

# Development of Concrete-Mix Design Using Locally Available Material for Two Different Weather Condition

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The strength and durability of concrete depend on both internal and external factors, concrete ingredients have to be properly classified and proportioned to build a mix that will be economical as well as meet the minimum requirements of functionality, safety and economics (cmu.edu. 2022). Most of the concrete mix as per the code varied the strength from location wise and to tackle a concrete mixed design is developed by the construction firm/company to obtain (concretesupplyco.2022). Hence it is felt to investigate the effect of material properties and weather conditions on the concrete mix design

A study has been undertaken to select the appropriate concrete mix proportion and effect of weather conditions on concreting to achieve desired strength with locally available materials. Two different temperature 28°C (normal weather condition) and 5°C (adverse weather condition) controlled environment has been setup to evaluate the performance of concrete quality.

Three different proportions were developed using water-cement ratio of 0.50, 0.45 and 0.42 respectively. The characteristics focused in the study include density, flexural behavior and compressive strength of the concrete at 28 days.

The result obtained from the experiment is given in Table 1.the compressive strength is found best at water cement ratio 0.42 with 29.22N/mm<sup>2</sup> at 28 days

**Table 1** Compressive Test Result of Concrete Mix Design

Sample No	Water-cement ratio	Age of curing (days)	Weight of cube (kg)	Failure Load(KN)	Compressive Strength(N/mm <sup>2</sup> )	Average Compressive Strength(N/mm <sup>2</sup> )
For normal weather condition						
A-1	0.5	7	8.121	261.5	11.62	11.62
A-2		14	8.059	421.6	18.73	18.73
A-3		28	8.067	504	22.4	22.15
A-4			8.211	419.9	18.66	
A-5			8.197	571.6	25.4	
B-1	0.45	7	8.006	410.6	18.24	18.24
B-2		14	8.001	448.7	19.94	19.94
B-3		28	8.271	595.6	26.47	27.45

B-4			8.202	621.9	27.64	
B-5			8.167	635.4	28.24	
C-1	0.42	7	8.343	495.6	22.02	22.02
C-2		14	8.374	487.2	21.65	21.65
C-3		28	8.049	691.5	30.73	29.22
C-4			8.672	682.9	30.35	
C-5			8.970	598.1	26.58	
For adverse climatic condition						
D-1	0.42	7	0.738	100.3	20.12	22.38
D-2			0.746	119.5	23.97	
D-3			0.734	114.9	23.05	
D-4		14	0.756	128.4	25.76	26.60
D-5			0.749	133.5	26.78	
D-6			0.752	135.9	27.26	

For normal and adverse weather conditions after 14 days of curing at 0.42 water-cement ratio the values was found to be 21.65 N/mm<sup>2</sup> and 26.60N/mm<sup>2</sup> respectively.

From these set of experiment, it is evident that the concrete can perform better in an adverse weather condition. The temperature of water plays an important role while concreting, it appear that the temperature at 5<sup>o</sup>C ±1<sup>o</sup>C is best suitable for achieving the target strength in 14 days. To achieve the target strength of M-25 grade it is suggested to adopt the proportion of 1:1.2:2.02 in place of 1:1:2 as per I.S code for the locally available material.

#### References

cmu.edu (2022) Quality Control and Safety During Construction [https://www.cmu.edu/cee/projects/PMbook/13\\_Quality\\_Control\\_and\\_Safety\\_During\\_Construction.html](https://www.cmu.edu/cee/projects/PMbook/13_Quality_Control_and_Safety_During_Construction.html) ). Accessed on 25/03/2022

Concretesupplyco (.2022) The Importance of Concrete Mix Design <https://concretesupplyco.com/concrete-mix-design/> Accessed on 25/03/2022