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Recycled aggregate for concrete-class H

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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 Institute (JCI) 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 5021 : 2005** is replaced with this Standard.

However, **JIS A 5021 : 2005** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until November 19th, 2013.

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Recycled aggregate for concrete-class H

1 Scope

This Japanese Industrial Standard specifies the recycled aggregate for concrete-class H (hereafter referred to as "recycled aggregate H") manufactured by giving high level treatment such as crushing, grinding and classification to the concrete lumps generated as a result, for example, of pulling down a building.

NOTE : Concrete lumps are generated not only by pulling down buildings but also by hardening the concrete which returned from concrete products and ready mixed concrete.

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) indicated below shall be applied.

- JIS A 0203 *Concrete terminology*
- JIS A 1102 *Method of test for sieve analysis of aggregates*
- JIS A 1103 *Method of test for amount of material passing test sieve 75 μ m in aggregates*
- JIS A 1104 *Methods of test for bulk density of aggregates and solid content in aggregates*
- 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 1121 *Method of test for resistance to abrasion of coarse aggregate by use of the Los Angeles machine*
- 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 1804 *Methods of test for production control of concrete — Method of rapid test for identification of alkali-silica reactivity of aggregate*
- JIS A 5002 *Lightweight aggregates for structural concrete*
- JIS K 8575 *Calcium hydroxide (Reagent)*
- JIS K 8576 *Sodium hydroxide (Reagent)*
- JIS R 3503 *Glass apparatus for chemical analysis*
- JIS R 3505 *Volumetric glassware*

JIS R 5201 *Physical testing methods for cement*

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

3.1 original concrete

concrete lump to be a raw material for manufacturing the recycled aggregate

3.2 original aggregate

aggregate contained in the original concrete

3.3 original coarse aggregate

coarse aggregate contained in the original concrete

3.4 original fine aggregate

fine aggregate contained in the original concrete

4 Classification, division and designation

4.1 Classification

The recycled aggregate H is classified as given in table 1.

Table 1 Classification

Class	Symbol	Remarks
Recycled coarse aggregate H	RHG	Coarse aggregate prepared by giving the original concrete a high level treatment such as crushing and grinding, and performing grading as necessary.
Recycled fine aggregate H	RHS	Fine aggregate prepared by giving the original concrete a high level treatment such as crushing and grinding, and performing grading as necessary.

4.2 Division according to grain size

The recycled aggregate H is divided as given in table 2 according to the grain size.

Table 2 Division according to grain size

Division	Grain size range mm	Symbol
Recycled coarse aggregate H 4005	40 to 5	RHG4005
Recycled coarse aggregate H 2505	25 to 5	RHG2505
Recycled coarse aggregate H 2005	20 to 5	RHG2005
Recycled coarse aggregate H 1505	15 to 5	RHG1505
Recycled coarse aggregate H 1305	13 to 5	RHG1305
Recycled coarse aggregate H 1005	10 to 5	RHG1005
Recycled coarse aggregate H 4020	40 to 20	RHG4020
Recycled coarse aggregate H 2515	25 to 15	RHG2515
Recycled coarse aggregate H 2015	20 to 15	RHG2015
Recycled coarse aggregate H 2513	25 to 13	RHG2513
Recycled coarse aggregate H 2013	20 to 13	RHG2013
Recycled coarse aggregate H 2510	25 to 10	RHG2510
Recycled coarse aggregate H 2010	20 to 10	RHG2010
Recycled coarse aggregate H	5 max.	RHS

4.3 Division according to alkali-silica reactivity

The recycled aggregate H is divided as given in table 3 according to the alkali-silica reactivity.

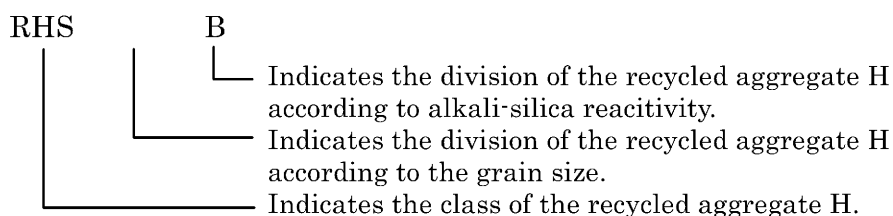
Table 3 Division according to alkali-silica reactivity

Division	Remarks
A	The recycled aggregate judged as “harmless” in alkali-silica reactivity in accordance with 5.3.
B	Other recycled aggregates than those judged as “harmless” in alkali-silica reactivity in accordance with 5.3.

4.4 Designation

The recycled aggregate H is designated as follows.

Example RHG 2005 A



5 Quality

5.1 Amount of impurities

The recycled aggregate H shall not contain harmful amount of impurities that may have an adverse effect on the quality of concrete. The amount of impurities shall satisfy the requirements in table 4 when tested in accordance with 7.2. The amount of

aluminium pieces and zinc pieces shall be tested in accordance with 7.3 and shall not exceed 5 ml in the amount of gas generation.

Table 4 Upper limit of the amount of impurities

Classification	Contents of impurities	Upper limit ^{a)} %
A	Tiles, bricks, pottery and asphalt concrete lumps	1.0
B	Glass pieces	0.5
C	Gypsum and gypsum board pieces	0.1
D	Other inorganic board pieces than C	0.5
E	Plastics pieces	0.2 ^{b)}
F	Wooden pieces, bamboo pieces, cloth pieces, paper scraps and asphalt lumps	0.1
G	Metal pieces other than aluminium or zinc	1.0
	Total amount of impurities (total amount of impurities of A to G)	2.0
Notes ^{a)} The upper limit is the value, expressed in mass ratio, of amount of impurity of each classification relative to the total amount of impurities. ^{b)} Some types of plastics have a lower softening point and at elevated temperatures, they can adversely affect the quality of concrete. Therefore, when concrete is to be steam cured or autoclave cured, the upper limit for plastics piece should be set to 0.1 %.		

5.2 Physical properties

The recycled coarse aggregate H and recycled fine aggregate H shall conform to the requirements in table 5 when tested in accordance with 7.4 to 7.6. The tolerance on the density in oven-dry condition shall be $\pm 0.1 \text{ g/cm}^3$ for the value agreed between the manufacturer and the purchaser.

Table 5 Physical properties

Test item	Recycled coarse aggregate H	Recycled fine aggregate H
Density in oven-dry condition ^{a)} g/cm^3	2.5 min.	2.5 min.
Percentage of water absorption ^{a)} %	3.0 max.	3.5 max.
Abrasion loss ^{b)} %	35 max.	—
Content of material finer than 75 μm sieve %	1.0 max.	7.0 max.
Notes ^{a)} Even in one test carried out in accordance with 7.4, the result shall conform to the requirements in table 5. ^{b)} Applicable to the case of using for pavement.		

5.3 Alkali-silica reactivity

5.3.1 Alkali-silica reactivity of recycled coarse aggregate H

When being in compliance with all of the following requirements, the alkali-silica

reactivity of recycled coarse aggregate H is judged as harmless.

- a) All the original coarse aggregates are identified ¹⁾.
- b) All the original coarse aggregates or recycled coarse aggregates H are judged as harmless by the alkali-silica reactivity test ²⁾ given in 7.7.

5.3.2 Alkali-silica reactivity of recycled fine aggregate H

When being in compliance with all of the following requirements, the alkali-silica reactivity of recycled fine aggregate H is judged as harmless.

- a) All the original coarse aggregates and original fine aggregates are identified ¹⁾.
- b) All the original coarse and fine aggregates, or the recycled fine aggregates H are judged as harmless by the alkali-silica reactivity ²⁾ test given in 7.7.

Notes ¹⁾ "Identification of original aggregate" is given in Annex A.

²⁾ Alkali-silica reactivity test shall be carried out for every original aggregate.

5.4 Grain size

5.4.1 Grain size

The grain size of the recycled aggregate H shall be tested in accordance with 7.8 and shall be within the range given in table 6. The manufacturer may consult with the purchaser to change the range of the mass fraction of those which pass the sieve for each division according to the grain size.

The specified range in table 6 is applicable to those retained on the sieve of nominal size 75 µm.

Table 6 Grain size

Division	Mass fraction of those passing through sieve %												
	Nominal sieve size ^{a)} mm												
	50	40	25	20	15	13	10	5	2.5	1.2	0.6	0.3	0.15
Recycled coarse aggregate H4005	100	95 to 100		35 to 70			10 to 30	0 to 5					
Recycled coarse aggregate H2505		100	95 to 100		30 to 70			0 to 10	0 to 5				
Recycled coarse aggregate H2005			100	90 to 100			20 to 55	0 to 10	0 to 5				
Recycled coarse aggregate H1505				100	90 to 100		40 to 70	0 to 15	0 to 5				
Recycled coarse aggregate H1305					100	85 to 100		0 to 15	0 to 5				
Recycled coarse aggregate H1005						100	90 to 100	0 to 15	0 to 5				
Recycled coarse aggregate H4020	100	90 to 100	20 to 55	0 to 15			0 to 5						
Recycled coarse aggregate H2515		100	95 to 100		0 to 15		0 to 5						
Recycled coarse aggregate H2015			100	90 to 100	0 to 15		0 to 5						
Recycled coarse aggregate H2513		100	95 to 100			0 to 15	0 to 5						
Recycled coarse aggregate H2013			100	85 to 100		0 to 15	0 to 5						
Recycled coarse aggregate H2510		100	95 to 100				0 to 10	0 to 5					
Recycled coarse aggregate H2010			100	90 to 100			0 to 10	0 to 5					
Recycled fine aggregate H		—	—	—	—		100	90 to 100	80 to 100	50 to 90	25 to 65	10 to 35	2 to 15
Note ^{a)} The nominal sieve sizes in the table correspond to the nominal sieve apertures specified in JIS Z 8801-1 , namely, 53 mm, 37.5 mm, 26.5 mm, 19 mm, 16 mm, 13.2 mm, 9.5 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 µm, 300 µm and 150 µm, respectively.													

5.4.2 Fineness modulus

The tolerance on the fineness modulus in the recycled aggregate H shall be ± 0.20 of the fineness modulus agreed between the manufacturer and the purchaser. Where the recycled coarse aggregate H is used by mixing with gravel, crushed stone, etc. and the recycled fine aggregate H with sand, crushed sand, etc., the manufacturer may relax the tolerance on the fineness modulus upon consultation with the purchaser.

5.4.3 Quantity which remains on adjacent sieves

The recycled fine aggregate H shall be such that, in any of the sieves given in table 6, the difference from the volume which remains on the adjacent sieve is not over 45 %.

5.5 Grain shape

The grain shape shall be as follows.