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Experimental Studies on Reduction of Water Absorption in Fly ash Bricks

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Abstract: ***The Bricks are the most commonly used for constructing building walls. The dampness occurs in building walls because of bad quality of material, poor workmanship, & poor planning. The humidity additionally shortens its lifespan but also makes the key components used in the building process unclean. Water sealing is a technique used for maintaining the basement, flooring, & buildings wet. Within your present experimental study to reduce the water absorption content in fly ash bricks the coating of bitumen and polymer on its surface is carried out. Further, its water absorption content with uncoated fly ash brick is compared. Since As well as taking preventative action to avert it due to avoidance is perpetually there are many different causes of dampness, many of which cannot be fully resolved afterwards, this work aims to provide all required precautions preferable to treatment. From the results it is concluded that using bricks coated with bitumen and polymer while constructing the building walls, can definitely reduce the dampness in it.***

Keywords: **Dampness, water absorption, bitumen, polymer.**

I. INTRODUCTION

A piece of brick is a form of slab utilized to build roadways, buildings, as well as other masonry elements. bricks can be attached to one another by different types of mortars, adhesives, or by interlocking (IS 2212:1991). Great deals of brickwork are produced in various lessons, forms, supplies, & dimensions and vary based upon their composition. Burnt clay bricks, sand lime bricks, hollow bricks, fire bricks, concrete bricks, flyash bricks, and engineering bricks are few of the varieties of bricks that are frequently used in These Tiles have a small water penetration rate, are inexpensive, durable, and have uniform dimensions for smoother stucco bonding. Masonry building. Flyash bricks are manufactured using flyash, an industrial waste from thermal power plants (Zhang, 2013).

Nowadays, building dampness in brick masonry is very common. It It could be the result of inferior quality of material, inadequate construction, or poor design. The condensation additionally shortens the structure's lifespan additionally makes the key components used in the building process unclean. The word "access to water guarding" refers to the process of preventing water from dripping from roofs, whereas "damp proofing" refers to the process of keeping the walls, floors, and bottom fresh.

The structure's materials' ability to absorb humidity represents one of the building's primary causes of moisture. Because given the elements' particle composition, wetness can enter the small spaces easy ease and flow in an assortment of ways thanks to the action of capillary action of directions. The important sources of dampness are: Moisture increasing with foundational building; humidity in damp soil can move substantially above the grade due to capillary behavior; water from rain can pass with a defective ceiling encasing on dropping roofs; and water from rain could fall back and bounce off the walls; and precipitation can pass via exposed barrier the highest, parapets, create barriers, and so on.

Fig.1. Dampness in masonry

Rainwater may enter the top supporting wall through a moisture caused by a malfunctioning roof system or overhanging or basin guttering. Water on roofs with flat surfaces can be caused by inadequate roof angles, wrong connections for rain pipes, and defective couplings among the underside of the roof and barrier block. Portune (2015) offered current knowledge concerning the different types of structural wetness, its effects, techniques for controlling wetness in structures, therapies to humidity, or moisture diagnosis. For the development sector, moisture sources constitute a particular concern because they can accelerate the emergence of mildew and microorganisms which may give rise to medical conditions and deteriorate architectural components like walls, ceilings, and rafters.

Campian and Pop (2016) studied very sensitive problem caused due to dampness elimination in building walls. The various methods such In addition to electro-osmotic or chemical approaches or physical method were discussed. Asamoah et al. (2017) studied rising damp in buildings and their effects and suggested remedial measures for controlling and treatment of rising damps. Hola (2018) examined the moisture level in the stone walls found in the cellars in a fourteenth-century European abbey located in northern Bohemia. The electricity and microwaves were employed in the harmless procedures. The weight and humidity of the the walls, to be ascertained by the gravimetric measurement approach, was utilized in the tests to establish the correlation reliance for the without dimension suggestions for the equipment.

Hoła (2020) carried out the experimental studies to determine the moisture content in brick walls of buildings. The tests were carried out non-destructive

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methods. The methodology was proposed for the various causes and negative effects of extreme moisture and salinity in brick walls. Knarud et al. (2021) investigated the interior portions of an insulate mortared brick wall that are being submerged and dried. The parts included an intelligent moisture barrier, inserted oak column finishes, and inside insulated. The mixing procedure for calcium buffered ash fly ash bricks was examined by Gupta et al. in 2021. The combined effects of the two distinct blending procedures and five distinct levels of moisture on the characteristics of bricks made with hydrated limestone and fly ash (HLF) was investigated. The four main types of supplies used to inhibit or avoid moisture in constructions are pliable substances: - like polyamide sheets, plastic roofing, rubberized felts (that might be Hessian-based or fiber/glass-based), etc., Partially rigid substances: -like mastic asphalt or a blend of substances or layers, Stiff substances: - like cement concrete, stones, mortar and grout, and slates used in engineering. Thus, in the present experimental work an attempt is done to reduce the water absorption content in fly ash bricks by coating its surface with bitumen and polymer and compare its water absorption content with uncoated fly ash and traditional clay bricks.

II. MATERIALS AND METHODOLOGY

A. Flyash bricks

A number of processes are involved in the manufacturing of typical fly ash stone: Combining different works: Typically, sands or limestone particles, fly ash, cement, limestone, gypsum, and numerous other materials all mechanically fed in a pan blender, to which fluid is supplied in the appropriate amount to ensure a consistent mixture. With regard to the quality of the initial materials, the quantity for the unprocessed material may change. Following combining, the mixture is fed into computerized brick-making machinery via a belt transport, where it is immediately crushed into bricks. After that, the cement blocks are positioned on steel or pallets made of wood and left that way for a few hours before being moved across an open space to be water cured for a total of twenty-eight days. Prior to being sent, the cement pieces are arranged and validated.

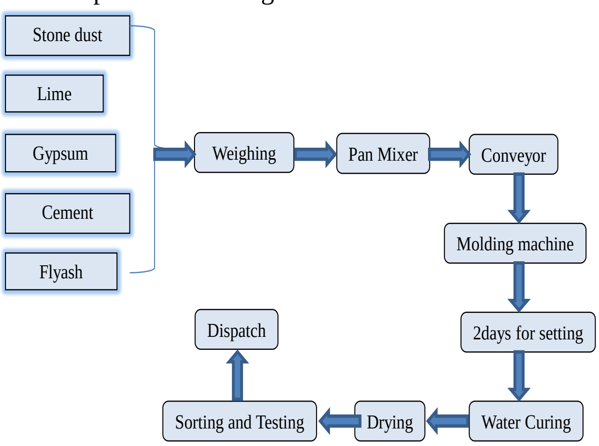

Fig.2. Flowchart for manufacturing process of flyash bricks

B. Water absorption

The water absorption test estimates the amount of moisture content in bricks. As per IS 12894: 2002 and IS 3495 (part 2): 1992 the limit for water absorption in high quality bricks is less than 20%. . The brick specimens are first dried at 105-115°C in an oven. After that the specimens are subsequently brought to normal room temperature, and weight is determined. The weight is recorded as W_1. The brick specimen is then completely immersed in clean water at a room temperature for 24 hours. The specimen is then removed, cleaned of water traces, and weighed accurately and recorded as W_2. The percentage water absorption of each brick specimen is given as

$$\%\ water\ absorption = \frac{(W_2 - W_1)}{W_1} \times 100 \tag{1}$$

The experimental study is carried out to reduce the water absorption content in fly ash bricks by coating its surface with bitumen and polymer and compare its water absorption content with uncoated fly ash bricks. The water absorption capacity ultimately relates the rate of dampness in masonry wall. Figure 3 shows the uncoated fly ash bricks. In order to reduce water absorption content in fly ash bricks bitumen and polymer coats are applied on the surface of the bricks as shown in Figures 4 and 5, respectively.

Fig.3. Uncoated flyash bricks.

Fig.4. Bitumen coated flyash bricks.

Fig.5.Polymer coated flyash bricks

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III. RESULTS AND DISCUSSIONS

A. Water absorption

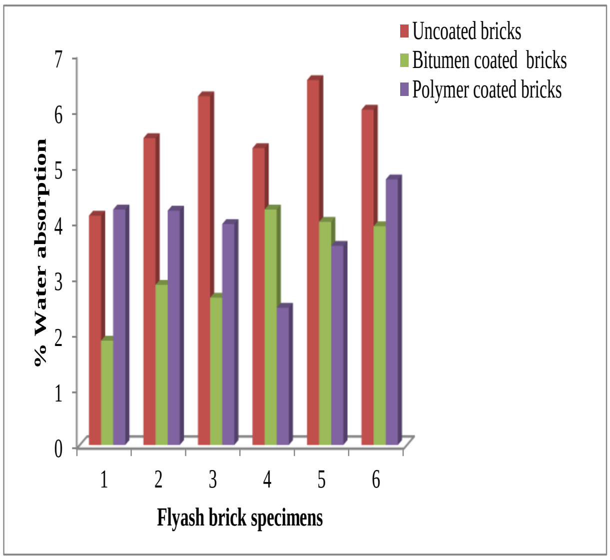
The water absorption in flyash bricks uncoated and coated with bitumen and polymer is given in Table 1 and Figure 6. The average water absorption is 5.62 % which is within the limits of IS codal provision. bitumen. The average water absorption is observed to be 3.25 % when coated with bitumen. The water absorption is also within the IS codal provision and less than the uncoated bricks. We see a typical consumption of liquid to be 3.86 % when coated with bitumen. The water absorption is also within the IS coal provision and less than the uncoated bricks.

It can be observed that the water absorption of fly ash bricks is reduced in the bricks coated with bitumen and polymer coats. It is observed that using bitumen coat the water absorption is reduced by 42.17% and by polymer coat it is reduced by 31.32%.

Hence by using the bitumen and polymer coats in the masonry walls where there is dampness for example walls near bathrooms, WC, kitchen sink etc. The portion of wall masonry bricks can be coated with bitumen and polymer can definitely reduce the dampness in building walls.

Table 1 Water absorption in uncoated and coated flyash bricks

Flyash brick specimens	Uncoated bricks	Bitumen coated bricks	Polymer coated bricks
1	4.11	1.87	4.22
2	5.50	2.87	4.20
3	6.25	2.64	3.96
4	5.32	4.22	2.46
5	6.54	4.00	3.57
6	6.01	3.92	4.76
Average water absorption (%)	5.62	3.25	3.86



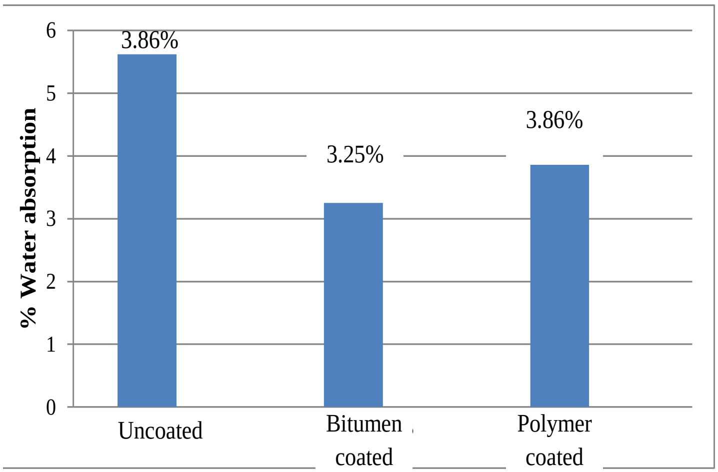


Fig.6 Water absorption in flyash bricks uncoated and coated with bitumen and polymer

IV. CONCLUSION

The experimental study to reduce the water absorption content in fl ash bricks by coating its surface with bitumen and polymer and compare its water absorption content with uncoated flyash bricks. Since there are many different causes of dampness, many of which cannot be fully resolved afterwards, this work aims to provide all required precautions Taking preventative action to avert it due to prevention never fails preferable to treatment. The following conclusions are drawn: The average water absorption of uncoated fly ash bricks is is 5.62 % which is within the limits of IS codal provision. In order to reduce water absorption content in fly ash bricks bitumen and polymer coats are applied on the surface of the bricks. After asphalt is applied, the mean transpiration of water is found to be 3.25%. When bitumen is applied, the median retention of water is found to be 3.86%. The absorption of water is lower as that of bare bricks and falls below the International Standards (IS) coda requirement. It is readily apparent one gets hold of water takes place by

1. Fly ash bricks is reduced in the bricks coated with bitumen and polymer coats. It is observed that using bitumen coat the water absorption is reduced by 42.17% and by polymer coat it is reduced by 31.32%.
2. Hence by using the bitumen and polymer coats in the masonry walls where there is dampness for example walls near bathrooms, WC, kitchen sink etc. The portion of wall masonry bricks can be coated with bitumen and polymer, can definitely reduce the dampness in building walls.

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