Road marking materials – Premix glass beads

Produits de marquage routier - Microbilles de verre
de prémélange

Straßenmarkierungsmaterialien – Premixglasperlen

ICS:

Descriptors : roads, signalling, marking, balls, glass, mixtures, specifications, grain size, classification, quality, defects tolerances, sampling, laboratory tests
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Foreword

This document (prEN 1424:2012) has been prepared by Technical Committee CEN/TC 226 “Road equipment”, the secretariat of which is held by AFNOR.

This document is currently submitted to the UAP.


This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports basic work requirements of Regulation (EU) No 305/2011.

For relationship with this Regulation, see informative Annex ZA, which is an integral part of this document."
1 Scope

This European Standard specifies the requirements applicable to premix glass beads intended to be used for providing night visibility to the road markings and added to road marking materials in the factory.

It also covers the relevant procedures for assessment and verification of the constancy of performance and for marking and labelling.

This European standard does not cover glass beads to be added as drop-on during the action of constructing the road marking assembly which are covered by EN 1423.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- EN 1423 Road marking materials - Glass beads antiskid aggregate and mixtures of the two
- ISO 565, Test sieves -- Metal wire cloth, perforated metal plate and electroformed sheet -- Nominal sizes of openings
- ISO 2591-1, Test sieving -- Part 1: Methods using test sieves of woven wire cloth and perforated metal plate
- ISO 3310-1, Test sieves -- Technical requirements and testing -- Part 1: Test sieves of metal wire cloth

3 Definitions

For the purpose of this product standard, the following definitions apply:

3.1 Glass beads

Transparent spherical glass particle, used to provide night visibility for the road markings by retroreflecting the incident headlight beams of a vehicle towards the driver.

3.2 Premix glass beads

Glass beads used for production of road marking materials in the factory

3.3 Intermediate bulk container (IBC)

Container with a capacity of up to 2000 kg, used as an intermediate solution in between bags and tins (25 kg to 50 kg) and bulk transport.

4 Product characteristics

4.1 General

Just after the road marking assembly is applied on the road surface premix glass beads are completely hidden into the road marking material and do not contribute to night time visibility. The action of traffic gradually removes away material and premix glass beads appear at the surface of the assembly and from that moment until they stay on the road marking they contribute to night time visibility.

Normally premix glass beads are added to road making materials without surface treatment but special coatings may be applied to the surface of the premix glass beads to enhance their adhesion to the road marking material.
The performance of the premix glass beads is defined by five characteristics: refractive index, maximum weighted percentage of defective glass beads, granulometry, content of dangerous substances and resistance to chemicals.

4.2 Visibility characteristics

4.2.1 Refractive index

The refractive index or index of refraction of a substance is a measure of the speed of light in that substance. It is expressed as a ratio of the speed of light in vacuum relative to that in the considered medium.

The refractive index \( n \) of premix glass beads shall be determined in accordance with Clause 5.3.1. It shall comply with and declared in accordance with the following classes:

- Class A: \( n \geq 1.5 \);
- Class B: \( n \geq 1.7 \);
- Class C: \( n \geq 1.9 \).

4.2.2 Maximum-weighted percentage of defective glass beads

In a collection of premix glass beads, maximum weighted percentage of defective glass beads is used to identify the percentage of premix glass beads that are not perfectly spherical.

The reference method for the determination of the maximum weighted percentage of defective glass beads is described in Clause 5.3.2. Glass beads defects are listed in Annex C of EN 1423.

Applying the reference method and taking into consideration only one defect per bead, the maximum weighted percentage of defective beads shall be 20% including a maximum of 3% of grains and foreign particles (see Table 1). If a granulometry includes premix glass beads with diameters lower than 1 mm and diameters equal to or greater than 1 mm they shall be separated by means of a sieve with nominal sizes of openings of 1 mm and checked separately.

<table>
<thead>
<tr>
<th>Diameter of premix glass beads mm</th>
<th>Maximum weighted percentage of defective glass beads %</th>
<th>Maximum weighted percentage of grains and foreign particles %</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>( \geq 1 )</td>
<td>20</td>
<td>3</td>
</tr>
</tbody>
</table>

Checking separately the premix glass beads with diameters lower than 1 mm and diameters equal to or greater than 1 mm, the maximum weighted percentage of defective glass beads of each fraction shall be recorded separately in the results of counting.

4.3 Granulometry

Granulometry is the measure of the size gradation of a collection of premix glass beads.

The granulometry of the premix glass beads shall be declared giving the minimum and the maximum percentages by mass of the cumulative retained glass beads on metal wire cloth test sieves sizes R 40/3 according to ISO 565, using the test sieving procedure defined in ISO 2591-1.
Granulometries of premix glass beads shall be described by selecting sieves in accordance with the following rules (also see Table 2):

- the upper safety sieve shall retain 0 – 0,1 % of the total mass of the glass beads ;
- the upper nominal sieve shall retain 0 % to 10 % of the glass beads ;
- if necessary, intermediate sieves shall be added to limit the ratio between the nominal sizes of openings of two successive sieves to a maximum of 1,7 : 1 for each of the intermediate sieves, the range by mass between the minimum $N_1$ % and the maximum $N_2$ % of the cumulative retained percentages shall be not more than 40 % ($N_2 - N_1 \leq 40$);
- the lower nominal sieve shall retain 95 % to 100 % of the glass beads.

**Table 2 Selecting sieves for premix glass beads**

<table>
<thead>
<tr>
<th>Sieves ISO 565 R 40/3</th>
<th>Cumulative retained mass %</th>
</tr>
</thead>
<tbody>
<tr>
<td>upper safety</td>
<td>0 – 0,1</td>
</tr>
<tr>
<td>upper nominal</td>
<td>0 to 10</td>
</tr>
<tr>
<td>intermediate</td>
<td>$N_1$ to $N_2$</td>
</tr>
<tr>
<td>lower nominal</td>
<td>95 to 100</td>
</tr>
</tbody>
</table>

The range of possible granulometries is defined in this Clause and by the Table 2 above.

The examples showed in Table 3, Table 4 and Table 5 illustrate proper interpretation of the standard. Granulometries of glass premix beads are not only restricted to the three examples of Table 3, Table 4 and Table 5.

**Table 3 Example 1: 300-53 microns**

<table>
<thead>
<tr>
<th>Sieves ISO 565 R 40/3</th>
<th>Cumulative retained mass %</th>
</tr>
</thead>
<tbody>
<tr>
<td>425 µm</td>
<td>0 – 0,1</td>
</tr>
<tr>
<td>300 µm</td>
<td>0 to 10</td>
</tr>
<tr>
<td>250 µm</td>
<td>5 to 30</td>
</tr>
<tr>
<td>150 µm</td>
<td>40 to 80</td>
</tr>
<tr>
<td>90 µm</td>
<td>80 to 100</td>
</tr>
<tr>
<td>53 µm</td>
<td>95 to 100</td>
</tr>
</tbody>
</table>

**Table 4 - Example 2: 1000-355 microns**

<table>
<thead>
<tr>
<th>Sieves ISO 565 R 40/3</th>
<th>Cumulative retained mass %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,18 mm</td>
<td>0 – 0,1</td>
</tr>
<tr>
<td>1 mm</td>
<td>0 to 10</td>
</tr>
<tr>
<td>850 µm</td>
<td>5 to 20</td>
</tr>
<tr>
<td>600 µm</td>
<td>45 to 85</td>
</tr>
<tr>
<td>355 µm</td>
<td>95 to 100</td>
</tr>
</tbody>
</table>

**Table 5 - Example 3: 850-212 microns**

<table>
<thead>
<tr>
<th>Sieves ISO 565 R 40/3</th>
<th>Cumulative retained mass %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mm</td>
<td>0 – 0,1</td>
</tr>
<tr>
<td>850 µm</td>
<td>0 to 10</td>
</tr>
<tr>
<td>500 µm</td>
<td>20 to 60</td>
</tr>
<tr>
<td>300 µm</td>
<td>60 to 95</td>
</tr>
<tr>
<td>212 µm</td>
<td>95 to 100</td>
</tr>
</tbody>
</table>
To achieve specific performances of the applied road marking, within the rules defined in Table 2 other granulometries better adapted to these specific uses can be designed and manufactured upon request.

### 4.4 Dangerous substances

#### 4.4.1 Content of arsenic, lead and antimony

In order to check the content of arsenic, lead and antimony, the premix glass beads shall be tested in accordance with Clause 5.5. Each element (As, Pb, Sb) shall be separately classified into one of the following two classes:

- Class 0: no value requested
- Class 1 $\leq 200$ ppm (mg/kg)

#### 4.4.2 Release of other dangerous substances

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, of dangerous substances, other than those dealt with in other clauses, when construction products covered by this standard are placed on those markets.

In the absence of European harmonized test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE: An informative database covering European and national provisions on dangerous substances is available at the Construction web site on EUROPA accessed through:

http://ec.europa.eu/enterprise/construction/cpd-ds/

### 4.5 Durability aspects

#### 4.5.1 Resistance to chemicals: water, hydrochloric acid, calcium chloride and sodium sulphide

Resistance to chemicals is used to verify that premix glass beads are not affected to exposure to the environment of the road.

The resistance to chemicals shall be determined in accordance with Clause 5.6.1 and premix glass beads shall not develop any surface haze or dulling when in contact with water or any of the following chemicals: hydrochloric acid, calcium chloride and sodium sulphide.

When tested in accordance to Clause 5.6.1, the resistance to chemicals of premix glass beads shall be declared as in Table 6

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Resistance to water</th>
<th>xx % of modified beads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Results</td>
<td>Resistance to hydrochloric acid</td>
<td>xx % of modified beads</td>
</tr>
<tr>
<td>Test Results</td>
<td>Resistance to calcium chloride</td>
<td>xx % of modified beads</td>
</tr>
<tr>
<td>Test Results</td>
<td>Resistance to sodium sulphite</td>
<td>xx % of modified beads</td>
</tr>
</tbody>
</table>

### 5 Testing, assessment and sampling methods

#### 5.1 General

The standard test methods for premix glass beads are listed in clauses 5.3 to 5.6.
Alternative test methods may be used providing that: the resulting values are comparable to those obtained using the standard methods;

5.2 Sampling

In order to test premix glass beads, a representative sample of the material to be tested shall be taken as follows.

The sample shall be taken from at least three bags or one Intermediate Bulk Container (IBC).

When M, in kilograms, is the mass of the premix glass beads to be tested, at least 1,5 kg of the material shall be taken by inserting an appropriate probe in the full height of a certain number \( S \) of bags, or inserting the probe \( S \) times in the whole height of an IBC. The probe shall be driven to the bottom of the bag, in an upright position, or into the IBC containing the material to be tested.

Another possibility to take a representative sample from the S bags is to use a 1/1 splitter.

\[
S = \frac{M}{150}
\]

and it shall be rounded up to the next higher unit.

A representative sample shall be obtained by mixing the material taken with the \( S \) insertions of the probe in the bags. The representative sample shall be split by means of a 1/1 splitter in the number of samples necessary for the tests.

NOTE: A test probe can be constructed from a tube of 28 mm to 34 mm diameter and 1000 mm to 1200 mm in length. The end of the probe which reaches the bottom of the bag or the IBC should be fitted with a plugging system. After penetration of the probe to the full depth of the bag or the IBC, the plug is inserted and the probe removed. The contents of the probe represent a single sample of the material to be tested.

When sampling into the IBC, if the test probe cannot go to the full depth of the container, the following alternative method shall be used:
- a quantity of 20kg +/- 1 kg shall be removed from the IBC in a bucket;
- the content of the bucket shall be split by means of a 1/1 splitter in the number of samples necessary for the tests.

5.3 Visibility Characteristics

5.3.1 Refractive index

The refractive index \( n \) of premix glass beads, shall be determined in accordance with Annex A of EN 1423.

5.3.2 Maximum weighted percentage of defective glass beads

The maximum weighted percentage of defective glass beads for premix glass beads shall be determined as described in Annex D of EN 1423.

NOTE: test method described in annex D shall be always considered as the reference test method, optical test methods can be used in Factory Production Control only if a correlation with the method described in Annex D of EN 1423 is available.

5.4 Granulometry

Granulometry of the premix glass beads shall be determined in accordance with the test method described in ISO 2591-1.
5.5 Dangerous substances

In order to check the content of arsenic, lead and antimony, the premix glass beads shall be tested in accordance with Annex I of EN 1423.

5.6 Durability aspects

5.6.1 Resistance to chemicals: water, hydrochloric acid, calcium chloride and sodium sulphide

The resistance shall be determined in accordance with Annex A of this standard.

6 Assessment and verification of constancy of performance - AVCP

6.1 General

The compliance of premix glass beads with the requirements of this standard and with the performances declared by the manufacturer in the DoP (Declaration of performance) shall be demonstrated by:
- determination of the product type on the basis of type testing
- factory production control by the manufacturer, including product assessment.

The manufacturer shall always retain the overall control and shall have the necessary means to take responsibility for the conformity of the product with its declared performances.

6.2 Type testing

6.2.1 General

All performances related to characteristics included in this standard shall be determined when the manufacturer intends to declare the respective performances.

Assessment previously performed in accordance with the provisions of this standard, may be taken into account provided that they were made to the same or a more rigorous test method, under the same AVCP system on the same product or products of similar design, construction and functionality, such that the results are applicable to the product in question.

Note 1: Same AVCP system means testing by an independent third party under the responsibility of a product certification body.

For the purposes of assessment, the manufacturer's products may be grouped into families, where it is considered that the results for one or more characteristics from any one product within the family are representative for that same characteristics for all products within that same family.

Note 2: Products may be grouped in different families for different characteristics.

Premix glass beads shall not be grouped into families for the assessment of granulometry and maximum weighted percentage of defective glass beads. Premix glass beads can be grouped into families for the assessment of: refractive index, dangerous substances and resistance against chemicals: water, hydrochloric acid, calcium chloride and sodium sulphide.

Note 3: Reference to the assessment method standards should be made to allow the selection of a suitable representative sample.

The performance of premix glass beads are defined by the following characteristics listed in Table 7.

In addition, the determination of the product type shall be performed for all characteristics included in Table 7 of the standard for which the manufacturer declares the performance:
- at the beginning of the production of a new or modified premix glass beads (unless a member of the same product range, intended as same granometric size gradation), or
- at the beginning of a new or modified method of production (where this may affect the stated properties); or

they shall be repeated for the appropriate characteristic(s), whenever a change occurs in the premix glass beads design, in the raw material or in the supplier of the components, or in the method of production (subject to the definition of a family), which would affect significantly one or more of the characteristics.
Where components are used whose characteristics have already been determined, by the component
manufacturer, on the basis of assessment methods of other product standards, these characteristics need not be
re-assessed. The specifications of these components shall be documented.
Products bearing regulatory marking in accordance with appropriate harmonized European specifications may be
presumed to have the performances declared in the DoP, although this does not replace the responsibility on the
premix glass beads manufacturer to ensure that the premix glass beads as a whole is correctly manufactured and
its component products have the declared performance values.

6.2.2 Test samples, testing and compliance criteria

The number of samples of premix glass beads to be tested/assessed shall be in accordance with Table 7

Table 7 — Number of samples and compliance criteria

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Requirement</th>
<th>Assessment method</th>
<th>Number of samples</th>
<th>Compliance criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractive index</td>
<td>4.2.1</td>
<td>5.3.1</td>
<td>2/family (*1)</td>
<td>4.2.1</td>
</tr>
<tr>
<td>Maximum weighted percentage of defective glass beads</td>
<td>4.2.2</td>
<td>5.3.2</td>
<td>1/product-type granulometry</td>
<td>4.2.2</td>
</tr>
<tr>
<td>Granulometry</td>
<td>4.3</td>
<td>5.4</td>
<td>1/product-type granulometry</td>
<td>4.3</td>
</tr>
<tr>
<td>Dangerous substances</td>
<td>4.4</td>
<td>5.5</td>
<td>2/family (*1)</td>
<td>4.4</td>
</tr>
<tr>
<td>Resistance against chemicals: water, hydrochloric acid, calcium chloride and sodium sulphide</td>
<td>4.5.1</td>
<td>5.6.1</td>
<td>2/family (*1)</td>
<td>4.5.1</td>
</tr>
</tbody>
</table>

*1 As long as there is only one product in the family only one sample has to be tested. From 2 products on, a second product has to be sampled to carry out the type testing of this characteristic to show that the results for this characteristic are representative for all premix glass beads within this same family.

6.2.3 Test reports

The results of the determination of the product type shall be documented in test reports. All test reports shall be retained by the manufacturer for at least 10 years after the last date of production of the premix glass beads to which they relate.

6.3 Factory production control (FPC)

6.3.1 General

The manufacturer shall establish, document and maintain an FPC system to ensure that the products placed on the market comply with the declared performance of the essential characteristics.
The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the production process and the product.

All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures. This factory production control system documentation shall ensure a common understanding of the evaluation of the constancy of performance and enable the achievement of the required product performances and the effective operation of the production control system to be checked. Factory production control therefore brings together operational techniques and all measures allowing maintenance and control of the compliance of the product with the declared performances of the essential characteristics.

6.3.2 Requirements

6.3.2.1 General

The manufacturer is responsible for organizing the effective implementation of the FPC system in line with the content of this product standard. Tasks and responsibilities in the production control organization shall be documented and this documentation shall be kept up-to-date.

The responsibility, authority and the relationship between personnel that manages, performs or verifies work affecting product constancy, shall be defined. This applies in particular to personnel that need to initiate actions preventing product non-constancies from occurring, actions in case of non-constancies and to identify and register product constancy problems.

Personnel performing work affecting the constancy of performance of the product shall be competent on the basis of appropriate education, training, skills and experience for which records shall be maintained. In each factory the manufacturer may delegate the action to a person having the necessary authority to:
- identify procedures to demonstrate constancy of performance of the product at appropriate stages;
- identify and record any instance of non-constancy;
- identify procedures to correct instances of non-constancy.

The manufacturer shall draw up and keep up-to-date documents defining the factory production control. The manufacturer's documentation and procedures should be appropriate to the product and manufacturing process. The FPC system should achieve an appropriate level of confidence in the constancy of performance of the product. This involves:

a) the preparation of documented procedures and instructions relating to factory production control operations, in accordance with the requirements of the technical specification to which reference is made;

b) the effective implementation of these procedures and instructions;

c) the recording of these operations and their results;

d) the use of these results to correct any deviations, repair the effects of such deviations, treat any resulting instances of non-conformity and, if necessary, revise the FPC to rectify the cause of non-constancy of performance.

Where subcontracting takes place, the manufacturer shall retain the overall control of the product and ensure that he receives all the information that is necessary to fulfil his responsibilities according to this European standard. If the manufacturer has part of the product designed, manufactured, assembled, packed, processed and/or labelled by subcontracting, the FPC of the subcontractor may be taken into account, where appropriate for the product in question.

The manufacturer who subcontracts all of his activities may in no circumstances pass the above responsibilities on to a subcontractor.

NOTE - Manufacturers having an FPC system, which complies with EN ISO 9001 standard and which addresses the provisions of the present European standard are considered as satisfying the FPC requirements of the Regulation (EU) No 305/2011.

6.3.2.2 Equipment

6.3.2.2.1 Testing

All weighing, measuring and testing equipment shall be calibrated and regularly inspected according to documented procedures, frequencies and criteria.
6.3.2.2 Manufacturing

All equipment used in the manufacturing process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the manufacturing process. Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer’s written procedures and the records retained for the period defined in the manufacturer’s FPC procedures.

6.3.2.3 Raw materials and components

The specifications of all incoming raw materials and components shall be documented, as shall the inspection scheme for ensuring their compliance. In case supplied kit components are used, the constancy of performance system of the component shall be that given in the appropriate harmonized technical specification for that component.

6.3.2.4 Traceability and marking

Individual premix glass beads shall be identifiable and traceable with regard to their production origin. The manufacturer shall have written procedures ensuring that processes related to affixing traceability codes and/or markings are inspected regularly.

6.3.2.5 Controls during manufacturing process

The manufacturer shall plan and carry out production under controlled conditions.

6.3.2.6 Product testing and evaluation

The manufacturer shall establish procedures to ensure that the stated values of the characteristics he declares are maintained. The characteristics, and the means of control, are described in Table 8:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Minimum frequency of tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractive index</td>
<td>1 test / year</td>
</tr>
<tr>
<td>Maximum weighted percentage of defective glass beads</td>
<td>Every batch and at least every 5 t</td>
</tr>
<tr>
<td>Granulometry</td>
<td>Every batch and at least every 5 t</td>
</tr>
<tr>
<td>Dangerous substances (Pb, As, Sb)</td>
<td>Every 1000 t and at least once a month</td>
</tr>
<tr>
<td>Resistance to chemicals : water, hydrochloric acid, calcium chloride and sodium sulphide</td>
<td>1 test/year</td>
</tr>
</tbody>
</table>

6.3.2.7 Non-complying products

The manufacturer shall have written procedures which specify how non-complying products shall be dealt with. Any such events shall be recorded as they occur and these records shall be kept for the period defined in the manufacturer’s written procedures.

Where the product fails to satisfy the acceptance criteria, the provisions for non-complying products shall apply, the necessary corrective action(s) shall immediately be taken and the products or batches not complying shall be isolated and properly identified.
Once the fault has been corrected, the test or verification in question shall be repeated. The results of controls and tests shall be properly recorded. The product description, date of manufacture, test method adopted, test results and acceptance criteria shall be entered in the records under the signature of the person responsible for the control/test. With regard to any control result not meeting the requirements of this European standard, the corrective measures taken to rectify the situation (e.g. a further test carried out, modification of manufacturing process, throwing away or putting right of product) shall be indicated in the records.

### 6.3.2.8 Corrective action

The manufacturer shall have documented procedures that instigate action to eliminate the cause of non-conformities in order to prevent recurrence.

### 6.3.2.9 Handling, storage and packaging

The manufacturer shall have procedures providing methods of product handling and shall provide suitable storage areas preventing damage or deterioration.

### 6.3.3 Product specific requirements

The FPC system shall address this European Standard and ensure that the products placed on the market comply with the declaration of performance. The FPC system shall include a product specific FPC, which identifies procedures to demonstrate compliance of the product at appropriate stages, i.e.:

a) the controls and tests to be carried out prior to and/or during manufacture according to a frequency laid down in the FPC test plan,

and/or

b) the verifications and tests to be carried out on finished products according to a frequency laid down in the FPC test plan

If the manufacturer uses only finished products, the operations under b) shall lead to an equivalent level of compliance of the product as if FPC had been carried out during the production.

If the manufacturer carries out parts of the production himself, the operations under b) may be reduced and partly replaced by operations under a). Generally, the more parts of the production that are carried out by the manufacturer, the more operations under b) may be replaced by operations under a).

In any case the operation shall lead to an equivalent level of compliance of the product as if FPC had been carried out during the production.

**NOTE:** Depending on the specific case, it can be necessary to carry out the operations referred to under a) and b), only the operations under a) or only those under b). The operations under a) refer to the intermediate states of the product as on manufacturing machines and their adjustment, and measuring equipment etc. These controls and tests and their frequency shall be chosen based on product type and composition, the manufacturing process and its complexity, the sensitivity of product features to variations in manufacturing parameters etc.

The manufacturer shall establish and maintain records that provide evidence that the production has been sampled and tested. These records shall show clearly whether the production has satisfied the defined acceptance criteria and shall be available for at least three years.

### 6.3.4 Initial inspection of the manufacturing plant and of FPC

Initial inspection of the manufacturing plant and of FPC shall be carried out when the production process has been finalized and in operation. The manufacturing plant and FPC documentation shall be assessed to verify that the requirements of clause 6.3.2 and 6.3.3 are fulfilled.

During the inspection it shall be verified:

a) that all resources necessary for the achievement of the product characteristics included in this European standard are in place and correctly implemented,

and

b) that the FPC-procedures in accordance with the FPC documentation are followed in practice,
c) that the product complies with the product type samples, for which compliance of the product performance to
the DoP has been verified.

All locations where final assembly or at least final testing of the relevant product is performed, shall be assessed to
verify that the above conditions a) to c) are in place and implemented. If the FPC system covers more than one
product, production line or production process, and it is verified that the general requirements are fulfilled when
assessing one product, production line or production process, then the assessment of the general requirements
does not need to be repeated when assessing the FPC for another product, production line or production process.
All assessments and their results shall be documented in the initial inspection report.

6.3.5 Continuing surveillance, assessment and evaluation of FPC

Continuing surveillance, assessment and evaluation of the FPC shall be undertaken at least once a year on each
production site. The surveillance of the FPC shall include a review of the FPC test plan(s) and production
processes(s) for each product to determine if any changes have been made since the last assessment or
surveillance. The significance of any changes shall be assessed.
Checks shall be made to ensure that the test plans are still correctly implemented and that the production
equipment is still correctly maintained and calibrated at appropriate time intervals.
The records of tests and measurement made during the production process and to finished products shall be
reviewed to ensure that the values obtained still correspond with those values for the samples submitted to the
determination of the product type and that the correct actions have been taken for non-compliant products.

6.3.6 Procedure for modifications

If modifications are made to the product, production process or FPC system that could affect any of the product
characteristics declared according to this standard, then all the characteristics for which the manufacturer declares
performance, which may be affected by the modification, shall be subject to the determination of the product type,
as described in 6.2.1.
Where relevant, a re-assessment of the factory and of the FPC system shall be performed for those aspects, which
may be affected by the modification.
All assessments and their results shall be documented in a report.

6.3.7 One-off products, pre-production products (e.g. prototypes) and products
produced in very low quantity

The premix glass beads produced as a one-off, prototypes assessed before full production is established, and
products produced in very low quantities [1 ton] per year) shall be assessed as follows.
For type assessment, the provisions of 6.2.1, 3rd paragraph apply, together with the following additional provisions:
- in case of prototypes, the test samples shall be representative of the intended future production and shall be
  selected by the manufacturer;
- on request of the manufacturer, the results of the assessment of prototype samples may be included in a
certificate or in test reports issued by the involved third party.

For prototypes, where the intention is to move to series production, the initial inspection of the factory and FPC
shall be carried out before the production is already running and/or before the FPC is already in practice. The
following shall be assessed:
- the FPC-documentation; and
- the factory.
In the initial assessment of the factory and FPC it shall be verified:

a) that all resources necessary for the achievement of the product characteristics included in this European
standard will be available, and
b) that the FPC-procedures in accordance with the FPC-documentation will be implemented and followed in
practice, and
c) that procedures are in place to demonstrate that the factory production processes can produce a product
complying with the requirements of this European standard and that the product will be the same as the
samples used for the determination of the product type, for which compliance with this European standard has
been verified.

Once series production is fully established, the provisions of clause 6.3 shall apply.
7 Marking
The manufacturer shall provide the following information to accompany the product.

Technical data sheet of the product mentioning the granulometry with all the sieves and specifications as defined in clauses 4.3.

Each packaging of the product shall contain the following identification:

— the last two digits of the year in which the product was manufactured;
— surface treatment; if present
— the batch number;
— Product identification: Name (e.g. commercial name or other unique identification of a granulometry);
— content of the packaging.

Where regulatory marking provisions require information on some or all items listed in this clause, the provisions of this clause concerning those common items are deemed to be met and the information needs not be repeated for the purpose of this clause.
ANNEX A (normative) Test methods to determine the resistance of the glass beads to the effects of water, hydrochloric acid, calcium chloride and sodium Sulphide

A.1 General

Samples shall be obtained in agreement of clause 5.2 of this norm

A.2 Resistance to the effects of water

In a distillation flask fitted with a glass tube at the top, this tube to serve as a reflux condenser, boil 10 g ± 0.1 g of glass beads for 60 min ± 10 min in 100 g ± 1 g of CO₂ free water. After the test objects have been boiled for the required period, filter the glass beads, dry them and note any changes which appear in the surface using the microscope at an enlargement of between 20× and 50×;

Compare these with an untreated sample and calculate the % of modified beads.

A.3 Resistance to the effects of hydrochloric acid

Immerse 10 g ± 0.1 g of glass beads in 100 ml ± 0.1 ml of dilute hydrochloric acid solution, buffered to give a pH of 5.0 to 5.3, for 90 h at a temperature of 20 °C ± 3 °C.

With the help of a microscope with 20× to 50× magnification, note any changes which may have appeared on the surface after the glass beads have been rinsed in distilled water and dried.

Compare these with an untreated sample and calculate the % of modified beads

A.4 Resistance to the effects of calcium chloride

Immerse 10 g ± 0.1 g of glass beads in 100 ml ± 0.1 ml of a normal solution of calcium chloride for 3 h at a temperature of 20 °C ± 3 °C.

With the help of a microscope with 20× to 50× magnification note any changes which may have appeared on the surface after the glass beads have been rinsed in distilled water and dried.

compare these with an untreated sample and calculate the % of modified beads

A.5 Resistance to the effects of sodium Sulphide

A.5.1 Apparatus and reagents

- Microscope with 20× to 50× magnification
- 50 ml bottle with a glass stopper
- distilled water
- a saturated solution of sodium sulphide in distilled water at 20°C with the addition of 2,0% anionic wetting agent.

A.5.2 Procedure

Take 10 g ± 0.1g of glass beads from a representative sample.

Place the glass beads in a stoppered bottle and cover with the solution containing the sodium sulphide and allow to stand for 1 h. Pour off the solution containing the sodium sulphide and rinse three times with distilled water.

Dry the glass beads in a oven at 100 °C ± 5 °C and, using the microscope, compare these with an untreated sample
A.6 Results

When compared with an untreated sample the glass beads shall not be darker. After comparison with untreated sample calculate the % of modified (darker) beads

A.6.1 Test report

<table>
<thead>
<tr>
<th>Date</th>
<th>gg/mm/yyyy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Operator</td>
<td>name surname - Company</td>
</tr>
<tr>
<td>Name of producer</td>
<td>Producer</td>
</tr>
<tr>
<td>Sampling method</td>
<td>hEN 1424:20xx Clause 5.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resistance of the glass beads to the effects of water, hydrochloric acid, calcium chloride and sodium Sulphide</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance to water</td>
<td>xx % of modified beads</td>
</tr>
<tr>
<td>Resistance to hydrochloric acid</td>
<td>xx % of modified beads</td>
</tr>
<tr>
<td>Resistance to calcium chloride</td>
<td>xx % of modified beads</td>
</tr>
<tr>
<td>Resistance to sodium sulphite</td>
<td>xx % of modified beads</td>
</tr>
</tbody>
</table>
Annex ZA (informative) Clauses of this European Standard addressing the provisions of the EU Construction Products Regulation

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under Mandate M/111 “Circulation Fixtures”, as amended by mandate M/132 given to CEN by the European Commission and the European Free Trade Association.

When this European standard is cited in the Official Journal of the European Union (OJEU), under Regulation (EU) No. 305/2011 it shall be used as basis for the establishment of the declaration of performance and the CE marking. Regulation (EU) 305/2011 as amended contains provisions for DOP and the CE marking, the clauses of this standard, shown in this annex, are considered to meet the provisions of the relevant mandate, under the Regulation (EU) No. 305/2011.

This annex deals with the CE marking of the premix glass beads intended for the uses indicated in Table ZA.1 and shows the relevant clauses applicable.

This annex has the same scope as in Clause 1 of this standard related to the aspects covered by the mandate and is defined by Table ZA.1

Table ZA.1 — Relevant clauses for product premix glass beads and intended use for road marking material

<table>
<thead>
<tr>
<th>Essential Characteristics</th>
<th>Clauses in this and other European Standard(s) related to essential characteristics</th>
<th>Classes and/or threshold levels</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visibility characteristics:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Refractive index</td>
<td>4.2.1</td>
<td>-</td>
<td>Test method in 5.4.1 Results expressed as Class</td>
</tr>
<tr>
<td>- Maximum weighted percentage of defective glass beads</td>
<td>4.2.2</td>
<td>-</td>
<td>Test method in 5.4.2 Results expressed as weighted percentage of defective glass beads ≤ 20% &gt; 20%</td>
</tr>
<tr>
<td>Granulometry:</td>
<td>4.3</td>
<td>-</td>
<td>Test method in 5.5 Results expressed as granulometry description sieve by sieve Retained mass per sieve in % of total glass beads</td>
</tr>
<tr>
<td>Dangerous substances:</td>
<td>4.4</td>
<td>-</td>
<td>Test method in 5.6 Results expressed as Class For each element As, Pb, Sb</td>
</tr>
</tbody>
</table>

DURABILITY
Resistance against chemicals: water, hydrochloric acid, calcium chloride and sodium sulphide

| Resistance to water: | --- | % of modified beads |
| Resistance to hydrochloric acid: | --- | % of modified beads |
| Resistance to calcium chloride: | --- | % of modified beads |
| Resistance to sodium sulphite: | --- | % of modified beads |

The declaration of the product performance related to certain essential characteristics is not required in those Member States (MS) where there are no regulatory requirements on these essential characteristics for the intended use of the product.

In this case, manufacturers placing their products on the market of these MS are not obliged to determine nor declare the performance of their products with regard to these essential characteristics and the option “No performance determined” (NPD) in the information accompanying the CE marking and in the declaration of performance (see ZA.3) may be used for those essential characteristics.

## ZA.2 Procedure for AVCP of premix glass beads

### ZA.2.1 System(s) of AVCP

The AVCP system(s) of premix glass beads indicated in Table ZA.1 established by EC legal act Decision(s) 1996/579/EC (OJEU L254 of 1996-10-08) as amended by EC Decision 1999/453/EC (OJEU L178 of 1999-07-14) is shown in Table ZA.2 for the indicated intended use, and relevant level(s) or class(es) of performance.

<table>
<thead>
<tr>
<th>Products</th>
<th>Intended use</th>
<th>Level(s) or class(es) of performance</th>
<th>AVCP system(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Road marking products: : “- Drop-on materials (glass beads, anti-skid aggregates and combinations of the two)”</td>
<td>For circulation areas</td>
<td>This column is deleted</td>
<td>1</td>
</tr>
</tbody>
</table>


The AVCP of the premix glass beads in Table ZA.1 shall be according to the AVCP procedures indicated in Table ZA.3 resulting from application of the clauses of this or other European Standard indicated therein. The content of tasks of the notified body shall be limited to those essential characteristics as provided for, if any, in Annex III of the relevant mandate and to those that the manufacturer intends to declare.

“NOTE: In accordance with annex 3 of mandate M132 as amended by document CONSTRUCT 09/851, and confirmed by the EC in the reply to TC226 to mandate M111, premix glass beads are to be considered equally as Drop-on materials (glass beads)”
ZA.3 Assignment of AVCP tasks

The AVCP of premix glass beads as provided in Table ZA.1 shall be the one according to the AVCP procedures indicated in Table ZA.3 resulting from the application of the clauses of this or other European Standards indicated therein. The content of the tasks assigned to the notified body shall be limited to those essential characteristics that the manufacturer intends to declare.

Taking into account the AVCP system defined for the products and the intended uses the following tasks are to be undertaken by the manufacturer and the notified body respectively for assessment and verification of the constancy of the performance of the product.

Table ZA.3 — Assignment of AVCP tasks for premix glass beads under system 1

<table>
<thead>
<tr>
<th>Tasks for the manufacturer</th>
<th>Content of the task</th>
<th>AVCP clauses to apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory production control (FPC)</td>
<td>Parameters Performances related to essential characteristics of Table ZA.1 relevant for the intended use which are declared</td>
<td>6.3</td>
</tr>
<tr>
<td>Further testing of samples taken at the manufacturing plant by the manufacturer in accordance with the prescribed test plan</td>
<td>Essential characteristics of Table ZA.1 relevant for the intended use which are declared</td>
<td>6.3.2.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tasks for the notified product certification body</th>
<th>Content of the task</th>
<th>AVCP clauses to apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial inspection of the manufacturing plant and of factory production control FPC</td>
<td>Visibility characteristics Granulometry Dangerous substances</td>
<td>6.2</td>
</tr>
<tr>
<td>Continuous surveillance, assessment and evaluation of factory production control FPC</td>
<td>Parameters Performances related to essential characteristics of Table ZA.1, relevant for the intended use which are declared, namely Visibility characteristics Granulometry Dangerous substances Documentation of the FPC</td>
<td>6.3.4</td>
</tr>
</tbody>
</table>

(b) The notified product certification body shall decide on the issuing, restriction, suspension or withdrawal of the certificate of constancy of performance of the construction product on the basis of the outcome of the following assessments and verifications carried out by that body: (i) an assessment of the performance of the construction product
ZA.3.1 Declaration of performance (DoP)

ZA.3.1.1 General

The manufacturer draws up the DoP and affixes the CE marking on the basis of the different AVCP systems set out in Annex V of the Regulation (EU) No 305/2011:
- the factory production control and further testing of samples taken at the factory according to the prescribed test plan, carried out by the manufacturer; and
- the certificate of constancy of performance issued by the notified product certification body on the basis of determination of the product type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product; initial inspection of the manufacturing plant and of factory production control and continuous surveillance, assessment and evaluation of factory production control.

ZA.3.1.2 Content

The model of the DoP is provided in Annex III of the Regulation (EU) No 305/2011.

According to this Regulation, the DoP shall contain, in particular, the following information:

- the reference of the product-type for which the declaration of performance has been drawn up;
- the AVCP system or systems of the construction product, as set out in Annex V of the CPR;
- the reference number and date of issue of the harmonised standard which has been used for the assessment of each essential characteristic;
- where applicable, the reference number of the Specific Technical Documentation used and the requirements with which the manufacturer claims the product complies.

The DoP shall in addition contain:

(a) the intended use or uses for the construction product, in accordance with the applicable harmonised technical specification;
(b) the list of essential characteristics, as determined in the harmonised technical specification for the declared intended use or uses;
(c) the performance of at least one of the essential characteristics of the construction product, relevant for the declared intended use or uses;
(d) where applicable, the performance of the construction product, by levels or classes, or in a description, if necessary based on a calculation in relation to its essential characteristics determined in accordance with the Commission determination regarding those essential characteristics for which the manufacturer shall declare the performance of the product when it is placed on the market or the Commission determination regarding threshold levels for the performance in relation to the essential characteristics to be declared.
(e) the performance of those essential characteristics of the construction product which are related to the intended use or uses, taking into consideration the provisions in relation to the intended use or uses where the manufacturer intends the product to be made available on the market;
(f) for the listed essential characteristics for which no performance is declared, the letters "NPD" (No Performance Determined);

The information referred to in Article 31 or, as the case may be, in Article 33 of Regulation (EC) No 1907/2006, (REACH) shall be provided together with the DoP.

EXAMPLE OF DoP DELETED

ZA.4 CE marking and labelling

The CE marking symbol shall be in accordance with the general principles set out in Article 30 of Regulation (EC) No 765/2008 and shall be affixed visibly, legibly and indelibly

- to the packaging

Or

- to the accompanying documents

The CE marking shall be followed by:

- the last two digits of the year in which it was first affixed,
- the name and the registered address of the manufacturer, or the identifying mark allowing identification of the name and address of the manufacturer easily and without any ambiguity,

- the unique identification code of the product-type
- the reference number of the declaration of performance
- the level or class of the performance declared regarding:
  - refractive index, maximum weighted percentage of defective glass beads, granulometry, dangerous substances, resistance against chemicals: water, hydrochloric acid, calcium chloride and sodium sulphide.
  - the dated reference to the harmonised technical specification applied
  - the identification number of the notified body,
  - the intended use as laid down in the harmonised technical specification applied.

The CE marking shall be affixed before the construction product is placed on the market. It may be followed by a pictogram or any other mark notably indicating a special risk or use.

EXAMPLES OF CE MARKING DELETED