

## LAB1: Testing of cement – part I.

### 1. Preparation:

- Fineness of cement – air permeability method (chapter 12.2.2 – p. 60)<sup>1</sup>
- Standard consistence (chapter 12.3.1. – p. 63)
- Setting time (chap. 12.3.2. –p.64)
- Samples for the determination of strength -preparation (chap. 13.1. – p. 66)

### 2. Procedure

#### Cement paste of standard consistence:

- calibrate the Vicat apparatus by lowering the plunger to rest on the base-plate to be used and adjusting the pointer to read zero on the scale. Raise the plunger to the stand-by position.
- weight 400 g of cement, The amount of water will be given by teacher. Measure the water in the graduated cylinder and put it into the mixer bowl.
- add the cement carefully to the water in order to avoid loss of water or cement. The time of addition shall be not less than 5 s nor more than 10 s. Note the time of completion of the addition as zero time, from which later measurements of time shall be made.
- start the mixer immediately and run at low speed. stop the machine after 90 s for 15 s during which remove with a suitable scraper any paste adhering to the bowl outside the mixing zone and return it to the mix. Restart the machine and run at low speed for further 90 s. The total mixer running time shall be 3 min.
- transfer the paste immediately to the mould and fill it to excess. Remove the excess gently and make a smooth upper surface
- immediately after levelling the paste, transfer the mould and base-plate to the Vicat apparatus and position it centrally under the plunger. Lower the plunger gently until it is in contact with the paste. Pause in that position for between 1s and 2s. Then release the moving part quickly and allow the plunger to penetrate vertically into the centre of the paste. The release of the plunger shall occur 4 min after zero time. Read the scale when penetration has ceased or 30 s after the release of the plunger, whichever is the earlier.
- record the scale reading, which indicates the distance between the bottom face of the plunger and the base plate. Clean the plunger immediately after each penetration.
- repeat the test with pastes containing different water contents until one is found to produce a distance between plunger and base-plate of  $6 \pm 2$  mm. Record the water content of that paste to the nearest 0,5% as the water for standard consistence.

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<sup>1</sup> Vimmrová A., Výborný J. : Building materials, ČVUT Prague, 2005.

Setting time test:

- put the mould, filled by paste of standard consistence into the automatic Vicat apparatus according the teachers instruction
- the results from automatic Vicat apparatus will be given to you at the LAB 3

Test samples preparation:

- demould one set of the samples from the previous day, mark them and put them into the water
- clean the mould, assemble and oil it
- firmly clamp the mould to the jolting table
- weight the given amount of the cement, sand and water for one batch (p.67)
- pour the water into the bowl and add the cement
- put the bowl into the standard mixer and start the mixing
- after audio signal add the sand steadily during the next 30 s ( when separate sand fractions are used, add the add the required quantities of each fraction in succession starting with the coarsest)
- when the mixer stops, during 15 s remove all the mortar from the bottom part of the bowl and from the blade and place in the middle of the bowl
- when the mixing is finished, introduce first layer of mortar (about 300 g) into each of the mould compartments. Spread the layer uniformly and compact the first layer using 60 jolts.
- introduce the second layer of mortar, level it and compact with a further 60 jolts
- lift the mould gently from the jolting table
- strike off the excess mortar with the metal straight edge, held almost vertically and moved slowly, with transverse sawing motion. Smooth the surface of the specimens using the same straight edge held almost flat
- label the mould to identify the specimens

### 3. Protocol

from given data count the density a specific surface of the cement

Cement density:

- count the density, measured by pycnometric method according the chapter 12.1.1, p. 59

Specific surface

- calculation according the chapter 12.2.2 Air permeability method, p. 61

**Calibration:**

- count the apparatus constant K (porosity  $e=0,500$ ) from the average value of three measured times and temperatures
- the value of air viscosity  $\eta$  and  $\sqrt{0,1\eta}$  are in the tab. 27, p. 63

**Measuring:**

- count three values of the specific surface for each measuring separately
- final value of the specific surface is the average value from the three separate values

**Cement bed.**

- Count the weights of the cement bed for both the reference and measured cements

For protocol you can use the form attached. If you use the hand made form, it has to be similar to this form.

## LAB 1 : Cement I - density and specific surface

<b>Name:</b>	<b>PIN:</b>
<b>Signature:</b>	<b>Study group:</b>
<b>Date:</b>	<b>Number of annexes :</b> (all calculations, given data)

<b>Results:</b>		
Cement density	$\text{g/cm}^3$	
Weight of reference cement bed	g	
Weight of measured cement bed	g	
Apparatus constant		
Specific surface	$\text{cm}^2/\text{g}$	