in Table :

cement	Finenes s (sq.m/kg)	Soundnes s in mm (Le-Ch atelier)	Initial Settin gTime (min.)	Final Settin gTime (min.)
PPC (As per IS)	300	10	30	600
PPC (Observed)	260	8	30	600
OPC (As per IS)	225	10	30	600
OPC (Observed)	240	9	30	600

2. Fine Aggregates :

Fine aggregate / crushed sand is an accumulation of grains of mineral matter derived from the disintegration of rocks. It is distinguished from gravel only by the size of the grains or particles. But it is distinct from clays which contain organic materials. Sands that have been sorted out and separated from theorganic material by the action of currents of water or by

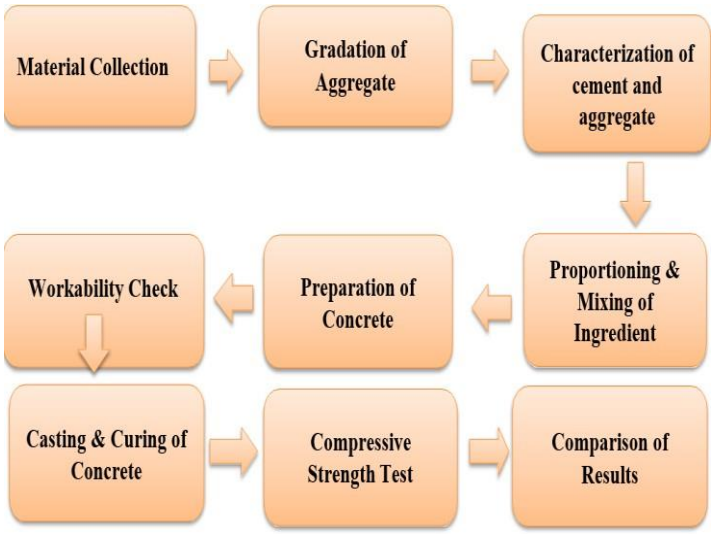
winds acrossarid lands are generally quite uniform in size of grains. Usually commercial sand is obtained from query.

3. Recycled Coarse Aggregates :

The recycled coarse aggregate contains original aggregate attached with mortar. The attached mortar is light and porous in nature. Therefore, it is obvious that the specific gravity and density of recycled aggregate are relatively less when compared to natural aggregate.
Recycled aggregate can be used: In paved roads as aggregate base, aggregate sub base, and shoulders. In gravel roads as surfacing as well as base for building foundations.

Physical properties of coarse aggregate :

SR.NO	PROPERTIES	RESULTS
1	Fineness Modulus	5.16
2	Specific gravity	2.82%
3	Crushing Value of Aggregate	24.84%
4	Flakiness Index of Aggregate	5.85%
5	Elongation Index of Aggregate	10.13%



4. Water:

Water fit for drinking is generally considered fit for making concrete. Water should be free from acids, oils, alkalis, vegetables or other organic Impurities.

Soft waters also produce weaker concrete. Water has two functions in a concrete mix. Firstly, it reacts chemically with the cement to form a cement paste in which the inert aggregates are held in suspension until the cement paste has hardened. Secondly, itserves as a vehicle or lubricant in the mixture of fine aggregates.

5. Admixtures:

An admixture is defined as ‑a material other than water, aggregates, cementitious materials, and fiber reinforcement, used as an ingredient of a cementitious mixture to modify its freshly mixed, setting, or hardened properties and that is added to the batch before or during its mixing.

V. Methodology:

5.1 PROCEDURE FOR PREPARATION OFMIX/MIXING.

STEP-1 [MIXING PLATFORM]

Concrete Mixer is cleaned with clean waterwhich will be used for concretemixing.

STEP-2 [DRY MIXING OF CEMENT & FINEAGGREGATE]

Dry mixing of measured quantity of cement & fine aggregate is done in concrete mixer till the mix attains uniform gray color. This mixing is continuedfor 10 min.

STEP-3 [DRY MIXING OF C.A. WITHCEMENT-FINE AGGREGATEMIX]

After completion of mixing of cement & fine aggregate, measured quantity of coarse aggregates are added in the mix and mixing operation is continued for at least 15 min. so thatmix become uniform.

STEP-4 [ADDITION OF WATER & ADMIXTURE]

Clean Potable water & admixture of measured quantity in liters is added to the above dry mix and mixing operation is continued for at least 15 min. in clockwiseand anti-clockwise rotation.

STEP-5 [MIXING THE MIX AGAIN ONCLEAN METAL PLATFORM]

For lean mixing of concrete the mix isagain mixed on clean platform of meta

SLUM CONE TEST:

The slump test indicates the behavior of a compacted concrete cone under the action of gravitational forces. The slump test is a practical means of measuring the workability i.e., consistency of concrete, where the nominal maximum size of the aggregate does not exceed 38 mm. Changes in the value of slump obtained during a job may indicate changes in materials, in the water content orin the proportions of the mix, soit is useful in controlling the quality of the concreteproduced.

Compressive Strength Test:

Compressive Strength Test, mechanical test measuring the maximum amount of compressive load a material can bear before fracturing. The test piece, usually in the form of a cube, prism, or cylinder, is compressed between the platens of a compression-testing machine by agradually applied load.

Compressive strength of concrete dependson many factors such as water-cement

ratio, cement strength, quality of concretematerial, quality control during the production of concrete, etc.

The compressive strength of concrete can be calculated by the failure load divided with the cross sectional area resisting the load and reported in pounds per square inch in US customary units and megaPascal's (MPa) in SI units.

Photographs:

VI. CONCLUSION:

- From the compressive strength results of recycled coarse aggregate concrete it can be concluded that the recycled aggregate concrete though has slower strength development than the conventional concrete, it can still be used in construction by electing the optimum replacement ratio.

- In this investigation it is found that up to 10% - 20% replacement of natural coarse aggregates by recycled aggregates can bedone and used as up to his replacement level, the strength obtained at 28 dayscrosses the target strength.

VII. FUTURE SCOPE :

California BearingRatio (CBR) test can be conducted on cubes.

Concrete mix can be madeup by mixing plastic (HDPE, PPCP,etc)

Ground Granulated Blast-furnace Slag can be mix with Recycled Coarse Aggregate and mix can be prepared for further experiments

VIII. REFERENCES

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