Compressive Strength of Hydraulic Cement Mortars
Using 50 mm Cube Specimens

( ASTM C109-88 )

Scope
This test method covers determination of the compressive strength of cement mortars, using 2 in(50mm) cube specimens. The results of this test have to be used for determination of the compliance with specifications.

Apparatus

- Specimens molds: three cubes of (50mm) side.
- Mechanical mixer.
- Glass Graduate: to measure the mixing water.
- Tamper (0.5 by 1 inch & 5 to 6 inch length, of no absorptive, no brittle material).
- Trowel.
- Testing machine.
- A balance of accuracy of 0.1 % of the weight of the sample.

The mixer

The specimens molds
Procedure

❖ Preparation of Materials:

1- Preparing the mortar according to the standard specification

Cement : sand : water
1 : 2.75 : 0.485

- For six cubes use 500g of cement 1375 g of sand & 242.5 g of water.
- The graded sand shall be of natural silica (C778) {Standard Ottawa Sand}.

❖ Preparation of Mortars:

2- Mix the proportions of the mortar as follows:

- Place all the mixing water in the bowl.
- Add the cement to the water, then start the mixer and mix at the low speed for 30 s.
- Add the entire quantity of sand slowly over a (30 s) period, while mixing at slow speed.
- Stop the mixer, change to medium speed and mix for 30 s.
- Stop the mixer and let the mortar stand for 1.5 min. During the first (15 s) of this interval, quickly scrape down into the batch any mortar that may have collected on the side of the bowl.
- Finish by mixing for (1 min) at medium speed.

❖ Molding the test specimen:

3- After finishing mixing we take mortar to prepare specimen for testing:

- Paint the cube by oil (to prevent mortar sticking on the corner of cube).
- Fill the first layer (half of cube height), then tamp it by using tamping rod made of wood or plastic (it must be non-absorptive & non-brittle), & tamped it 32 time on four stages (8 tamp for each stage).

Note:- The way of tamping (Fig(1)).
Fill the second layer (the other half of cube length) in the same way of filling the first layer & level the surface of cube.

Keep the cubes in wet place & away from sun ray for 24 hours.

Submerged the cubes of mortar in the water until the day we break it (after 3 or 7days), 15 minutes before breaking we exist it & dry its surface.

Put the cube on the testing machine, apply the load on the true plane surfaces of the specimen in a rate such that the failure will occur in (20 to 80)s.

Record the maximum load (P_{com.}) from the testing machine & calculate the compressive strength from the following equation:

$$\sigma = \frac{P_{com}}{A}$$

where

$A = \text{the area of loaded surface}$

Compare the result with the ASTM requirements:

<table>
<thead>
<tr>
<th>Age of test specimens (Day)</th>
<th>Min Compressive Strength (MPa)</th>
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<tbody>
<tr>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>19</td>
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<td>28</td>
<td>28</td>
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