EXPERIMENTAL INVESTIGATION ON PARTIALLY REPLACEMENT OF FLUORESCENT LAMP POWDER WITH CEMENT AND FULLY REPLACEMENT OF FINE AGGREGATE BASED CONCRETE

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ABSTRACT

Resources are found to be depleted due to making of ordinary concrete. One of the main ingredients in making concrete is fine aggregate. There is a huge demand for fine aggregate at present scenario. As growth of industries takes place, production of slag from industries increases

In this work an attempt has been made to use fluorescent lamp powder 20% replacement of cement. And the fine aggregate was fully replaced by iron slag and quarry dust. The fine aggregate replaced by iron slag 50% and Quarry dust 50%.

Mortar cube of ratio 1:3 and 1:4 and M25 gradeof concrete cubes were cast with water cement ratio 0.5 and 0.52 respectively andthe compressive strength of concrete cubes aged 7, 14 and 28 days were tested and the results were compared. The results were found to be good.

Keywords: Fluorescent Lamp Powder, Iron slag, Quarry dust

1-INTRODUCTION

Concrete is one of the unique materials in construction industry. Achieving strength and durability is a greatest constraint. Using of conventional material in concrete is costly and one of the greatest threat to environment. To overcome these problems lot of investigations were carried out to use industrial waste materials, these acts like mineral admixture. As usage of fluorescent lamp is more, disposal of these fluorescent lamp is a problem so in this work partial replacement of fluorescent powder in cement was made and quarry dust and iron slag were replaced for fine aggregate .The main objective of this work is to

1. To find the strength performance of fluorescent lamp powder in concrete
2. To find the strength performance of quarry dust and iron slag in concrete
3. To find the performance of different water cement ratio in concrete 0.5 and 0.52
4. To find out optimum performance

2-LITERATURE REVIEW

Several researchers **(Salem et al. 2003, Buyle-Bodin and Hadjieva-Zaharieva 2002, Ravindrarajah 1985)** have found increased water absorption, drying shrinkage and air permeability of the recycled aggregate concrete when compared with normal. An initial absorption is made by using nearly four times that of normal concrete has been measured with recycled aggregate concrete **(Buyle-Bodin and Hadjieva-Zaharieva 2002)**. Increased moisture absorption and drying shrinkage of recycled aggregate concrete influence its long-term performance and durability (Mehta 2006, Neville 2000, Basheer et al. 2001). Moisture movement in hydrated cement paste influences the drying shrinkage of concrete. Use of Large-volume recycled aggregate concrete requires resolution of the problems with increased water absorption drying shrinkage resulting concrete.

Radhikesh et al (2020) have conducted an experimental study to investigate the suitability of quarry dust as fine aggregate for producing paving blocks. The test results show that the replacement of fine aggregate by quarry dust up to 50% has an effect on the reduction of physical and mechanical properties while there is a saving of 56% of money and the percentage of saving would be more for mass production of paving blocks.

Manasseh Joel (2020)has investigated the suitability of crushed granite fines to replace river sand in concrete production for rigid pavement. Therefore it is concluded that, based on economic analysis and strength test results, river sand replaced with 20% of crushed granite fines is recommended for production of concrete for rigid pavement.

3-METHODOLOGY

The methodology of work is shown in Fig 3.1

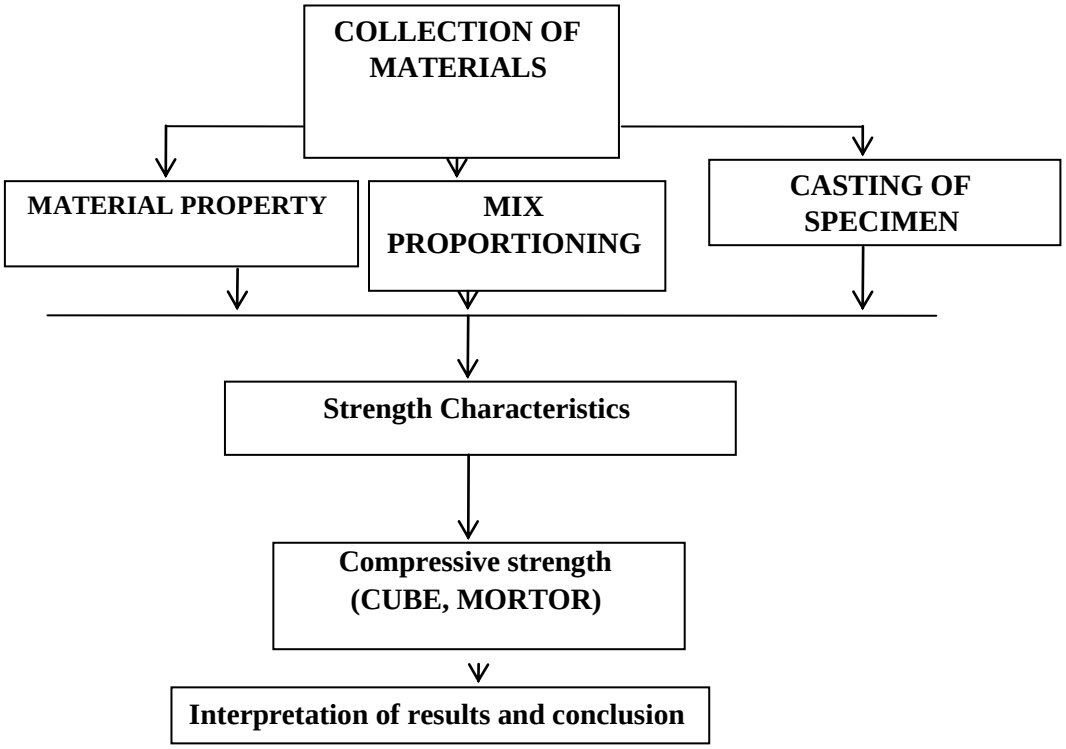

Fig. 3.1 Flow chart of methodology

3.1CEMENT

Ordinary Portland cement of 53 grade was used to conforming a IS code 12269-1987. The specific gravity of cement was found to be 3.15

3.2FLUORESCENT LAMP POWDER

A fluorescent lamp in Powder form with specific gravity 2.59 was used in this work

3.3FINE AGGREGATE

Natural river sand was used as fine aggregate. The properties of sand were found as per IS: 383-1970. The specific gravity was found to be 2.65 and Fineness modulus was found to be 2.64

3.4COARSE AGGREGATE

Coarse aggregate of size 20mm is sieved and used in this work

3.5 QUARRY DUST

The quarry dust is the by-product which is formed in the processing of the granite stones which broken downs into the coarse aggregates of different sizes. Specific gravity was found to be 2.55

3.6IRON SLAG

Iron slag is an industrial waste material. It is a by-product of the iron and steel making process. Specific gravity was found to be 2.69

3.7WATER

Portable water free from salts was used for casting and curing of concrete as per IS: 456-2000 recommendations were used.

3.8MIX PROPORTION DETAILS

MIX RATIO 1:3and 1:4

Mortar cubes were prepared for control mortar and replacement of fluorescent lamp Powder for cement and iron slag , quarry dust for fine aggregate in ratio 1:3 and 1:4 respectively for different water cement ratio 0.50 and 0.52

Mix Proportioning for Concrete

Concrete cubes of M25grade with mix ratio 1:1:2 is done for conventional concrete and replacement of fluorescent lamp Powder for cements and iron slag, quarry dust for fine aggregate respectively

4-TEST RESULTS AND DISCUSSION-COMPRESSION STRENGTH TEST

Test specimens of size 150 × 150 × 150 mm for concrete and 70.6×70.6×70.6 mm for mortar cube were prepared for testing the compressive strength concrete were done as per IS Code. Fig 4.1 and 4.2 shows average compressive strength of mortar cube for mix ratio 1:3 and 1:4 with water cement ratio 0.50. Fig 4.3 and 4.4 shows average compressive strength of mortar cube for mix ratio 1:3 and 1:4 with water cement ratio 0.52. Fig 4.5 and 4.6 shows average compressive strength of concrete cube for mix ratio 1:1:2 with water cement ratio 0.50 and 0.52

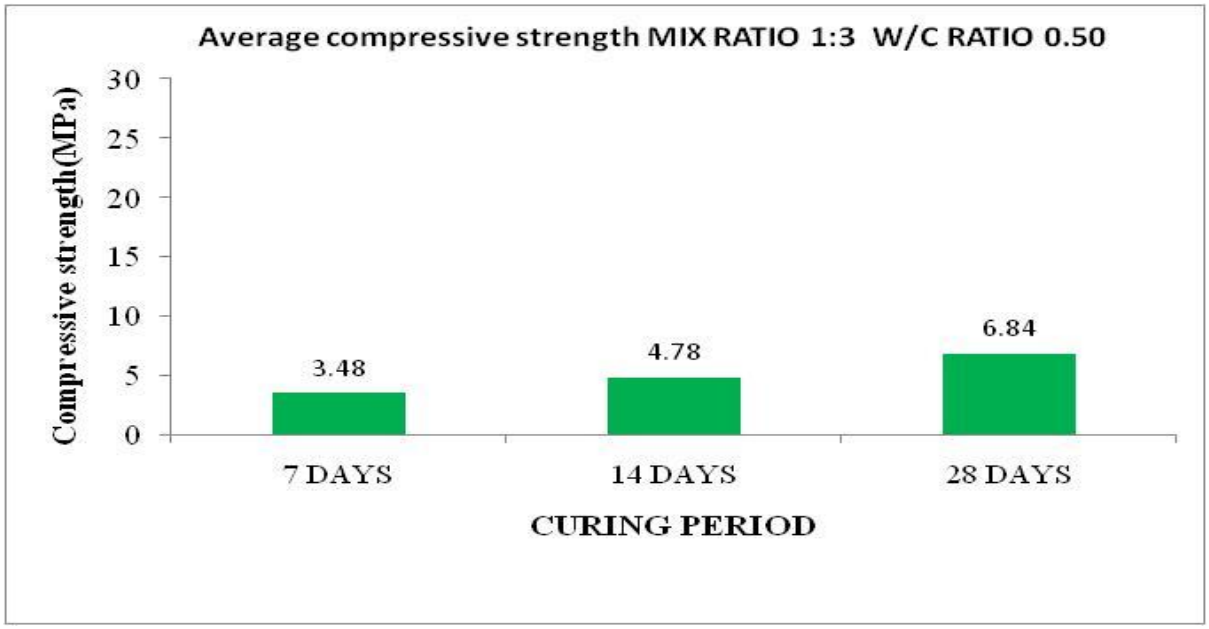

Fig4.1 Mix 1:3 Avg compressive strength for 7, 14, 28 days curing for w/c ratio 0.50

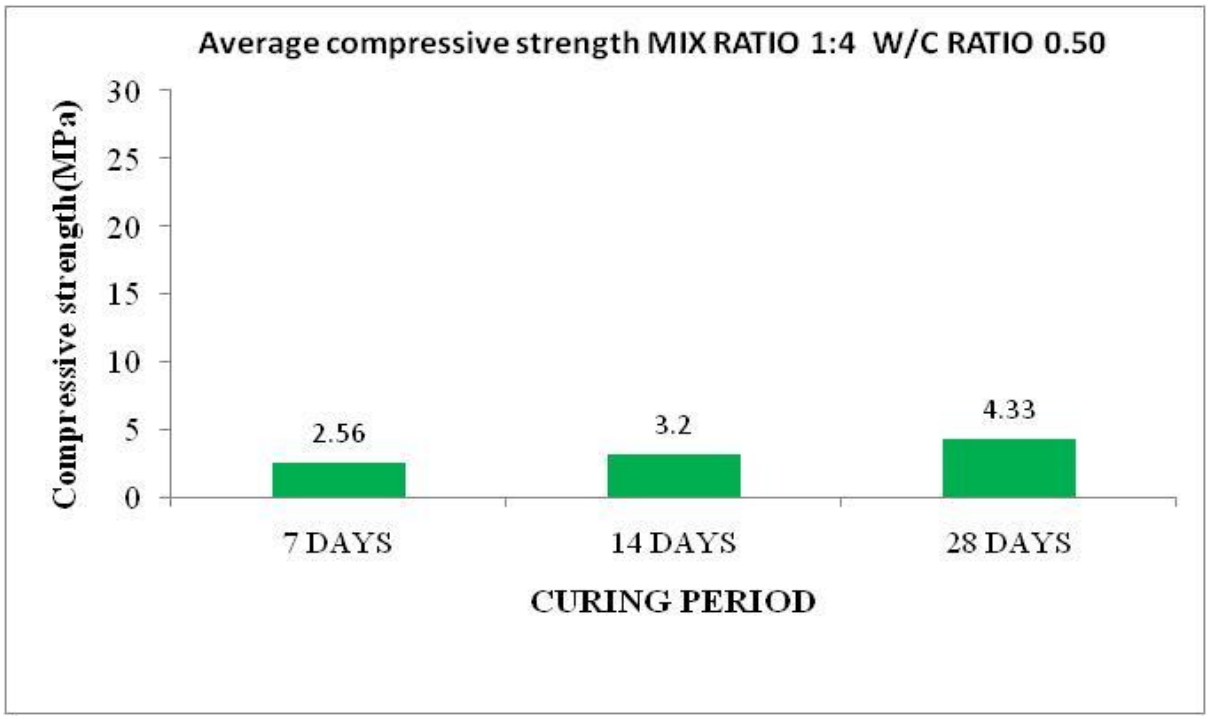

Fig 4.2 Mix 1:4 Avg compressive strength for 7, 14, 28 days curing for w/c ratio 0.50

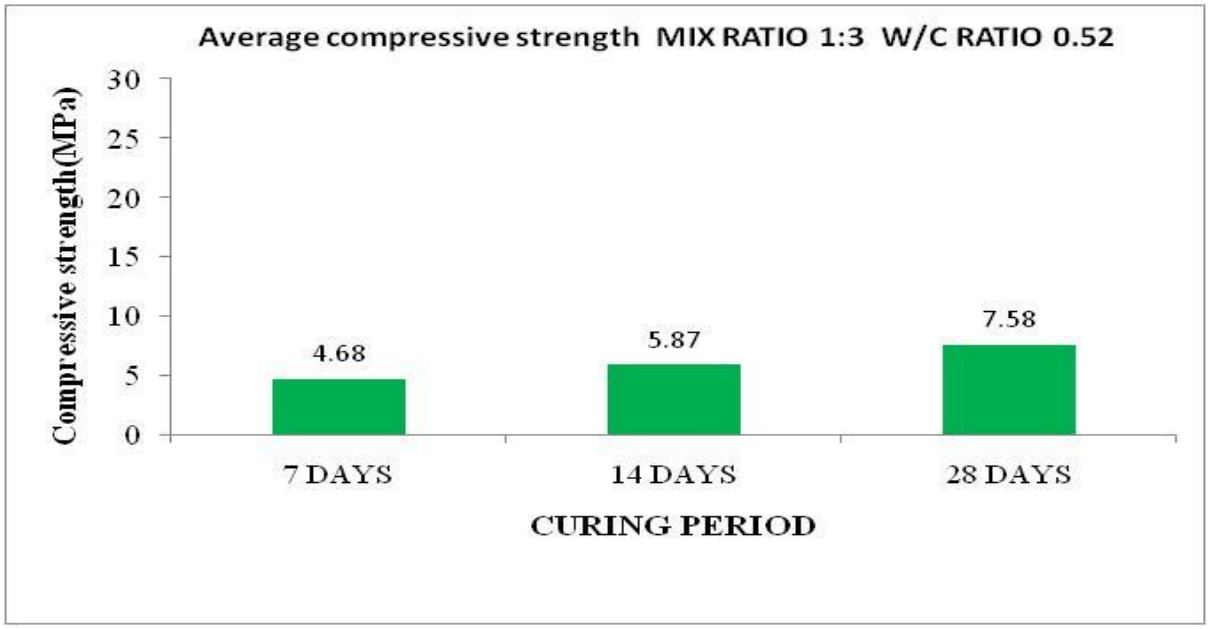

Fig 4.3Mix 1:3 Avg compressive strength for 7, 14, 28 days curing for w/c ratio 0.52

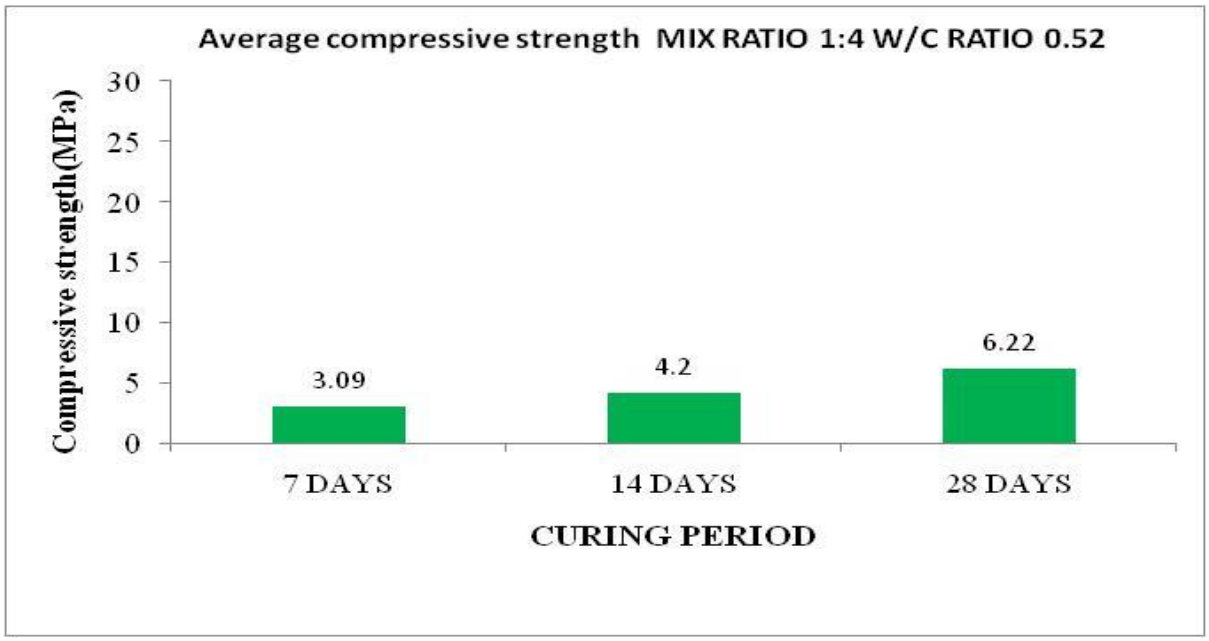

Fig 4.4 Mix 1:4 Avg compressive strength for 7, 14, 28 days curing for w/c ratio 0.52

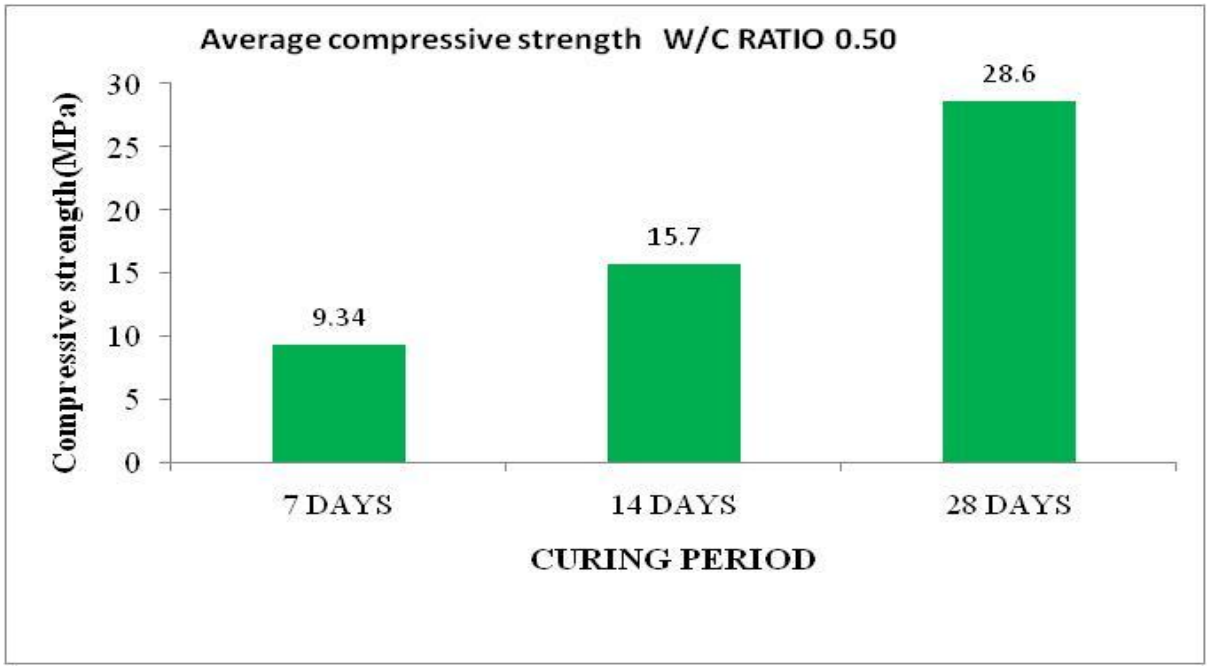

Fig 4.5 Avg compressive strength for 7, 14, 28 days curing for w/c ratio 0.50

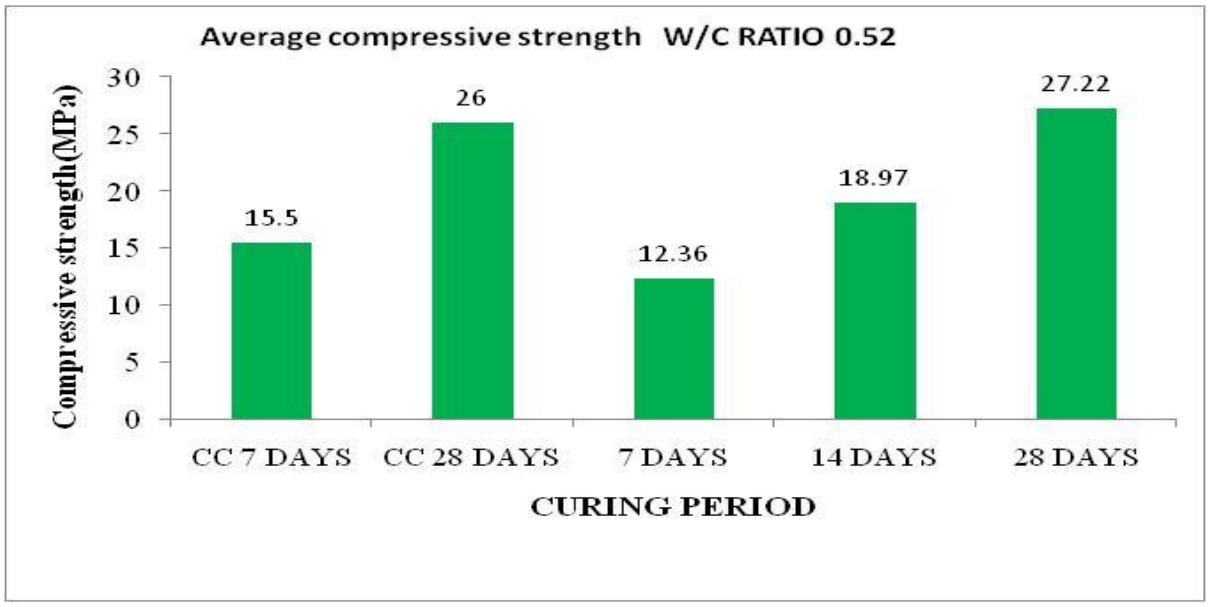

Fig 4.6 Avg compressive strength for 7, 14, 28 days curing for w/c ratio 0.52

CONCLUSION

1. From the above experiments, it is found that Fluorescent lamp powder can be used as partially alternative material for Cement and quarry dust and iron slag can be used as alternative material for fine aggregate
2. Compressive strength was found to be higher for 0.5 water cement ratio for 28 days curing
3. Compressive strength was found to be higher for 0.52 water cement ratio for 7 days and 14 days curing

4. Workability and property of fresh concrete were found to be good in case of replaced concrete

5. Mix ratio 1:3 and 1:4 was found to be better in w/c ratio 0.52 when compared to w/c ratio 0.5.

6. Mix ratio 1:3 strength was found to be higher in 1:3 ratio than 1:4 ratio for water cement ratio 0.5

7.Using of Fluorescent lamp powder, quarry dust and iron slag is eco friendly

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