

## CEN/TC 104/SC 1/TG 19 – Use of aggregates in concrete

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Sixth draft text for EN 206  
September 19<sup>th</sup> 2012

### 5.1.3 Aggregates

(1) ~~Aggregates allowed for use in concrete are~~ General suitability is established for:

- natural normal-weight *aggregates*, and heavy-weight aggregates *and air-cooled blast furnace slag* conforming to EN 12620 ~~and the categories stated in table 15;~~
- lightweight aggregates conforming to EN 13055;
- ~~air-cooled blast furnace slag conforming to EN 12620 and the categories stated in table 15;~~
- reclaimed aggregates conforming to 5.2.3.3.

(2) Recycled and other-manufactured aggregates *other than air-cooled blast furnace slag, stated in annex A of EN 12620 and within the scope of EN 12620*, may be used as aggregate for concrete if the suitability is established ~~(see note in 5.1.1).~~

*NOTE The establishment of suitability may result from a relevant national standard or provisions valid in the place of use of the concrete which refers specifically to the use of the aggregate in concrete conforming to EN 206.*

~~(3) Where aggregates listed in prEN 12620:2011, table A.1, do not have a history of use in concrete they shall not be used except where suitability is established and the use is specified.~~

(34) Aggregates listed in prEN 12620:2012<sup>4</sup>, table A.24, identified as needing additional requirements shall not be used except where the additional requirements are specified.

*Recommendations for the use of aggregates are given in annex E (informative).*

### ~~5.2.3.4 Recycled and manufactured aggregates~~

~~Recommendations for the use of coarse recycled aggregates are given in Annex E (informative).~~

~~NOTE No recommendations for the use of fine recycled aggregates are given in this Standard.~~

## Annex A (normative)

### Initial test

#### A.4 Test conditions

(9) Where concrete containing recycled aggregates is to be produced, *the producer shall consider the need to carry out tests to determine* and the compressive strength class of the concrete is higher than C55/67, the initial tests shall include the determination of the drying shrinkage, creep and/or modulus of elasticity.

## Annex E (informative)

### Recommendation for the use of aggregates

#### D.1 General

(1) This annex provides recommendations for the use of:

- natural normal-weight aggregates, heavy-weight aggregates and air-cooled blast furnace slag conforming to EN 12620;
- recycled coarse aggregates conforming to EN 12620;
- lightweight aggregates conforming to EN 13055.

#### D.2 Natural normal-weight and heavy-weight aggregates and air-cooled blast furnace slag

(1) Table E.1 provides recommendations for the specification of properties of natural normal-weight and heavy-weight aggregates and air-cooled blast furnace slag.

**Table E.1 - Recommendations Requirements for natural normal-weight and heavy-weight aggregates and for air-cooled blast furnace slag**

Property <sup>a</sup>	Category according to EN 12620 <sup>b</sup>
Fines content	Category or value to be declared
Flakiness Index	$\leq FI_{5040}$ or $SI_{55}$
Shell content <sup>eb</sup>	SC <sub>10</sub>
Resistance to fragmentation	$\leq LA_{50}$ or $SZ_{38}$
Oven dried particle density $\rho_{rd}$	Value to be declared
Water absorption	Value to be declared
Acid-soluble sulfate	Natural aggregates: $\leq AS_{0,8}$ Air-cooled blast furnace slag: $AS_{1,0}$
Total sulfur content	Natural aggregates: $S_1$ Air-cooled blast furnace slag: $S_2$
Water-soluble chloride ion content	Value to be declared
<sup>a</sup>	Category NR (no requirement) may apply to for all other properties not stated in this table for which a category NR can be declared according to EN 12620.
<sup>b</sup>	<del>These categories apply except where more stringent categories are given in provisions valid in the place of use.</del>
<sup>be</sup>	Only relevant for aggregate from marine origin.

### D.3 Recommendation for the use of coarse-recycled **coarse** aggregates

(1) This **paragraph** ~~annex~~ provides recommendations for the use of recycled coarse aggregates.

(2) Table E.24 gives limits for the replacement of natural normal-weight coarse aggregates by recycled coarse aggregates in relation to exposure classes. Table E.24 is valid for recycled coarse aggregates conforming to EN 12620 and the categories stated in table E.32.

**Table E.24 - Maximum percentage of replacement of coarse aggregates (% by mass)**

Recycled aggregate type	Exposure classes			
	X0	XC1, XC2	XC3, XC4, XF1, XA1, XD1	All other exposure classes <sup>a</sup>
Type A: (Rc <sub>90</sub> , Rcu <sub>95</sub> , Rb <sub>10-</sub> , Ra <sub>1-</sub> , FL <sub>2-</sub> , XRg <sub>1-</sub> )	50 %	30 %	30 %	0 %
Type B <sup>b</sup> : (Rc <sub>50</sub> , Rcu <sub>70</sub> , Rb <sub>30-</sub> , Ra <sub>5-</sub> , FL <sub>2-</sub> , XRg <sub>2-</sub> )	50 %	20 %	0 %	0 %

<sup>a</sup> Type A recycled aggregates from a known source may be used in exposure classes to which the original concrete was designed with a maximum percentage of replacement of 30 %.

<sup>b</sup> Type B recycled aggregates should not be used in concrete with compressive strength classes > C30/37.

NOTE For the risk of alkali-silica reaction with recycled aggregates see annex CD of EN 12620.

**Table E.32 - Recommendations Requirements for recycled coarse aggregates**

Property <sup>a</sup>	Clause in EN 12620	Type	Category according to EN 12620
Fines content	4.4	A + B	Category or value to be declared
Flakiness Index	4.6	A + B	≤ FL <sub>40</sub>
Resistance to fragmentation	5.2	A + B	≤ LA <sub>50</sub>
Oven dried particle density ρ <sub>rd</sub>	5.4.1	A	≥ 2,10 Mg/m <sup>3</sup>
		B	≥ 1,70 Mg/m <sup>3</sup>
Water absorption	5.4.2	A + B	Value to be declared
Constituents <sup>b</sup>	6.3	A	Rc <sub>90</sub> , Rcu <sub>95</sub> , Rb <sub>10-</sub> , Ra <sub>1-</sub> , FL <sub>2-</sub> , XRg <sub>1-</sub>
		B	Rc <sub>50</sub> , Rcu <sub>70</sub> , Rb <sub>30-</sub> , Ra <sub>5-</sub> , FL <sub>2-</sub> , XRg <sub>2-</sub>
Water soluble sulfate content	6.4.3	A + B	≤ SS <sub>0,7</sub>
<del>Acid</del> Water-soluble chloride ion content	6.5	A + B	Value to be declared
Influence on the initial setting time	6.7.1	A + B	≤ A <sub>40</sub>

<sup>a</sup> Category NR (*no requirement*) may apply ~~ies for to all~~ other properties not stated in this table for which a category NR can be declared according to EN 12620.

<sup>b</sup> For special applications requiring high quality surface finish the constituent FL should be limited to category FL<sub>0,2-</sub>.

NOTE The use of recycled fine aggregates is not covered by this annex.

#### **D.4 Recommendation for the use of lightweight aggregates**

(1) Table E.4 provides recommendations for the specification of properties of lightweight aggregates.

**Table E.4 - Recommendations for lightweight aggregates**

<b>Property</b>	<b>Clause in EN 13055</b>	<b>Requirement</b>
Particle density	5.2.2	Value to be declared
Grading	5.4	Grading to be declared
Fines content	5.5	Value to be declared
Water absorption (5', 60' and 24h)	5.9	Value to be declared
Bulk crushing resistance	5.10	Value to be declared
Water-soluble chloride ion content	5.25.3	Value to be declared
Acid-soluble sulfate	5.25.4.1	≤ 0,8 % by mass
Total sulfur content	5.25.4.2	≤ 0,8 % by mass
Organic contaminants <sup>a</sup>	5.25.7	E.3 of EN 13055
<sup>a</sup> Only for natural lightweight aggregates.		

**NOTE** For the risk of alkali-silica reaction with lightweight aggregates see annex E of EN 13055