ISSN: 2456 - 1819
EIJO: Journal of Civil Engineering, Architecture, Interior Design and Innovative Research (EIJO–CEAIDIR)
Einstein International Journal Organization (EIJO)
Available Online at: www.eijo.in
Volume – 6, Issue – 1, January - February - 2021, Page No. 01 - 12

# Replacement of Cement, Sand and Aggregate Partially with Waste Material Occurred from Constructional Site

[1]Khushi Mohammad Khan, M. Tech Scholar, Department of Civil Engineering, Jagannath University, Jaipur, Rajasthan
[2]Himanshu Bhardwaj, Assistant Professor, Department of Civil Engineering, Jagannath University, Jaipur, Rajasthan
[3]Dr. Bharat Nagar, Professor & Head Department of Civil Engineering, Jagannath University, Jaipur, Rajasthan

**Abstract**

Industrial waste such as glass and sawdust to make room for the new and the modern is widespread in metropolitan areas due to rapid urbanization. However, very little waste is recycled or reused. The strict environmental laws and the lack of landfills in urban areas make the disposal of industrial waste problematic on the one hand and the extraction of raw materials becomes difficult on the other. This thesis presents the results of the practical investigations carried out in order to evaluate the effect of the partial replacement of cement, fine aggregates and coarse aggregates with glass and sawdust on the strength and concrete produced. For the study, a M20 class structural concrete mix (conventional concrete) was prepared using IS: 10262-2009. Subsequently, the various constituents of the concrete were replaced one after the other and finally in one, replacing them with the various sieved fractions of crushed industrial waste. Compressive strength was measured after 7 and 28 days. Therefore, the present study aims at a concrete mix in which coarse aggregates, fine aggregates and cement are partially replaced by pieces of glass (0%, 10%, 20% and 30%). Glass (1%, 2%, 3%, 4% and 5%) and sawdust (0%, 10%, 20% and 30% respectively) were performed for concrete.

**Keywords:** Concrete, Pieces Of Glass, Sawdust, Glass Dust, Coarse Aggregates, Fine Aggregates, Cement

## Introduction

Today solid waste dumping process becomes one of the most essential environmental & public issues in all country. In India, the disposal of cement and other materials and solid waste is inadequate, but are instead discarded in open spaces. In addition, through rapid construction work, natural materials are also quickly reduced especially ordinary and Soft River sand.

As an alternative method of solving such problems, it is very important to use waste materials in conventional concrete and build waste materials as processing materials. According to the report, partially recycled glass, glass dust and sawdust made entirely from waste and building materials can be used as substitutes for natural materials. This study identified the potential for waste management and demolition, construction and replacement of cementitious raw materials. Many old buildings repaired due to aging and cracks were demolished and the waste materials of those buildings were demolished.

When new buildings are constructed, the waste generated is construction waste. The total amount of C and D waste generated by the building is approximately 25% of the old construction solid waste and 75% of the new construction solid waste each year. This work uses window glass stains from C&D construction waste because it has some properties of volcanic ash, such as concrete. Therefore it was replaced by concrete. Glass fragments collected from waste and ground into fine particle dust are similar to concrete particles. Likewise, small pieces of wood are often used in floor systems, installations, light walls, and kitchen cabinets. Collect and pulverize into powder, then replace it with fine pellets. Compared to a good total, the water absorption rate of wood chips is high.

In this research work, we have discovered the best strength of cement in concrete conditions and the ability of cement to work in new conditions using another type of natural material that can be converted into demolition waste, and we also have other properties of concrete.

**Advantage over Normal Concrete**

Ordinary cement is important and cheap, but on the other hand, due to the maintenance cost of conventional concrete, when C&D waste is used instead of cement, the cost of cement increases, maintenance costs decrease, and the durability and workforce are very important in conventional concrete.

Compared to conventional cement, the conversion of C&D waste and raw materials into cement can improve printing and performance, thereby reducing the content and average content. C&D pollution improves water use and reliability in all specific years. Parts are lighter during processing and have less permeability.

**Objective**

- To understand its use in the construction industry.
- To reduce the additional burden on natural materials, replace construction and demolition waste
- Ability to compare natural materials with glass pieces; glass dust and C&D waste filters.
- To determine the properties of new and hard concrete and construction and demolition waste.
- To understand the compressive strength of construction and demolition waste used for construction concrete and conventional concrete.

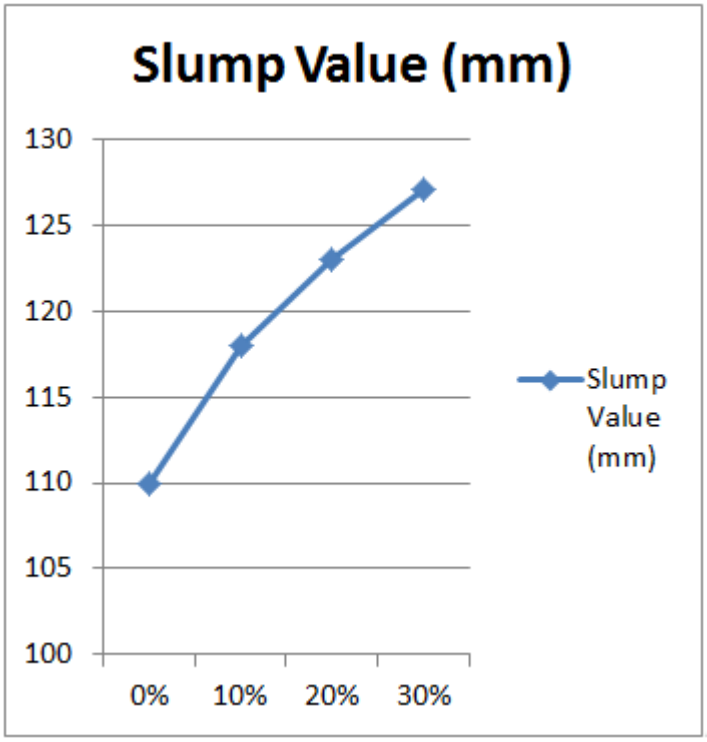
**Methodology**

- This study introduces the results of practical research to evaluate the effect of partial replacement of concrete with glass and sawdust, fine aggregates and coarse aggregates on strength and on the concrete produced.
- For research purposes, IS: 10262-2009 was used to prepare a concrete mix M20 (conventional concrete).
- Subsequently, the various components of the concrete were replaced separately, and finally replaced with one, and replaced with various sieved and crushed industrial waste.
- Compressive strength was measured after 7 and 28 days. Therefore, in this study, glass chips (0%, 10%, 20% and 30%), glass dust (1%, 2%, 3%, 4% and 5%) or wood chips (0%, 10%), 20% and 30%).

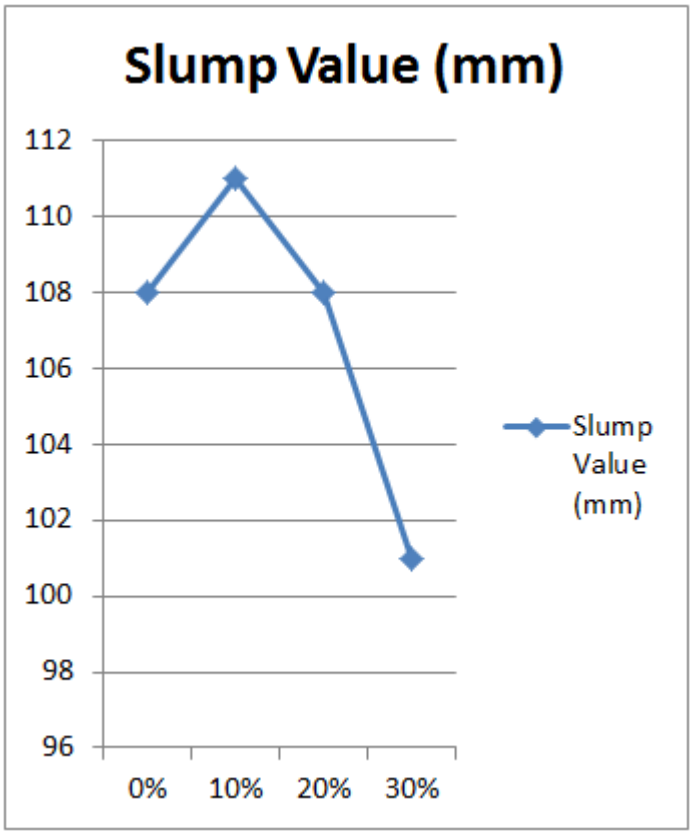
**Results And Analysis**

In this section, you will perform the results of your experimental work. The results are displayed in graph and tabular format. Results will vary for cement, coarse aggregate and fine aggregate. Cement, coarse aggregate and fine aggregate are waste glass powder, and the ratio of recycled coarse aggregate to sawdust is as low as 0% to 30%, and sawdust is 1%. The concrete mass M-25 is 3%. As a result, a sagging test and a compressive strength test were performed.

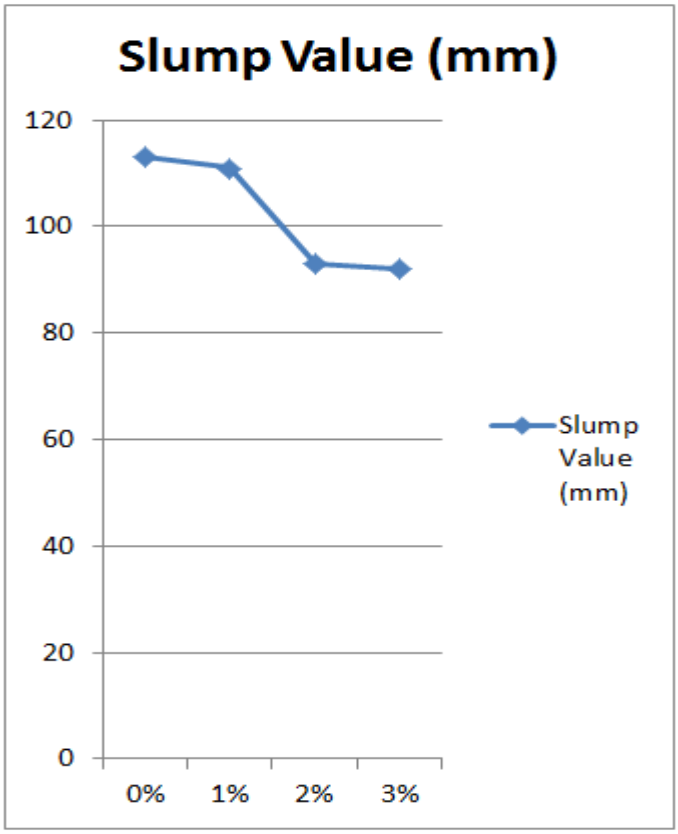
**Result of Slump test**



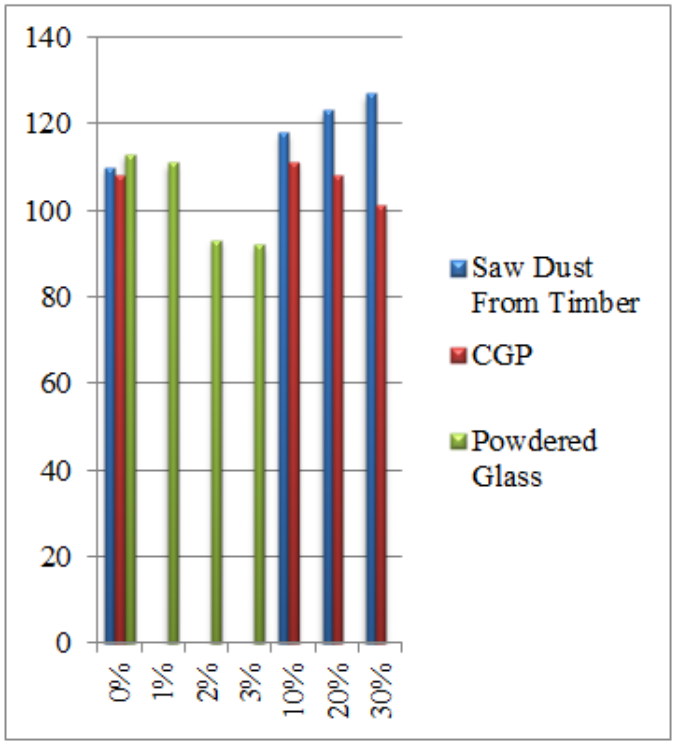

Graph 1: Effect of GP on Slump of Concrete for M25 Grade




Graph 2: Effect of CGP on slump of concrete for M25 grade



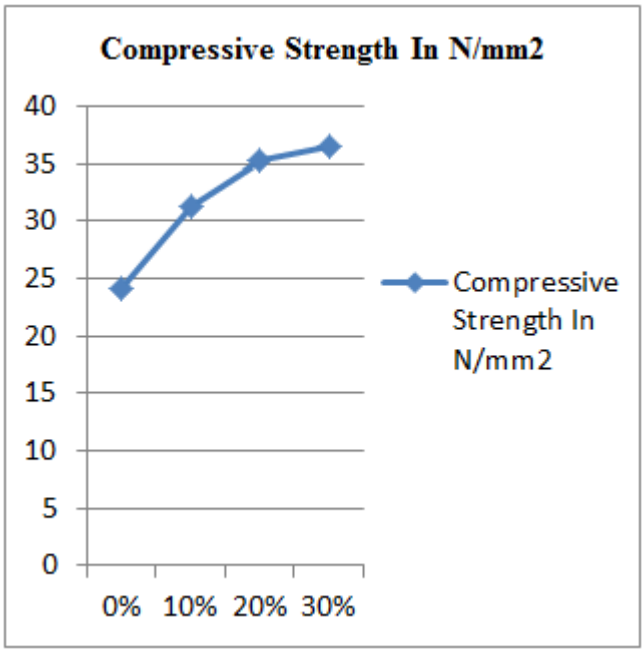

Graph 3: Effect of PG on slump of concrete for M25 grade



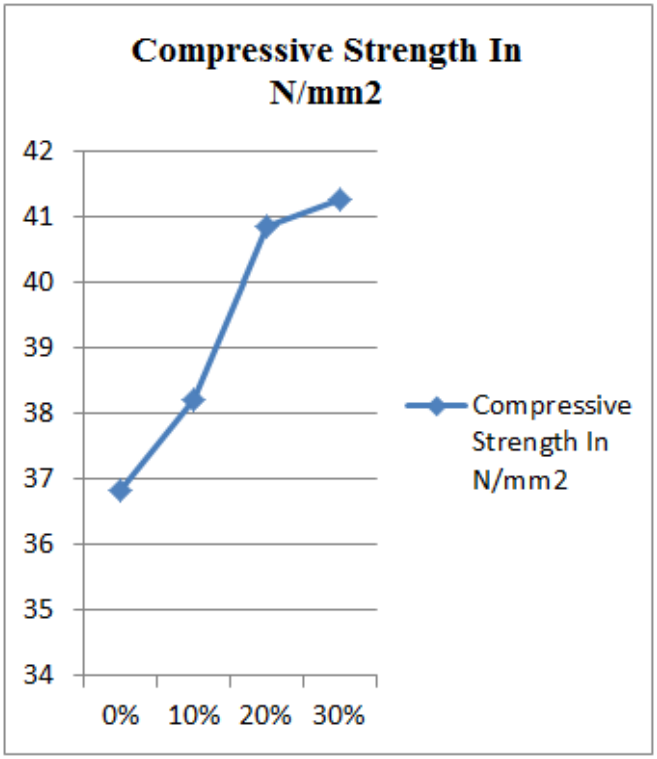

Graph 4: Combined Effect of Materials on Slump of Concrete

**Result of Compressive strength**

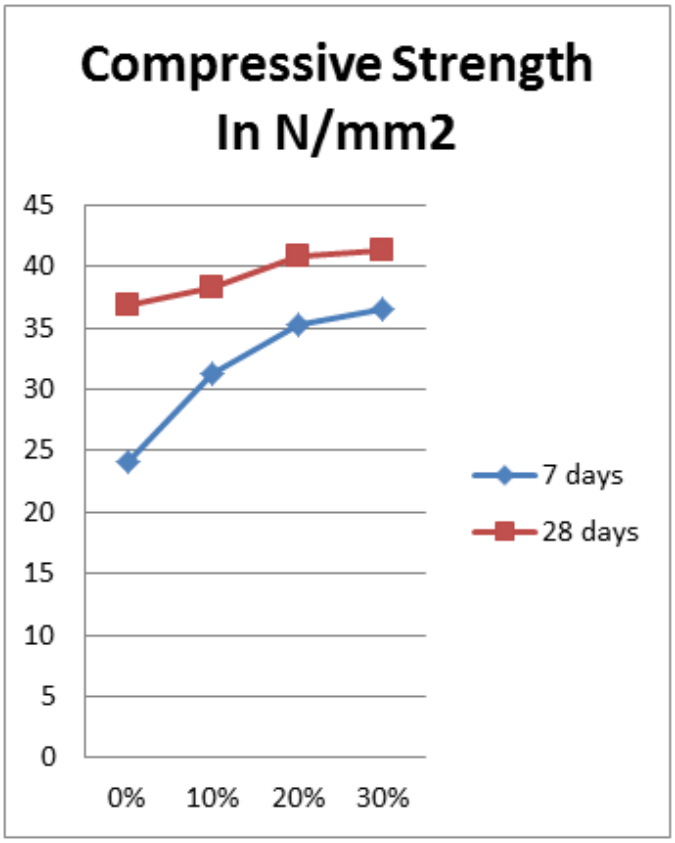
As per IS: 516-1959, the compressive strength of all concrete mixes with a cubic shape size of 150 mm × 150 mm × 150 mm was calculated. The cubic shape was tested in water 7 days and 28 days after it was fully cured.



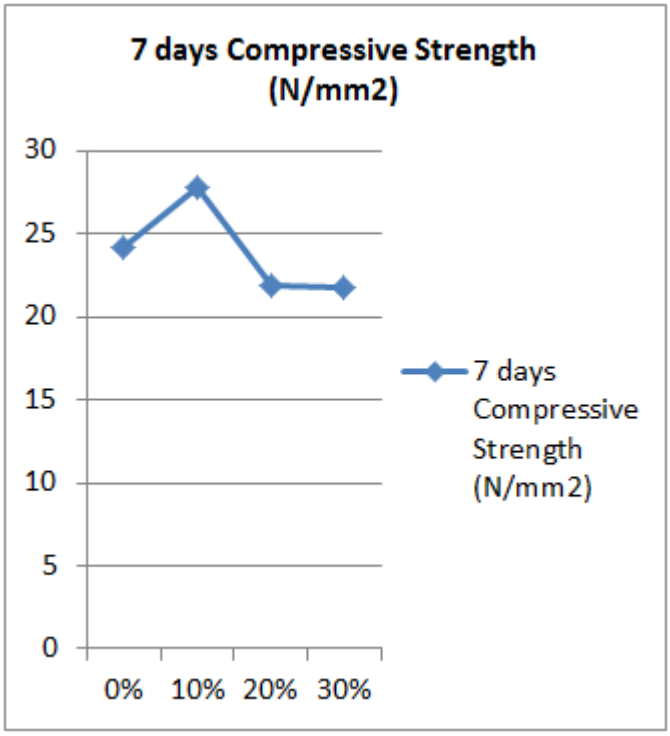

Graph 5: Compressive Strength of M25 at 7 Days on Different % Replacement of Wood waste from Timber with Cement



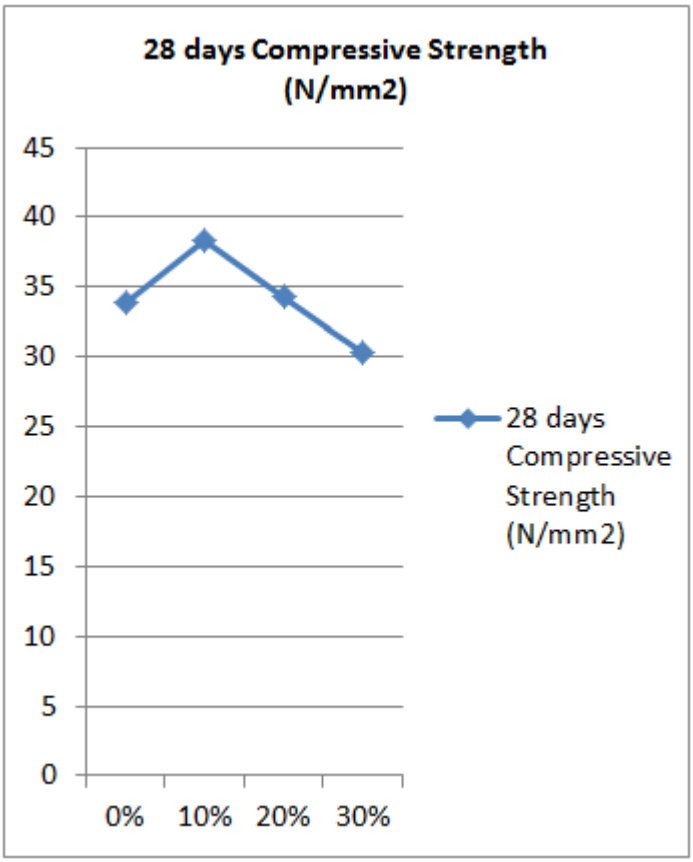

Graph 6: Compressive Strength of M25 at 28 Days on Different % Replacement of Saw Dust from Timber with Cement



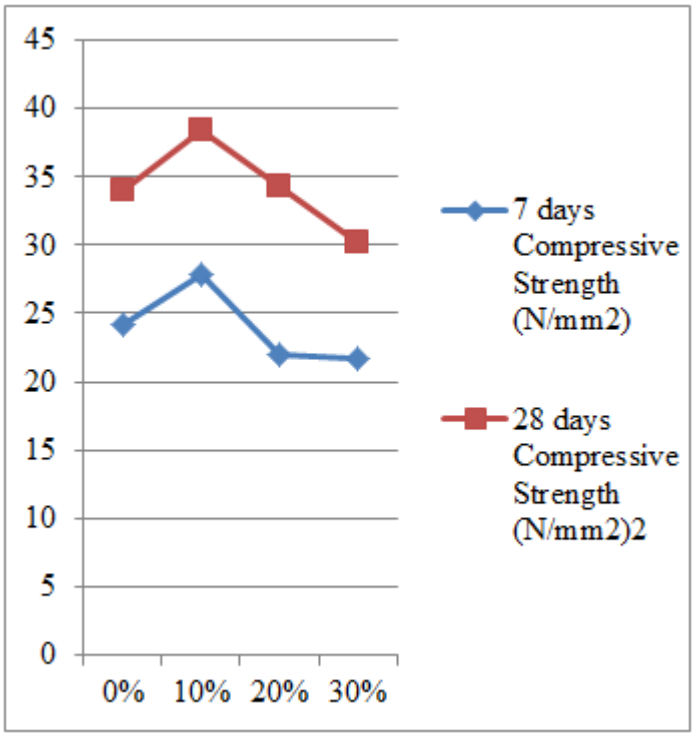

Graph 7: Compressive strength of M25 grade for 7& 28 days on replacement of wood waste with cement



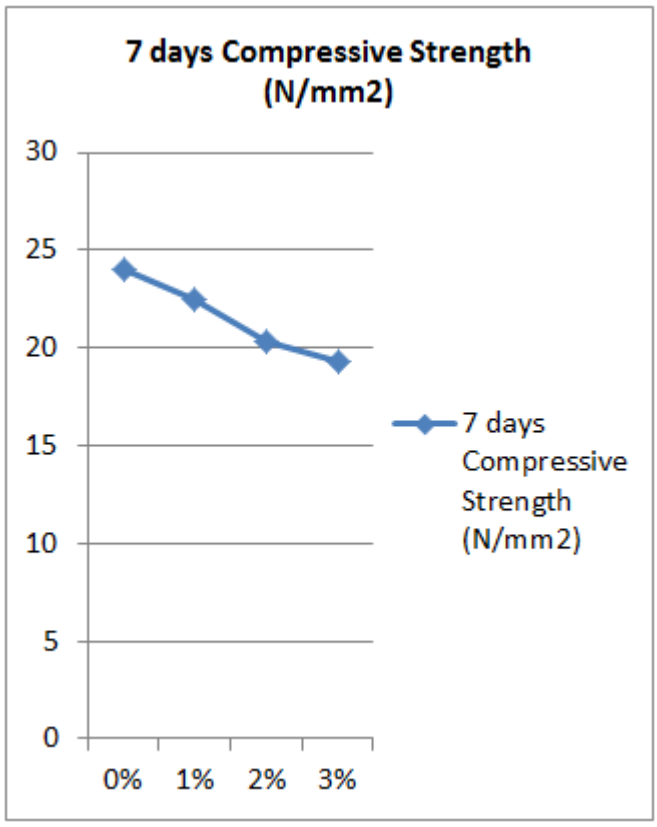

Graph 8: Compressive strength of M25 at 7 days on different % replacement of replacement of CGP with NCA



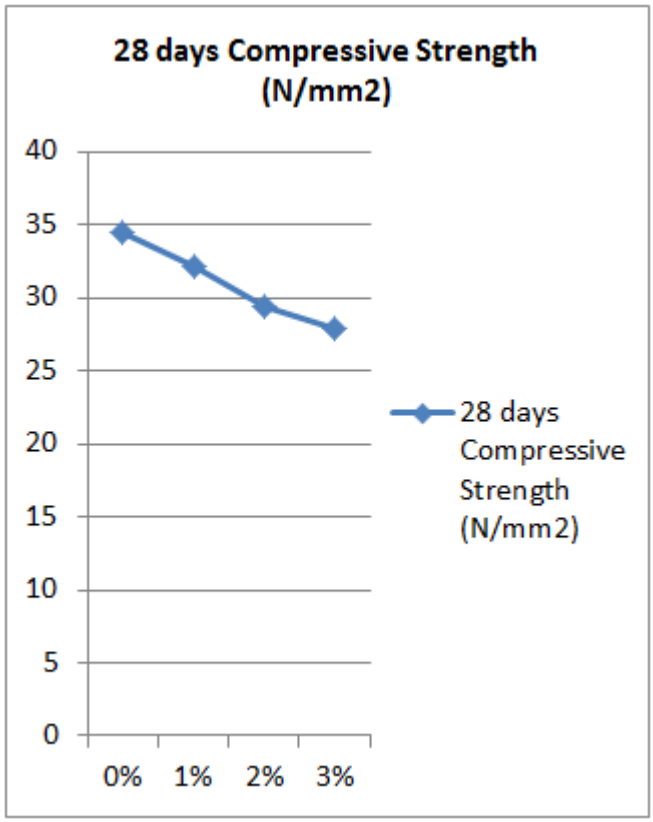

Graph 9: Compressive strength of M25 at 28 days on different % replacement of CGP with NCA



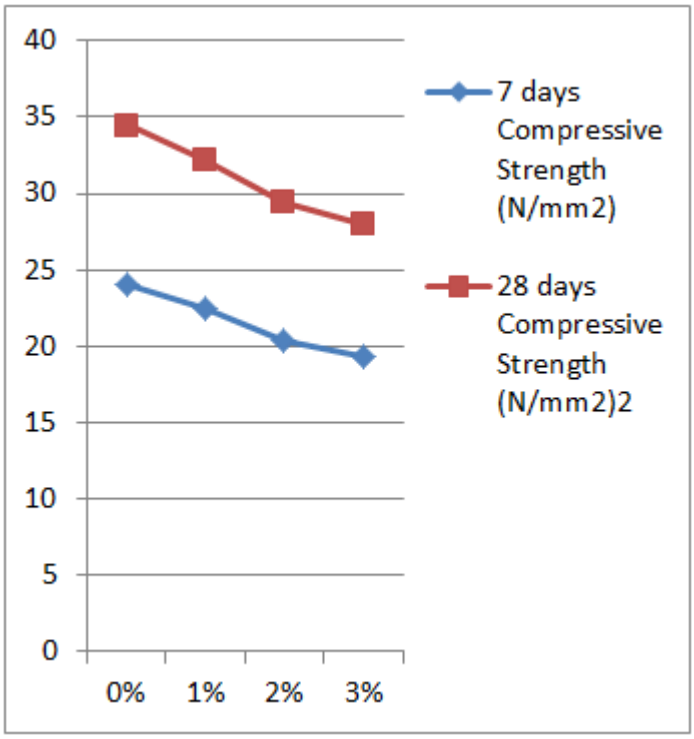

Graph 10: Compressive strength of M25 grade for 7 and 28 days on replacement of CGP with NCA




Graph 11: Compressive strength of M25 at 7 days on different % replacement Glass powder with NFA




Graph 12: Compressive strength of cube at 28 days on replacement of Glass Powder with NFA for M25 grade




Graph13: Compressive strength of M25 grade for 7 and 28 days on replacement of Glass Powder with NFA

**Conclusion**

This study found another way to reduce the environmental impact of the use of C and D waste in the production of cement / lime due to uneven handling of C and D waste and the use of other C and D waste that it will be released. Reduce raw materials.

The following conclusions from this experimental study are as follows:

**Conclusion of Fresh concrete**

- As the NFA content in the glass powder increases, water absorption decreases.
- The rate of water absorption increases as the amount of wood waste in the concrete increases.
- Likewise, when the percentage of CPG increases to 10%, the water absorption rate decreases, but when it exceeds 20% to 30%, the water absorption rate increases.
- Use better levels for better research, resulting in a significant increase in complaints.
- Due to the low water demand, the drop rate of the glass frit of the cement mixture is increased to 30% of the slow yield Compared to the drop value of the control mix; the slump drop is 127 mm. The 110 mm standard for the best concrete M25.
- Similarly, for raw glass, due to the low water demand, the CGP cement value in the concrete batch can be increased by up to 10%, while the standard quality batch value is reduced by 111 mm. M25 (108 mm). However, due to the increase in water demand and total recovery, the additional depreciation value was reduced from 20% to 30%.
- For wood waste, due to the large amount of water needed to reduce wood waste in the concrete mix, the yield slowly decreases by up to 3% at 92 mm compared to the reduced value of the control mix M25 (111 mm).

**Hardened concrete conclusion**

**At 7 days compressive power**

- The compressive force of concrete, found that the performance of replacing wood waste with cement is slowly increasing, up to 30%. Compared with the standard mixture M25, the performance value at 30% is 36.48 N/mm2 (24.18N/mm2).
- As regards the CGP compression force of concrete, it was found that the recycled aggregate replaced with coarse aggregate improved its strength to 10%, and the strength value at 10% was 27.83N/mm2, compared with the standard mixture quality control M25 (24.18 N/mm2).
- For the M25 category, the percentage change is large at 15.14%. However, as the density of concrete decreases and the absorption of substitute water increases the added value of compressive force decreases from 20% to 30%.
- The same is true for the compressive strength of the glass powder of concrete. The glass powder is replaced by fine aggregate. The resistance of the fine aggregate is slowly reduced by 3% during the replacement process. Compared with the standard value, the resistance value is as high as 3%, 19.33N/mm² M25 quality control mixture (24.18 N/mm²).
- Finally, we see that the compressive force of cement decreases as the percentage of wood waste substitution increases, and increases as the percentage of glass powder substitution increases, and first increases with the percentage, and then as the percentage of CGP substitution increases. Increase and decrease.

**At 28 days compressive power**

- The compressive strength of concrete, where wood and concrete waste slowly increased by up to 30% and strength by 30% was 41.26N/mm2 compared to conventional control blends. Class M25 (36.83N/mm²). The greatest percentage change was observed at 12.08% for the M25 class.
- The largest percentage difference turned out to be 10.84% for the M25 class. However, the added value of the compaction force from 20% to 30% decreases due to a decrease in the density of the concrete and an increase in the absorption of alternative water.
- With glass powder, the compressive strength of the cement, where the glass powder was replaced with a good total, slowly dropped to 3% and the 3%% strength value was 27.93 N/mm² compared to the conventional M25 control mixture (34.46N/mm²). The percentage decrease was observed (18.94%) for the M25 brand. 1% glass powder conversion lens
- The surface finish with cubes cast with glass powder and wood waste was softer and better than the surface finish of ordinary concrete cubes.
- The use of waste in concrete reduces the level of natural materials, especially river sand, and therefore the use of natural resources.
- The use of waste has had the opportunity to replenish waste and reduce the need for new waste.

**Future scope of work**

This research may be possible and is mentioned below:

- This study can be done with other types of stronger and more durable concrete (such as M40 and M50).
- This study is divided into other common types of clay, glass and wood flour. That is, almost all processed construction projects and demolition works can be produced from garbage waste, but other than construction waste, construction glass may be glass powder. Use glass boxes and cut wood instead of glass boxes and sticks
- Further evidence of alternative comparisons of alternating waves between aggregate and total aggregate utilization for M25 cement.
- Comprehensive pollution counter and soft cut glass powder.

**References**

1. Abhishek Verma, Krishna Murari, Shivanshu Awasthi, Shivank Kansal, Nitin Okte, and Yash Goyal, "Recycled aggregate from C & D waste modified by dry processing and used as a partial replacement of coarse aggregate in concrete" – a review, JMSSE, 5(7) : 671-678 (September2017).
2. Abishek Narayanan, Hemnath. G, Sampaul K and Anne Mary "Replacement of fine aggregate with sawdust " – a review, IJARBEST Volume: 3 (April, 2017)
3. Al Jburu Najad A.A., Hasan Kareem, J.K., Noor Azline, and Ostovar "Waste as a partial replacement management" (2019).
4. B.L. Gupta and Amit Gupta, Concrete Technology, Standard publishers distributer, Revised Edition,2012
5. IS: 10262-2009, Guidelines for mix Design of the concrete, Indian Standards Bureau, NewDelhi.
6. IS: 2386-1963, Guidelines for the method of test of aggregate for concrete, Indian Standards Bureau, NewDelhi.
7. IS: 383-1970, Guidelines of Indian standard specification for fine aggregate and coarse aggregate from a natural source for concrete, Indian Standard Bureau, NewDelhi.
8. IS: 516-1959, Guidelines for the method of test for the strength of concrete, Indian standard Bureau, NewDelhi.
9. Junaid Ahmed Peer, Syed Azhar Nazir, Mohammad Iqbal Malik, "Partial replacement of cement of cement using glass powder" (2015).
10. MS Shetty, Concrete Technology, Theory and practice, S. Chand and Company Ltd. Revised Edition,2018
11. N. Kumarappan "Partial replacement cement in concrete using waste glass" – a review, IJERT, Volume: 2 (October2013).
12. Prema Kumar W P, Ananthayya M B and Vijay K, "Effect of partial replacement of cement with waste glass powder on the properties of concrete" – a review, IJSCER, Volume: 3 (May2014).
13. R. Chitra, B. Vamshi, B. Kalyan Kumar, D. Guru Mahendra and G. Sunil Kumar "Experimental study on strength of concrete by partial replacement of fine aggregate with sawdust" – a review, IJPAM, Volume: 116(2017).
14. S. Baskar, G. Makendran and C. Arivarasi, "Experimental investigation on partial replacement of cement using glass powder" – a review, JCPS, Volume: 8 (December2015)
15. S. Jagadeesh, Dr. J. Vanketeswara Rao and CH. Vasavadatta, "An experimental study on the effective use of recycled concrete aggregate in rigid pavements" – a review, IJCIET, Volume: 9 (August 2018)

16. Sagar Raj, Purnima Birangi, Shridhar K, Vinoda M N, Sunitha H K "Study on effect of waste of glass as partial replacement for coarse aggregate in concrete" (2019).
17. Saurabh Singh and Dr. Gaurav Sancheti, "Replacement of aggregate by C & D waste concrete" – a review, IRJET, Volume: 6 (March2019)
18. Shilpa Raju and Dr. P. R. Kumar, " Effect of using glass powder inconcrete" – a review, IJIRSET, Volume: 3 (July 2014)
19. IS: 8112-2013, Guidelines for the test of OPC 43-grade, Indian Standard Bureau, NewDel