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IMPROVING THE STRENGTH OF CONCRETE USING DEMOLITION WASTE FOR FOREST & CLIMATE CHANGE USING DEMOLITION WASTE

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ABSTRACT :

This project explores the use of demolition waste as a sustainable alternative to natural aggregates in concrete, addressing the environmental impact of the construction industry and contributing to climate change mitigation. The research focuses on evaluating the compressive strength of concrete incorporating recycled aggregates from demolition waste. By optimizing mix design and assessing mechanical properties, this study aims to:

(1) Reduce the demand for natural resources like sand and gravel, minimizing habitat destruction.

(2) Divert demolition waste from landfills, reducing waste accumulation.

In comparison to normal mixes, concrete samples with different replacement ratios of recycled aggregates will undergo compressive strength testing. The ideal replacement percentage for preserving structural performance and optimizing environmental advantages will be determined by this research. The results will encourage a circular economy and sustainable building techniques.

Key Words: Demolition waste, Recycle Aggregates, Compressive strength, Climate change mitigation.

Introduction

The construction industry is a significant contributor to global carbon emissions, primarily due to the high demand for raw materials like sand, gravel, and cement. With increasing environmental concerns, particularly climate change, the need for sustainable construction practices has never been more critical. One promising approach to mitigating the environmental impact of construction is the reuse of demolition waste as fine aggregate in concrete.
Debris from the destruction of buildings, roads, bridges, or other constructions is referred to as demolition waste. Although the composition of debris varies, the main components by weight include drywall, steel, concrete, wood goods, asphalt shingles, brick and clay tile, and wood products. There are a lot of recyclable components in demolition garbage. An increase in the rate of construction is expected to occur from 6 to 8% in the coming decades due to rapid urbanization in India, and it is likely that it will become the third largest in the world halfway through the decade.
Demolition waste typically consists of materials such as concrete, wood, bricks, plastics, metals, and glass, which are generated from the demolition of buildings, roads, and other infrastructure. Among these, concrete debris, in particular, can be recycled and processed into aggregates that serve as a substitute for natural sand in concrete production. Recycled demolition debris may be used as fine aggregate to cut down on the quantity of trash that ends up in landfills, lessen the requirement for virgin raw materials, and lessen the carbon footprint of the concrete production process.
There are several financial and environmental advantages to using demolition debris as fine aggregate in concrete mixtures.

1. Reduction of Natural Resource Depletion
2. Waste Management
3. Lower Carbon Footprint
4. Energy Conservation

Objective

1. To find the effect of demolition waste on the strength property of concrete.
2. To research demolition waste's characteristics, potential hazards, and safe recycling, reuse, and disposal techniques.
3. To study of existing practice done for managing construction and demolition waste.
4. To comparison cost of recycled products with available market product.

Methodology

The compressive strength of M20 and M25 concrete cells is excavated in this study by the relief of fine total with annihilation waste, ordinary portland cement (OPC), annihilation waste (reclaimed concrete aggregate) as fine aggregate, crushed granite as coarse aggregate, and potable water are employed. Mix rates of M20 is 1:1.5:3 and M25 is 1:1:2 with 10%, 20% and 30% of the fine aggregate by weight is replaced with annihilation waste. Concrete block (150x150x150)mm are cast, compacted using a mechanical vibrator, and cured in water for 7, 14, and 28 days. Compressive strength is tested using a Universal Testing Machine after the curing periods. The maximum weight at failure is recorded.

Result and Discussion Compressive Strength

Using M20 and M25 grade concrete mix with ratio 1:1.5:3 and 1:1:2 Compressive strength is a key parameter in determining structural performance. The values for cubes are summarized below in Newton per square milli-meter (N/mm²):

M20:

Type of concrete cube	**'Average Compressive strength' (N/mm2)**		
	7 Days	**14 Days**	**28 Days**
Normal cube	**13.5**	**17.6**	**19.4**
10% DW	**13**	**17.1**	**18.9**
20% DW	**12.9**	**16.5**	**18.7**
30% DW	**12.2**	**16.4**	**18.2**

*DW=Demolition Waste

Table no:1

M25:

Type of concrete cube	**'Average Compressive strength' (N/mm2)**		
	7 Days	**14 Days**	**28 Days**
Normal cube	**16.2**	**21.4**	**24.1**
10% DW	**15.9**	**21.2**	**23.9**
20% DW	**15.7**	**21**	**23.8**
30% DW	**15.2**	**20.8**	**22.8**

*DW=Demolition Waste

Table no:2

Density of various mixes:

%Replacement of DCW	**Weight of cubes in kg**	**Density in kg/m3**
0%	8.20	2429.63
10%	8.96	2654.82
20%	8.25	2444.45
30%	7.94	2352.60

Slump cone Test

Concrete's plasticity or fluidity y is measured by depression cone test. Concrete thickness or stiffness is measured laterally. A system is used to determine the thickness of concrete known as a depression test. The quantum of water used in the blend is indicated by the thickness or stiffness. The conditions for the finished product quality should be matched by the stiffness of the concrete blend.

%Replacement of DW	**W/C Ratio**	**Slump(mm)**
0%	0.5	72
10%	0.5	73
20%	0.5	78
30%	0.5	81

Comparison cost of Demolition Waste with available market product:

Concrete	**Cost of 1m3 concrete (Rs)**				
	Cement	**Fine aggregate**	**Demolition**	**Coarse aggregate**	**Total**
Normal concrete	3360	525	---	1302	5187
Demolition concrete(10%)	3360	472.2	45	1302	5179.5
20%	3360	420	90	1302	5172

Conclusion and Recommendation

1. The operation of sustainable concrete accoutrements, like reclaimed summations should be increased. This will prop in reducing the environmental impact of concrete product.
2. After 7,14,28 days, the compressive strength of M20 and M25 grade concrete are and of the normal concrete at independently.
3. Lower carbon emigrations due to reduced need for natural resource birth and transportation.
4. Waste reduction by repurposing construction debris, helping divert waste from tips
5. Energy savings in the overall material processing, leading to a lower carbon footmark.
6. In discrepancy, concrete with natural fine total has a advanced environmental impact due to the energy- ferocious birth processes, advanced CO_2 emigrations, and resource reduction.
7. The use of obliteration waste represents a more sustainable and climate-conscious choice, supporting indirect frugality principles and helping to alleviate climate change.

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