

1. Clay Bricks Test

فحوصات الطابوق

1.1 فحص ابعاد الطابوق (Dimensions Test)

Clay brick used in building should be:

- a. Uniformed in shape
- b. The angles and corners of brick should be undamaged and rectal
- c. The face of the brick should be plane and empty of cracks
- d. The section of brick should be homogeneous, completely fired and empty of gypsum pieces, stones and calcareous nodes

Objective:

Specify the dimensions of the bricks and compare it with the limits of Iraqi standard specification.

✚ Standard dimensions of brick: (240 x115 x 75) mm

Standard specification:

The Iraqi standard specifications adopted in this test were:

- Iraqi standard specifications No. 24 /1988 (IQS 24-1988)
- Iraqi standard specifications No. 25 /1988 (IQS 25-1988)

Apparatus:

- Measuring tape or steel ruler

Procedure :

- 1) Remove all bulges and grains which attached with in the bricks
- 2) Attached 24 bricks adjacently in straight line on the plane surface in three ways: (as shown in figure (1))
 - In length direction

- In width direction
- In depth direction

- 3) Measure the length, width and depth for all attached bricks using the measuring tape.
- 4) Calculate the mean of length, width and depth for 24 bricks.

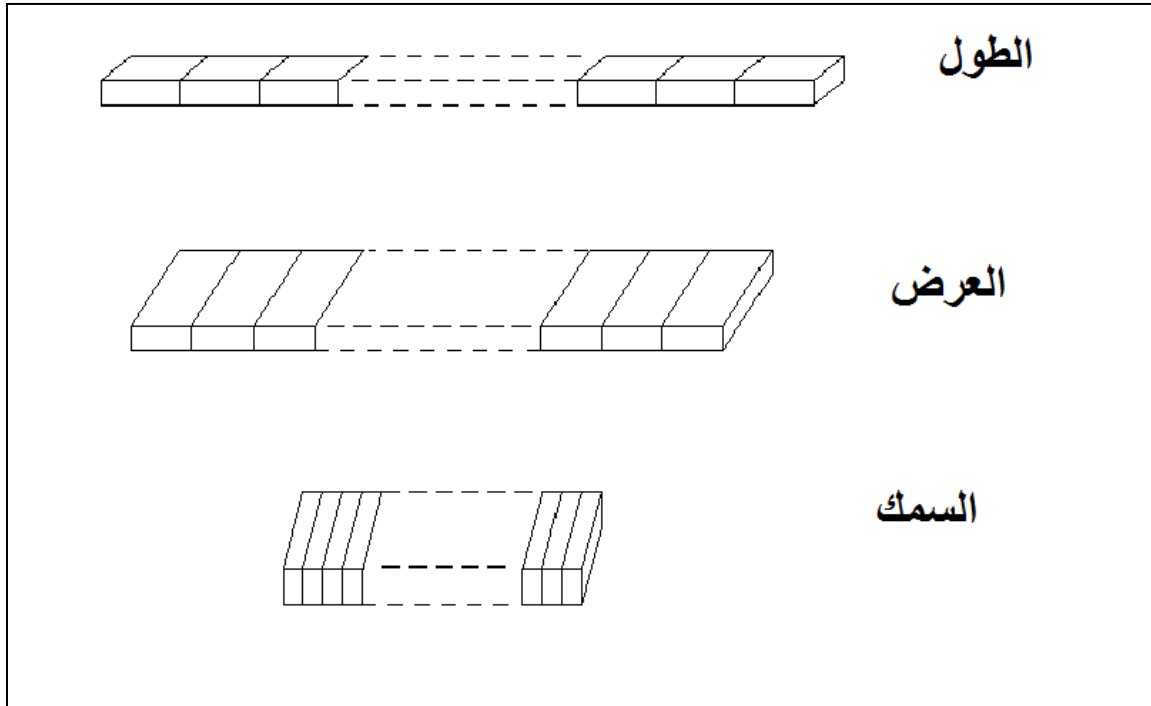


Figure (1): The different directions way for measuring the dimensions

- ❖ If it can't specify the dimension of 24 bricks, we can measure the dimensions into two groups of 12 bricks or into three groups of 8 bricks, in such way each group measures the dimensions separately and the dimensions be taken performed by 24 bricks.

Calculation:

After measuring the dimension of 24 attached bricks,

1. Calculate the mean of length, width and depth by:

$$\text{Mean of length of 24 bricks} = \frac{\text{Total length of 24 bricks}}{24}$$

$$\text{Mean of width of 24 bricks} = \frac{\text{Total width of 24 bricks}}{24}$$

$$\text{Mean of depth of 24 bricks} = \frac{\text{Total depth of 24 bricks}}{24}$$

❖ If it was two or three groups:

$$\text{Mean of the dimension} = \frac{\text{avg.dimension of group No.1} + \text{avg.dimension of group No.2} + \text{avg.dimension of group No.3}}{3}$$

2. Calculation the varying percent of length, width and depth by:

$$\text{Length varying percent (\%)} = \frac{\text{measured length} - \text{standard length}}{\text{dimension standard length dimension}} \times 100$$

$$\text{Width varying percent (\%)} = \frac{\text{measured width} - \text{standard width}}{\text{dimension standard width dimension}} \times 100$$

$$\text{Depth varying percent (\%)} = \frac{\text{measured depth} - \text{standard depth}}{\text{dimension standard depth dimension}} \times 100$$

Specification limits:

Iraqi standard specification No. 25 specify the accepted limit of varying percent with (%3 ±) in length and width, and (%4 ±) in depth.

Table (1): Result of the test

Group No.	Brick No.	Total length (mm)	Total width (mm)	Total depth (mm)	Mean (mm)
1					
2					
3					

(Water Absorption Test) فحص الامتصاص 2.1

Objective:

Determine the water absorption percentage of bricks to specify the usage of tested brick.

Standard specification:

The Iraqi standard specifications adopted in this test were:

- **Iraqi standard specifications No. 24 /1988 (IQS 24-1988)**
- **Iraqi standard specifications No. 25 /1988 (IQS 25-1988)**

Apparatus:

- **Accurate balance**
- **Pan filled with water**
- **Oven**

Samples of Test:

Number of samples used in test was 10 according to Iraqi standard specification No. 24.

Procedure :

- 1. Dry the brick samples in oven at (110-115°C) until the weight settle down**
- 2. Cool the specimens at room temperature and weighed by accurate balance to be the dry weight.**
- 3. Submerses the samples in pan filled with water at room temperature for 24 hours.**

4. After 24 hrs., remove the specimens from the pan and dry the surface by piece of cloth.

5. Weighed the samples to be the wet weight.

Calculation:

1. Calculate the water absorption percentage of brick from:

$$\% \text{ Absorption} = \frac{\text{Dry weight} - \text{Wet weight}}{\text{Dry weight}} \times 100$$

2. Calculate the average of absorption percentage of 24 brick

Table (1): Result of the test

Sample No.	Dry weight of sample (gm)	Wet weight of sample (gm)	% Absorption
1			
2			
3			
Average of absorption percentage			

اصناف الطابوق :

صنفت المواصفة القياسية العراقية رقم 25 الطابوق الطيني الى ثلاث اصناف :

- صنف (أ): يستخدم هذا الطابوق في اجزاء المنشآت والاسس المحملة بالاثقال والمعرضة الى التآكل بفعل العوامل المناخية والطبيعية او طابوق الجدران الخارجية المعرضة الى التآكل.
- صنف (ب): يستخدم هذا الطابوق في اجزاء المنشآت والاسس المحملة بالاثقال وغير المعرضة الى التآكل بفعل العوامل المناخية والطبيعية الاخرى في الجدران الداخلية و الخارجية المحمية من الرطوبة.
- صنف (ج): يستخدم هذا الطابوق في اجزاء المنشآت التي لا تتعرض الى العوامل المناخية والطبيعية وغير المحملة كالقواطع وغيرها.

❖ حددت المواصفة القياسية العراقية رقم 25 الحد الاعلى لنسب امتصاص الطابوق للماء وكما

يلي:

الحد الاعلى لنسبة امتصاص الطابوق للماء		صنف الطابوق
معدل امتصاص (10) طابوقات	امتصاص طابوقة واحدة	
%20	%22	أ
%24	%26	ب
%26	%28	ج

3.1 فحص تحمل الانضغاط (Compressive Strength Test)

الضغط او مقاومة الانضغاط هي القوة المسلطة على وحدة المساحة ويعبر عنها بوحدات ميكا باسكال

$$\text{ميكا باسكال (Mpa)} = \text{نيوتن/ملم}^2 \text{ (N/mm}^2\text{)}$$

Objective:

Determine the compressive strength of the bricks

Standard specification:

The Iraqi standard specifications adopted in this test were:

- Iraqi standard specifications No. 24 /1988 (IQS 24-1988)
- Iraqi standard specifications No. 25 /1988 (IQS 25-1988)

Apparatus:

- Pan filled with water
- Two of flakes lath
- Compressive strength machine

Samples of Test:

Number of samples used in test was 10 according to Iraqi standard specification No. 24.

Procedure:

1. Submerses the samples in pan filled with water at room temperature for 24 hours.
2. Remove the specimens from the pan and dry the surface by piece of cloth.
3. Put the samples between the two flack lath (3mm in depth) and insert in the compressive machine in such way that the center of samples applies on the center of machine.

4. Applied the load gradually and regularity from zero until the samples failed with loading rate (14 MPa/min).
5. Record the applied load in KN.

Calculation:

1. Calculate the compressive strength of bricks from:

$$\text{Compressive strength (N/mm}^2\text{)} = \frac{\text{applied load (N)}}{\text{area subjected to load (mm}^2\text{)}}$$

2. Calculate the average compressive strength of 24 bricks.

Table (2): Results of the test

Samples No.	Applied load (N)	Compressive strength (N/mm²)
Avg. compressive strength		

Specification limits:

Iraqi standard specification No.25 specifies the minimum limit for compressive strength, as shown in Table (2).

Table (2): Specification limits for compressive strength

Type of brick	Min. limit of compressive strength	
	Compressive strength for one brick (MPa)	Compressive strength for avg. ten brick (MPa)
A	16	18
B	11	13
C	7	9

➤ اصناف الطابوق المذكورة في الجدول اعلاه هي نفسها المذكورة في فحص امتصاص الطابوق للماء.

4.1 فحص التزهير (Efflorescence Test)

Objective:

Specify the salt percentage in bricks.

Standard specification:

The Iraqi standard specifications adopted in this test were:

- Iraqi standard specifications No. 24 /1988 (IQS 24-1988)
- Iraqi standard specifications No. 25 /1988 (IQS 25-1988)

Apparatus:

- Pan (at least 5 cm in depth) contains of distilled water (at least 2.5 cm in depth)

Samples of Test:

Number of samples used in test was 10 according to Iraqi standard specification No. 24.

Procedure:

1. Take the brick specimens and marked a line (2.5 cm) depth in the longitudinal direction around the brick.
2. Put the specimens in the pan and pour the water in the pan till reaches 2.5 cm depth. See Figure below.
3. The specimens be separated from each other and from the edge of the pan
4. Leave the specimens in the pan for 7 days with addition the distilled water whenever it's quantity reduce.
5. Dry the specimens in the same pan (without water) for 3 days

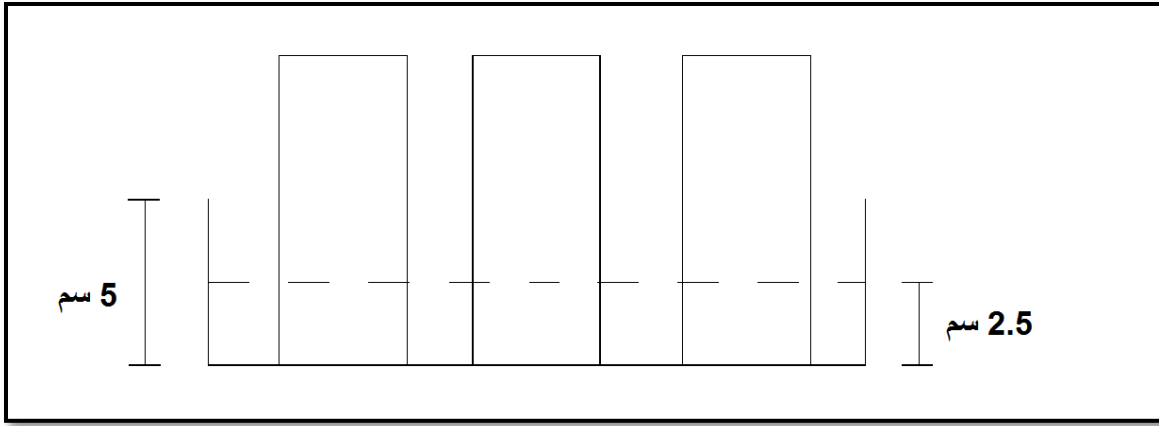


Figure (1): Longitudinal direction way of specimens

Calculation:

- Determine the effloresce percent from:

$$\text{Effloresce percent} = \frac{\text{summation of effloresce area}}{\text{summation of brick face areas except the faces immersed in water}} \times 100$$

- Calculate the average of effloresce percent of 10 bricks

Table (1): Results of test

Specimens No.	Effloresce area	Brick face area	Effloresce percent
1			
2			
3			
Avg. effloresce percent			

درجات التزهـر:

يعبر عن التزهـر بالدرجات التالية:

الدرجة	تأثير التزهـر
معدوم	عندما لا يظهر التزهـر
خفيف	عندما تكون مساحة السطح المغطاة بطبقة خفيفة من الملح لا تزيد عن 10% من مجموع سطح الوحدة
متوسط	عندما تكون الطبقة الملحية اكثر من السابقة (درجة الخفيف) ولا تزيد عن 50% من مساحة الوحدة على ان لا يصحب ذلك تفتت او تقشر السطح
كثيف	عندما تكون الطبقة الملحية كثيفة وتغطي اكثر من 50% من مساحة الوحدة دون ان لا يصحب ذلك تفتت او تقشر السطح
كثيف جدا	عندما تكون الطبقة الملحية كثيفة جدا ويصحب ذلك تفتت او تقشر السطح او كلاهما

حدود المواصفة : (Specification Limits)

حددت المواصفة القياسية العراقية رقم 25 الحد الاعلى لتزهـر الطابوق وكما يلي:

الحد الاعلى للتزهـر	صنف الطابوق
خفيف	أ
متوسط	ب
-	ج

❖ اصناف الطابوق المذكورة في الجدول اعلاه هي نفسها المذكورة في فحص امتصاص الطابوق للماء.