

BUILDING DIGEST

CENTRAL BUILDING RESEARCH INSTITUTE, INDIA



FLYASH MORTAR FOR BRICK MASONRY

Flyash is a finely divided residue resulting from the combustion of pulverised coal in boilers. It is transported from the boiler by flue gases and collected by means of electrical precipitators or mechanical collectors or a combination of both. It is a pozzolanic material and can be used in combination with cement or lime, sand and water to produce flyash mortars suitable for use in brick masonry.

A good masonry mortar should have sufficient workability and water retention to provide easy spreading and filling of joints and good bond with bricks. It should develop adequate strength to carry the imposed load. It should be durable and be able to withstand the action of weathering and efflorescence. In order to have these properties in flyash mortars it is necessary to exercise proper control over the quality of materials, preparation of mortar and curing of brick masonry.

Selection of Materials

The material used for making flyash mortar should conform to the following specified requirements.

Cement

The cement should comply with the requirements of IS : 269-1967 "Specification for ordinary, rapid-hardening and low heat Portland Cement (Second Revision)". It should be clean and free from air-set lumps.

Lime

The lime should conform to the requirements of class C of IS : 712-1964 "Specification for building lime". If it is available as quick lime, then it should be slaked and run into putty in accordance with IS : 1635-1960 "Code of Practice for field slaking of lime and preparation of putty." The actual weight of dry hydrated lime in the putty is determined by using the following formula :

$$W_h = \frac{G}{G-1} (W_p - 1000)$$

where W_h = Weight of dry hydrate (kg/m³)

G = Specific gravity of hydrate (usually assumed to be equal to 2.25)
 W_p = Weight of putty (kg/m³)

Flyash

The flyash should conform to the requirements of IS : 3812 (Part I)-1966 "Specification for flyash, Part I. For use as pozzolana". It should be clean and free from any contamination of bottom ash, a grit or small pieces of pebbles.

Sand

The sand should conform to the requirements of IS : 2116-1959 "Specification for sand masonry mortars". It should be inert, water insoluble and free from acid, alkali or organic matter.

Water

Water used for making mortars should be clear and free from deleterious materials. Potable waters are generally considered suitable for use.

Preparation of Mortar

The mix proportions of cement-flyash-sand mortars and lime-flyash mortars recommended for use in place of commonly used cement-sand mortars and lime-pozzolana (surkhi or cinder) mortars are listed in Table 1.

The cement-flyash-sand mortars should be prepared by following the usual method of preparing cement-sand mortars. The batching should preferably be done by weight. If unavoidable, batching may be done by volume using gauge boxes of suitable capacity.

For preparing lime-flyash mortars, lime (either dry slaked lime or lime putty) and flyash should be mixed in the specified proportion and ground in a mortar mill with addition of required quantity of water till lime and flyash get mixed intimately as indicated by uniform colour of the paste. Sand should then be added (in case of lime-flyash-sand

Table 1 : Recommended Mix Proportions of Flyash Mortars

Commonly used mix proportions (by volume)	Recommended mix proportions of equivalent flyash mortars	
	Proportions by weight	Proportions by volume
1 : 3 Cement-sand	1 : 0.75 : 3.0 Cement-flyash-sand	1 : 1.5 : 3.0 Cement-flyash-sand
1 : 4 " "	1 : 1.0 : 4.0 " "	1 : 2.0 : 4.0 " "
1 : 5 " "	1 : 1.25 : 5.0 " "	1 : 2.5 : 5.0 " "
1 : 6 " "	1 : 1.50 : 6.5 " "	1 : 3.0 : 6.5 " "
1 : 8 " "	1 : 2.0 : 8.0 " "	1 : 4.0 : 8.0 " "
1 : 2 Lime-surkhi (or cinder)		1 : 2 Lime-flyash*
1 : 3 " "		1 : 3 " "
1 : 1 : 2 Lime-surkhi (or cinder) -sand		1 : 1 : 2 Lime-flyash-sand

mortars) to the mix and grinding continued till every aggregate particle gets coated uniformly with the cementitious paste.

Curing of Brick Masonry

Proper curing is essential for satisfactory strength development. Green masonry work should be protected from rain by suitable covering. Brick work in cement-flyash-sand mortar should be kept moist on all the faces for a minimum period of seven days. The top of the brick work should be left flooded at the close of the day. In case of lime-flyash mortars, curing should commence 2 days after the laying of masonry and should continue for at least 7 days.

Precautions in use of Mortars

- (1) Cement-flyash-sand mortars should preferably be used within half an hour of its preparation. In no case it should be left over beyond two

hours of its preparation. The mortar that has stiffened due to evaporation of water may be re-tempered by adding water as frequently as needed to restore the desired consistency but this should be done within two hours of the preparation of the mortar.

- (2) Lime-flyash mortars after grinding should be kept damp and not allowed to dry. This may be ensured by covering it with wet gunny bags.
- (3) All lime-flyash mortars should be used within 24 hours of grinding.
- (4) Partly set and dried mortar should not be re-tempered for use.
- (5) When used for plastering brickwork the recommended mixes of flyash mortars should be prepared using coarse sand. This would avoid development of cracks in the plaster.

* Note—For volume batching 1.5 parts of lime putty may be taken for 1.0 part of dry slaked lime.

There is a demand for short notes summarising available information on selected building topics for the use of Engineers and Architects in India. To meet the need, this Institute is bringing out a series of Building Digests from time to time and the present one is the 87th in the series. Readers are requested to send to the Institute their experience of adopting the suggestions given in this Digest.

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