

CEEN 3320 - Behavior and Properties of Engineering Materials
Laboratory Experiment 4 - Portland Cement Mortar

Objective: To evaluate the effects of curing time & temperature, W/CM ratio, and set accelerators on the strength of Portland cement mortar cubes.

Equipment: Mortar mixer, scales, molds, tampers, mixing spoons.

ASTM Ref: C 109, C 1074

- Procedure:**
1. Prepare a cube mold (3 cubes total) by lightly oiling the sides and bottom.
 2. Weigh and combine in the mixer bowl a mixture of sand and cement according to the target proportions listed in Table 1. Record these weights in Data Table 1. Dry mix by hand until a uniform mixture is obtained.
 3. Add the appropriate amount of mixing water and 30% CaCl₂ solution to achieve the target water to cement ratio listed in Table 1. Record these weights in Data Table 1.
 4. Mix the mortar in the Hobart mortar mixer on low speed for approx. 1 minute or until a homogeneous mixture is obtained.
 5. Transfer enough mortar to the prepared molds to fill to approximately 2/3 full. Consolidate the mortar by tamping 32 times (4 circuits around the mold with 8 tamps per circuit). The consolidation should be completed in approx. 10 seconds using a tamping pressure just enough to ensure uniform filling of the molds. After the first layer is consolidated, fill the mold with sufficient mortar to ensure complete filling after a second round of tamping. Repeat the tamping procedure ensuring that excess mortar which spills out over the top of the mold is scraped back in after each round.
 6. Move the filled mold to the appropriate curing environment as listed Table 1.
 7. Repeat steps 1 – 6 for each additional target mortar mixture.

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Table 1. Target Mixture Components

Mortar Type	w/c	Curing Environment	Sand g	Cement g	Water g	CaCl₂ ml
Plain	0.35	70 F	687.5	250	87.5	0
Plain	0.60	70 F	687.5	250	150	0
Plain	0.35	35 F	687.5	250	87.5	0
Accelerated	0.35	35 F	687.5	250	71.5	16

Table 2. Mortar Mixtures and Curing Environments

Mortar Type	w/cm Ratio	Curing Environment
Plain	0.35	70 F
Plain	0.60	70 F
Plain	0.35	35 F
Accelerated	0.35	35 F

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Data Table 1 – Actual Mixture Components

Mortar Type	Curing Environment	Sand g	Cement g	Water g	CaCl₂ ml
Plain w/c = 0.35	70 F				
Plain w/c = 0.60	70 F				
Plain w/c = 0.35	35 F				
Accelerated w/c = 0.35	35 F				

Data Table 2 - Mortar Strength Test Data

Mortar Type	w/c	Curing Environment	1-Day Compressive Load To Failure, lb	7-Day Compressive Load To Failure, lb
Plain	0.35	70 F		
Plain	0.60	70 F		
Plain	0.35	35 F		
Accelerated	0.35	35 F		