Analysis of Concrete Behavior With Lime Dust And Banana Fiber With Recycled Aggregate

Bharti Rai[1], Prof. Satyendra Dubey[2], Prof. Anubhav Rai[3]
[1, 2] Dept of Civil Engineering
[2] Prof., Dept of Civil Engineering
[3] Prof. and HOD, Dept of Civil Engineering
[1, 2, 3] GGITS, Jabalpur

Abstract- *In this effort a variety of Waste product additives can be combined with concrete to optimize strength properties. The combination of these, often called hybridization, is introduced by using different material proportions like Banana fibers, Lime dust and Recycle Aggregate. Right now, consequences of the Strength properties 0f 0%, 25%, 50%, 75% and 100% of course recycled aggregate with 0%-15% of lime dust and 2% of banana fibre with M30 grade of concrete. The results exhibit that Banana fiber with Lime dust and Recycle Aggregate improve the compressive strength marginally as compared to banana fibers. The strength of cube with M-30 grade concrete. Finally, we obtained that by addition of fiber and mineral admixture in the concrete increase their properties as compare to normal concrete mass.*

Keywords- fibrous concrete, banana fiber, Lime dust, hybridization, fiber, natural fiber, strength – properties, mineral admixture.

I. INTRODUCTION

Concrete is a composite material, and consists of several different constituent parts. These parts are cement, water, aggregate (sand and stone) and usually one or more special additives to ensure that the concrete has the desired properties. Cement is a hydraulic binding agent, which means that it's a binding agent that hardens when water is added. The cement type that is used today is called Portland cement, because of its colour which is similar to the colour of stone from the island of Portland. The cement is mainly consisting of four minerals which constitute 90-95% of the blend. These are made up of oxides of calcium (Ca), silicon (Si), aluminium (Al) and iron (Fe). In addition to the "main minerals" the cement contains small amounts of oxides of manganese (Mn), sulphur (S),potassium (K) and sodium (Na) The main minerals in the blend influence its properties like heat generation, development of strength, the final strength and its durability. These properties may be controlled by changing the proportionality of the main minerals.

Even though the rest of the minerals make up a small part of the cement, these can have important effects on the cement's properties as well. The potassium- and sodium oxides (the alkalies) are important. They can make the cement harden faster and make it expand. When the different minerals in the cement react with water there will be heat generation. As a result of this it is important to keep the concrete damp while hardening to avoid dehydration and cracking.

II. LITERATURE REVIEW

Frank Stephen (2020) to cut back prices and increase the characteristic strength of the structure This was Determine replaces coarse combination (RAC) with recycled combination by twenty fifth, 50%, 75%, and 100%. The cement part additionally removes twenty p .c of fly ash. The aim of the project was to research the compressive force and split durability, concrete flexural strength. for every quantitative relation three specimens were ready to seek out compressive and break durability and concrete flexural strength. **S Jagan (2020)** Industrialization and urbanization square measure 2 major factors that contribute to the scarcity in concretes moreover resulting in dependency on different materials in construction. Presence of adhered mortar on the surface of recycled aggregates tends to scale back the standard of recycled aggregate concrete.

Dr. V. Mallikarjuna Reddy and M. Manikanta Sai Swaroop (2020) was study was concerned to utilize the recycled coarse mixture and recycled fine mixture as replacement of natural mixture in concrete combine. aim of study was to check between recycled coarse mixture and recycled fine aggregate with natural coarse mixture and sand in terms of relative density, water absorption, particle size distribution.

Jung-Ho Kim (2019) the number of construction waste and recycled mixture has been increasing every year in2019. However, because the recycled mixture was poor quality, it's not used for concrete, and the Korean government has strong the standard standards for recycled mixture for concrete. In

this was study, Determine was conducted on the mechanical and sturdiness characteristics of concrete using recycled mixture, once developing instrumentality to boost the standard of recycled mixture to increase the utilization of recycled mixture for environmental enhancements. The results illustrated improvements within the air volume, slump, compressive strength, state change and thawing resistance, and drying shrinkage. moreover, this was study was predicted to contribute to the redoubled use of recycled aggregate within the future.

P S Pawan (2018) Recycled aggregates square measure aggregates derived from the process of materials antecedently used in construction. Examples embrace recycled concrete from construction and demolition waste material (C&D), rescued combination from asphalt pavement and scrap tires. Coarse Recycled Concrete combination (RCA) was made by crushing sound, clean demolition waste of a minimum of 95% by weight of concrete, and having a complete material level usually under I Chronicles of the bulk mass. alternative materials which will be gift in RCA square measure gravel, crushed stone, hydraulic-cement concrete or a mix deemed appropriate for pre-mix concrete production.

Aman Bathla (2017)The attainable answer was to employ recycled concrete mixture in situ of natural mixture, that reduces lowland disposal, protective the first resources and reducing the transportation value and promote the property development. therefore its have to be compelled to study the structural properties of recycled mixture concrete. Recycled mixture area unit simply on the market and economical compared to alternative natural resources. razed structures, web site tested concrete, pile cap razed concrete area unit the nice sources of recycled mixture. during this was paper
varied studies done by the authors was studied.

III. OBJECTIVE OF THE STUDY

The main objective of the study is to investigate the change in characteristics strength properties and workability of concrete mixed with different percentage of Recycle aggregate, Lime dust with Banana fibers. Following are objectives of the study.

- To find out the effect of Recycle aggregate, Lime dust with Banana fibers and on strength when mixed with concrete sample.
- To study the workability of concrete on variation in different % with different percentage of Waste when mixed with concrete.
- To find out the change in slump value.
- To perform the sieve analysis and specific gravity of aggregate used.

IV. METHODOLOGY

Following test were conducted on prepared samples and materials also as per relevant IS code of Practice:

1. Sieve analysis Test
2. Specific Gravity Test
3. Slump Cone Test
4. Compressive Strength Test

SIEVE ANALYSIS

The Aggregate which is passing through 4.75mm sieve is known as fine aggregate. Locally available river sand which is free from organic impurities is used. Sand passing through 4.75mm sieve and retained on 150 micron IS sieve is used in this investigation.

The sample shall be brought to an air-dry condition before weighing and strivings this may be achieved by dryings at room temperature or by heating at a temperature of 100 ^{o}C to 110 ^{o}C, the airdry sample shall be weighted and sieved successively on the appropriate sieves starting with the largest. Care shall be taken to ensure that the sieves are clean before use.

SPECIFIC GRAVITY TEST

Specific gravity G is defined as the ratio of the weight of a given volume of solids at a given temperature to the weight of an equal volume of distilled water at that temperature, both weights being taken without air.

SLUMP CONE TEST

This is a test used extensively in site work all over the work. The slump test does not measure the workability of concrete although ACI 116R – 90 describes it as a measure of consistency, but the test is very useful in detecting variations in the uniformity of a mix of given nominal proportions. The slump test is prescribed by IS: 456 (2000), ASTM C 143 90A and BS1881 Part 102:1983.

COMPRESSIVE STRENGTH TEST

Compressive strength of concrete depends on many factors such as water-cement ratio, cement strength, quality of concrete material, quality control during production of concrete etc. Test for compressive strength is carried out either on cube or cylinder. Various standard codes recommend

concrete cylinder or concrete cube as the standard specimen for the test. Out of many test applied to the concrete, this is the utmost important which gives an idea about all the characteristics of concrete. By this single test one judge that whether Concreting has been done properly or not.

V. OBSERVATION AND RESULTS

1. SIEVE ANALYSIS

The coarse aggregate used in this investigation in 20mm downsize crushed aggregate and angular in shape as per Indian Standard specifications IS: 383 – 2016.

Table - Sieve Analysis of Coarse Aggregate

Sr. No	Is sieve size	Weight retained (gm)	Cumulative weight retained	Cumulative percentage weight retained	Cumulative percentage passing.
1.	63.00	0.00	0.00	0.00	100
2.	40.00	0.00	0.00	0.00	100
3.	20.00	2000	2000	20.00	80.00
4.	12.50	7580	9580	95.80	4.20
5.	10.00	220.0	9800	98.00	2.00
6.	8.00	120.0	9920	99.20	0.80
7.	6.30	40.00	9960	99.60	0.40
8.	4.75	20.00	9980	99.80	0.20
9.	Pan	20.00	10,000	-	0.00

2. SPECIFIC GRAVITY TEST

Particulars	I	II	III
M1	654.45	654.45	654.45
M2	1054.45	1004.45	954.45
M3	1788.13	1744.45	1714.66
M4	1527.02	1527.02	1527.02
Specific Gravity (G)	2.88	2.64	2.67
Average Specific Gravity (G)	**2.73**		

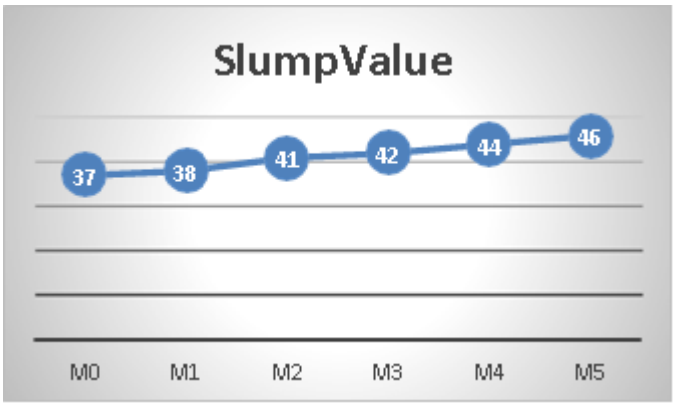
3. SLUMP CONE TEST

This is a test used extensively in site work all over the work. The slump test is
prescribed by IS: 456 (2000), ASTM C 143 90A and BS 1881 Part 102:1983.

SLUMP CONE VALUE OF M30 GRADE OF CONVENTIONAL CONCRETE WITH DIFFERENT % OF RECYCLED AGGREGATE AND LIME DUST WITH BANANA FIBER

S NO	MIX	RECYCLED AGGREGATE (%)	LIME DUST (%)	BANANA FIBER (%)	SLUMP VALUE (mm)
1	M0	0	0	0	37
2	M1	0	15	2	38
3	M2	25	15	2	41
4	M3	50	15	2	42
5	M4	75	15	2	44
6	M5	100	15	2	46

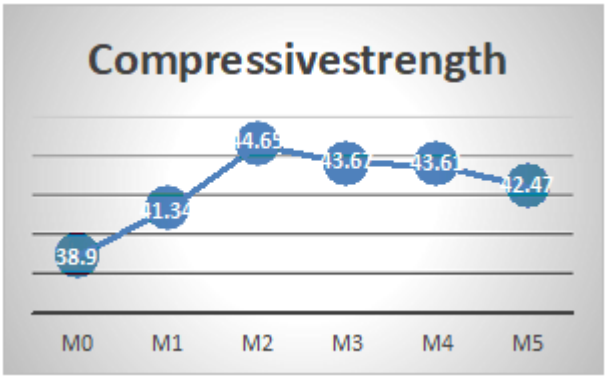
SLUMP CONE VALUE OF M30 GRADE OF CONVENTIONAL CONCRETE WITH DIFFERENT % OF RECYCLED AGGREGATE AND LIME DUST WITH BANANA FIBER



4. COMPRESSIVE STRENGTH TEST

The compressive strength of concrete is one of the most important Properties of concrete in most structural application concrete is implied primarily to resist compressive stress.

COMPRESSIVE STRENGTH VALUE OF M30 GRADE OF CONVENTIONAL CONCRETE WITH DIFFERENT % OF RECYCLED AGGREGATE AND LIME DUST WITH BANANA FIBER FOR 28 DAYS



COMPRESSIVE STRENGTH VALUE OF M30 GRADE OF CONVENTIONAL CONCRETE WITH DIFFERENT % OF RECYCLED AGGREGATE AND LIME DUST WITH BANANA FIBER FOR 28 DAYS

VI. CONCLUSION

The experiment shows that the effect of recycled aggregate and Lime dust scrap with normal concrete can still be a promising work as there is always a need to overcome the problem of brittleness of concrete. The following conclusions could be drawn from the present investigation.

The maximum compressive strength of specimen after 28 days is 44. 65 N/mm² with 25 % of recycled aggregate and 15 % of Lime dust scrap with 2% Banana Fiber comparisons of normal concrete and other mix. It is about 15 % increase overcome with normal concrete.

From the above points it can be concluded that recycled aggregate and Lime dust and Banana Fiber scrap is very effective for improving the strength of the concrete. Therefore the performance of the concrete will be improved if proper design and construction methodology is adopted.

VII. SCOPE FOR FUTURE STUDY

Based on the assessment and conclusions described above, several recommendations have been made to proceed with future research. Future research may include, but should not be limited to the following.

1. Stress- strain behavior of concrete mixture, using lime dust with recycled aggregate.
2. Behaviors of concrete mixture under dynamic loading.
3. A comparative study of lime dust with recycled aggregate using different grades of concrete.
4. Study of flexural strength of structural components contained with lime dust with recycled aggregate.
5. Durability aspects of concrete mixture.

REFERENCES

[1] IS: 456: 2000, Plain and Reinforced Code of practice
[2] IS: 10262-2019 (Reaffirmed 2004): Recommended guidelines for concrete mix design, Bureau of Indian Standard, New Delhi-2004.
[3] IS: 383-1970: Specification for Coarse and Fine Aggregates from Natural Sources for Concrete, Bureau of Indian Standard, And New Delhi- 197.
[4] Gambir, M.L., "Concrete Technology", 2nd edition, Tata McGraw hill co. Ltd, New Delhi, 1995.
[5] Shetti M S "Concrete Technology- Theory and Practices", *S Chand publications,* New Delhi.
[6] Prabir k Sarkar and b Vijya Rangan, "Geo polymer Concrete using Fly ash" ,ISBN 978 -2, Nova Science Publishers, INC. 2014.
[7] Pidugu Prasanna kumar and Bypaneni Krishna Chaitanya "Performance evaluation of glass fiber reinforced high-performance concrete with silica fume and nano- silica, 24-25 September 2021.
[8] Sachin Patil, Somasekharaiah h m ,Sudarsana Rao H & Vaishali G.Ghorpade, 69(5):69-84 DOI:10.14445/22315381/IJETT- V69I5P212
[9] kumar, Pidugu Prasanna ; Chaitanya, Bypaneni Krishna "Performance evaluation of glass fiber reinforced high-performance concrete with silica fume and nano-silica" IOP Conference Series: Earth and Environmental Science, Volume 982, Issue 1, id.012018, 9 pp. Pub Date: March 2022
[10] Sachin Patil, Dr.H.M. Somasekharaiah, Dr. H. Sudarsana Rao, Dr.Vaishali G.Ghorpade, "Effect of Fly ash, Silica fume, Glass Fiber and Polypropylene Fiber on Strength Properties of Composite Fiber Reinforced High Performance Concrete,"
[11] Mohammad Imteyazuddin , Prof. Syed Arafath " An Experimental Investigation on Strength Characteristics of Concrete with Partial Replacement of Silica Fume and Metakaolin with Cement on M- 30 Grade of Concrete"| IJMER | ISSN: 2249–6645 | www.ijmer.com | Vol. 4 | Iss.9| Sept. 2014
[12] C M Kansal, S Single and R Garg "Effect of Silica Fume & Steel Slag on Nano-silica based High- Performance Concrete" (2020) 012012 IOP Publishing doi:10.1088/1757899X/961/1/01201.