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Physical testing methods for cement

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JAPANESE INDUSTRIAL STANDARD

JIS R 5201 : 1997

Physical testing methods for cement

Introduction This Japanese Industrial Standard has been prepared supplementing Annex 1 and Annex 2 in which the method of strength test is revised to as specified ISO 679, *Methods of testing cement*—*Determination of strength* published in 1989, and the methods of setting time test and soundness test specified in ISO 9597, *Cements*—*Test methods*—*Determination of setting time and soundness* published in 1989 are adopted in addition to the conventional test methods, in the style of the original International Standard.

Though **ISO 679** specifies that the certification testing of standard sand shall be undertaken by laboratories approved for this purpose by the appropriate national standardization organization, this provision is modified in conformity with the actual situation of Japan, because this certification is not established at present in Japan.

1 Scope This Japanese Industrial Standard specifies the physical testing methods for cement.

Remarks The following standards are normative references to this Standard.

ISO 3310-1	<i>Test sieves—Technical requirements and testing—Part 1:</i> <i>Test sieves of metal wire cloth</i>
JIS B 7733	Compression testing machines
JIS K 2203	Kerosine
JIS K 2204	Gas Oil
JIS P 3801	Filter Paper (for chemical analysis)
JIS Z 8401	Rules for rounding off of numerical values
JIS Z 8801	Test sieves

2 Test items The testing items specified in this Standard shall be as follows:

(1) Density test

(2) Fineness test

- (a) Specific surface area test
- (b) Wire sieve test
- (3) Setting time test
- (4) Soundness test
- (5) Strength test

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- (a) Compressive strength
- (b) Flexural strength
- (6) Flow test
 - Remarks The setting time test, soundness test and strength test may also be tested in accordance with Annex 1 or Annex 2.

3 Expression of test result The test result shall be rounded off in accordance to **JIS Z 8401** to the number of figures specified in each test item.

- **4 Sample** The sample shall be as follows:
- (1) An appropriate quantity (¹) of cement shall be sampled and reduced so that each inspection unit will represent the mean quality of the cement. The sampling and reducing method shall be determined by agreement between the parties concerned with delivery.

- (2) The sample taken shall be preserved in a tightly sealed moisture proof and air tight vessel after being cleared of impurities with the standard wire sieve of 850 µm specified in JIS Z 8801. For the testing, the sample shall be preliminarily put in a test room in order to equalize its temperature with room temperature.
- 5 Test water Distilled or deionized water or drinking water shall be used for tests.

6 Density test

6.1 Apparatus The apparatus shall be as follows:

Le Chatelier flask The Le Chatelier flask shall be made of glass, and its capacity and size at 20° shall be as follows (see Informative reference Fig. 1):

Capacity between scale marks 0 and 40	$:40.00 \text{ ml}\pm0.05 \text{ ml}$
Capacity between scale marks 0 and 29	$:29.00 \text{ ml} \pm 0.05 \text{ ml}$
Any capacity between scale mark interval shall not	have error of 0.025 ml or over.
Capacity below scale mark 0	$:250 \text{ ml}\pm 5 \text{ ml}$
Height from bottom of pycnometer to scale mark 40	$:280 \mathrm{mm}\pm20 \mathrm{mm}$

Note(¹) The appropriate quantity shall mean the quantity of 5 kg or over after the reduction of the sample.

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Informative reference Fig. 1 Le Chatelier's pycnometer

6.2 Mineral oil The mineral oil to be used shall be kerosine specified in JIS K 2203 or gas oil specified in JIS K 2204. These oils are all dehydrated perfectly.

6.3 Procedures Put mineral oil into the pycnometer to its scale mark between the 0 ml and the 1 ml mark and leave the pycnometer standing still in the water bath. Read the scale mark of liquid level of the mineral oil (the first reading) when that has become nearly stationary.

Next, weigh 100 g of the sample to the nearest 0.1 g and put it gently, little by little, into the pycnometer. After all the sample has been put in, shake the flask appropriately to expel air thoroughly. And, leave the flask standing still in a water bath and read the scale mark of the liquid level of the mineral oil (the final reading) when that has become nearly stationary.

Remarks The temperature of water in the water bath shall not fluctuate by more than 0.2° during the density test.

6.4 Calculation The density shall be calculated from the following equation:

$$\rho = \frac{m}{v}$$

where, ρ : density of the sample (g/cm³)

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m : mass of the sample weighed out (g)

v : difference between the first and the final readings (ml)

The density tests shall be carried out at least twice, and the mean of the density that have come within the difference of 0.01 g/cm³ shall be adopted and be rounded off to two decimal places.

7 Fineness test

7.1 Specific surface area test

7.1.1 Apparatus The apparatus shall be as follows:

- (1) Blaine air permeability apparatus (see Informative reference Fig. 2)
 - (a) Dimensions of the Blaine air permeability apparatus shall be as follows:

Distance between the marked lines A and B	$:40 \text{ mm}\pm1 \text{ mm}$
Distance between the marked lines B and C	$:55.0 \text{ mm} \pm 0.2 \text{ mm}$
Distance between the marked lines C and D	$:15 \text{ mm} \pm 1 \text{ mm}$
Inside diameter of the cell	$: 12.7 \text{ mm} \pm 0.7 \text{ mm}$
Distance between the upper brim of cell and the upper brim of ledge	: 50 mm±3 mm
Difference between the inside diameter of cell and the outside diameter of plunger	: 0.1 mm max.
Width of the vent on the side of plunger	$:3.0~\mathrm{mm}\pm0.5~\mathrm{mm}$
Thickness of the perforated metal disc	$:0.9 \text{ mm}\pm 0.1 \text{ mm}$
Difference between the diameter of perforated metal disc and the inside diameter of cell	: 0.5 mm max.
Diameter of holes	$: 1.0 \text{ mm} \pm 0.2 \text{ mm}$

Further, the length of plunger from the lower face of collar shall be a length large enough to make a bed 15 mm \pm 1 mm in height.

- (b) Materials of the cell, plunger and perforated metal disc shall be the metal which will not be eroded by cement.
- (c) Inside surface of the cell, shall be polish-finished, and the cell and manometer shall be tightly fitted by grinding.
- (d) The number of holes on the perforated metal disc shall be 25 to 35, and they shall be perforated evenly over the whole surface.
- (e) Filter paper used shall be class 5A specified in **JIS P 3801**, and its size shall be equal to the inside diameter of cell.