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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 2419-2005

Replacing GB/T 2419-1994

Test method for the fluidity of cement mortar

水泥胶砂流动度测定方法

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1 Scope

This standard specifies the principle, the apparatus, the test conditions and materials, the test procedure and the calculation of the results for the determination of the fluidity of cement mortar.

It applies to the determination of the fluidity of cement mortar, and it replaces GB/T 2419-1994.

3 Apparatus and procedure

The apparatus is a flow table: a circular disc that can be raised and dropped through a fixed height by a cam, a truncated conical mould placed at its centre, and a rule for measuring the spread.

The mortar is placed in the mould in defined layers and tamped a defined number of times. The mould is lifted, the table is dropped twenty-five times in twenty-five seconds, and the diameter of the resulting spread is measured in two directions at right angles. The mean of the two, in millimetres, is the fluidity.

Nothing about that is subtle, and the crudeness is deliberate. The measurement has to be reproducible in a works laboratory with no instrumentation, by an operator following a count, and it has to give the same answer in two laboratories on two continents.

A small standard that a great many others rest on

Fluidity is not a property anybody buys cement for. It is a control measurement, and its value is that other standards use it to define a state.

GB/T 17671, the strength test for cement, needs mortar of a defined consistency, because a mortar mixed wetter is weaker and one mixed drier is stronger. Admixture standards need

it because the whole claim of a water reducer is that it produces a given fluidity at less water. Masonry mortar standards need it because workability is what a bricklayer judges the material on.

In each of those the fluidity figure fixes the state at which the real measurement is made. A strength result quoted without a fluidity is a number whose conditions are unknown, which is why this eight-page method sits underneath a large part of the cement literature.

There is no neutral way to measure workability

Fresh mortar has no single property called flowability. It is a suspension whose apparent viscosity depends on how hard you are working it, and any test measures the behaviour under the particular disturbance the test applies.

A flow table drops the sample twenty-five times and measures how far it spreads. A slump cone lets it settle under its own weight. A vane rheometer shears it at a controlled rate. All three are looking at the same mortar and none of the three answers can be converted into the others.

So the only useful thing a standard can do is fix one convention and require everyone to use it. That is what this document is: not a measurement of a physical quantity, but an agreement about which disturbance to apply and how to read the result, so that two figures produced anywhere can be compared.

A small standard many others rest on

Cement is tested by making a mortar of defined composition and measuring what it does - and almost every property so measured depends on the water in that mortar.

And there is no neutral choice

Different cements need different water to reach the same consistency.

Compare two at the same water-cement ratio and you compare mortars of different workability; compare them at the same workability and you compare mortars of different water content.

So the convention is fixed, and this fixes it

Where a method requires equal consistency, this is how consistency is determined.

Crude on purpose

Mortar in a truncated conical mould on a flow table; the mould lifted, the table dropped a set number of times from a set height at a set rate, and the spread diameter measured.

The result is entirely a product of the apparatus and the handling - which is why the table, the mould, the filling and tamping, the drops and the timing are all specified, down to the minutes between mixing and testing.

Twenty-five drops in twenty-five seconds

The procedure specifies the number of drops of the flow table and the time in which they are made, and both matter more than they appear to. The mortar is thixotropic: it spreads under repeated disturbance and stiffens again when the disturbance stops.

Doing the drops faster gives a wider spread, because the material has less time to recover between them. Doing fewer gives a narrower one. Neither is more correct than the other, and both would be defensible as a measurement of something, which is precisely why the count and the timing are fixed.

It is also why the table itself is specified down to the drop height and the mass of the disc. What is being standardised is the amount of energy put into the sample, and a table that drops through a different height puts in a different amount and returns a different number for the same mortar.

Three editions of the same six pages

This method has been reissued three times: GB 2419-1981 for mastic cement, GB/T 2419-1994, and this 2005 edition. A test that changes that little over a quarter of a century is one whose value lies in not changing.

The reason is what it is used for. Every strength result, every admixture claim and every mix design that cites a fluidity is citing this convention, and a revision that altered the number a given mortar returns would break the comparability of everything measured before it.

So the revisions have gone to the apparatus tolerances and the description of the procedure rather than to the method. The 2005 edition is a clearer and tighter statement of the same twenty-five drops, which is the right kind of revision for a document that other standards depend on.