

## TESTS OF HARDENED CONCRETE

1) The strength and mechanical properties of concrete can be determined by carrying out some “*standard tests*” . These standard tests must have detailed specifications. What is the purpose of having detailed specifications in standard tests?

2) What are the slump types? What do these slump types indicate?

3) You prepared a mix proportion for concrete and calculated the weights for 1 m<sup>3</sup> concrete as follows:

Cement 300 kg  
Fine aggregate 850 kg  
Coarse aggregate 505 kg  
Water 145 kg

By using these values you prepared a trial batch and employing the procedure for the determination of the unit weight of concrete, you measured the weight of concrete as 13.96 kg in a 8 liter bowl.

- What is the unit weight of the concrete in kg/m<sup>3</sup> ?
- Considering that the proportioning is correct, what is the air content of your concrete?
- What is the yield of the mixture?
- Remedy your amounts for obtaining a batch of 1m<sup>3</sup> concrete?

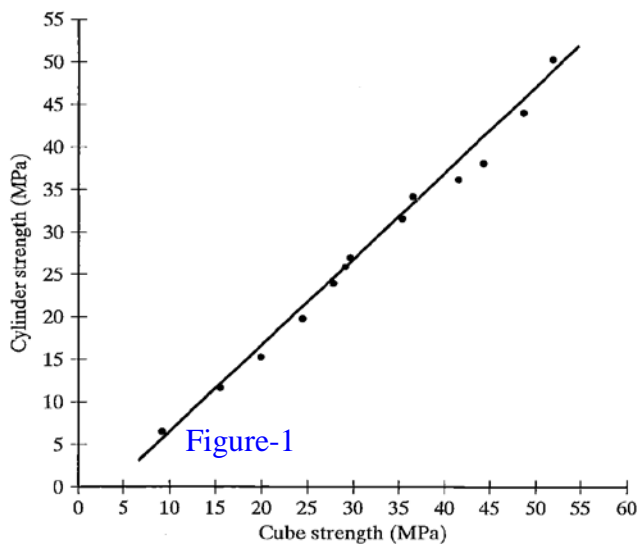
4) Figure 1 shows the relationship between cylinder strength and cube strength

a-) Using Fig.1 find a formula between the cube and cylinders strength.

b-) Table 1 gives the failure load for cube specimen (a=15cm) at 1, 3,7,28, and 90 days. Plot the strength-time (MPa-days) graph. Use your group data.

Table-1

DAY	Failure Loads (*1000 kg.m/s <sup>2</sup> )									
	GROUPS									
	1	2	3	4	5	6	7	8	9	10
1	32	63	45	74	87	99	109	149	124	136
3	120	230	166	277	323	369	406	554	461	508
7	185	355	255	425	496	567	624	850	709	780
28	293	563	405	675	788	900	990	1350	1125	1238
90	349	670	482	803	938	1071	1178	1606	1339	1473



c-) Using the formula obtained in part a. Plot the strength-time (MPa-days) graph for an equivalent cylinder specimen.

d-) Compare the cylinder and cube strengths for compressive strength.

5) What is the reason for specifying different required slump values for concretes to be used in different applications such as mass concrete, foundation?

6) The most common test carried out on concrete is the compressive strength test. What are the reasons for this?

7) Three cylindrical concrete specimens (15x30cm) were subjected to compressive load at the end of 7 days. The specimens failed at the following loads:

P1 = 29300 kgf

P2 = 31700 kgf

P3 = 32100 kgf

Calculate the 7-day compressive strength of the concrete and make an estimation for the 28-day and 90-day compressive strengths and 28-day tensile strength of these concrete samples.

8) A 15x30 cm cylindrical concrete specimen was subjected to a split tensile load of 11900 kgf at fracture. Calculate the split tensile strength of the concrete.