

# Effect of Nano-Silica in Performance of Recycled Aggregate Concrete

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**Abstract** - The effect of recycled coarse aggregate in nano silica solution on the properties of recycled aggregates concrete is compared with the direct mixing of NS in concrete. In this study, four series of concrete are considered. The first and second series are control series containing 100% natural coarse aggregate (NCA) and 100% RCA, respectively. The third and fourth series are similar to the second series in every aspect except that 2 wt% NS is added through direct mixing in concrete and presoaking of RCA in 2 wt% NS solution of 24 hr, respectively. Results show that the measured 7-day compressive strength of recycled aggregate concrete containing presoaked RCA is higher than that containing direct mixing of NS in concrete. The total porosity of mortar adjacent to RCA is also found to be significantly lower than the same, where NS is mixed directly. The concentration of pores in the matrix adjacent to RCA is also shifted to medium capillary pores from the large capillary pores of matrix adjacent to RCA containing no NS. The volume of medium capillary pores reduced significantly in the matrix adjacent to presoaked RCA compared to the same, where NS is mixed directly.

## 1. INTRODUCTION

- Reprocessing into coarse aggregates of concrete is a sustainable solution for the disposal of construction and demolition (C&D) waste. The use of recycled coarse aggregates however leads to a degradation in the resulting concrete, which then limits the use of recycled aggregate concrete (RAC) in structural elements.
- However, both the compressive strength and elastic modulus of RAC are generally lower than that of normal natural aggregate concrete.
- Due to this, the use of nano-silica into recycled aggregate concrete can enhance the performance of concrete.

## 2. METHODOLOGY

1. Collection of materials
2. Determining the properties of materials like cement and aggregate.
3. Preparation of mix at different proportion by replacing the cement with nano silica with 0%, 2%, 4%, 6% and 8%.
4. Testing for determining the performance of block.

### 3. OBJECTIVES

- To study the characteristic of nano-silica used in concrete.
- To determine the properties of Recycled aggregate.
- To determine the performance of recycled aggregate concrete with nano-silica.
- To study the strength of concrete

### 4. Result and discussion

Table 1: Compressive test of Concrete cube

Sample No	Date of test	Area (mm <sup>2</sup> )	Max. Load (KN)	Strength (N/mm <sup>2</sup> )	Avg
1	21/08/24	22500	220	9.78	13.93
2	21/08/24	22500	348	15.4	
3	21/08/24	22500	375	16.6	

Table 2: Compressive test of Concrete cube with Recycled Aggregate

Sample No	Date of test	Area (mm <sup>2</sup> )	Max. Load (KN)	Strength (N/mm <sup>2</sup> )	Avg
1	21/08/24	22500	186	8.26	9.28
2	21/08/24	22500	210	9.33	
3	21/08/24	22500	240	10.26	

**Table 3: Compressive test of Concrete cube with 2% Nano Silica**

Sample No	Date of test	Area (mm <sup>2</sup> )	Max. Load (KN)	Strength (N/mm <sup>2</sup> )	Avg
1	21/08/24	22500	369	16.4	16.75
2	21/08/24	22500	376	16.71	
3	21/08/24	22500	386	17.15	

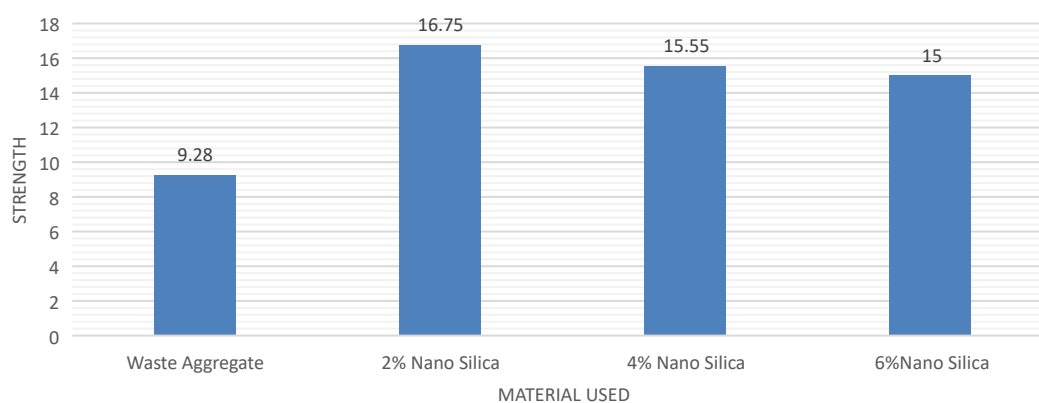
**Table 4 : Compressive test of Concrete cube with 4% Nano Silica**

Sample No	Date of test	Area (mm <sup>2</sup> )	Max. Load (KN)	Strengt h (N/mm <sup>2</sup> )	Avg
1	21/08/24	22500	357	15.86	15.55
2	21/08/24	22500	342	15.2	
3	21/08/24	22500	351	15.6	

Table 5 : Compressive test of Concrete cube with 6% Nano Silica

Sample No	Date of test	Area (mm <sup>2</sup> )	Max. Load (KN)	Strength (N/mm <sup>2</sup> )	Avg
1	21/09/24	22500	321	14.26	15
2	21/09/24	22500	336	14.93	
3	21/09/24	22500	356	15.82	

Comparison of material



## PHOTOS

### 1.Collection of material

We collected the material like cement (PPC), Fine aggregate , coarse aggregate.



### 2.Work Done







#### 4. CONCLUSIONS

It is concluded that the waste aggregate is not as strong as different percentages of nano silica. The 2% nano silica cube exhibits a superior strength compared to the 4%, and 6% nano silica, while the 2% and 4% nano silica are comparable in strength.

## 5. ACKNOWLEDGEMENT

We would like to express our gratefulness and sincere gratitude to my guide Mr. Y. U. Kulkarni, for guiding us to accomplish this project work. It was our privilege and pleasure to work under his able guidance, we are indeed grateful to him for providing helpful suggestion, from time to time. Due to his constant encouragement and inspiration we are able to present this project. We are thankful to our parents for their moral as well as financial support.

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