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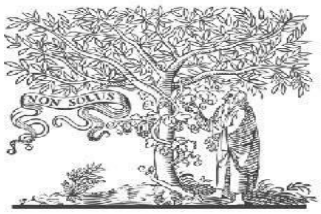

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Paper Authors

K. Manasa Reddy, B. Fayaz

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STUDY ON COMPRESSIVE AND FLEXURAL STRENGTH OF CONCRETE WITH CERAMIC POWDER MATERIAL AS PARTIAL REPLACEMENT OF CEMENT

K. Manasa Reddy[1], B. Fayaz[2]
[1]M.Tech Student, PVKK Institute of Technology
[2]Assistant Professor, Department of Civil Engineering, PVKKIT

ABSTRACT

The current existence has shown enormous urbanization of the use of ceramic waste. Almost 15% -30% of production of ceramics goes as discarded. In the existing society, these wastes pose a challenge and require a proper management to achieve sustainable development. A sustainable concrete from ceramic waste is extremely important to develop. Ceramic waste is economical and enhances the strength characteristics and prevents contamination by harmless waste clearance. This research study compared the ordinary Portland cement and its flexing strength, split tensile strength of conventional concrete and the ceramic replaced concrete with a result which replaced ceramic waste polish in the range of 0 percent, 10 percent, 20 percent, 40% and 50 percent by weight with M-50 concrete and a compressive strength bending force.

1. INTRODUCTION

CONCRETE

The concrete consists mainly of water, aggregates and cement, and is a composite material. By adding additifs and reinforcements to the concrete mixture, the physical properties desired for the finished material can be achieved. By blending these ingredients in certain proportions a solid mass can be easily molded into the desired shape. Over time, a hard cement matrix connects the remaining components into one (strong) durable, single material for various applications, like buildings, pavements, etc. The concrete technology had previously been adopted by the ancient Romans at large, and the majority of the concrete technology in the Roman Empire was widely used. The main building of the coliseum in Rome was concrete and the pantheon dome is the biggest non-reinforced cement structure in the world. In the mid-18th century following the collapse of the Roman Empire, technology had become pioneer in the field of concrete. In terms of tonnage, today the widely used human material is concrete.

HISTORICAL BACKGROUND

Although high strength concrete is regarded as a relatively new material, over the years its development has gradually increased. In the 1950s, the USA considered the 34 mpa compressive concrete to be high. The 41mpa to 52mpa compressive concrete was used for commercial use in the 1960s. 62mpa concrete was produced in the early 1970s. Within the last 15 years, however, concrete with an extremely large strength has entered the high-rise and long-range construction sector. IS 456-2000 has been designed for use with pre-stressed concrete elements and cast on-site buildings to achieve compressive force over 110mpa.

Recently, however, reactive concrete could have almost 250mpa compressive force. Poszolanic materials are fully supported. The first distinction between high-fit concrete and nominal-fit concrete refers to the relation of extreme resistance provided for the application of any kind of load by the compressive force of the concrete sample. While there is no correct split between high-fit concrete and normal-fit concrete, the Yankee Concrete Institute has defined a high-fit concrete of the compressive force greater than 42pa.

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PROPERTIES OF CONCRETE

The concrete is usually a material with high compressive resistance compared to tensile strength. As the tensile stress is lower, some materials, such as steel, are generally reinforced with high pressure. The elastic behavior of concrete is relatively constant at low stress levels, but at higher stress levels, as the fracturing matrix develops. Beton has a low thermal expansion coefficient and is shrinking in its maturity.

All concrete structures break up in some way because of the shrinkage and tension. Subject to duration forces. Concrete susceptible to creeping. Different tests are performed for the applications to ensure that the concrete properties meet the specifications. Various concrete strengths are achieved using different mixtures, measured in psi or Mpa, of concrete ingredients. Different concrete strengths are used for various building purposes. A very low-strength concrete can be used if the concrete needs to be lightweight. The lightweight concrete is obtained by adding small aggregates, air or foam, the secondary effect is that concrete's strength is reduced. The concrete is usual in routine work with 3000-psi to 4000-psi. Although the 5000-psi concrete is a more costly option, it is more durable and commercially available. Beton with 5,000-psi is frequently used for larger civil projects. Concerning specific construction elements, the concrete strength above 5000 psi was often used. For example, buildings of high-rise concrete made up of columns of the lower floor can use twelve thousand psi or more solid concrete to keep the columns small.

2. LITERATURE REVIEW

GENERAL:

studied the replacement of 0%,20%,50% and 100 % of total natural aggregate volume with recycled aggregate (recycle brick and sanitary ware aggregate) for determination of its mechanical properties i.e. workability, Fresh density, compressive strength , split tensile strength, modulus of elasticity, abrasion resistance and influence of superplasticizers. Wioletta et al. [7]

Studied about the properties of cement matrix modified with ceramic waste by the addition of
ceramic filler (10%, 15% and 20% of cement mass) with Mortar and tested its consistency retention, workability retention, shrinkage test, freeze-thaw resistance test, flexural and compressive test (2,7,14,28 and 56 days) .Jiménez et al. [8]

tested the replacement of natural fine aggregate with ceramic waste in masonry mortar with the
replacement of fine aggregate (0%, 5%, 10%, 20% and 40%) of natural sand with ceramic recycled fine aggregate in a ratio of 1:7 volumetric cement-to-aggregate. Katzer [9]

did the strength performance comparison of mortar made with waste fine aggregate and ceramic fume with exchange of cement by ceramic fume Lots of researcher has been done a research on concrete. This paper covers some of the paper based on partial replacement of cement.

The effect of ground granulation blast furnace slag was investigated by Wen-Tens Kuoet al.[1] (GGBFS). At the age of 28 days of cure, the compressive force of the control group was in the range of 29.1–1.7 MPa, whereas the pulse strength of PZT was within the range of 26.8–30.0 MPa. The compression power of PZT was measured at the level of 26.9–30.0 Mpa. In the electricity property test under 50 V, the monitoring group showed higher results (1786-2075 X), compared to lower results (1368-1562 X). PZT was less effective. The compression strength and test results showed that compressive strength and resistance were decreased as the substitution of GGBFS

increased. The electrical property tests showed that The strength of the control group was higher than that of PZT, as the piezoelectric material was replaced by 5 per cent of the fine aggregate and the piezoelectric material was water resistant. The piezoelectric material cannot therefore be combined effectively with fine aggregates and cement.

3. MATERIALS AND PROPERTIES

DESCRIPTION OF MATERIALS

Concrete is a three-pronged composition. Cement, fine and coarse compounds. In manufacturing concrete these three raw materials play an important role. The properties of concrete change by changing the properties and the quantity of these materials. Cement, fine aggregate, coarse aggregate are the main raw materials used in this experimental work.

CEMENT:

The most common type of concrete used around the world as a basic ingredient is ordinary Portland Cement, made from concrete, morter, stuccus and most non-specialty grout. Cement is the main component of concrete production. By changing the cement content, the characteristics of the concrete are greatly affected. This project uses ordinary cement, 53-grade Portland, which is confirmed by IS 12269–1987.

It developed in England in the mid-19th century from other types of hydraulic lime and usually comes from calcareous stone. It is a fine powder made from clinker-forming heating materials. We add small quantities of remaining ingredients after grinding the clinker. There are many different types of cements on the market. The OPC Cement 53 Grade provides a constantly higher strength in comparison to others when it comes to various grades of cement. The grade number of the cement underlines the compressive strength minimum that the cement will be achieved in 28 days, as per the Bureau of the Indian Standards (BIS). For 53 degrees, OPC Cement should not be less than 53MPa, or 530 kg/cm2, the minimum compression strength obtained by the cement by end of 28 days. The color of the OPC is gray and white cement is obtained by removing ferrous oxide during the cement production process.

The 53-grade Ordinary Portland Cement Ultra Tech Company was used to investigate and available in the local market. The procurement has been carried out from single batching in air-tight containers so that atmospheric conditions do not occur. This concrete was tested according to IS: 169-1989 for physical requirements and IS: 4032-1988 for chemical requirements. Table – 1 shows the physical characteristics of cement.

Fine Aggregate:

Additives with sizes ranging from 0,075 mm to 4,75 mm are considered to be fine. Two kinds of fine aggregates were used in this experimental work. It's sand and the river (Bottom ash). According to IS-383, the fine aggregate is selected.

River sand:

Also known as natural sand. A good quality naturally occurred in this work. The sand is medium in sand and confirms Zone-II in accordance with standard requirements.

3.2.3 Coarse Aggregate

Size over 4.75mm is generally seen as a coarse aggregate. For this experimental work, the maximum size of Coarse aggregate is 20 mm and 12 mm. The next crusher unit produces a good quality of the coarse aggregate. The ground unit is chosen according to IS-383.

3.3 PROPERTIES OF MATERIALS:

Several tests for the physical and mechanical properties on the raw materials were performed. The following are the detailed test results.

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3.3.1 Tests on Cement:

3.3.1.1 Specific Gravity of Cement

Le-flask chatlier's method is the method used for calculating the specific gravity of cement. Kerosene is tested in this cement. The specific gravity of cement tested is 3.15

3.3.1.2 Normal Consistency of Cement

The standard test is carried out according to IS 4031 (part 4) – 1988. Its main aim is to determine the quantity of water to be added to make a standard consistency cement paste. For this test, VICAT devices are usually used and IS 5513 – 1976 is validated.

4. TEST RESULTS

WORKABILITY RESULTS

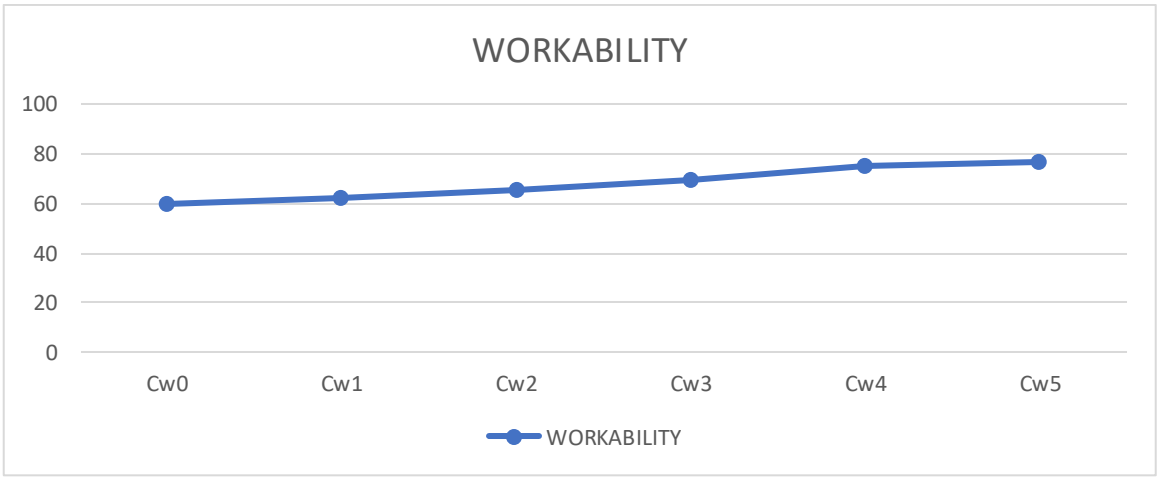
The ideal concrete is that which can be easily prepared, compacted and molded under all conditions. Two methods are used in this chapter to evaluate the workingability:

Testing Slump Cone:. The test for fresh concrete was conducted in advance of the moulding process. At different times 14 different concrete mixtures are prepared. Capacity of work Table 7 shows the outcome of the concrete grade M30 slump cone test.

Table 7: Test results from slump cone test for workability in mm

S.No	Mix ID	cement Replacements % (CCA)	Workability (mm)
1	C0	0	60
2	CW1	5	62
3	Cw2	10	65
4	Cw3	15	69
5	Cw4	20	75
6	Cw5	25	77

Graph-01: Test results from slump cone test for workability in mm



With increasing mix ratio replacement, the workability of the slump cone test will increase. The range of workability of concrete increases as described while it is overall medium.

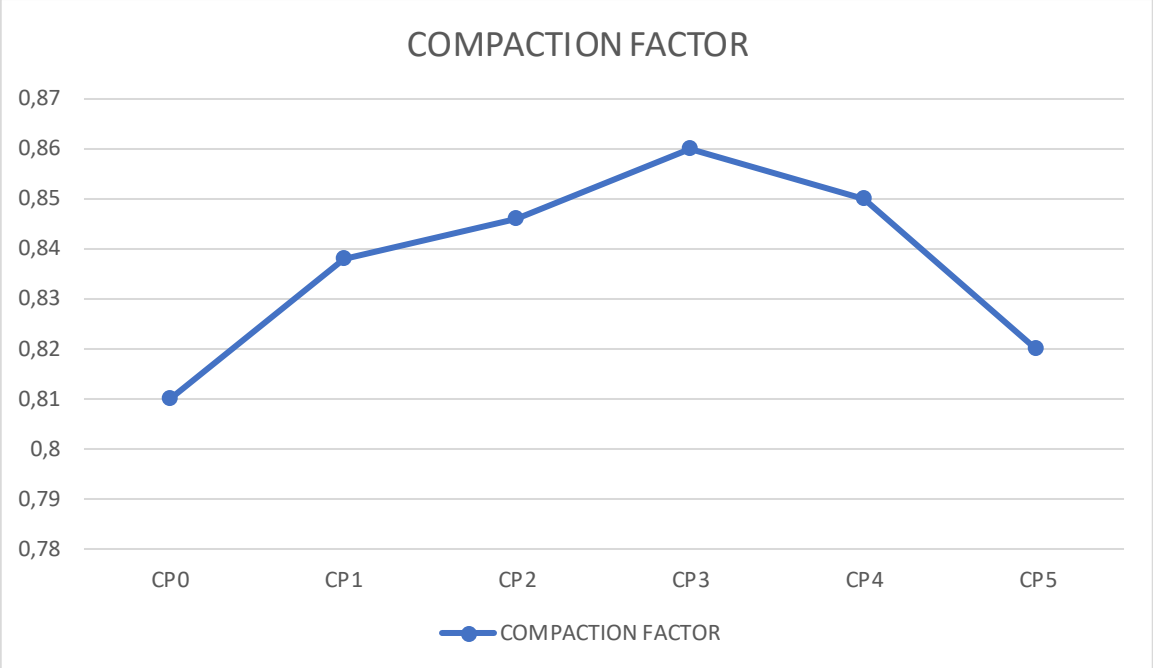
COMPACTION FACTOR TEST:

The compaction factor test was carried out in the same mixture as the slump cone tests were carried out for functionality. The results of the compaction factor test for the operability of different substitution mixtures of concrete grades M30 are tabled as follows:

Table 8: Test results of compaction factor test for workability

S.No	Mix ID	cement Replacements % (CCA)	Compaction Factor
1	CP0	0	0.81
2	CP1	5	0.838
3	CP2	10	0.846
4	CP3	15	0.86
5	CP4	20	0.85
6	CP5	25	0.82

Graph02: Test results of compaction factor test for workability



The working ability of concrete M30 is similar to the slump cone test with a compaction factor test. The pattern is quite the same for the mixes, which are further discussed.

Compressive strength:

Tested and tested for 7 days, 14 days and 28 days, 90 days, each 10 cubes were tested and cast for a total of 40 cubes in size 150 x 150 x 150 x 150 mm. The following are the results:

Table: 09: Compressive strength results of M30 grade of concrete for 7 days

MIX ID	COMPRESSIVE STRENGTH 7-DAYS
CP0	23.45
CP1	24.25
CP2	25.40
CP3	24.22
CP4	22.85
CP5	21.36

Graph: 03: Compressive strength results of M30 grade of concrete for 7 days

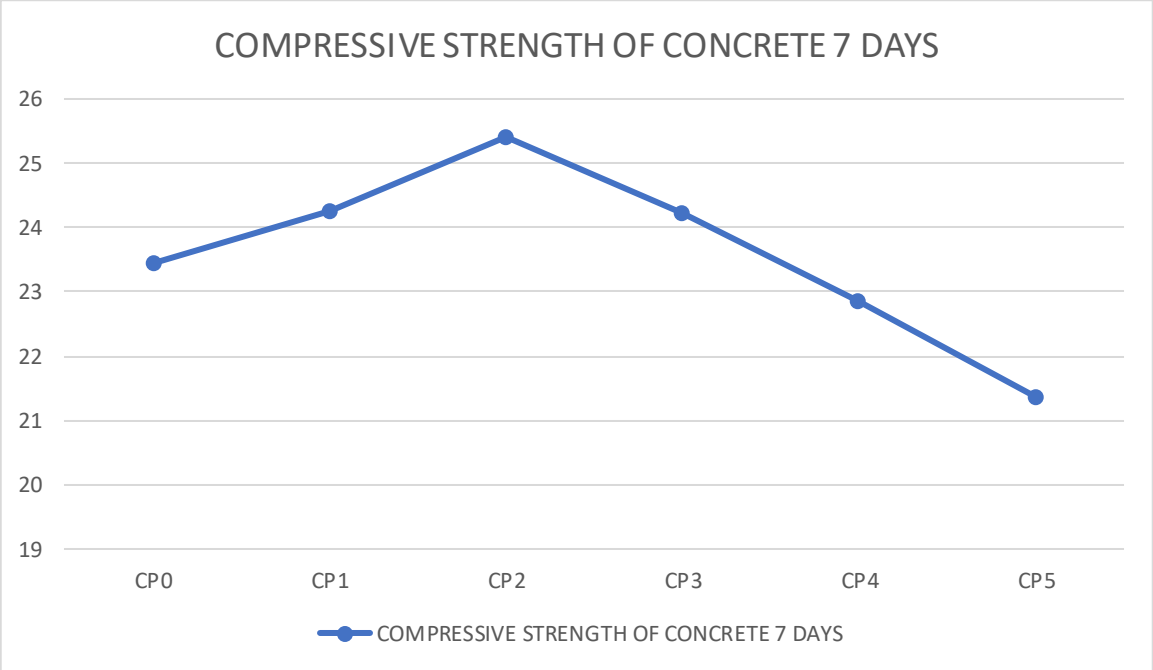
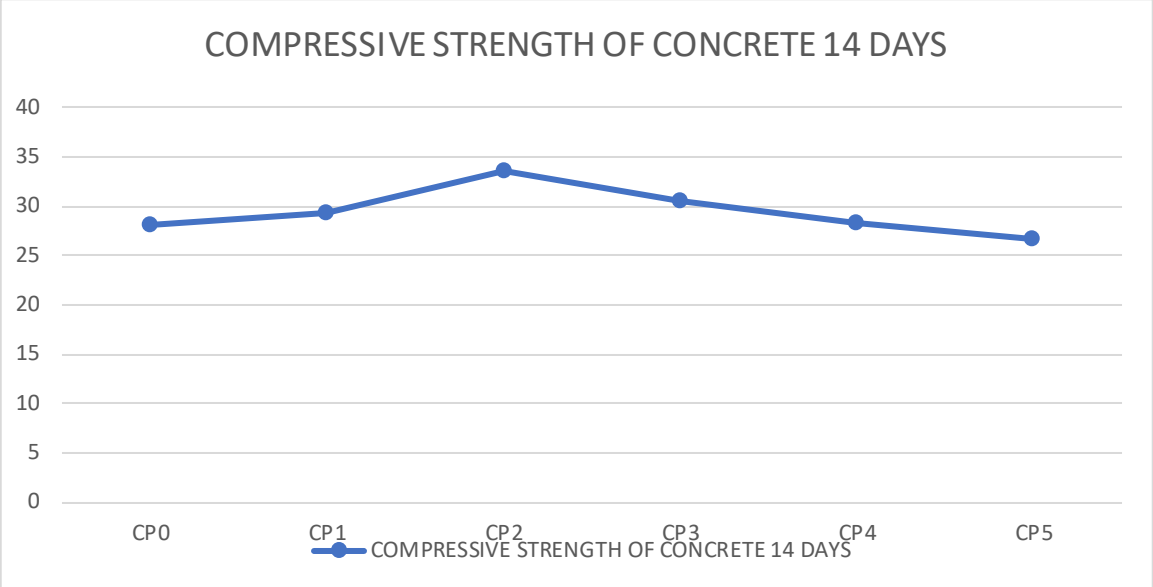


Table: 10: Compressive strength results of M30 grade of concrete for 14 days

MIX ID	COMPRESSIVE STRENGTH 14-DAYS
CP0	28.14
CP1	29.35
CP2	33.51

CP3	30.46
CP4	28.24
CP5	26.74

Graph: 04: Compressive strength results of M30 grade of concrete for 14 days



CONCLUSIONS:

The water bond proportion is low in the elite plan of the solid blend. For the required usefulness, it is important to maintain super plasticisers. As the level of mineral adds in the blend increases, the level of super plasticizers increases further, so that the required opposition can be acquired.

The highest level of compression quality for cement assessment M30 is acquired at 47,26 Mpa for 90 days at a rate of replacement of bindings with 10 percent ceramic waste powder due to various levels of substitution of mineral added substances. High strength

Rationale In our development exercises, the field of use of elite concrete is large, with specific preassembled spans, multi-story structures, faucets and structures in front areas of the beach, etc. We should reactivate the structural plan to influence this change by enabling high quality cement to be used.

When the smaller fraction appears, the high-quality solid forms are abruptly disappointed.

REFERENCES

1. Aruna D, Rajendra Prabhu, Subhash C Yaragal, Katta Venkataramana IJRET:eISSN: 2319-1163 | pISSN: 2321-7308.
2. Batriti Monhun R. Marwein, M. Sneha, I. Bharathidasan International Journal of Scientific & Engineering Research, Volume 7, Issue 4, April-2016 ISSN 2229-5518.
3. Iranian Journal of Science & Technology, Transaction B, Engineering, Vol. 31, No. B5, pp 561-565 Printed in The Islamic Republic of Iran, 2007
4. Department of Engineering and Agricultural Sciences, University of Leon, Avenida Portugal 41, Leon 24071, Spain.
5. International Journal of Innovative

Research in Science,Engineering and TechnologyISSN(Online): 2319-8753 ISSN (Print): 2347-6710.

6. N.Naveen Prasad, P.Hanitha, N.C.Anil IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 13, Issue 6 Ver. V (Nov. - Dec. 2016), PP 168-176.
7. Journal of Multidisciplinary Engineering Science and Technology (JMEST) ISSN: 3159-0040 Vol. 2 Issue 11, November - 2015
8. Paul O. Awoyera , Julius M. Ndambuki , Joseph O. Akinmusuru , David O. Omole-4048 2016 Housing and Building National Research Center. Production and hosting by Elsevier B.V. 15 November 2016)