

The research on high-strength concrete creep

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Abstract: By a series of creep test on and natural environment, the development trend and law of C60 high-strength concrete creep on natural environment are analyzed and the creep law of reinforced concrete is discussed in this article.

The study on concrete creep

Concrete creep is important physical and mechanical properties with respect to time, which is affected by the composition of material and external conditions and other factors, and the creep mechanism is so complex that there is not a completely accurate theory which could explain or predict concrete creep so far. Currently most of creep prediction models are based on experimental data and statistics obtained by fitting, and the research materials are mostly subjected to normal strength concrete, so the prediction models have some limitations because of few research on high-strength concrete currently. In addition, with the applications of the high-strength materials, new construction methods as well as geographical differences [1-8]. Therefore, further research on high-strength concrete creep show the importance and necessity.

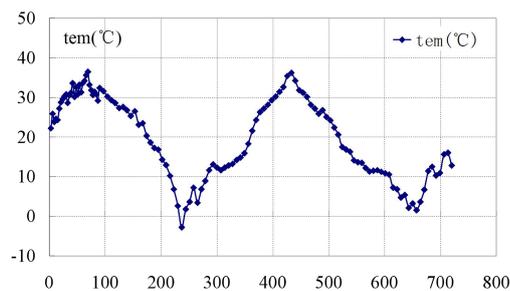


Fig.1 The temperature of test environment

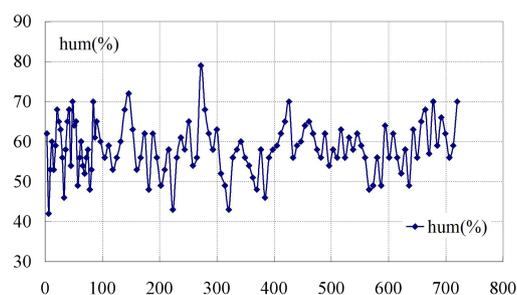


Fig.2 The humidity of test environment

The creep test under natural environment

Creep test

The researches on loading age, reinforcement ratio and other factors on high-strength concrete creep characteristics are through five groups of axial compression specimens under natural environment (shown in Figs.1-2). Each test component is made of a combination of three different age segments with 1m segment length and 250mm×250mm section size. Three trials are designed, and reinforcement ratio are respective 0.3%, 0.72% and 1.45%. The specimens loaded multi-age groups which designed a series loading age of 15d, 30d, 60d etc, considering among different age segments. Creep specimens loaded with pre-stressed anchorage system with 15 ϕ^s 9 high strength

steel of smaller loss, which are controlled 12Mpa.

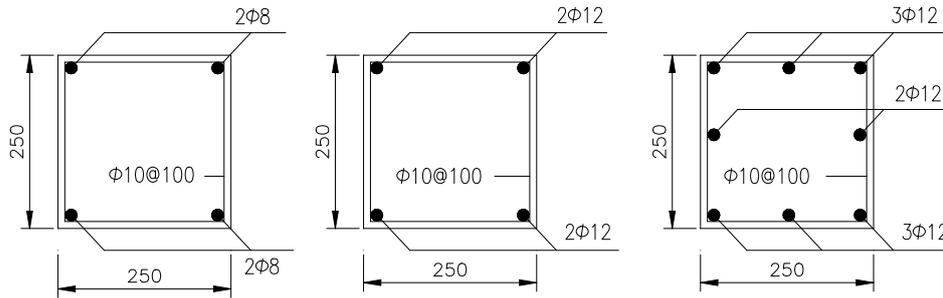


Fig.3 The creep specimen of reinforcement



Fig.4 Creep specimen groups

Table 2 Creep groups

Specimen Group	Loading age	Reinforcement ratio	Loading stress	Picture
1	7d 14d 28d	0.30%	12MPa	Fig.5
2	7d 14d 28d	0.72%	12MPa	Fig.6
3	7d 14d 28d	1.45%	12MPa	Fig.7
4	15d 30d 60d	0.72%	12MPa	Fig.8

Test results of creep

As shown in Fig.5, the creep coefficient curve is gradually flatten with the increase of time, of which the creep strain of 7d specimen is maximum , and the creep strain of 14d specimen is slightly larger than those of creep and 28d specimen, and the creep strain in the previous 200 days is about 90% of the total creep.

As shown in Fig.6, the creep coefficient curve is gradually flatten with the increase of time, of which the creep strain of 7d specimen is the maximum, and those of 28d specimen is the minimum, and the creep strain in the previous 200 days is about 90% of the total creep. The results of comparative tests between group1 and group 2 , the creep data is relatively close with the increase of reinforcement ratio, which indicating that the reinforcement ratio increased from 0.3% to 0.72% impact on the results of creep is not obvious.

As Shown in Fig.7, the creep coefficient curve is gradually flatten with the increase of time, of which the creep of 7d specimen is the maximum , and those of 28d specimen is the minimum; the creep strain in the previous 200 days is about 90% of the total creep. The results of comparative tests between group1 and group 2 , the creep data is relatively close with the increase of reinforcement ratio, which indicating that the reinforcement ratio increased from 0.72% to 1.45% impact on the results of creep is relatively obvious.

As shown in Fig.8, the creep coefficient of 15d loading age specimen is the maximum, and those of 60d loading age specimen creep coefficient is the minimum, and the creep coefficient curve is gradually flatten with the increases of time, and creep value in the first 200 days of the specimen is also nearing completion of 95% of the total creep values. Comparing test results between 4 and 5 groups, the creep result of 15d, 30d, 60d is less than those of corresponding 10d, 20d, 40d specimen, but no significant changes.

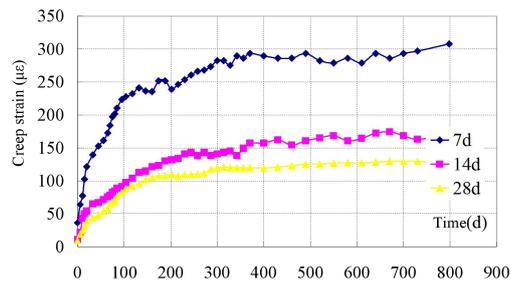
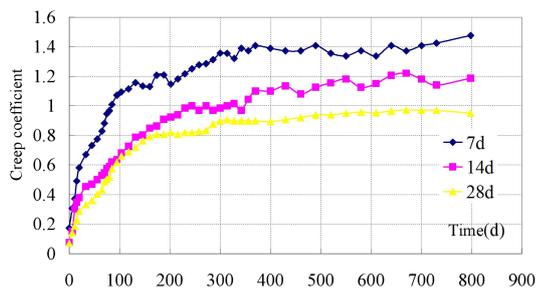


Fig.5 experimental Group 1 ($\rho = 0.3\%$)

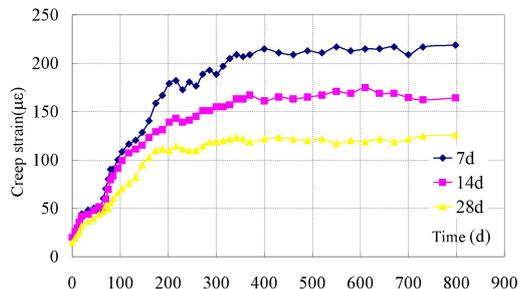
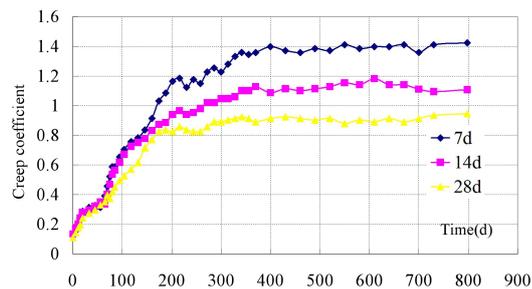


Fig.6 experimental Group 2 ($\rho = 0.72\%$)

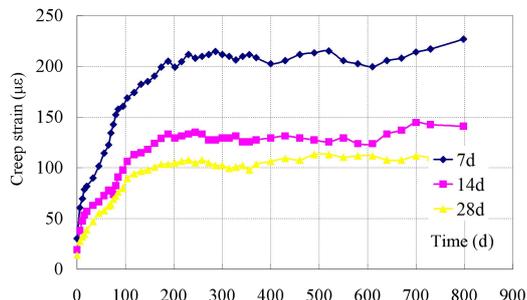
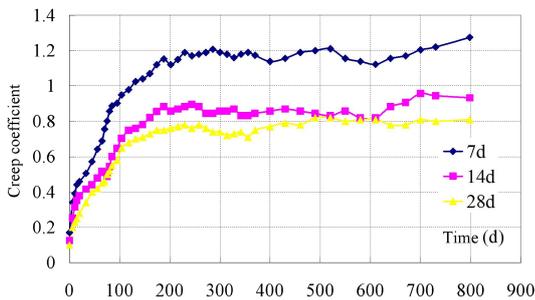


Fig.7 experimental Group 3 ($\rho = 1.45\%$)

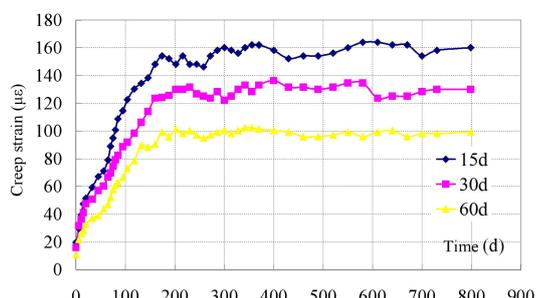
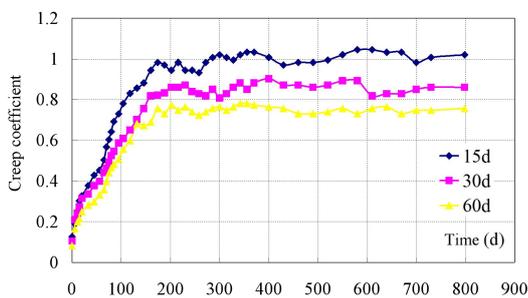


Fig.8 experimental Group 5 ($\rho = 0.72\%$)

Conclusion

High-strength concrete creep tests under natural environment are concluded as follows:

The concrete creep coefficient decreases with increasing loading age. External factors such as environmental factors will be influenced the test results of concrete creep, and test results show that the short-term creep defer concrete loading age, which can effectively reduce early concrete creep.

The creep law of reinforced concrete is discussed in this paper, and creep values decreases

with increasing reinforcement ratio , but the magnitude of decrease is not obvious.

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