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Experimental Study on Behaviour of Steel composite Blocks Using Epc

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ABSTRACT

Concrete is the most important engineering material and the addition of some other material may changes the properties of concrete. This research is carried out to produce a low cost and eco-friendly concrete steel blocks. Studies have been carried out to investigate the possibility of utilization a broad range of material of partial replacement of coarse aggregate. Here the partial replacement of coarse aggregate by expanded polystyrene in the percentage of 25%, 30%, 35%. The tests were carried out on standard cube of 150x150x150mm for 7, 14, 28 days to determine the optimum percentage replacement. The steel blocks are made in dovetail shape and EPC is poured in it. The strength of steel composite blocks are then studied. The aim of the research is to know the behavior of steel composite blocks after addition of EPS and find its application.

Keywords: Concrete, concrete steel blocks, EPS

INTRODUCTION

Now-a-days construction sector is exploring rapidly on a large scale in construction of modern infrastructures and industrialization. It also involves new techniques for rapid and comfort works on the field. Concrete plays a major role in the construction process. Concrete is a versatile material which can be cast with or without reinforcement. It can also be precast or prestressed in order to achieve the required strength. Structural members must always be proportioned to resists loads in order to provide safety against failure. As we know that concrete is strong in compression and weak in tension, steel is used for strengthening and reinforcing the tensile strength of concrete. The steel must have appropriate deformations to provide strong bonds and interlocking of both materials.

LITERATURE REVIEW

P.L. Chowdary suggests that optimum utilization of EPS beads as a replacement of aggregate is found to be 30% to obtain better strength. The compressive strength generally increases with age at curing, but it decreases densities and strength when EPB beads increased accordingly. 10% of cement is replaced by cement with water cement ratio 0.55. The flexure strength decreases when EPB beads replaced content decreased.

Bengin A Herki, Zrar Safary, Osama Khalid concluded that large quantity of polystyrene is disposed in landfills as a waste. Collecting waste polymer before disposed in landfill sites in crushed and graded form can be used as a lightweight aggregate to produce

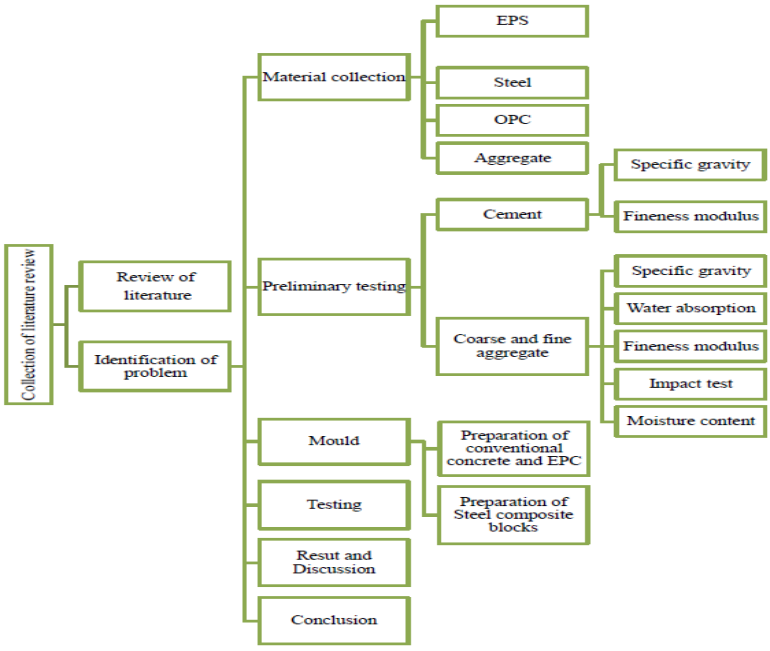
lightweight aggregate concrete. The water/cement (W/C) ratio of 0.5 was kept constant. The workability of the concrete decreased with the increase in waste polymer content. Unlike control concrete (0% waste polymer) the failure observed with concrete containing higher amounts of waste polymer was more gradual and compressible under compressive loading.

Vandhiyan.R , Ranjith Babu.B , Nagarajan.M describes that the natural coarse aggregate were replaced with 0% ,10% ,20% ,30% ,40% & 50% (by volume) of EPS & the OPC was replaced with 30% (by weight) of flyash. EPC concrete shows good workability, without using as special bonding agent. The density of concrete was decreased with increase in EPS , decrease about 3.5% to 23.5%.

Thomas Tamut, Rajendra Prabhu, Katta Venkataramana, Subhash C Yaragal reports on the partial replacement of coarse aggregate by EPS beads. Increase in the EPS beads content in concrete mixes reduces the compressive and tensile strength of concrete. Workability increases with increase in EPS beads content. Obtained results suggest that expanded polystyrene concrete has scope for non-structural applications, like wall panels, partition walls, etc.

B. Singh, M. Gupta, Monika Chauhan and S. K. Bhattacharyya suggested that expanded polystyrene beads can be effectively used as part replacement of the normal aggregates in making lightweight geopolymer concrete in different densities. The mix was cohesive with SBR latex rewetted EPS beads. The floating and segregation of EPS beads can be minimized by using low slump of mix and fast setting of geopolymer with hardener. The compressive strength and split tensile strength decreased with the increase of EPS bead aggregate. Flammability results indicate that EPS geopolymer concrete exhibited no support to the growth of fire. The thermal conductivity reduced significantly when EPS beads were added to geopolymer mortar/concrete. It is concluded that EPS/geopolymer concrete can be successfully used in precast building components and also for insulation purpose.

METHODOLOGY



DAY	3rd day		7th day		28th day	
LOAD & COMPRESSIVE STRENGTH	LOAD (kN)	COMPRESSIVE STRENGTH (N/mm²)	LOAD (kN)	COMPRESSIVE STRENGTH (N/mm²)	LOAD (kN)	COMPRESSIVE STRENGTH (N/mm²)
Control specimen	560	24.89	740	32.88	880	39.11
25% EPS	**540**	**25.33**	**745**	**33.11**	**890**	**39.56**
30% EPS	550	24.44	740	32.89	875	38.89
35% EPS	545	24.22	730	32.44	860	38.22

TABLE: 7

TEST PROCEDURE:

The cube is kept in the compression testing machine and adjusted until the top steel bearing plate touches the surface of the cube. The load is applied until the ultimate plate appears and the specimen fail and the crushing load is observed.

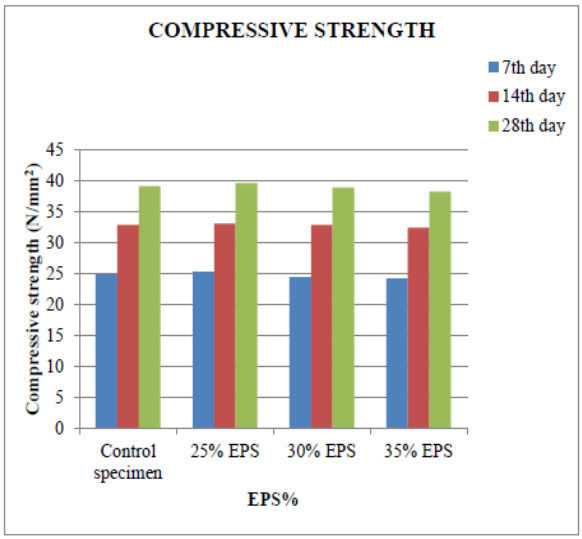


FIGURE: 14

Hence optimum percentage of 25% is assumed for effective replacement of coarse aggregate.

TESTING OF STEEL COMPOSITE BLOCKS

The composite steel blocks are casted and steam curing is done. Then the strength is calculated using compression testing.

BLOCK NUMBER	LOAD (kN)	Compressive strength (N/mm²)
Block 1	1504	31.26
Block 3	1537	29.41
Block 4	1625	28.92
Block 5	1674	24.02

RESULT AND DISCUSSION

Form the results of the experiment, the steel composite blocks shows good result in both engineering and economic wise.

By the addition of 25% of EPS as a partial replacement of coarse aggregate we get the compressive strength as 39.56 N/mm2. Thus EPS replacement in steel composite blocks will be an effective process.

By the cost analysis, the rate of waste EPS are very cheap when compared to other replacement materials. Also this concept is used in the place load bearing structures. The arrangement of these blocks forms a panel which is placed in the corners of the wall in multi-storey buildings. The left over spaces can be filled with brick masonry. Thus it transmits the entire load only through the corner panels. The concept of panel like walls reduces the use of heavy reinforcement which is a major tool in multi-storey construction. Also it reduce the cost when compared to traditional type. Hence the use of EPS in steel composite construction increases the load carrying capacity and reduce the disposal of waste EPS.

CONCLUSION

Among the various mixes it was observed that at the age of 28 days the maximum strength attained at 25% replacement of EPS. Use of higher proportion of EPS reduces the strength of concrete and hence a constant value of 25% is maintained throughout the project. This composite steel block preparation is eco-friendly and cost effective. The main advantage of this concept is the application in load bearing multi-storey building, reduction of environmentally hazardous material and increases the strength of blocks to desirable percentage. But advanced researches are required for practical application.

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Conflict of Interest

None of the authors have any conflicts of interest to declare.