**MATERIALS OF CONSTRUCTION LABORATORY   
 DEPARTMENT OF CIVIL ENGINEERING, M.E.T.U.**



**CE344 MATERIALS OF Construction, GROUP 5**

**TESTS ON HARDENED CONCRETE**

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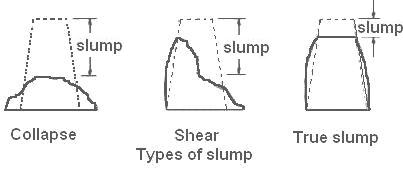
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Question 1:

The purpose of having detailed specifications is so that the test can be carried out in an equal way in every part of the world. If there were no detailed specifications 2 person doing the same test to the same material may find different results thus effecting the result of the project & the work they are working on. All in all these detailed specifications make sure that the test is carried out in a uniform way all around the globe.

Question 2:

There are three slump types:

* True slump
* Shear slump
* Collapse slump

**True slump** is the uniform drop of concrete without disintegration.

If the top portion of the concrete shears off and slip sideways or one-half of the cone slides down an inclined plane, the slump is called as **shear slump.** If shear slumpoccurs, it means the concrete lacks cohesion. It may undergo segregation and/or bleeding, which will be harmful in terms of durability of concrete.

In a **collapse slump** the concrete collapses completely. Collapse slump shows that the concrete is too wet.

Question 3:

1. 8lt = 0.008m^3

(13.96/0.008) = 1745kg

a = 1745kg/m^3

1. 300+850+505+145= 1800kg

(1800-1745)/1800\*100 = 3.06

1. Y = (Calculated unit weight of concrete)/ (Actual unit weight of concrete)

Y= (1745)/(1800) = 0.9694

1. Weight of Cement = 300 / 0.9694 = 309.47 kg  
   Weight of F.A. = 850 / 0.9694 = 876.83 kg  
   Weight of C.A. = 505 / 0.9694 = 520.94 kg   
   Weight of Water = 145 / 0.9694 = 149.58 kg

Question 4:

1. Cy1=4 & Cu1=7

Cy2=52 & Cu2=55

m= (Cy2-Cy1)/(Cu2-Cu1) = (52-4)/(55-7)=1

Cu = 4+Cy



|  |  |  |
| --- | --- | --- |
| day | Failure Loads (\*1000 kg.m/s2 ) | Mpa |
| 1 | 87 | 3,866667 |
| 3 | 323 | 14,35556 |
| 7 | 496 | 22,04444 |
| 28 | 788 | 35,02222 |
| 90 | 938 | 41,68889 |



|  |  |  |  |
| --- | --- | --- | --- |
| day | Failure Loads (\*1000 kg.m/s2 ) | Mpa | Mpa |
| 1 | 87 | 3,866667 |  |
| 3 | 323 | 14,35556 | 10,35556 |
| 7 | 496 | 22,04444 | 18,04444 |
| 28 | 788 | 35,02222 | 31,02222 |
| 90 | 938 | 41,68889 | 37,68889 |

1. The cubes compressive strength seems to be slightly higher than cylinders compressive strength. They increase the same amount during their first 90 days but the difference comes from the first 1-2 days of their life as a concrete.

Question 5:

The reason is that for different applications concretes with different properties are needed. It would not be wise to use a concrete with the same slump value to a bridge and a road. For example a concrete which is to be used in foundation needs to have a slump value a lot different than a concrete to be used in a dam. That is why the requirements changes from according to the application site of the concrete.

Question 6:

The most common test done on concrete is compressive strength test because:

* The chief reason for utilizing concrete in structural applications is to resist compressive stresses.
* Calculations done during the design of structures are generally based on the compressive strength of concrete.
* Compressive strength is the property of concrete which is most easily determined.
* With the help of some correlations, other important properties of hardened concrete such as shear and tensile strength, abrasion resistance and permeability can be estimated by making use of the results of compressive strength tests.

Question 7:

P1 = 29300 kgf = 287.33 kN

P2 = 31700 kgf = 310.87 kN

P3 = 32100 kgf = 314.79 kN

l = 0.3m , D = 0.15m

, = 0.01767

= 16260.9 kPa = 16.27 Mpa

) =

) = 16.27/0.65 = 25.03 Mpa

) =

= 25.03\*1.20 = 30.03 Mpa

*Please note that the tensile strength of concrete can be measured by “direct tensile loading test”, however, it is usually measured by “indirect tension or splitting test”.*

(28 days) = (2\*P) / ()

(28 days) = (2\*287.33) / (3.14\*0.3\*0.15) = 4070 kPa = 4.07 Mpa

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Compressive Strength (MPa)** | | | **Tensile strength (MPa)** |
|  | **7 days** | **28 days** | **90 days** | **28 days** |
| ***Specimen 1*** | 16,27 | 25,03 | 30,03 | 4,07 |
| ***Specimen 2*** | 17,60 | 27,08 | 32,49 | 4,40 |
| ***Specimen 3*** | 17,82 | 27,42 | 32,90 | 4,46 |
| ***Average*** | 17,23 | 26,51 | 31,81 | 4,31 |

Question 8:

l = 0.30 m, D = 0.15m, P = 11900 kgf = 116.7 kN

T = (2\*P) / ()

T= (2\*116.7) / (3.14\*0.30\*0.15) = 1652 kPa = 1.652 MPa