

# A REVIEW PAPER ON EXPERIMENTAL STUDY OF HIGH STRENGTH CONCRETE CONTAINING CERAMIC WASTE AS A TILE

<sup>1</sup>Sunny Vachhani, <sup>2</sup>Prof. Y.V. Akbari, <sup>3</sup>Dr. N.K. Arora

<sup>1</sup>PG student, <sup>2</sup>Master of Structural Engineering, DIET- Rajkot, Gujarat, India, <sup>3</sup>Principal of L.E.College Morbi

**Abstract** — Everyday 15 to 20% of tiles become a waste in ceramic industry because there are cracks and bending in design. These are use in to fill the dump. Therefore environment become a polluted so in this research replace ceramic tiles as a coarse aggregate and fine aggregate with natural aggregate for water cement ratio 0.35. In this research replaces 0%, 10%, 20%, 30%, 40, and 50% as a coarse aggregate. On the basis of getting best result from the coarse aggregate to start a replacement of the fine aggregate with 0%, 10%, 20%, 30%, 40%, and 50% with the same content of coarse aggregate. In this research check the fresh property of concrete and hardened property of concrete. In fresh property of concrete have do two tests. First one slump test and another one is compaction factor test. For the hardened property of concrete investigate three tests. First test is compressive strength second one is split tensile test last one is flexure test.

**Index Terms**— ceramic tile, slump value, compressive strength, split tensile strength, flexure strength, high strength

## I. INTRODUCTION

In earlier age cement are made with lime stone and gypsum. Lime stone is one type of stone. When water mix with cement it's become a mortar which use as an adhesive material. Cement concrete is a best material for all industrial and civil engineering buildings. Now India is a developing nation so high-rise building is introduce from last 10 years. Ceramic waste is one of the most active areas in the field of research as it is very peak time to find a solution for alternative of a coarse aggregate and fine aggregate. Coarse aggregate, fine aggregate and cement are the most important material for the production of the concrete so large quantity of natural resources used in the production. Waste material dump in large quantity every year so utilization of it is most important for it so environment become a disturbance free. This material should be used in certain limitation. In these review paper ceramic tiles is used as a coarse aggregates. Save natural resources by using the ceramic waste tile with replacement of the aggregate in concrete.

## II. LITERATURE REVIEW

**Mechanical Property of Concrete Utilization Waste Ceramic as Coarse Aggregate (Derric J. Anderson, Scott T. Smith, Francis T.K. Au) 29 April 2016**

In this research paper to use a ceramic waste as a coarse aggregate replaced with the coarse aggregate about 20%, 25%, 35%, 50%, 65%, 75%, 80%, and 100%. In this research paper to use a ball-pain hammer for breaking into a ceramic waste of different size with effort given method fragment mostly with in the 5-20 mm aggregate range. Angularity of ceramic aggregate cannot be controlled during the breaking of the particle. Thickness of the tile is about 8.4mm is used as aggregate. Compressive strength of concrete is increased for the 20% replacement of the ceramic waste. Absorbed water had a nominal effect on the compressive strength of concrete.

**Effect of Partial Replacement of Fine and Coarse Aggregate (10mm) with Ceramic Waste on the Properties of Concrete (vikas rajora, Gurtej singh sidhu) IJSR august 2016**

Study investigates a partial replacement of a fine and coarse aggregate with ceramic waste on concrete. In this research paper ceramic waste is replaced for M25 grade of concrete. Here water absorption, free moisture content and specific gravity is about 0.52%, 0.6% and 2.61% simultaneous for 10mm aggregate. For 20 mm aggregate water absorption, free moisture content, specific gravity is about 0.68%, 70% and 2.52%. Compressive strength is reduced with replacement of the ceramic aggregate. Flexure strength of concrete reduced with replacement of the ceramic waste.

**Incorporation of Fine Sanitary Ware Aggregate in Coating Mortars (C.Farinha, J.de brito, R.veiga) science direct march 2015**

In this research paper analyses the behavior of cement mortars with addition of grinded fine sanitary ware aggregate in percentage of 0%, 10%, 15% and 20% of the natural aggregate's volume to be used as renderings. Three prism of size 160\*40\*40 mm<sup>3</sup> per batch is casted for experiment. The specimen was maintained in moduls until 2 days at a temperature of 23+2 C. mortar is a better perform for the 20 percentage of the ceramic waste.

**Durability of Recycled Concrete Made with Recycled Ceramic Sanitary ware Aggregate. Inter-indicator Relationship (C. Medina, M.I. Sanchez de Rojas, C. Thomas, J.A. Polanco, M. Frias) Science direct (22 December 2015)**

In this research paper to study about durability of concrete with replacement a ceramic waste as a sanitary ware. In this study natural coarse aggregate replaced by sanitary ware. In this research coarse aggregate is replaced with the natural aggregate from 20 to 25%. Here maximum size of the ceramic sanitary ware aggregate is 12.5mm. The recycled ceramic aggregate consist of jaw-crushed sanitary ware after crushing material passed through the 12.5mm sieve. There is no any adverse effect on the aggregate due to use of the sanitary ware as an aggregate in concrete. Performance of the sanitary ware is decreased with increased percentage of the sanitary ware.

**Durability-related Performance of Concrete Containing Fine Recycled Aggregate from Crushed Brick and Sanitary ware (T. Vieria, A. Alves, J. de brito, R.V. Silva) Science direct 7November 2015**

Ceramic and sanitary coarse aggregate with replacement 20%, 50%, 100%. Shrinkage, water absorption by immersion, water absorption by capillary action, carbonation and chloride ion penetration tests were carried out. In this research the mix design was adjusted on a case by case basis, so that all mixes based on slump of 125 mm. Crushed red clay bricks and sanitary ware have a higher water absorption capacity thus additional amount of water required for the concrete. It is also increased a water cement ratio with increased an additional water. Compressive strength of concrete is reduced with increased a sanitary ware and crushed red clay brick.

#### **Application of Waste Ceramic Tile Aggregate in Concrete (MdDanial, Shakeel Ahmad) IJIRSET (Vol. 4, issue 12, December 2015)**

Replacement of ceramic waste as a coarse aggregate 10 to 50% with different water cement ratio 0.4, 0.5, 0.6 w/c ratio. First the ceramic aggregate crushed and grading by the IS sieve. Total 54 test specimen casted in steel cubic mould 150\*150\*150 mm and compaction on vibrator table determine the compressive strength and unit weight after 28 days of curing. Here maximum size of ceramic aggregate is about 20mm. water absorption capacity of ceramic aggregate is 4.5% and specific gravity is about 2.35. Workability of concrete is decreased with increase using the ceramic tile. Density of concrete is also decreased cause of an increased a water cement ratio. Flexural strength of concrete is increased than the normal concrete.

#### **Ceramic Waste: Effective Replacement of Cement for Establish Sustainable Concrete (Amitkumar D. Raval, Dr. Indrajit N. Patel, prof. jayeshkumar pitroda) IJETT volume4 issue-6 June 2013**

Here in this paper to use a ceramic powder to replace with the cement to become an environment cleaner or eco efficient. In this research paper ceramic powder replaced with the cement from 10% to 50% for M20 grade of concrete. Here compared with the normal concrete with replacement of ceramic waste concrete. Three samples is casted for the each test of the specimen. Concrete on 30% replacement of cement with ceramic powder, compressive strength obtained is 22.98 N/MM<sup>2</sup> and vice versa the cost of the cement is reduced up to 12.67% in M20 grade. It is a possible alternative solution for safely disposal waste of ceramic waste powder.

#### **Use of a Ceramic (Sanitary ware) Waste in Making Green concrete (Sharad M. Kondhiya, Prof. Yogesh V. Akbari, Prof. N.K.Arora) Volume 7 IJ-ETA-ETS**

Here in this paper to use of a sanitary ware as a coarse aggregate for the M20 and M35 aggregate. Coarse aggregate is replaced as a coarse aggregate 0%, 10%, 20%, 30%, 40%, 50%, and 70% by weight. To investigate the compressive, split tensile test, flexure test, Density and water absorption of the concrete. Ceramic aggregate is crushed by jaw crusher to get the required 20mm size. Specific gravity of ceramic aggregate is about 2.50. The flakiness index and elongation index is maintain less than the 15%. Results should be says that the property of the ceramic waste is a smoother than the crushed stone aggregate, chemical resistance against all chemical. For the hardened concrete for M-20 grade, compressive strength of concrete is increased at 20% of the replacement of ceramic waste. For the flexure strength of concrete is increased for the 50% of the replacing of the ceramic waste. For split tensile strength of concrete is also increased for the 50% replacement of ceramic waste. For M-30 grade of concrete compressive strength is increased for the 20% replacement of the ceramic waste. Flexure strength of concrete is decreased with the 20% replacement of the ceramic waste and for the split tensile strength of concrete is increased for the 20% replacement of concrete.

### **III. CONCLUSION**

1. Replacement of the natural aggregate is a best utilization of ceramic aggregate with the minor reduction of the compressive strength of the concrete. For higher grade of concrete Increase a compressive strength of concrete with the replacement of 20% of ceramic waste tiles. Compressive strength of concrete is reduced when ceramic tile increase a waste up to 30 percentage. For lower grade of concrete a compressive strength of concrete increase for 50% of the replacement of the ceramic waste.
2. Tensile strength of concrete is increased for the 30% of replacement of the ceramic aggregate for lower grade. For the higher grade of the concrete split tensile strength is increased for the 20% replacement of the ceramic waste.
3. Flexure strength of concrete reduced with replacement of the ceramic waste aggregate
4. Due to higher water absorption rate of tile, requirement quantity of water increases with increase in a quantity of ceramic aggregate.
5. Workability of concrete reduces with increment in a ceramic tile in a concrete because of the water absorbed by the ceramic waste.
6. Angularity of ceramic aggregate can't be controlled during the crushing of the ceramic tile aggregate.
7. Higher water requirement due to higher rate of water absorption.
8. Due to use of the ceramic waste aggregate the concrete become a more economical than the normal concrete.

### **IV. Reference**

- [1] Mechanical property of concrete utilization waste ceramic as coarse aggregate (Derric J. Anderson, Scott T. Smith, Francis T.K. Au) 29 April 2016
- [2] Effect of partial replacement of fine and coarse aggregate (10mm) with ceramic waste on the properties of concrete (vikas rajora, Gurtej singh sidhu) IJSR august 2016
- [3] Incorporation of fine sanitary ware aggregate in coating mortars (C.Farinha, J.de brito, R.veiga) science direct march 2015
- [4] Durability of recycled concrete made with recycled ceramic sanitary ware aggregate. Inter-indicator relationship (C. Medina, M.I. Sanchez de Rojas, C. Thomas, J.A. Polanco, M. Frias) science direct (22 December 2015)
- [5] Durability-related performance of concrete containing fine recycled aggregate from crushed brick and sanitary ware (T. Vieria, A. Alves, J. de brito, R.V. Silva) Science direct 7November 2015
- [6] Application of waste ceramic tile aggregate in concrete (MdDanial, Shakeel Ahmad) IJIRSET (Vol. 4, issue 12, December 2015)
- [7] Ceramic waste: Effective replacement of cement for establish sustainable concrete (Amitkumar D. Raval, Dr. Indrajit N. Patel, prof. jayeshkumar pitroda) IJETT volume4 issue-6 June 2013
- [8] Use of a Ceramic (Sanitary ware) Waste in Making Green concrete (Sharad M. Kondhiya, Prof. Yogesh V. Akbari, Prof. N.K.Arora) Volume 7 IJ-ETA-ETS