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**STUDIES ON EFFECT OF SEWAGE WATER ON NATURAL CONCRETE AND
RECYCLED CONCRETE**

Sambhav Gangwal*, Raksha Parolkar

ABSTRACT

Concrete is the premier construction material across the world and the most widely used in all types of Civil engineering works, including infrastructure, low and high-rise buildings, defense installations, environment protection and local/domestic developments. However, in recent years the wisdom of our continued wholesale extraction and use of aggregates from natural resources has been questioned at an international level. This is mainly because of the depletion of quality primary aggregates and greater awareness of environmental protection. In light of this, the availability of natural resources to future generations has also been realized. In fact many governments throughout the world have now introduced various measures aimed at reducing the use of primary aggregates and increasing reuse and recycling, where it is technically, economically, or environmentally acceptable. The project explores a theme on the need for recycled aggregates and highlights its potential use as aggregate in new concrete construction. Research comprises of studies on effect of sewage water on normal concrete and recycled concrete for which concrete cubes of natural aggregate and recycled aggregate were casted and immersed in plain water and sewage water for 28 days in order to know the deterioration in concrete due to sewage water for which comparison of compressive strength of both normal concrete and recycled concrete is done. Studies on effect of sewage water on normal concrete and recycled concrete gave a result that strength of recycled concrete as compared to normal concrete is lower but it has sufficient strength which can be used for sewage construction like manholes, chambers, carriage ways, sewer pipes etc.

KEYWORDS Natural Concrete, Recycled Concrete, Compressive Strength, Natural Aggregates (N.A), Recycled Concrete Aggregate (R.C.A), Recycled Concrete and Masonry (R.C.M)

INTRODUCTION

Concrete industry, uses twelve billion tons of raw materials each year, is the largest user of natural resources in the world. The environmental impact of production of raw ingredients of concrete (such as cement and coarse and fine aggregates) is considerable. The scale of the problem makes it prudent to investigate other sources of raw materials in order to reduce the consumption of energy and available natural resources

Waste arising from construction and demolition constitutes one of the largest waste streams within the country. Of this a large proportion of potentially useful material disposed of as landfill. The environmental and economic implications of this are no longer considered sustainable and, as a result, the construction industry is experiencing more pressure than ever before to overcome this practice. On the other hand, in recent years the wisdom of continued wholesale extraction and use of aggregates from natural resources has been questioned at an international level. This is mainly because of the depletion of quality primary aggregates and greater

awareness of environmental protection. The results of an extensive experimental programme aimed at examining the performance of Portland-cement.

Concrete produced with natural and coarse recycled aggregates. The effects of up to 100% coarse recycled concrete aggregate on a range of fresh, engineering and durability properties have been established and assessed its suitability for use in a series of designated applications. Sustainable construction is a widely used concept now. It was introduced due to the growing concern about future of the planet, and it applies specifically for construction industry as, this being a huge consumer of natural resource. In addition to the 1.6 billion tons (1.5 billion tones) of cement used worldwide, the concrete industry is consuming 10 billion tons of sand and rock, and 1 billion tons of mixing water annually. In short the concrete industry, which uses 12.6 billion tons of raw materials each year, is the largest user of natural resources in the world. It's the world's most widely used construction material, but at the same time it is not an environmentally friendly material too. On the out-source when a building is demolished after its use, for

repairs or for deterioration it generates large amount of waste streams, which conventionally and till today is used for land filling. In recent years, the recyclable potential of construction and demolition waste has made it a target of interest and the main focus of waste management policies on encouraging minimization, reuse, recycling, and valorization of the waste as opposed to its final disposal in landfills. The increasing trend of land filling and the scarcity of natural aggregates on other hand encourage the use of waste from the construction sites as a source for aggregate.

OBJECTIVE

- To compare the compressive strength of natural aggregate concrete, recycled concrete aggregate and recycled concrete masonry when used in normal construction.
- To compare the compressive strength of natural aggregate concrete, recycled concrete aggregate and recycled concrete masonry for durability.

SCOPE OF THE WORK

As India is a fast growing and developing country all over networks of road ways is developing at a fast rate due to which old structures are being demolished in order to widening of roads & construction of sewage conveyance lines Due to this use of natural resources like natural aggregates has increased to a great extent .now due to demolishing of old structures we are getting large amount of demolished concrete which can be recycled in form of aggregates and can be used in replacement of natural aggregate.

METHODOLOGY

Methodology behind the research is as follows:

Natural Aggregates (N.A)

Natural aggregates consists of rock fragments that are used in their natural state ,or are used after mechanical processing such as crushing ,washing and sizing.

Crushed stone and sand and gravel are the two primary sources of natural aggregate , which are used directly in construction or as a raw material for construction products such as concrete and bituminous road materials .

Preparation Of Cubes

- Firstly eighteen concrete cubes of 150mm X 150mm X 150mm of natural aggregates are casted.

- Natural aggregates Cubes of following proportion are casted :
 1. 1:2:4 - 6 no.s
 2. 1:1.5:3 - 6 no.s
 3. 1:1:2 - 6 no.s

Curing Of Cubes

- Three sample of each proportion of natural aggregate cube mentioned above is cured by plain water.
- Three sample of each proportion of natural aggregate cube mentioned above is cured in sewage water in order to compare the deterioration in concrete cubes strength.
- This curing of both samples is done for 28 days by ponding the cubes.

Compressive Strength

- Compressive strength of all cube samples are measured by compressive testing machine
- Results are compared between plain water cured natural aggregate (N.A.) cubes and sewage water cured natural aggregate (N.A.) cubes .
- By this comparison of strengths we will get to the effect of sewage on the strength of concrete.

Recycled Aggregates

Recycled aggregates are aggregates derived from the processing of materials previously used in a product and/or in construction. Examples include recycled concrete from construction and demolition waste material.

Recycled Concrete Aggregate (R.C.A)

Coarse recycled concrete aggregate (RCA) is produced by crushing sound, clean demolition waste of at least 95% by weight of concrete, and having a total contaminant level typically lower than 1% of the bulk mass. Other materials that may be present in RCA are gravel, crushed stone, hydraulic-cement concrete or a combination there of deemed suitable for premix concrete production.

Preparation of Cubes

- Firstly For this purpose total eighteen concrete cubes of 150mm X 150mm X 150mm of recycled concrete aggregate (R.C.A) are being casted
- Recycled concrete aggregate (R.C.A) Cubes of following proportion are casted :
 1. 1:2:4 - 6 no.s
 2. 1:1.5:3 - 6 no.s

3. 1:1:2 - 6 no.s

Curing Of Cubes

- Now three sample of each proportion of recycled concrete aggregate (R.C.A) cube mentioned above are cured by plain water.
- And three sample of each proportion of recycled concrete aggregate (R.C.A) cube mentioned above are cured in sewage water in order to compare the deterioration in concrete cubes strength.
- This curing of both samples is done for 28 days by ponding the cubes.

Compressive Strength

- Now compressive strength of all cube samples are measured by compressive testing machine
- Now results are compared between plain water cured recycled concrete aggregate (R.C.A) cubes and sewage water cured recycled concrete aggregate (R.C.A) cubes .
- By this comparison of strengths we will get to results that concrete made of recycled aggregate can be used in construction of sewage components like sewer lines ,manholes etc

Recycled Concrete and Masonry (R.C.M)

Coarse recycled concrete and masonry (RCM) is graded aggregates produced from sorted and clean waste concrete and masonry typically for road sub base applications. The material may contain small quantities of brick, gravel, crushed rock or other forms of stony material as blended material. Fine recycled aggregate may also be referred to as crushed concrete fine

Preparation of Cubes

- Firstly For this purpose total eighteen concrete cubes of 150mm X 150mm X 150mm of recycled concrete and masonry (R.C.M.) are being casted
- recycled concrete and masonry (R.C.M.) Cubes of following proportion are casted :
 1. 1:2:4 - 6 no.s
 2. 1:1.5:3 - 6 no.s
 3. 1:1:2 - 6 no.s

Curing of Cubes

- Now three sample of each proportion of recycled concrete and masonry (R.C.M.) cube mentioned above are cured by plain water.
- And three sample of each proportion of recycled concrete and masonry (R.C.M.) cube mentioned above are cured in sewage water in order to compare the deterioration in concrete cubes strength.
- This curing of both samples is done for 28 days by ponding the cubes.

Compressive Strength

- Now compressive strength of all cube samples are measured by compressive testing machine
- Now results are compared between plain water cured recycled concrete and masonry (R.C.M.) cubes and sewage water cured recycled concrete and masonry (R.C.M.) cubes.
- By this comparison of strengths we will get to results that concrete made of recycled aggregate can be used in construction of sewage components like sewer lines ,manholes etc

RESULTS

To estimate the compressive strength of NA, RCA and RCM concrete mix cubes are prepared. For the concrete mix cubes pounded in plain water for 28 days, compressive strength test has given following results.

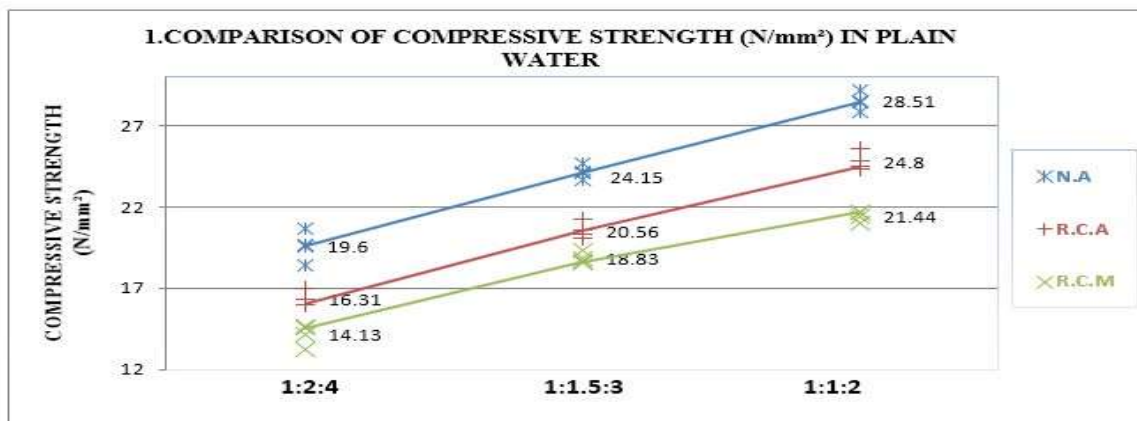
PROPORTION	N.A			R.C.A			R.C.M		
1 : 2 : 4 MIX	19.6	18.3	20.5	15.9	16.9	16.0	13.2	14.5	14.6
MEAN STRENGTH		19.6			16.3			14.1	
1 : 1.5 : 3 MIX	24.6	23.6	24.1	20.3	21.2	20.1	18.6	18.5	19.3
MEAN STRENGTH		24.1			20.5			18.8	
1 : 1 : 2 MIX	27.8	28.4	29.2	24.3	24.5	25.6	21.0	21.6	21.6
MEAN STRENGTH		28.5			24.8			21.4	

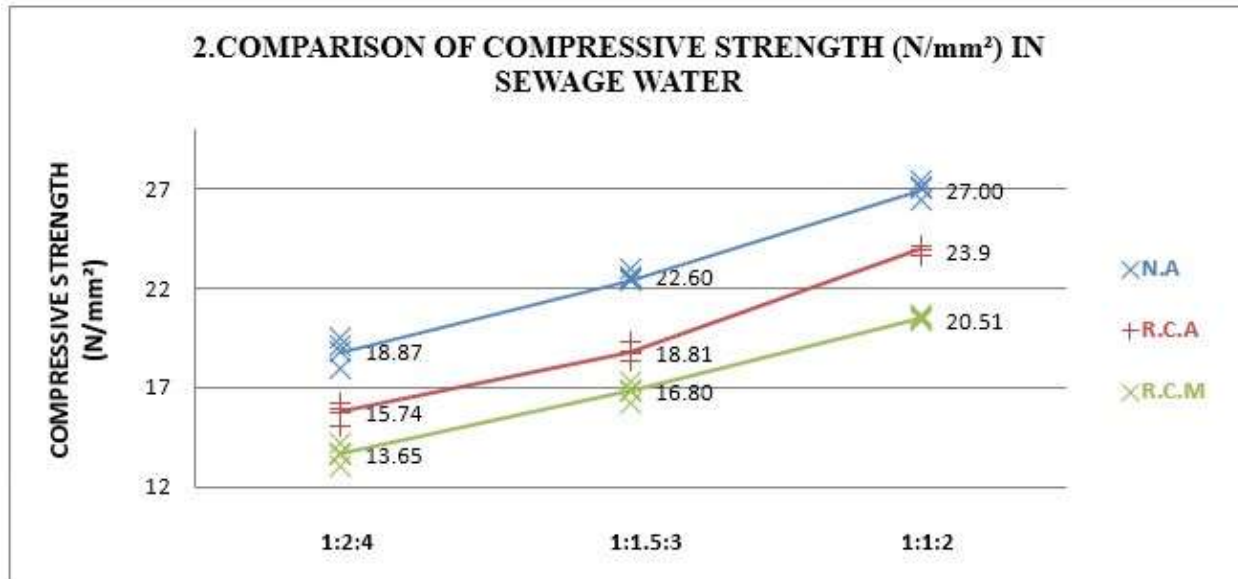
TABLE NO.1 COMPRESSIVE STRENGTH (N/mm²) AFTER 28 DAYS CURING IN PLAIN WATER

To estimate the compressive strength of NA, RCA and RCM concrete mixture cubes are prepared. For the concrete mixture cubes pounded in sewage water, compressive strength test has given following results.

PROPORTION	N.A			R.C.A			R.C.M		
1 : 2 : 4 MIX	19.1	17.96	19.54	15.01	15.96	16.24	13.01	13.65	14.2
MEAN STRENGTH		18.87			15.74			13.62	
1 : 1.5 : 3 MIX	22.48	22.96	22.36	18.35	18.76	19.31	16.91	16.22	17.28
MEAN STRENGTH		22.60			18.81			16.80	
1 : 1 : 2 MIX	26.45	27.45	27.1	23.96	23.65	24.10	20.36	20.54	20.63
MEAN STRENGTH		27.00			23.9			20.51	

TABLE NO.2 COMPRESSIVE STRENGTH (N/mm²) AFTER 28 DAYS CURING IN SEWAGE WATER





CONCLUSION

Studies on effect of sewage water on natural concrete and recycled concrete gave the conclusion that compressive strength of natural concrete is higher than recycled concrete but difference between strength is within acceptable limit in all cases compared and has not decreased to such a great extent. Maximum difference observed is 10.63 % and minimum of 3.54 % .After studying effect of sewage water on natural aggregate concrete and recycled aggregate concrete it was found that recycled aggregate concrete have less strength than natural concrete but it can be used as replacement of natural concrete in sewage conveyance structures like chambers ,pipes ,manholes etc.

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