

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Construction Materials

Properties and Testing



Lecture #3

Concrete Laboratory

Test #3: Efflorescence of Clay Brick

By

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Test No. 3

Efflorescence of Clay Brick

Introduction

- Efflorescence is the usual terms for deposit of soluble salts, formed in or near the surface of a porous material, as a result of evaporation of water in which they have been dissolved.



Test No. 3

Efflorescence of Clay Brick

Introduction

- The causes of efflorescence is the combination of these three circumstances, if any one of these conditions is eliminated, the efflorescence will not occur:
 - **Soluble compounds in the masonry or adjoining materials.**
 - **Moisture to pick up the compounds and carry them to the surface.**
 - **Evaporation or hydrostatic pressure that causes the solution to move.**

Test No. 3

Efflorescence of Clay Brick

Test Objective

- The objective of this is to observe the deposit of soluble salt that deposit on the total surface of the clay brick is called Efflorescence.

Test No. 3

Efflorescence of Clay Brick

Requirements

- This test is done according to ASTM C 67-09 and Iraqi Standard specification 24/1988, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- The selected Specimens shall be representative of a lot of units and brushed to remove dirt, mud, mortar and any foreign materials.
- According to the ASTM specification, the number of selected specimens is at least 10 individual bricks for lots of 1 000 000 bricks or fraction or .
- The test specimens shall consist of ten full-size bricks that shall be stored into five pairs so the both specimens of each pair will have the same appearance as nearly as possible and brush any adhering dirt.

Test No. 3

Efflorescence of Clay Brick

Apparatus

- **Tray and Containers** : the properties of the trays or pans as follow:
 - The materials of watertight shallow pans or trays must be a corrosion-resistant metal that will not provide soluble salts when in contact with distilled water containing leaching from brick.
 - The pan shall provide an area such that the total volume of water is large in comparison with the amount evaporated each day, so it will provide not less than 25.4 mm depth of water. Suitable apparatus shall be provided for keeping a constant level of water in the pan.
- **Drying Room**, maintained at a temperature of $24 \pm 8^{\circ}\text{C}$, with a relative humidity between 30 and 70%, and free from draft.
- **Drying Oven** that provides a free circulation of air through the oven and is capable of maintaining a temperature between 110 and 115°C .

Test No. 3

Efflorescence of Clay Brick

Procedure

1. Select 10 bricks randomly.



Test No. 3

Efflorescence of Clay Brick

Procedure

2. Set each specimen from each of the five pairs, on end, partially immersed in distilled water to a depth approximately 25.4mm for 7 days in the drying room separated the individually by a spacing of at least 50.8 mm.



Test No. 3

Efflorescence of Clay Brick

Procedure

3. Set other specimen from each of the five pairs in the drying room without contact with water.
4. At the end of 7 days, inspect the first set of specimens and then dry both sets in the drying oven for 24 hrs.
5. After drying, examine and compare each pair of specimens, observing the top and all four faces of each specimen from a distance of 3m under good illumination by an observer with normal vision.



Test No. 3

Efflorescence of Clay Brick

Result

- No information is presented about either the precision or bias of the test method for efflorescence because the test result is non quantitative, but the results can be concluded as follow :
 - ❑ Nil: no perceptible deposit of salts.
 - ❑ Slight: no more than 10% of the area of face covered with a deposit of salts.
 - ❑ Heavy: more than 50% of the area of face covered with deposit of salts but without powdering and flaking of the surface.
 - ❑ Very Heavy: more than 50% of the area of face covered with deposit of salts. However, powdering and flaking of the surface.

Test No. 3

Efflorescence of Clay Brick

Specification

According to Iraqi Standard Specification 25/1988, the maximum efflorescence of the clay brick illustrated as follow:

Iraqi Standard Specification 25/1988		Efflorescence (Maximum)
Class A	Used to structure parts and foundation loaded and exposed to erosion because of climatic effects and for external walls exposed to erosion.	Slight
Class B	Used for bearing structure parts unexposed to erosion or for internal wall protected from moisture	Medium
Class C	Used for structure parts unexposed to climatic effects and unloaded as a partitions.	---

Test No. 3

Efflorescence of Clay Brick

Data Sheet

Group No.	Efflorescence
1	
2	
3	
4	
5	

Test No. 3

Efflorescence of Clay Brick

- Reduction of Efflorescence Potential in New Masonry Walls

How?