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Suitability of Partial Replacement of Coarse Aggregate by Replacement Coarse Aggregate

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Abstract - Concrete is the main material used in construction, composed of water, fine aggregate, coarse aggregate, and cement. The aggregates, sourced from nature, are depleting rapidly due to excessive use for development, creating a future shortage. To address this, it's essential to find alternatives. Demolition waste, a byproduct of construction and renovation Demolish concrete is huge problem we are facing now a days waste accumulates in large quantities, hampers the environment of disposal sites. The aggregate resource is limited it create imbalance between the high demand and supply. We collected demolished concrete from the construction site at Yashoda Technical Campus, Satara and we did several procedures on it such as separation, crushing, sieving, washing and quality control. We have Replaced natural aggregate with RCA of 10% to 40% were taken into account. Both the 7 and the 28 days strength were used for the examinations. We got maximum compressive strength for M25 grade of concrete at 10 % replacement but we can also use 40% RCA

Key Words: Recycled Coarse Aggregate, Compressive Strength, Crushing Strength, M25 grade concrete

1. INTRODUCTION *(Size 11, Times New roman)*

One promising approach in concrete research is the use of recycled aggregates derived from construction and demolition waste. Recycled aggregates, compared to natural aggregates, tend to be more porous and less strong, which can lead to a reduction in overall concrete strength. Studies have shown that adding up to 20% fine or 30% coarse recycled concrete particles generally does not negatively impact concrete strength. However, beyond these levels, strength tends to decline. The influence of recycled aggregate quality on concrete strength is more pronounced at low water-to-cement ratios, while at high ratios, its impact is minimal. Additionally, a higher cement-to-water ratio can help minimize the loss in compressive strength when using recycled materials.

2. Body of Paper

In this study, M25-grade concrete was prepared with RCA replacing natural coarse aggregate at 0%, 10%, 20%, 30%, and 40%. After proper separation, crushing, sieving, washing, and quality-control testing of RCA from Yashoda Technical Campus, cubes were cast and tested at 7 and 28 days.

Table -1: Sample Table format

Table DAY 28 Compression Test Result

	0%		10%		20%		30%		40%	
Sr.no	Kn	N/ mm^2	Kn	N/ mm^2	Kn	N/ mm^2	Kn	N/ mm^2	Kn	N/ mm^2
1	578.3	25.7	629.2	29.3	714.4	31.7	970.4	43.9	692.4	30.6
2	591.5	26.2	656.3	29.1	715.8	31.8	846.5	37.6	610.3	27.0
3	606.3	26.9	634.1	25.1	694.1	30.8	942.0	41.8	754.3	33.3
AVG	**592.2**	**25.01**	**639.8**	**28.4**	**708.1**	**31.4**	**919.6**	**40.8**	**685.8**	**30.4**

Compressive Strength:

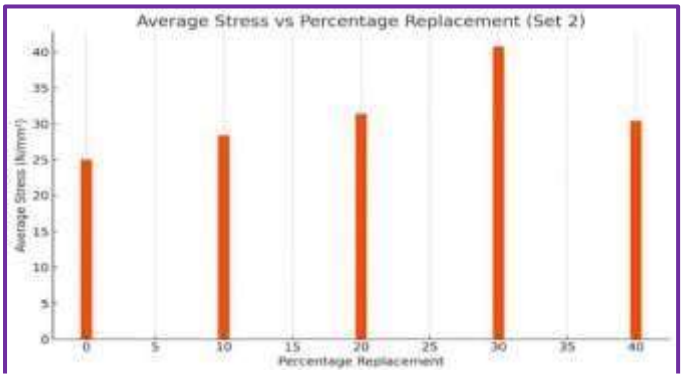
- **10–20% RCA**: 7-day strength slightly lower, but 28-day results within 3–5% of control, matching literature that shows ~≤4% strength drop per 10% RCA increment.
- **30% RCA**: Strength remained within 5–10% of control—still acceptable for M25 concrete .
- **40% RCA**: Strength declined by ~10–20%, aligning with reported higher porosity and weaker interfacial bonding .

Workability&Durability:

Slump values decreased with increased RCA (e.g. ~75 mm control to ~55 mm at 40%), due to higher absorption. Pre-soaking RCA mitigated slump loss

Fig -1: Figure

Charts



3. CONCLUSIONS

- Up to 20% RCA replacement results in compressive strengths very close to control mixes, showing minimal reduction (~<5%)
- At 30% replacement, concrete still meets M25 benchmarks, often within 5–10% of control strength
- At 40% replacement, strength drops significantly (10–20%) due to increased porosity and weaker bond at the aggregate-cement interface.
- Workability decreases with higher RCA content due to greater water absorption; pre-soaking RCA helps mitigate slump loss
- RCA concrete shows slightly lower density and potential for increased capillary absorption and permeability, though studies report acceptable performance up to 30% replacement.

ACKNOWLEDGEMENT

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REFERENCES

[1] B. Chaudhary, S. Dhiman, R. Talwar et al (2021) Experimental investigation of strength of concrete using recycled demolished construction materials as coarse aggregate. Materials Today: Proceedings https://doi.org/10.1016/j.matpr.2021.08.238

[2] D. Oh et al. Renewable and Sustainable Energy Reviews 135 (2021) Proposal of demolished concrete recycling system based on performance evaluation of inorganic building materials manufactured from waste concrete powder https://doi.org/10.1016/j.rser.2020.110147

[3] D. Pedro, J. de Brito, L. Evangelista, Influence of the use of recycled concrete aggregates from different sources on structural concrete, Constr. Build. Mater. 71 (2014) 141–151, https://doi.org/10. 1016/j. conbuildmat. 2014.08.030

[4] Eman Abdulhasan Mohammed Al-Ghalibi, Safaa A. Mohamad (2021) Evaluate the durability and effect of water absorption of recycled aggregate used in pavement. Materials Today: Proceedings https://doi.org/10.1016/j.matpr.2020.12.579