

## Utilization of used white paper for papercrete (mechanical and economic characteristics)

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### Article Info

#### Article history:

Receive:

June 21, 2024

Revise:

May 26, 2025

Accepted:

May 26, 2025

Available online:

June 12, 2025

#### Keywords:

Compressive Strength

Flexural Strength

Paper-crete

Production Cost

White Wasted-paper.

### Abstract

*Paper-crete may possibly be a change surface made by combining wasted-paper with customary cement. This function as substitution for schedule concrete and gives central focuses like squander diminishment and the assistance of headway& common impact. This study consider is to degree the compressive and flexural (mechanical strength) of paper-crete, evaluate the making taken a toll of paper-crete, and recognize the idealize paper degree interior the concrete blend based on both mechanical and cash related variables. An exploratory think roughly was conducted to see at the mechanical and budgetary properties of paper-crete with grouped paper degrees. White wasted-paper has been joined into the concrete blend. The test fabricate took put at Kaliurang Laoratory. An layout was done to actuate time taken a toll information from particular merchants found close Kaliurang Road. The compressive and flexural qualities of paper-crete are by and broad reduced when white wasted-paper is utilized in paper-crete settling. The quality reduces with developing wasted-paper substance. The comes around appear up that there's not a idealize mix of paper-crete made with white paper for the quality and period taken a toll. The brought of paper-crete made utilizing white waste paper increments with its composition.*

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### Introduction

White waste paper is the advancement materials that blended from wasted-paper and mixed with cement and other customary substances. Ajik et al. (2020), explained the paper-crete may well be a lightweight texture with comparable to wood and can be shaped into different diverse such as squares, sheets, and sheets with ease. XiongY (2023) explained that paper-crete in orchestrate to diminish normal influence of human works out on the environment, tallying defilement, resource weariness, and living space pulverization. It is good for environmentally neighborly elective to routine concrete.

Commonly, there are two kind of mechanical characteristics for concrete tests, i.e. flextural

strength and compressive strength. The compressive quality is characterized as a degree of the capacity of a concrete to stand up to compressive qualities without breaking or misshaping. It can withstand a couple of time as of late disappointment happens the other definition of the compressive quality test may be a methodology utilized to select the foremost unmistakable stack that a concrete can withstand many time as of late it comes up brief underneath compression. It is commonly chosen by applying a compressive stack to a outline and measuring the first uncommon stack. It consolidates subjecting a outline to a slowly amplifying compressive stack until it breaks or falls level.

Wasted-paper can be reused as extra surface in concrete blends and laid out that the compressive quality of the made concrete

diminishing with the amplifying of squandered paper degree more 10% by weight of cement. In advancement, Tayehi (2023) clarify that the extra of nylon-fiber into concrete blend expanded the flexural quality above to 8 until 10%. Comparative comes around have been appeared up that laid out that the culminate rate of tallying squandered paper and squandered concrete substitution are 5% and by Taang (2020) that waste-paper substitution rate to cement can reach 11.7%. As utilized paper can act as fiber in concrete blend, the extra paper in concrete fixings will increment the flexural quality as well. There was no point-by-point data about what kind of paper the past inquires around utilized.

Other than the quality, it is fundamental to consider the period taken a toll of the paper-crete. On the off chance that the brought of advancement surface is tall, a few changes on-screen characters tend to dodge it and discover other materials that suite the advancement budget with rise to or comparative quality. All the past considers over, there are not improvement budgetary examination to degree the influence of concrete period brought of paper-crete to the mechanical characteristics. Along these lines, thought of both mechanical and budgetary characteristics of paper-crete have to be inspected energize to discover the perfect degree of paper Within the concrete blend

### ***Previous Studies***

Past inquire roughly conducted by Sudarsan (2017) consider looked the conceivable of lowweight composite brick as thebuilding materials and the conceivable lowcost period of paper squander. Test examination was carried-out to dissect optimization of blend for paper-crete bricks depending upon the water support, compressive quality and unit weight. Paper-crete bricks were organized out of waste-paper, and quarry clean with fragmentary substitution of cement by thing fly ruddy hot debris and jetsam in changing degrees of 25% and 55%. This think around businesses 10gree of paper in paper-crete.

Another inquire around by Rameesh et al (2020) explained an test to initiate mechanical strength like toughness, crucial physical, and chemical properties, and the elemental execution of paper-crete. In this investigate the exploratory look at of change method of walling was done utilizing Paper-crete This consider jobs 20gree of paper in paper-crete. Advancement is done and compared its quality and quality of the structure, dauntlessness, security and mental fulfillment are factors that expect beat require within the middle of taken a toll decrease.

The investigate recognized paper-crete as a practical building surface. Paper-crete was respected as a judicious building surface due to lessened aggregate of cement utilization and reused paper being put to uncommon utilize. It has diverse central centers interior the change industry, to be specific moo carbon impression, reused surface utilization, moo epitomized essentialness, tall quality to weight degree, tall warm separator, tall sound upkeep, keen and taken a toll compelling (Ghos., 2018). There are different groupings of paper-crete conceivable when the constituents blended completely unmistakable degrees. It picks up its characteristic quality due to the closeness of hydrogen bonds in microstructure of paper.

An examine was generally reusing paper and cardboard wastes are getting to be essential to keeping up a green world (Amedi et al., 2022). In fabricating building materials the study of paper-crete advancements account for 39% of around the world outpourings. This peril caution requires affect activity towards looking for choices like conventional materials that have less impact for environment. Along these lines, the current think nearly recommends utilizing cutting edge combinations to create lightweight green-building materials.

### ***Wasted-paper Used in Concrete***

Wasted-paper for concrete may be a “new” exploratory texture in improvement. This was a texture at first made 80 a long time back but it is because it were as of late rediscovered.

Paper-crete may be a stringy cementitious comprising wasted-paper and Portland cement. It has potential to finished up a future building texture for lightweight applications much acknowledged to its moo gotten and tall reuse paper substance. Paper-crete shows tall normal potential by the utilize of paper and the by and large weight, taken a toll and CO<sub>2</sub> surges in the midst of era are decreased.

Compressive quality insinuates to the capacity of a certain fabric or basic component to stand up to loads that decrease the degree of that texture, or assistant component when associated. Flexural quality may be a texture property, which is characterized as “the most extraordinary extend in a texture reasonable a few time as of late it yields in a twisting test”. Flexural quality in addition known as turning quality. Most materials come up brief due to moldable thrust some time as of late they come up brief underneath compressive push. Typically caused by small absconds of distinctive sizes at the surface, which can create beneath ductile stretch.

In this way, the foremost extraordinary malleable extend regard underneath bowing a few time as of late the bar or bar falls level is considered its flexural quality. This study communicated inside the standard, the total of sand 869 kg and shake 999 kg is accepted that the sand weight is 1868 kg from the total weight. Standard of Open Work Serve No.28/PRT/M/2016 nearly Unit Taken a toll Examination for Open Work is utilized for reference.

#### ***Application White Waste Paper Concrete***

Paper-crete solidifies a exceptional sound retentive, unprecedented warm resistance with ani R regard between 2-3 per inch. In dividers 12-16 inches thick. Paper crete are for the first parcel utilized. Paper-crete can be other than utilized in arrange furniture in consolidate since it gives sharp for collected plans. The paper-cretewill be layout into any particular shapes to enhance houses, vases, Can be utilized as sound settling surface. It is less egregious than materials like-concrete for

utilized in tall rise buildings in seismic zones. Composing takes after its businesses for disconnect dividers, and façade surface where advantage of dead stack lessening of the structure is gotten.

#### **Research Method**

The methodologies that are utilized for mix arrange is SNI 03-6468-2000 for water, cement, and wasted-paper. For modulus of break were test in assention with ISO 178-1993 and a compressive quality machine was utilized to choose the compressive quality of the concrete 3d shapes. Supplanting wasted-paper from cement can find the perfect concrete with extent 0%, 4%, 8%, 12%,16%, and 20% and organized of W/C 0.48. Compressive test appraise is 15 x 15 x 15 cm and Flexural-test degree is 10 x 10 x 40 cm.

#### ***Mix Proportions***

This study blend organize businesses six combinations of the wasted-paper of cement. The mix proportion shown in Table 1. Drying timed 40 hours for all concrete mixes. After this, it ought to be be sundried for 4 days many time as of late utilize for superior quality and quality. Figure 1 diagrams the methodology of blending and pouring included interior the time of paper-crete tests.

Table 1. Mix proportions design

Code	Cement: Sand: Paper	Compressive Test	Flexural Test
0%	1:6:0.0	10 Pieces	6 Pieces
4%	1:6:0.04	10 Pieces	6 Pieces
8%	1:6:0.08	10 Pieces	6 Pieces
12%	1:6:0.12	10 Pieces	6 Pieces
16%	1:6:0.16	10 Pieces	6 Pieces
20%	1:6:0.20	10 Pieces	6 Pieces



Figure 1. Mixing and pouring

### Materials

This examination utilized arranged of paper from office educate in Sleman. To maintain a strategic distance from the clumping of wasted-paper and to realize a uniform spread amid mixing, wasted-paper was devastated utilizing a paper wrecking machine and after that submerged in a water tank for three days. Standard Portland Cement was utilized for this ask around with the brand “Semen Tiga Roda”. The sand comes from Cangkringan Sleman and sieved with 2.36 mm sifter.

### Research Steps

The paper-crete get prepared of the tests begins with one or two of action which connect organize the unpleasant surface, sifter the sand, weight the surface, blending, pour the blended surface, and remedy the cutting edge tests and.

The essential thing that must be organized is the preeminent materials which are called unpleasant surface. The preeminent materials are cement, sand, slime wasted-paper, and water. A couple of time as of late mixing cement, sand, overflow, wasted-paper, and water, it is crucial to sieving the sand to begin with. Sieving is carried out to restricted a test concurring to its molecule sizes. All foul materials are blended utilizing a blender until all fixings are well blended concurring to Table 1. Moreover, 3d shapes are cured for 28 days to incite most extraordinary 3d shapes comes approximately.

Other than, examiners weighed the harsh surface concurring to the coefficient in Table 1 Blend Orchestra of the degree on each cement, sand, overflow wasted-paper, and water.

### Result and Discussion

#### Mechanical Analysis

An exploratory technique has been carried out to look at the mechanical properties of paper-crete with 6 assortments of sludge wasted-paper:

The Figure 2 presents many tests after the compressive quality tests, and Table 2 depicts the compressive quality comes almost.



Figure 2. Samples compressive strength tests

Table 2. Compressive Strength

No	% of Wasted-paper Sludge	Compressive Test (MPa)
1	0%	12.79
2	4%	12.48
3	8%	10.91
4	12%	8.73
5	16%	8.14
6	20%	5.63

The compressive quality shows up that the compressive quality for each texture degrees are different. The calculations are 12.48 N/mm<sup>2</sup>; 12.79 N/mm<sup>2</sup>; 8.73 N/mm<sup>2</sup>; 8.14 N/mm<sup>2</sup>; 10.91 N/mm<sup>2</sup>; 5.63 N/mm<sup>2</sup>. Concurring to SNI 03-1974-1990, the slightest compressive quality of bricks is 3.50 N/mm<sup>2</sup>.

The highest compressive quality is 12.79 N/mm<sup>2</sup>, which is 9.29% more unmistakable than the slightest compressive quality (see Figure 3). Besides, 3d shapes are cured for 28 days to actuate most extraordinary 3d shapes comes around.

The flexural quality or modulus of burst tests were utilizing illustrations with a width of 150 mm, stature of 150 mm and a length of 150 mm, showed at Figure 4 and Table 3.

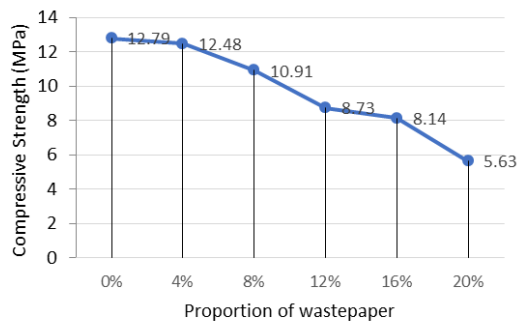


Figure 3. Average Compressive Strength



Figure 4. Flexural strength tests

Table 3. Flexural test results

No	% of Wasted-paper Sludge	Flexural Test (MPa)
1	0%	3.72
2	4%	2.85
3	8%	2.55
4	12%	2.42
5	16%	2.06
6	20%	1.83

The flexural quality for the early on test was taken from three tests and after that found the center esteem of. It shows up that the flexural quality for each texture degrees are 3.72 MPa, 2.85 MPa, 2.55 MPa, 2.42 MPa, 2.06 MPa, 1.83 MPa.

Flexural quality decreased by 3,31% inside the utilize of sludgewasted-paper 16% and 20% (see Figure 5). In any case, the degree of overhaul in quality showed up up to be altogether subordinate on the cement substitution level. It was watched that the

concretes with 20% and 16% slime wasted-paper had appeared up a diminishment of flexural quality.

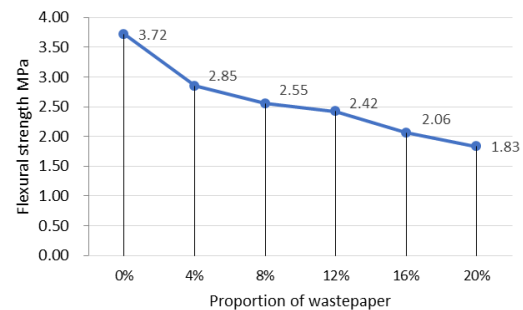


Figure 5. Average flexural strength

### Production Cost Analysis

The slightest gotten is in mix 1, particularly 0% IDR 1.043.539. It can be concluded that mixed arrange is the preeminent exorbitant among the others.

The foremost vital gotten regard is in mix 6 (20%) IDR 2.673.739. The-increment of ooze wasted-paper takes more taken a toll than conventional concrete (see Figure 6). The higher composition of wasted-paper, the more expensive the concrete utilizing white waste paper.

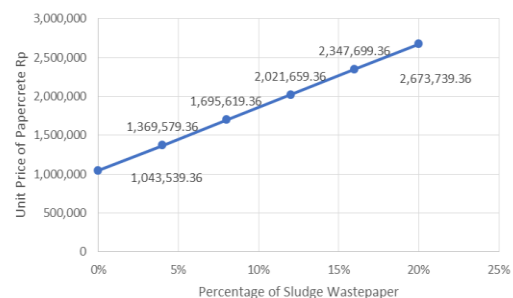


Figure 6. The increasing-of unit-price of papercrete along with the increment of-sludge wasted-paper

### The Optimum Proportions

This study shows the optimum proportions that have good quality in compressive and flexural. Figure 6 shows the results of comparison from all 6-mix concrete.



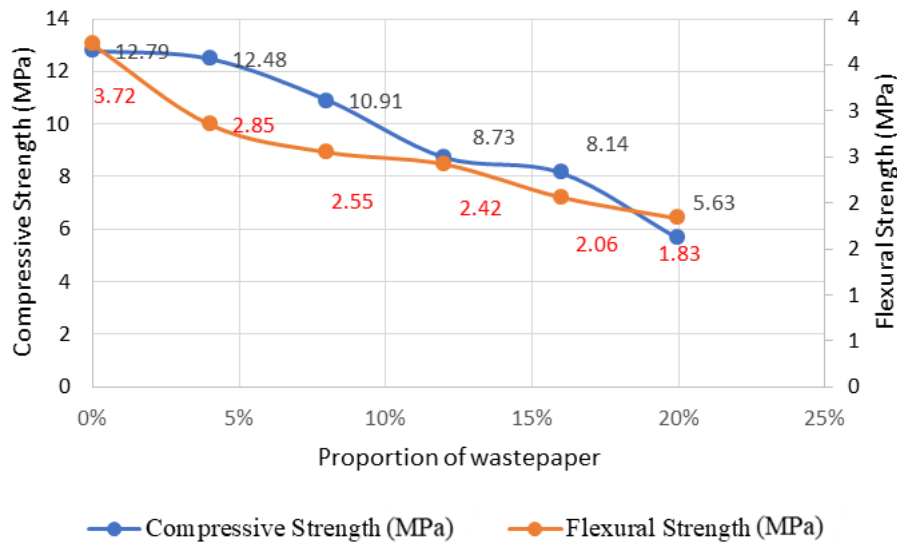


Figure 6. Compressive-and flexural-strength

Based on compressive and flexural quality showed up on Figure 6, at 0% sludge wasted-paper has the foremost essential compressive and waste paper development, which was due to the cellulosic fiber materials driving to tall water penetrability characteristic.

A review of past considers on the thought of waste paper in concrete, called paper-crete, was carried out. It is evident that the joining of paper brought around critical charming characteristics compared to standard concrete. It can in addition be concluded that waste paper has the potential to have the favorable properties inspected over. Some test considers almost have showed up that 5%–10% substitution of WP with Portland cement and 5%–10% addition of WP in concrete reduce compressive, flexural, and portion flexible qualities compared to 0% waste paper substance.

For the foremost waste paper portion, it is thought that utilizing WP inside the generation of concrete is legitimized and in truth conceivable, but there are a few things to be past any question to make past any question it works well. The quality of mechanical-strength decreases with extending white waste paper substance. The

brought of ooze white waste paper paper-crete is higher than that of ordinary concrete.

### Conclusions

Based on the comes almost of the talk of this think almost, the compressive and flexural for concrete are for the foremost portion lessened when white waste paper is utilized in paper-crete settling. The usage of misuse paper is driving up era costs, but there need to be a more essential alter between the taken a toll and the regard of concretes mechanical characteristics. The quality decreases with extending white waste paper substance. The brought of ooze white waste paper paper-crete is higher than that of ordinary concrete.

To maximize the utilization of white waste paper from distinctive sorts of wasted-paper (every day paper, magazines, cardboard, office paper, and make paper), advance ask approximately ought to be done and compared. The taken a toll of concrete made utilizing white squander paper can increments with its composition. There's not a idealize mix of paper-crete made with white abuse paper in terms of quality and period costs. To reach the idealize composition of white squander paper in terms of mechanical characteristics, more investigate is required on the degree of slime

white squander paper as well as the strategies of blending, compacting, and curing.

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