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Chemical admixtures for concrete

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Concrete Admixture Association (JCAA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS A 6204:2006** is replaced with this Standard.

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Chemical admixtures for concrete

1 Scope

This Japanese Industrial Standard specifies air-entraining admixture, high-range water-reducing admixture, accelerator, water-reducing admixture, air-entraining and water-reducing admixture, air-entraining and high-range water-reducing admixture and superplasticizer used for the chemical admixtures for concrete (hereafter referred to as “chemical admixtures”).

No International Standard corresponding to this Standard has been established at this point.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) listed below shall be applied.

JIS A 0203 *Concrete terminology*

JIS A 1101 *Method of test for slump of concrete*

JIS A 1103 *Method of test for amount of material passing test sieve 75 μm in aggregates*

JIS A 1105 *Method of test for organic impurities in fine aggregate*

JIS A 1108 *Method of test for compressive strength of concrete*

JIS A 1109 *Methods of test for density and water absorption of fine aggregates*

JIS A 1110 *Methods of test for density and water absorption of coarse aggregates*

JIS A 1115 *Method of sampling fresh concrete*

JIS A 1118 *Method of test for air content of fresh concrete by volumetric method*

JIS A 1119 *Method of test for variability of freshly mixed concrete by measuring mortar and coarse aggregate contents*

JIS A 1122 *Method of test for soundness of aggregates by use of sodium sulfate*

JIS A 1123 *Method of test for bleeding of concrete*

JIS A 1128 *Method of test for air content of fresh concrete by pressure method*

JIS A 1129-1 *Methods of measurement for length change of mortar and concrete—Part 1: Method with comparator*

JIS A 1129-2 *Methods of measurement for length change of mortar and concrete—Part 2: Method with contact-type strain gauge*

JIS A 1129-3 *Methods of measurement for length change of mortar and concrete—Part 3: Method with dial gauge*

JIS A 1132 *Method of making and curing concrete specimens*

JIS A 1137 *Method of test for clay lumps contained in aggregates*

JIS A 1138 *Method of making test sample of concrete in laboratory*

- JIS A 1145 *Method of test for alkali-silica reactivity of aggregates by chemical method*
- JIS A 1146 *Method of test for alkali-silica reactivity of aggregates by mortar-bar method*
- JIS A 1147 *Method of test for time of setting of concrete mixtures by penetration resistance*
- JIS A 1148 *Method of test for resistance of concrete to freezing and thawing*
- JIS A 5002 *Lightweight aggregates for structural concrete*
- JIS A 5005 *Crushed stone and manufactured sand for concrete*
- JIS K 0050 *General rules for chemical analysis*
- JIS K 0113 *General rules for methods of potentiometric, amperometric, coulometric, and Karl Fischer titrations*
- JIS K 0121 *General rules for atomic absorption spectrometry*
- JIS K 0127 *General rules for ion chromatographic analysis*
- JIS P 3801 *Filter paper (for chemical analysis)*
- JIS R 5210 *Portland cement*
- JIS Z 8801-1 *Test sieves—Part 1: Test sieves of metal wire cloth*

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in **JIS A 0203**, and the following terms and definitions apply.

3.1 chemical admixture

admixture mainly used for improving various properties of concrete through surface activation effect and/or hydration control effect

3.2 air-entraining admixture

chemical admixture used for making a number of minute and independent air bubbles distribute uniformly in concrete and the like in order to improve workability and resistance to freezing

3.3 high-range water-reducing admixture

chemical admixture which reduces the quantity of water per unit volume required for obtaining the required slump to a great extent or increase the slump to a large extent without changing the quantity of water per unit volume

3.4 accelerator

chemical admixture used for accelerating the hydration of concrete to increase the strength at initial material age

3.5 water-reducing admixture

chemical admixture for reducing the quantity of water per unit volume necessary for obtaining the required slump

3.6 air-entraining and water-reducing admixture

chemical admixture which has the air-entraining performance and reduces the quantity of water per unit volume necessary for obtaining the required slump

3.7 air-entraining and high-range water-reducing admixture

chemical admixture which has the air-entraining performance, and has higher water-reducing performance and better slump maintaining performance than those of air-entraining and water-reducing admixture

3.8 superplasticizer

chemical admixture added to the premixed concrete then agitated, mainly for increasing the plasticity of concrete

3.9 normal type

chemical admixture with little effect on the setting time of concrete

3.10 retarding type

chemical admixture which retards the setting of concrete

3.11 accelerating type

chemical admixture which accelerates the setting and development of initial strength of concrete

3.12 reference concrete

concrete to which chemical admixture is not added to be used as the reference for testing the performance thereof

However, for testing the performance of superplasticizer, the air-entraining admixture shall be used.

3.13 test concrete

concrete to which chemical admixture is added for testing the performance thereof

3.14 initial type test

test covering all items carried out initially at the time of developing the product for checking the performance

3.15 performance check test

test on a part of items in initial type test which is carried out periodically for the purpose of checking that the quality is equivalent to that when tested in the initial type test

4 Classification

Chemical admixtures shall be classified as shown in table 1 according to the performance and classified as shown in table 2 according to chloride ion (Cl^-) content, respectively.

Table 1 Classification of chemical admixtures according to the performance

Air-entraining admixture	—
High-range water-reducing admixture	—
Accelerator	—
Water-reducing admixtures	Normal type
	Retarding type
	Accelerating type
Air-entraining and water-reducing admixture	Normal type
	Retarding type
	Accelerating type
Air-entraining and high-range water-reducing admixture	Normal type
	Retarding type
Superplasticizer	Normal type
	Retarding type

Table 2 Classification of chemical admixtures according to the chloride ion (Cl^-) content

Unit: kg/m^3

Classification	Chloride ion content (Cl^-)
Class I	0.02 max.
Class II	Over 0.02 up to and incl. 0.20
Class III	Over 0.20 up to and incl. 0.60

5 Quality

5.1 Performances

The performances of chemical admixtures shall be tested in accordance with **6.2**, and shall meet the requirements in table 3.

Table 3 Performances of chemical admixtures

Item		Air-entraining admixture	High-range water-reducing admixture	Accelerator	Water-reducing admixture			Air-entraining and water-reducing admixture			Air-entraining and high-range water-reducing admixture		Superplasticizer	
					Normal type	Retarding type	Accelerating type	Normal type	Retarding type	Accelerating type	Normal type	Retarding type	Normal type	Retarding type
Water reducing rate %		6 min.	12 min.	—	4 min.	4 min.	4 min.	10 min.	10 min.	8 min.	18 min.	18 min.	—	—
Ratio of bleeding amount %		—	—	—	—	100 max.	—	70 max.	70 max.	70 max.	60 max.	70 max.	—	—
Difference in bleeding amount cm ³ /cm ²		—	—	—	—	—	—	—	—	—	—	—	0.10 max.	0.20 max.
Difference in setting time min	Start	−60 to +60	+90 max.	—	−60 to +90	+60 to +210	+30 max.	−60 to +90	+60 to +210	+30 max.	−60 to +90	+60 to +210	−60 to +90	+60 to +210
	End	−60 to +60	+90 max.	—	−60 to +90	0 to +210	0 max.	−60 to +90	0 to +210	0 max.	−60 to +90	0 to +210	−60 to +90	0 to +210
Ratio of compressive strength %	Material age 1 day	—	—	120 min.	—	—	—	—	—	—	—	—	—	—
	Material age 2 days (5 °C)	—	—	130 min.	—	—	—	—	—	—	—	—	—	—
	Material age 7 days	95 min.	115 min.	—	110 min.	110 min.	115 min.	110 min.	110 min.	115 min.	125 min.	125 min.	90 min.	90 min.
	Material age 28 days	90 min.	110 min.	90 min.	110 min.	110 min.	110 min.	110 min.	110 min.	110 min.	115 min.	115 min.	90 min.	90 min.
Ratio of length change %		120 max.	110 max.	130 max.	120 max.	120 max.	120 max.	120 max.	120 max.	120 max.	110 max.	110 max.	120 max.	120 max.
Resistance to freezing and thawing (relative dynamic modulus of elasticity %)		60 min.	—	—	—	—	—	60 min.	60 min.	60 min.	60 min.	60 min.	60 min.	60 min.
Change over time	Slump cm	—	—	—	—	—	—	—	—	—	6.0 max.	6.0 max.	4.0 max.	4.0 max.
	Air content %	—	—	—	—	—	—	—	—	—	Within ±1.5	Within ±1.5	Within ±1.0	Within ±1.0

5.2 Chloride ion (Cl^-) content

The chloride ion (Cl^-) content in concrete shall be obtained in accordance with **6.3**, and the values shall meet the requirements in table 2.

5.3 Total alkali content

The total alkali content in concrete shall be obtained in accordance with **6.4**, and the values shall be not more than 0.30 kg/m^3 .

6 Test methods

6.1 General matters

The tests shall be divided into the initial type test and the performance check test, and respective testing items shall be as shown in table 6.

6.2 Concrete test

6.2.1 Materials used in test

The materials used in the concrete test shall be as follows.

- a) **Cement** The cement for the test shall be the ordinary portland cement specified in **JIS R 5210** prepared by three different manufacturers arbitrarily chosen, and an equivalent quantity of each shall be used.
- b) **Aggregate** The aggregate shall be clean, solid and durable without harmful amounts of dust, soil, organic impurities, chloride, etc. Coarse aggregate shall be crushed stone, and fine aggregate shall be sand. The quality thereof shall be as shown in table 4.

The grading of aggregate shall be as moderate mixture of large and small grain sizes within the range shown in table 5.