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Testing method for heat of hydration of cement

ICS 91.100.10

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law:

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In the event of any doubts arising as to the contents,
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Testing method for heat of hydration of cement

1 Scope This Japanese Industrial Standard specifies the testing method for heat of hydration of portland cement, portland blast-furnace slag cement, and portland fly-ash cement.

Remarks : The normative references to this Standard are as follows.

JIS K 8405 *Zinc oxide*

JIS K 8541 *Nitric acid*

JIS R 5201 *Physical testing methods for cement*

JIS Z 8401 *Rules for rounding off of numerical values*

JIS Z 8801 *Test sieves*

2 Sampling Weigh out 500 g of the sample in accordance with the prescription in 4 of JIS R 5201.

3 Apparatus and instruments

3.1 Calorimeter The construction of calorimeter shall be as shown in Attached Fig. 1.

- (1) **Vacuum jar** When put about 425 ml of warm water⁽¹⁾ in a vacuum jar, stoppered with a cork plug, allowed to stand for 30 min, if the temperature descent of 0.001 °C or more per minute is found to the difference of 1 °C between the temperature of warm water and room temperature, the vacuum jar shall be rejected.

The inside surface of the jar shall be coated with polyethylene, bees wax, fluororesin, or other suitable hydrofluoric acid-resistance material.

Note (1) This water is about 5 °C higher than a room temperature.

- (2) **Inner cylinder** The inner cylinder for keeping the vacuum jar shall measure 150 mm in inside diameter and 230 mm in depth, and be lined with thermal insulating cork about 25 mm thick. The lid of the inner cylinder shall be equipped with the cork lid for vacuum jar and have three openings. The central opening is for a stirring rod for acid solution, and the other two openings for a thermometer and a funnel.

These openings are constructed so that it prevents the water from entering. The lid of inner cylinder is fastened with a wing nut to the inner cylinder using an O-ring.

- (3) **Thermometer** A sensor type thermometer or a Beckmann's thermometer shall be used.

The sensor-type thermometer shall be a thermistor type or quartz type one which has a resolution power as accurate as 0.001 °C.

Beckmann's thermometer shall be graduated to 0.01 °C, have measurable range of about 6 °C, which has been guaranteed.

The part which is to be immersed in the vacuum jar shall be coated with polyethylene, bees wax, fluororesin, or other hydrofluoric acid-resistance material.

- (4) **Stirring device for acid solution** The portion of the stirring rod, which is to be immersed in the vacuum jar, shall be made of glass or metal protected with polyethylene, bees wax, fluororesin, or other suitable hydrofluoric acid-resistance material.

Alternatively, the one made of resin can be used. The axle part of the stirring device for acid solution shall be equipped with a ball bearing mechanism, and driven through a pulley and belt.

The stirring device shall be such that the revolution number of the stirring rod can be controlled at about 500 rpm.

- (5) **Water tank** The water tank has about 30 L capacity, and with an agitator for making water temperature uniform.

3.2 Kneading device Kneading of cement paste shall be carried out manually or mechanically.

When carried out mechanically, employ a hand mixer and a beaker⁽²⁾ or a porcelain evaporating dish⁽³⁾.

When carried out manually, employ a stainless steel spoon and a porcelain evaporating dish⁽³⁾.

Notes (2) The 300 ml capacity is suitable.

(3) That of a round bottom with 150 mm outside diameter is suitable.

3.3 Bottle for cure The bottle for cure, in which cement paste is sealed, shall be made of polypropylene, with a lid, and its measure is about 26 mm in inside diameter and about 55 mm in height.

3.4 Thermostat for cure For dipping the bottle for cure, and capable of controlling at $20\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$.

3.5 Mortar The mortar for grinding hydrated cement is made of stainless steels.

3.6 Sieve The sieve used for preparation of the powered hydrated-cement sample shall be of 850 μm wire sieve specified in **JIS Z 8801**.

The sieve for preparation of zinc oxide which is used for the determination of heat capacity of calorimeter shall be of 150 μm wire sieve specified in **JIS Z 8801**.

3.7 Thermometer Guaranteed thermometer is used for the measurement of water temperature in water tank, room temperature, and other spots, and shall be graduated to 0.1 $^{\circ}\text{C}$.

4 Reagents

4.1 Zinc oxide Guaranteed reagent specified in **JIS K 8405**, or at least equivalent thereto.