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COMPARISON BETWEEN EPS CONSTRUCTION AND BRICK CONSTRUCTION

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ABSTRACT

EPS Core Panel system is a recent technology that has potential to replace conventional masonry construction. EPS panel is used as Insulated wall panels for office, for floors, roofs, and sandwich panels for residential and commercial. It is proven that EPS is environmentally friendly and also is 100% recyclable. It helps in reducing emissions from harmful chemicals such as CFC's and VOC's. This research work focused on the use of EPS and in construction industry, cost comparison of EPS vs Conventional bricks. Concrete use was of grade - . In experimental analysis, three test were performed compressive flexural and water absorption. A specimen size 150X150X150 mm was used with 3 different densities of EPS panel namely 15kg/m3, 20kg/m3 and 30kg/m3. Flexural test of specimen size 400x100x100 mm was calculated. Costing was carried out and comparison was done.

Keywords: EPS Core Panel, Flexural, Water Absorption, Compressive, Eco-Friendly, Comparison.

I. INTRODUCTION

The major role in construction sector is played by bricks, which is more time and cost consuming. Usually bricks has a very less tensile strength and requires more laborer's to produce it. To increase the efficiency of structure and to decrease unwanted cost this type of technology will be suitable. The results also shows that EPS is more efficient than conventional bricks and it consumes very less time as compared to bricks. EPS technology can substitute the conventional masonry construction it can reduce construction period and cost of transportation. Keeping in mind the increase level of global warming and greenhouse effect on our planet it is necessary for construction industry to use material which are environment friendly which is what EPS capable of.

II. LITERATURE SURVEY

Ari Wibowo, Indrani Wijatmiko (2018), researchers carried out the study in which they tested cyclic behaviour of a precast polystyrene reinforced concrete wall "quasi static load in the form of displacement control cyclic test is been carried out ". "The result shows that EPS walls give sufficient seismic performance for moderate seismic region reaching upto 1% drift and 20% drop of a peak load." Researchers drawn out relation between lateral load and displacement in flexural shear and yield deformation. The comparison between experimental data and theoretical data also been carried out.

Avirup Sarkar, adil ahmad (2016, researchers carried out study on EPS Panel seismic design of G+3 building belonging to North Indian city Sonepat developed in SAP 2000 and analyse all the loads and stresses acting on the building. The subjected load are according to IS code. The result show that the stresses are in the permissible limit of RCC walls and the steel wire mesh is strong enough to resist the design forces.

Nor Hafizah Ramli Sulong (2018), in this study researchers provided detailed overview of application of EPS in various construction elements such as light weight concrete decorative styles, insulated and composite panel as a backfill material also article analyse various EPS properties such as fire behaviour mechanical properties water and moisture absorption and their toxic effect on human and environment.

PCR Collier, G B Baker (2004), in this study try to improve performance of the EPS core panel which they called polystyrene insulated panels they perform test to analyse of joint section panels and corner joint , they tested fire properties for both the test. The fire properties also tested for ceiling panel and various system like hanger system the result show by this test are came out satisfactorily . future improvement and recommendations on addition PIP also been added.

P.S. Nalawade, P.P Dalavi (2018), the researchers carried out a study in which they check strength capability of light weight sandwich panels, also determine appropriate construction method and ideal properties required

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for EPS. In this experimentation work they tested mortared EPS specimen with appropriate material property with compression, flexural and water absorption test. Then try to compare study with conventional brick. The result obtain are good.

III. METHODOLOGY

The whole experimental work divided into two parts in first part the properties of EPS has been tested (compression, flexural, and water absorption test). Three eps panels of various densities with specified dimensions are taken. The material properties has been taken as per specified IS code and Cost of each material is taken from District Schedule Rate (DSR). In second part the cost of 100 square m EPS wall is estimated the result obtain from this test is then compared first class clay bricks.

For testing part materials required for specimen making are:

EPS Core Panel: High density expanded polystyrene core panel of 8 cm reinforced by welded galvanized wire mesh is used. EPS is light-weight and recyclable construction material. Bulk density of EPS as per tested data is 30 kg/m^2. EPS is reinforced by galvanized steel, the diameter of steel wire is 2 mm and centre to centre distance between wires is 50 mm. EPS foam is pierced with diagonal wire.

Cement: For this investigation, Ordinary Portland Cement (OPC) of 53 grade is used According to IS 12269:1989.

Fine Aggregate: Crushed River sand size of 4.75mm is used. Comparable to IS 383-1970. The specific gravity of CA is 2.64 and bulk density for compacted FA obtained by test is 1638 kg/m^3. Fineness modulus is 2.90.

Coarse Aggregate: Crushed stones size of 12.5 mm is used. Data is taken according to IS 2386-1983. The specific gravity of CA is 2.74 and bulk density obtained by test is 1600 kg/m^3. Fineness modulus is 3.40.

Preparation of EPS specimen: for performing different test the eps panel are molded in two different dimensions for compression test and water absorption test specimen size is 150 mm x 150 mm x 150 mm and for flexural test specimen size is 400 mm x 100 mm x 100 mm. The specimen are molded in three different concrete layer. The EPS Panel is placed after 1st layer in middle of the mold. The curing of specimen are carried out for 28 days and then test in UTM machine. The test are conduct till the specimen failure.

Fig No 1: Placing of Specimen

Fig No 2: Test specimens

IV. RESULTS AND DISCUSSION

Compressive and Flexural test is carried out for M25 Expanded polystyrene foam concrete specimen. The compressive strength of specimen at 28th day is given below.

Table 1: Test Result of Compressive and Flexural strength

Sample Size	Compressive strength (N/mm^2)	Flexural Strength (N/mm^2)
15 Kg/m^3 Density EPS	8.7	2.7
20 Kg/m^3 Density EPS	10.3	3.5
30 Kg/m^3 Density EPS	12.9	4.8

Water Absorption test is carried out on different densities Expanded polystyrene foam.

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Table 2: Water absorption test results

Sample Name	Water Absorption (%)
15 Kg/m^3 Density of EPS Panel	7.6
20 Kg/m^3 Density of EPS Panel	6.8
30 Kg/m^3 Density of EPS Panel	6.3

Detailed Quantity Analysis and cost estimation of (3 m x 4 m) wall :

Table 3: Cost analysis of EPS Construction

EPS core panel Wall Construction			
Material	Quantity	Rate	Amount (Rs.)
EPS Panel	12 Sq.m	260 / sq.m	3120.00
Cement	131 kg	290 / kg	759.00
Sand	19 cft	424 / cft	8065.00
Extra Reinforcement	14 m	120 / m	1440.00
Total Cost of EPS Construction			**Rs. 13384.00/-**

Table 4: Cost Analysis of Brick Construction

Brick Wall Construction			
Material	Quantity	Rate (Rs.)	Amount (Rs.)
Brick	1200 no's	4 / no's	4800.00
Cement	150.17 kg	290 / kg	870.00
Sand	21.89 cft	424 / cft	9259.00
Total Cost of EPS Construction			**Rs. 14929.00/-**

V. CONCLUSION

Based on experimental work following conclusions are drawn.

- The compressive strength of EPS core panel is 26% greater than 1st class conventional brick, flexural strength is approx. 37% more.
- Significance fall in water absorption test is detected, approximately 35% less water absorption is found in EPS core Panel.
- Properties of EPS like compressive test, flexural and water absorption improved with increasing density.
- EPS core Panel is exceptional lightweight and galvanized wire mesh make it strong as compared to conventional bricks and EPS is recyclable material and it has a very low carbon foot print.
- The construction cost of EPS is found in between 12-13% less than conventional brick method. Also construction of EPS takes less time.

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