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Experimental study of double T slab with conventional concrete and concrete made up with Quarry Dust and Pond Ash

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Abstract— the double tee slab is capable of withstanding high loads while having a long span. Two point load test will be conducted to study the behavior and load carrying capacity of slabs. In this experimental workthe fine aggregate is partially replaced with quarry dust by 20%, 35%, and 50%. Along with that the cement is also partially substituted with Pond ash by 5% and 10%. There are seven batch mixes including conventional one. In this study the following tests has been done : (1) Compression test (2) Split tensile test (3) Flexural test. From these tests, optimum replacement percentage of fine aggregate and cement is found. IS: 10297 is used for deciding the geometry of slab panel. The slab panel made for the experiments are having a 1.5 meter length and 0.3 meter width. The concrete grade M25 is used as per IS: 456-2000.The water-binder is 0.45.

Keywords— Double T slab, Quarry dust, Pond Ash

I.INTRODUCTION

The double tee slab is a load bearing structure that resembles two T-beams connected to each other side by side. The strong bond of the flange and the two webs creates a structure capable of withstanding high loads while having a long span. The use of this precast slab has been increasing due to shorten construction time. The double tees are manufactured in factories. The process is same as other precast elements. The beds for making double tees are of typical sizes of the area that double tees will be used. The provision of groove is provided at the bottom of the ribs to enables the resting of slab on the support.

.II.OBJECTIVE AND SCOPE

Mostly, the research work is done to replace the coarse aggregate in the slab. Very less or no work is done to check the effect of partial substitution of fine aggregate and cement on slab. Quarry dust and Pond ash are the waste materials which are dumped at one place, creating an environmental problem. Production of cement releases vast amount of greenhouse gases and there is a problem of natural sand Scarcity. The whole slab system ultimately leads to a

cost effective flooring system.

A.Objective

To compare the load carrying capacity of precast slab panel experimentally with conventional concrete and the blended concrete made up with Quarry dust and Pond ash. To determine the first crack load and ultimate failure load.

B.Scope

Cube test : total 21 cubes will be cast for 7 batch mixes to determine the compressive strength at 28 days.

Split tensile test : total 21 cylinder will be cast for 7 batch mixes to determine the tensile strength at 28 days.

Flexure test : total 21 beams will be cast for 7 batch mixes to determine the flexural strength at 28 days.

To investigate experimentally 2 double tee slab specimens with same profile**.** To observe ultimate load, first crack load and deflection for all slab.

III.EXPERIMENTAL PROGRAM

The slab specimens will be cast with the conventional concrete and concrete with quarry dust and wood ash. For that mix design of concrete is carried out in experimental study according to IS 456:2000 and IS 10262:2009.

Coarse aggregate : The aggregates having maximum size of 10 mm are used. Bulk density is 1600 kg/m^3 . Specific gravity and water absorption of aggregates are 2.60 and1.2% respectively.

Sand : The natural river sand having zone-3 and specific gravity and water absorption 2.58 and 0.2 % respectively is used. Bulk density of sand is 1650 kg/m^3.The fineness modulus is 2.48.

Quarry Dust : The quarry dust having fineness modulus 2.87, specific gravity 2.24, Bulk density 1711 kg/m^3, SiO_2 : 38.66%, Al_2O_3 : 30.56% is used.

Sample of Quarry Dust

Pond ash : The Pond ash has specific gravity 2.026, Bulk density 848 kg/m^3, SiO_2 45.30%, Al_2O_3 30.23% is used.

Pond ash

Cement: The cement is a material with adhesive and cohesive properties. The cement, when mixed with aggregates and water, binds the particles in to a compact whole.53 grade OPC Ultra tech cement has been used in this experimental work.

Water: The Water is used for mixing and curing. Potable and drinking water is used satisfactory for mixing concrete.

Super Plasticizer: The super plasticizer used here is FAIRFLO 120. It is high water reducing cum slump retainer admixture for concrete conforming to ASTM C-494 type 'G' and IS 9103-1999

Mix Proportion :- There are seven batch mix for different replacement percentage of fine aggregate and cement.

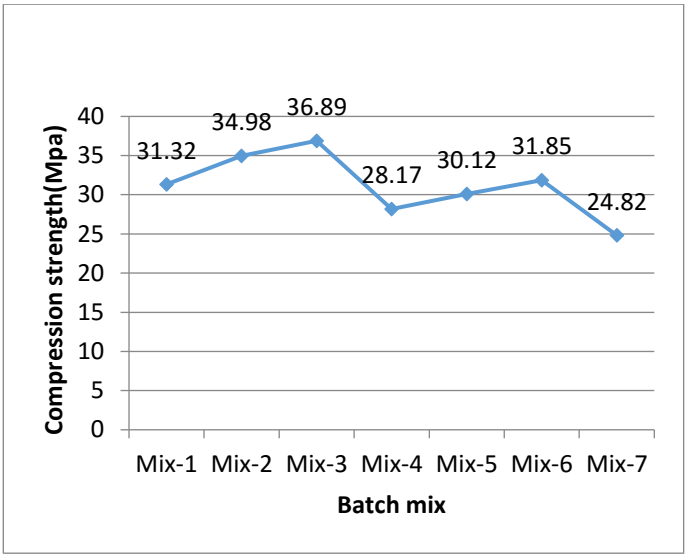
Batch mix	Pond ash: Cement	Quarry dust: Natural sand	Admixture Dosage (%)
mix-1	0:100	0:100	0.25
mix-2	5:95	20:80	0.50
mix-3	5:95	35:65	1.00
mix-4	5:95	50:50	1.00
mix-5	10:90	20:80	0.25
mix-6	10:90	35:65	1.00
mix-7	10:90	50:50	1.00

Mix design:- The desired grade of concrete is M25. The mix design is as per the IS 10262:2009 and is as below.

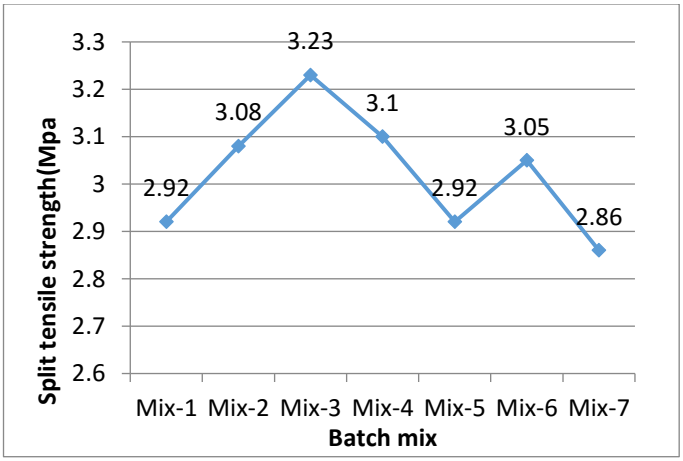
Mass of Cement (kg/m3)	Mass of Water (kg/m3)	Mass of Fine Aggregate (kg/m3)	Mass of Coarse Aggregate (kg/m3)
462.22	208	848.7	821.72
1	0.45	1.83	1.78

Casting of Cubes :- The concrete cubes of standard size 150 mm×150 mm×150 mm are casted. Total 21 cubes are casted for 7 different mixes and tested at 28days.

Compression test on cubes :-

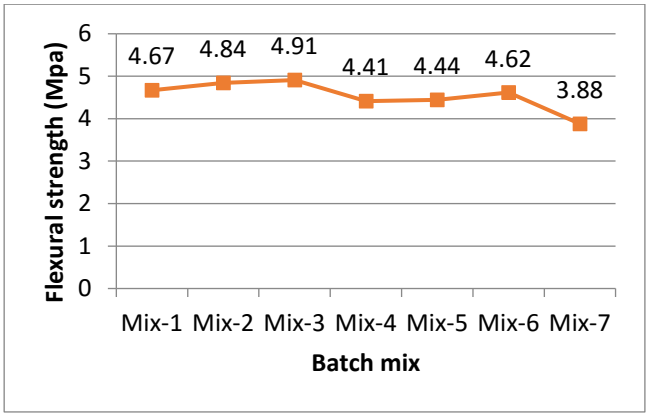


Casting of cylinder:- The concrete cylinder of length 300 mm and diameter of 150mm are casted. Total 21 cylinders arecasted for 7 different mixes and tested at 28days.



Casting of beam :- The concrete beam of size 150mm X 150mm X 700mm are casted. Total 21 beams are casted for 7 different mixes and tested at 28days.

Flexure test on beam



From the above test results it is cleared that batch mix-3 i.e. 5% pond ash and 35% quarry dust gives the maximum result in terms of compressive strength, split tensile strength and flexural strength. Hence it is choosen for casting of slab.

D casting

The 8mm diameter bars are used for under reinforced slab panel as main steel. The steel wire mesh of 2 mm diameter at the spacing of 30 mm center to center is provided as temperature reinforcement in the flange. The 20 mm cement block is used as a cover..

Fig formwork prepararion and castin

Curing of slab has done with the help of jute bags at normal temperature

F. Test setup

For the experiment work, dial gauges, proving ring and loading jack were used. The test set up along with the loading frame is shown in above figure. The longitudinal edges of slab panel were supported on the main cross girders of loading frame. The simple supports were placed in such a way that effective span is 1.32 m. Then two I-sections were placed perpendicular to the longitudinal edges of the slab at a distance equal to shear span 440 mm from the support both side. So, the applied shear span is 440 mm. Then the two I-girders are placed parallel to the longitudinal edges of the slab.

Fig 5 test setup for double T slab

IV.RESULT AND DISCUSSION

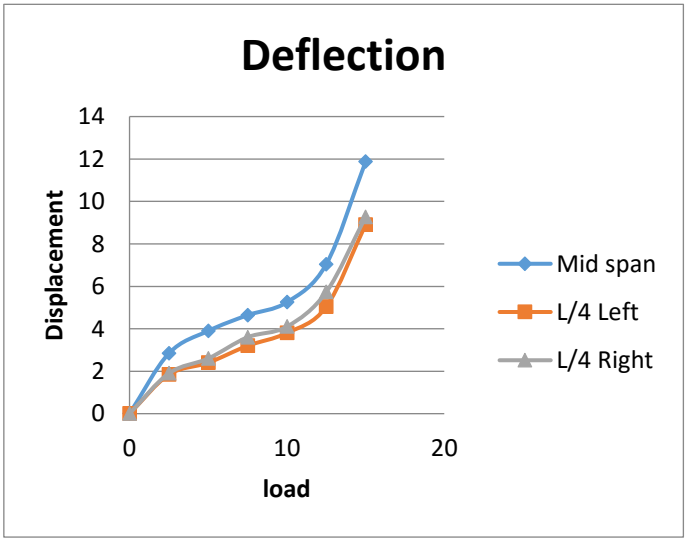


Fig Deflection of conventional double T slab

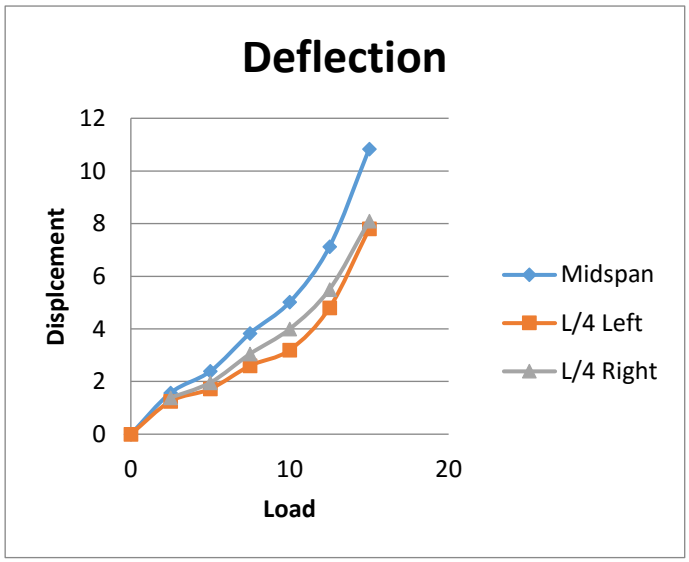


Fig Deflection of blended double T slab

A. DISCUSSION

After testing the slab result is shown in graph of load vs displacement. Load is applied on slab in 2.5kn variations.

- For convention slab ultimate load is found 10kN. deflection measure is 5.25mm at mid span. Maximum allowable deflection for slab as per IS code is L/250.
- Maximum load taken by slab is 15kN
- Maximm deflection is 11.87 under 15 kN
- For blended slab the ultimate load is found 11kN deflection measure is 5.27mm at mid span. Maximum allowable deflection for slab as per IS code is L/250 = 5.28mm
- Maximum load taken by slab is 15kN
- Maximm deflection is 10.84 under 15 kN
- Both slab fails in flexure.

V. CONCLUSIONS

From the study of slab load, its crack pattern, and deflection, the conclusion of the study is that the behavior of double t slab panel made up of conventional concrete and blended concrete is almost same. The slab made up of blended concrete shows better behavior then conventional one. Hence, simultaneous incorporation of Pond ash and quarry dust in concrete can be successfully done.

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