

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# Construction Materials

## Properties and Testing



*Lecture #1*

*Concrete Laboratory*

**Test #1: Compressive Strength of Clay Brick**

*By*

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# Test No. 1

## Compressive Strength of Clay Brick

### *Introduction*

- Clay products are one of the most important classes of structural materials.
- One of the oldest building material brick continues to be a most popular and leading construction material because of being cheap, durable and easy to handle and work with.
- Clay bricks are used for building-up exterior and interior walls, partitions, piers, footings and other load bearing structures.

# Test No. 1

## Compressive Strength of Clay Brick

### *Introduction*

- The Compressive strength of clay bricks depends on:
  - The type of clay used,
  - How the units are made,
  - The temperature and duration of firing, and
  - The shape and size.
  
- When the bricks laid in a structure are subjected to compression, the bricks placed in bottom layers are subjected to greater compression and are thus liable to damage.
  
- So the bricks are therefore to be tested for compression.

# Test No. 1

## Compressive Strength of Clay Brick

### Test Objective

- The objective of the compression strength test of clay brick is to determine the resistance of the brick under exposed compressive load.

# Test No. 1

## Compressive Strength of Clay Brick

### Requirements

- This test is done according to ASTM C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile and Iraqi specification No24/1988.
- 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.

# Test No. 1

## Compressive Strength of Clay Brick

### Requirements

- The test specimens shall consist of dry half brick from ten selected specimens.
  - **(Full Depth) X (Full Width) X (0.5 Length).**
- If there is a problem with the test machine the specimens can be dimensioned **(Full Depth) X (Full Width ) X (Length not less than of 0.25 the full length)** and with a gross cross-sectional area perpendicular to bearing not less than **(90.3 cm<sup>2</sup>)**.
- Each specimen shall be marked to identify at any time and shall cover not more than 5% of the superficial area of the specimen.

# Test No. 1

## Compressive Strength of Clay Brick

### Apparatus

- Electrical Oven

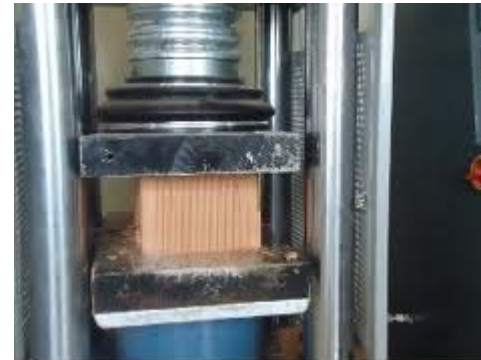


# Test No. 1

## Compressive Strength of Clay Brick

### Apparatus

- Compressive Test Machine





# Test No. 1

## Compressive Strength of Clay Brick

### Procedure

1. Select 5 half-brick from 5 bricks which are selected randomly



# Test No. 1

## Compressive Strength of Clay Brick

### Procedure

2. Dry the specimen in a drying oven at a temperature of (110 to 115°C) for not less than 24 hrs.



# Test No. 1

## Compressive Strength of Clay Brick

### Procedure

3. Remove the bricks from the oven and cool them to room temperature ( $24 \pm 8^{\circ}\text{C}$ ), with a relative humidity between 30 and 70 % .



# Test No. 1

## Compressive Strength of Clay Brick

### Procedure

4. Put brick specimens flatwise (applied load in the direction of the depth of brick) in the testing machine and load them until the specimens crushed and record the maximum applied load. Test structural clay brick specimens in a position such that the load is applied in the same direction as in service.



# Test No. 1

## Compressive Strength of Clay Brick

### Calculation

- The compressive strength for each specimen to the nearest 0.01 MPa as follow:

$$\textit{Compressive Strength, } C = \frac{P}{A}$$

Where:

**P:** maximum recorded load indicated in testing machine (N).

**A:** Average of the gross of the upper and lower bearing surface of the specimens mm<sup>2</sup>.

# Test No. 1

## Compressive Strength of Clay Brick

### Specification

- According to ASTM specification, the minimum compressive strength of the clay brick illustrated as follow:

Grade	ASTM Specification	Minimum Compressive Strength (MPa)		
		Average of 5 brick	Individual	
C 62	Building Brick	SW: Sever Weathering .	20.7	17.2
		MW: Moderate Weathering	17.2	15.2
		NW: Negligible Weathering	10.3	8.6

# Test No. 1

## Compressive Strength of Clay Brick

### Specification

- According to ASTM specification, the minimum compressive strength of the clay brick illustrated as follow:

Grade	ASTM Specification		Minimum Compressive Strength (MPa)	
			Average of 5 brick	Individual
C 216	Facing Brick	SW: Sever Weathering .	20.7	17.2
		MW: Moderate Weathering	17.2	15.2

# Test No. 1

## Compressive Strength of Clay Brick

### Specification

- According to ASTM specification, the minimum compressive strength of the clay brick illustrated as follow:

Grade	ASTM Specification		Minimum Compressive Strength (MPa)	
			Average of 5 brick	Individual
C 652	Hollow Brick	SW: Sever Weathering .	20.7	17.2
		MW: Moderate Weathering	17.2	15.2



# Test No. 1

## Compressive Strength of Clay Brick

### Specification

- According to ASTM specification, the minimum compressive strength of the clay brick illustrated as follow:

Grade	ASTM Specification		Minimum Compressive Strength (MPa)	
			Average of 10 brick	Individual
C 902	Pedestrian and Light Traffic Paving Brick	SX: Sever Weathering Extra cont.	27.6	24.1
		MX: Moderate Weathering Extra	20.7	17.2
		NX: Negligible Weathering Extra	20.7	17.2

# Test No. 1

## Compressive Strength of Clay Brick

### Specification

- According to ASTM specification, the minimum compressive strength of the clay brick illustrated as follow:

Grade	ASTM Specification		Minimum Compressive Strength (MPa)	
			Average of 10 brick	Individual
C 1272	Heavy Vehicular Paving Brick	F: Freezing	69.9	60.7
		R: Thawing	55.2	48.3

# Test No. 1

## Compressive Strength of Clay Brick

### Specification

- According ASTM specification, the minimum compressive strength of the clay brick illustrated as follow:

Grade	ASTM Specification		Minimum Compressive Strength (MPa)	
			Average of 10 brick	Individual
C 126 coring	Ceramic Glazed Facing Brick	Vert.	20.7	17.2
		Horiz	13.8	10.3

# Test No. 1

## Compressive Strength of Clay Brick

### Specification

- According to ASTM specification, the minimum compressive strength of the clay brick illustrated as follow:

Grade	ASTM Specification	Minimum Compressive Strength (MPa)	
		Average of 10 brick	Individual
C 1405	Single Fired Glazed Brick	EXT.	34.8
		INT.	17.2

# Test No. 1

## Compressive Strength of Clay Brick

### Specification

- According to Iraqi specification No. 24/1988,
- the minimum compressive strength of the clay brick
- illustrated as follow:

Iraqi Specification		Minimum Compressive Strength (MPa)	
		Average of 10 brick	Individual
Class A	Used to structure parts and foundation loaded and exposed to erosion because of climatic effects and for external walls exposed to erosion.	18.0	16.0
Class B	Used for bearing structure parts unexposed to erosion or for internal wall protected from moisture	13.0	11.0
Class C	Used for structure parts unexposed to climatic effects and unloaded as a partitions.	9.0	7.0

# Test No. 1

## Compressive Strength of Clay Brick

### Data Sheet

Group No.	Area (mm <sup>2</sup> )	Load P(N)	Compressive Strength MPa	Average Compressive Strength
1				
2				
3				
4				
5				

Test No. 1  
Compressive Strength of Clay Brick

END