

Compressive Strength of Mortar - Mix Ratio and Cube Test

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Compressive strength of mortar is determined by using 2 inch or 50mm cubes as per ASTM C109 / C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars. Mortar is a combination of cement, sand mixed with water. It is used for masonry works such as brick masonry and stone masonry and for plastering walls, columns etc. Common mix ratio of mortar used in masonry works are 1:3, 1:4 and 1:6 of cement to sand ratio. For important masonry structures such as brick walls, 1:3 ratio is used.

Why Compressive Strength Test of Mortar is Important?

Generally masonry structures are constructed as load bearing. For example, load bearing walls, load bearing masonry columns etc. are constructed for residential and other masonry buildings. For a masonry buildings, foundations are also constructed with brick masonry. For a load bearing masonry construction, it is important to know the compressive strength requirement of masonry to withstand the load subjected on it. A masonry wall is subjected to compressive loads from floors above it and should have sufficient strength to withstand it. So, masonry compressive strength should be enough to support the loads on wall.



Determination of Compressive Strength of Mortar

To find the compressive strength of standard cement sand mortar cubes, following are the apparatus and procedures of the test.

Apparatus

70.6mm cubes moulds (50cm^2 face area), apparatus for gauging and mixing mortar, vibrator, compression testing machine etc.

Procedure for Compressive Strength of Mortar

Take 200gm of cement and 600gm of standard sand in the mix ratio 1:3 by weight) in a pan. The standard sand shall be of quartz, of light, gray or whitish variety and shall be free from silt. The sand grains shall be angular, the shape of grains approximating to the spherical

form, elongated and flattened grains being present only in very small quantities. Standard sand shall pass through 2 mm IS sieve and shall be retained on 90 microns IS sieve with the following particle size distribution.

Particle size	Percent
Greater than 1mm	33.33
Smaller than 1mm & >500 microns	33.33
<500 microns	33.33

Mix the cement and sand in dry condition with a trowel for 1 minutes and then add water. The quantity of water shall be $(p/4+3)\%$ of combined weight of cement and sand where, p is the % of water required to produce a paste of standard consistency determined earlier. Add water and mix it until the mixture is of uniform colour. The time of mixing shall not be < 3 minutes & not > 4 minutes. Immediately after mixing the mortar, place the mortar in the cube mould and prod with the help of the rod. The mortar shall be prodded 20 times in about 8 sec to ensure elimination of entrained air. If vibrator is used, the period of vibration shall be 2 minutes at the specified speed of 12000 ± 400 vibrations /minutes. Then place the cube moulds in temperature of $27 \pm 2^\circ$ C and 90% relative humidity for 24 hours. After 24 hours remove the cubes from the mould and immediately submerge in clean water till testing. Take out the cubes from water just before testing. Testing should be done on their sides without any packing. The rate of loading should be $350 \text{ kg/cm}^2/\text{minute}$ and uniform. Test should be conducted for 3 cubes and report the average value as the test result for both 7 day and 28 day compressive strength.

Result of Mortar Cube Test

Compressive strength at 7 days =.....N/mm² Compressive strength
at 28 days =.....N/mm²

Calculations of Compressive Strength of Mortar

Range Calculation Allowable compressive stress= Area of cross
section of cubes=50cm² Expected load=stress x area x f.s= Range to
be selected is **Compressive Strength of Mortar** Breaking
load= Area of cross section=..... Compressive
strength=.....