
Detection of precast concrete strength based on rebound method

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Abstract

Concrete strength testing technology is widely used in concrete construction quality control, acceptance, appraisal, evaluation and other aspects. At present, the commonly used concrete strength detection technology in China is divided into non-destructive testing and micro damage detection. Non-destructive testing mainly includes rebound method, comprehensive method, ultrasonic method, etc. Micro-damage testing mainly includes drilling core method, pull-out method, Post-anchoring method, direct pull-out method and so on. NDT is easy to operate, but the error is large. Although the accuracy of micro-damage detection is high, there are many disadvantages, such as many working procedures, inconvenient operation, etc. For example, the common drilling core method has a large damage to the structure because of the diameter of core sample, and it is easy to deviate from the measured strength value in the drilling, cutting, grinding, compression and other links.

Keywords

Rebound method, synthesis method ,ultrasonic method.

1. Rebound method

This method is based on the surface hardness of concrete to estimate the compressive strength of the structure, only suitable for the compressive strength of 10-50 MPa, age of 14-1000 days of ordinary concrete. However, this method can not be applied to concrete exposed to frost damage, fire and surface corrosion.

The rebound method is generally used to select the rebound instrument to test the surface hardness of concrete, and to estimate the strength of concrete as a means of testing. The working principle of the spring back instrument is mainly that it contains a standard weight hammer which impacts the rod in contact with the concrete surface under the action of the standard spring force. Because it will be subjected to the elastic force, the heavy hammer on the spring back instrument will jump to the opposite distance, at the same time it will drive the pointer and then mark the corresponding scale. The resilience value (N) is recognized, which directly reflects the hardness of concrete.

The hardness of the material surface is related to the strength of the material itself, so the impact rebound value and concrete strength curve can be easily drawn, we can according to the size of the rebound value of concrete strength to calculate accurately.

The advantages of this method are simple operation, fast detection process and relatively low cost; concrete inspectors can easily collect relevant samples; the data after testing can accurately reflect the concrete strength data; can make the relevant inspectors understand the concrete strength very clearly. So that we can get all the real data.

But the disadvantage of this detection technology is that the accuracy is relatively poor compared with other detection methods. If the surface hardness and strength quality of concrete are different, such as chemical corrosion and other natural factors, this method should not be preferred. Because concrete is

a kind of inhomogeneous material, the hardness of concrete is directly related to the type of cement, the thickness of aggregate and the size of particle. At the same time, the interference of carbonization often leads to the inaccuracy of testing results in the process of strength testing, so we must do a good job of various factors. The preparation work ensures the scientificity of the test results.

2. Core drilling method

The principle of testing concrete strength by drilling core is to sample the concrete structure with drilling core, and then to test its compressive strength after some treatment. Concrete age is not less than 15 days, and concrete with strength above 10MPa can basically be used. But because drilling core will cause more or less damage to the concrete structure after sampling, so in the process of such testing must go through the design unit's agree! The testing method of core drilling is a very direct and accurate detection method. Usually when we can not accurately detect the strength of concrete by means of non-destructive testing, we can choose this kind of testing method. At the same time, after sampling, we can directly check the internal situation of concrete structure, such as whether there are cracks, aggregate distribution and so on.

The advantages of the core drilling method are that it can accurately reflect the actual strength of the structure, and it is suitable for the strength estimation of concrete at different ages. The disadvantage of this method is that the labor intensity is relatively large, the equipment is complex, the cost is high, for the concrete structure is often easy to cause internal damage, sometimes in the process of sampling often encounter steel bars and lead to the sampling work can not be carried out smoothly.

3. Ultrasonic method

The use of ultrasonic instruments and equipment to test the strength of concrete method we generally call it ultrasonic method. The principle of ultrasonic testing is that when ultrasonic wave propagates in concrete (medium), if it encounters different interfaces, it will produce certain reflection or refraction, which will lead to the change of propagation speed, waveform, frequency and other parameters. According to the changing rules of these data, we can calculate the internal strength of concrete through calculation. In other words, ultrasonic testing technology is based on the ultrasonic propagation in concrete to evaluate the final results. Relevant test results show that the higher the strength of concrete structure, the faster the ultrasonic wave propagates in it; and the lower the strength of concrete structure, the slower the ultrasonic wave propagates. Therefore, we can use ultrasonic testing technology to detect concrete strength more scientifically.

The application of ultrasonic technology in concrete strength detection is less, because this detection technology is just rising in our country is not mature, but because of the continuous development of ultrasonic instruments, the accuracy of concrete strength detection has been rapidly improved. But we should also be aware that there are many factors that affect the strength of concrete, such as the interference of signal frequency, the difference of concrete component size, the difference of reinforcement position and so on. These factors will affect the effect of ultrasonic testing method.

Since there is no national standard for this method, only the provinces have formulated the corresponding testing standards according to the actual situation in different parts of the country, so the application scope of this method is only suitable for ordinary concrete with compressive strength of 10-50 MPa and age of 14-700 days. However, this method can not be applied to concrete exposed to frost damage, fire and surface corrosion.

4. Pull method

For the pull-out method, it is now being improved to summarize a new method: pull off method. The process of pulling out the specimen is to drill deep core 44mm on the structure and do not remove it. The test method is to adopt automatic adjusting clamping force, clamping and pulling out the

integrated pull-out instrument to directly pull out the core sample and collect the peak pull-out force. Concrete members with concrete strength less than C100 can be detected. As the pull-out method is developed on the basis of the above methods, the goal is to overcome the shortcomings of the above methods, so far no systematic defects have been found.

Strength measurement by pull-off method is to use the correlation between concrete tensile strength and compressive strength to test and deduce the compressive strength of concrete structures or components. It is based on the existing micro-damage detection technology and synthesizes the advantages of other detection technology. After repeated tests, it has the advantages of automatic clamping and dynamic adjustment of diameter. The pull out operation of core sample is completed to the clamping force pulling instrument. The technology is simple in operation and portable in equipment, the test pieces need not be processed, and the test is quick and convenient. It can test the compressive strength of concrete in the dense parts of steel bars, and can test the compressive strength of concrete in different ages and in the strength of 10-100 MPa.

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