

Flyash lime gypsum bricks - A boon for Vidarbha region

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ABSTRACT

Flyash lime gypsum bricks are much superior to conventional clay bricks available in the Vidarbha region. This fact has been established by the authors through extensive research work. Need of the hour is to give proper technical support to the manufacturers of the fly ash bricks and to provide proper facilities to monitor the quality of these bricks so as to make them popular and acceptable to the consumers.

Key words : Flyash utilisation, Lime gypsum bricks, Building materials

1.0 INTRODUCTION

Disposal of fly ash is a major problem in thermal power stations. In Vidarbha region, about 4,000 MW electricity is generated and the quantity of fly ash generated per day is about 20,000 MT. Re-use of fly ash is a good alternative to solve the problem of disposal of fly ash. Use of fly ash for the production of bricks is a well-known fact and is gaining popularity day by day. Despite this there are some doubts about the quality of fly ash bricks. This paper is aimed at establishing the fact that fly ash bricks are much superior as compared to locally available clay bricks. This paper is based on an extensive research being carried out by the authors in Yeshwant Rao Chavan College of Engineering, Nagpur. This paper illustrates the comparative performance of conventional clay bricks available in local market and the fly ash bricks. The performance analysis has been carried out for both types of bricks. This paper also deals with 1) performance of fly ash brick masonry, 2) doubts about fly ash bricks and 3) comparison between fly ash and clay bricks.

2.0 PERFORMANCE ANALYSIS OF BRICKS AVAILABLE AROUND NAGPUR

A detail study was carried out by the authors to compare the performance of clay bricks and fly ash lime gypsum bricks. In this study, clay bricks from eight major manufacturers and fly ash bricks from single major manufacturer were tested for the following properties :

1) Compressive strength - dry and wet,

2) Water-absorption,

3) Efflorescence and

4) Dimensions and tolerance.

These tests were performed as per IS 3495- 1976 and IS 1077- 1992. In addition, the cost analyses of brickwork using clay bricks and fly ash

2.1 Compressive Strength

The properties like compressive strength, water absorption and efflorescence of fly ash bricks and their classification are governed by IS 12894-1990 and that of clay bricks are governed by IS 1077-1992.

Table 1 shows the details of these properties:

Table 1: Properties of clay and Fly Ash Bricks (FAL-G)

S.N.	Description	Fly ash bricks IS 12894-1990		Clay bricks IS 1077-1992	
		Class	Range	Class	Range
0.1	Av. compressive strength in N/mm ² IS 3495-1976 Part I	7.5	7.5-10.0	3.5	3.50-5.00
		10	10.0-15.0	5.0	5.00-7.50
		15	15.0-20.0	7.5	7.50-10.0
		20	20.0-	10.0	10.0-12.5
				12.5	12.5-15.0
				15.0	15.0-17.5
				17.5	17.5-20.0
				20.0	20.0-25.0
				25.0	25.0-30.0
				30.0	30.0-35.0
		35.0	35.0-		
02.	Water of absorption IS 3495-1976 Part II	7.5-10.0	<20%	3.5-12.5	<20%
		15.0-20.0	<15%	12.5-35.0	<15%
03.	Efflorescence IS 3495-1976 Part III	7.5-10.0	moderate	3.5-12.5	moderate
		15.0-20.0	slight	12.5-35.0	slight

The test results of the fly ash bricks and clay bricks are summarised in Table 2

Table 2 : Compressive strength results of the bricks (N/mm²)

Make No.	Clay Bricks		Fly Ash Bricks	
	Dry	Wet	Dry	Wet
01.	5.75	5.35	23.60	18.66
02.	4.76	3.54		
03.	5.57	3.88		
04.	4.73	4.64		
05.	4.78	4.35		
06.	5.41	5.19		
07.	7.38	6.99		
08.	5.19	3.81		

Above results clearly indicate that the compressive strength of fly ash bricks very high compared to clay bricks available locally.

2.2 Water-Absorption

The test results of water of absorption test are shown in Table 3

Table 3 : Results of water absorption test

Make No.	Clay Bricks % water absorption	Fly Ash Bricks % water Absorption
01.	18.75	14.94
02.	13.78	
03.	10.59	
04.	15.05	
05.	22.33	
06.	15.75	
07.	14.76	
08.	14.27	

Above test results show that water absorption is within limits in almost all samples of clay bricks as well as in fly ash bricks.

2.3 Efflorescence

Test results showed that the efflorescence was slight to nil in all brick samples for both clay and fly ash bricks.

2.4 Cost Analysis

The cost of brickwork was:

A) for clay bricks : Rs. 1013 - 1137 per cum.

B) for fly ash bricks : Rs. 1105 per cum.

This shows that the fly ash bricks are equally cost effective as compared to clay bricks. It may be added here that the cost of plaster work over fly ash bricks shall be less than the plaster work over clay bricks due to the uniform size of fly ash bricks.

2.5 Dimensions and Tolerance

The test results are shown in Table 4.

Table 4 : Test results of dimensions and tolerance

Make	Clay bricks			Fly ash bricks			
	Tolerance	L	W	H	L	W	H
	Limits	±80	±40	±40	±80	±40	±40
01.		+26	-11	-75	+48	+13	+25
02.		+16	+30	-5			
03.		-45	+85	+75			
04.		+179	-40	-21			
05.		+10	+10	-75			
06.		-2	-63	-7			
07.		+13	-45	-110			
08.		+130	+114	+13			

Above results indicate that fly ash bricks are of more uniform and correct dimensions as compared to clay bricks available in the region.

3.0 DOUBTS ABOUT FLY ASH BRICKS

From the above results it is clear that fly-ash-lime gypsum bricks are much superior to clay bricks available in the region. Despite this, these bricks do not find much acceptance amongst architects, builders and people in general. This is due to a few doubts in the minds of people. The doubts and actual facts established through extensive work done by the authors can be summarised as follows:

DOUBT NO. 1 : Fly ash bricks have smooth surface. Therefore bond between bricks and cement mortar is weak.

FACT : Tensile strength of fly ash brick masonry built in mortar stronger than M1 type is 0.25 N/mm^2 while that for clay bricks it is 0.15 N/mm^2 . The minimum required strengths are 0.07 and 0.14 N/mm^2 respectively.

DOUBT NO. 2 : Since frog is not provided in fly ash bricks, the masonry is weaker.

FACT : Shear strength of fly ash brick masonry was found to be 0.70 N/mm^2 and that of clay bricks was found to be 0.58 N/mm^2 . The codal provision for shear strength is 0.50 N/mm^2 for both types of bricks.

It may however be stated here that quality of fly ash bricks is highly affected by the quality of ingredients and their proportions and method of curing. Fly ash bricks also react sharply to seasonal variations.

4.0 ADVANTAGES OF FLY ASH BRICKS

The advantages of fly ash bricks are summarised in table 5.

Table 5: Comparison between fly ash bricks and clay bricks

Fly Ash Bricks	Clay Bricks
1. Machine made and hence uniform in shape.	1. Hand made and hence not uniform in shape
2. Compressive strength much higher.	2. Low compressive strength.
3. Less no. of bricks required per cum. (375 per cum.)	3. More no. of bricks required per cum. (425 per cum.)
4. Cement mortar required is 8-10%	4. Cement mortar required is 23-25%
5. Quantity of mortar for plaster required is less.	5. More quantity of mortar required.
6. Bond and shear strength are more	6. Bond and shear strength are less.

5.0 CONCLUDING REMARKS

- 1) Fly ash bricks satisfy all codal provisions.
- 2) Fly ash bricks are much superior to clay bricks available in local area and as such can prove to be boon in building construction field. These have several advantages over clay bricks.
- 3) Fly ash bricks should be manufactured with full care and the process should be monitored constantly. The bricks manufactured should be regularly tested for various parameters.
- 4) Fly ash bricks manufacturers should be given proper and adequate technical support. R & D support centres may be established throughout the country so that the products become popular and acceptable to consumer.