

Montažni betonski izdelki – Klasifikacija obnašanja betona, armiranega s steklenimi vlakni

Precast concrete products - Classification of glassfibre reinforced concrete performances

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Precast concrete products - Classification of glassfibre reinforced concrete performances

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Foreword

This document (prEN 15191:2005) has been prepared by Technical Committee CEN/TC 229 “Precast concrete products”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

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Introduction

This standard deals with the properties of GRC depending on the constituent materials, the composition of glassfibre reinforced concrete and the production processes. The glassfibre reinforced concrete (GRC) can be manufactured using different combination of materials to meet the required properties. Mix composition, type of cement, and the proportion, length and orientation of glassfibres may all be varied to produce a specific product. A polymer dispersion may be used for curing purposes.

The classification is based on the material properties to be achieved.

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1 Scope

This European standard deals with the classification of glassfibre reinforced concrete. This classification conforms to the needs of the design process of glassfibre reinforced concrete components. This European standard applies only if the standard EN 1169 is followed.

This standard does not include the design methods.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1169, *Precast concrete products — General rules for factory production control of glassfibre reinforced cement.*

EN 1170-1, *Precast concrete products — Test method for glassfibre reinforced cement — Part 1: Measuring the consistency of the matrix — “Slump test” method.*

EN 1170-2, *Precast concrete products — Test method for glassfibre reinforced cement — Part 2: Measuring the fibre content in fresh GRC — “Wash out test”.*

EN 1170-3, *Precast concrete products — Test method for glassfibre reinforced cement — Part 3: Measuring the fibre content of sprayed GRC.* (standards.iteh.ai)

EN 1170-4, *Precast concrete products — Test method for glassfibre reinforced cement — Part 4: Measuring bending strength — “Simplified bending test” method.*

EN 1170-5, *Precast concrete products — Test method for glassfibre reinforced cement — Part 5: Measuring bending strength — “Complete bending test” method.*

EN 1170-6, *Precast concrete products — Test method for glassfibre reinforced cement — Part 6: Determination of the absorption of water by immersion and determination of the dry density.*

EN 1170-7, *Precast concrete products — Test method for glassfibre reinforced cement — Part 7: Measurement of extremes dimensional variations due to moisture content.*

ENV 1170-8, *Test method for glassfibre reinforced cement — Part 8: Cyclic weathering type test.*

prEN 14649, *Precast concrete products — Test method for strength retention of glassfibre in cement and concrete (SIC TEST).*

prEN XXXXX, *Specification for the Alkali Resistance of glassfibres for the reinforcement of concrete (or cement).*

ISO 12491:1997, *Statistical methods for quality control of building materials and components.*

3 Definitions and abbreviations

3.1 Terms and definitions

For the purposes of this standard, the following definitions apply:

3.1.1

additive

product that may be added by volume to the matrix composition to improve some properties. It can be reactive (e.g. silica fumes) or inert, mineral or organic (e.g. polymer dispersions)

3.1.2

admixture

product added in quantity less than 5% by volume (or the mass of cement), before or during mixing and giving expected modifications to the initial properties (e.g. plasticiser, air entraining agents)

3.1.3

AR glassfibre

a glassfibre product with a proven resistance (prEN XXXX) to the alkaline environment of matrices made from hydraulic cement

3.1.4

basic strand

glassfibre obtained by stranding a number of filaments (typically 100 to 200) having a defined individual diameter (typically 10 µm to 30 µm)

3.1.5

roving

a number of parallel strands wound together on a mandrel to form uniform cylindrical package size

3.1.6

glassfibre reinforced concrete

GRC

composite material consisting of a matrix of hydraulic binder reinforced with glassfibres, these materials being compatible

3.1.7

matrix

composition of the glassfibre reinforced concrete without the fibres. It is made of the mixture of sand, cement, water and any additives and admixtures

3.1.8

spray processes

processes whereby continuous glassfibre are cut into set lengths and sprayed together with the matrix. The processes are designed to give a glassfibre reinforced concrete in which the fibres are oriented parallel to the mould surface

3.1.9

premix processes

processes whereby chopped strands of glassfibres are blended with the matrix to make a glassfibre reinforced concrete ready for processing. The processes may be: "casting and vibration", wet or dry spraying, injection, extrusion, etc.

3.1.10

processes with oriented fibres

processes whereby chopped strands or roving of glassfibre or place in the matrix in a defined direction

3.1.11**facing coat**

an initial layer without fibre but containing decorative sands or aggregates and often pigmented

3.1.12**SIC test**

test method for strength retention of glassfibres in concrete (or cement)

3.1.13**fibre content**

the fibre content of glassfibre reinforced concrete is given in percentage by weight and it is related to the total weight of the GRC

3.1.14**limit of proportionality****LOP**

point at which the linear-elastic material behaviour becomes plastic in the stress-strain diagram

3.1.15**modulus of rupture****MOR**

ultimate tension achieved in the stress-strain diagram

3.1.16**characteristic property**

the value of a property above which 95 % of the population of all possible measurements of that property of the specified GRC are expected to lie

3.1.17**acceptance test**

a test carried out on a predetermined regular basis to confirm that batches of product conform to specification

3.1.17**type test**

a type test may be necessary for the approval of a new GRC formulation or for a new product (classification concerning , for example :sound insulation, fire resistance, etc.)

3.2 Symbols and abbreviated terms

AR	alkali resistant
GRC	glass fibre reinforced concrete
LOP	limit of proportionality
MOR	modulus of rupture
SIC	stand in cement

4 Characteristics of the composite material

Glassfibre reinforced concrete is a composite material for which the glassfibre has the function of a reinforcement for the cementitious matrix.

The properties of the composite material as manufactured depend on:

— the properties of the matrix as base;

- the properties, geometry, quantity and orientation of the glassfibre as reinforcement;
- the bond between matrix and glassfibre;
- the manufacturing processes;
- the conditions and the treatments during production (curing).

The mix design must be such that the mechanical properties of GRC in clause 7 are achieved and that these requirements are consistent with the design .

5 Composition of GRC in the uncured state

The mechanical properties of GRC depend on the mix design with and have to be consistent with the design of the product. The mix designs in Table 1 are intended as a guide; designs falling outside these values may be acceptable but should be scrutinised before use.

Table 1 — Basic formulations of GRC

Manufacturing technique	Spray processes	Premix processes
Fibre content in weight (%)	3,0 – 5,5	1,5 – 3,5
length of AR fibres ¹ (mm)	≥ 25	≤ 25
water/cement ratio ²	0,35 ± 0,05	0,37 ± 0,05
sand/cement ratio ³	≤ 2:1	≤ 2:1
Polymer in volume ⁴ (%)	0 – 7	0 – 7

¹ In case of oriented fibres the fibre length depends on the product.

² Water/cement ratio: the ratio of the mass of total water to the mass of dry cement in the GRC in the uncured state. When pozzolanic fillers are used they can be considered as cementitious and the water/cement ratio can be expressed as a water/total binder ratio (for examples : such pozzolanic fillers are pulverised fuel ash ,micro-silica and metakaolin).

³ Sand/cement ratio :the ratio of the mass of total dry aggregate to the mass of dry cement in the GRC.

⁴ The values of polymer refer to the dispersion with solid content of 50 %.

6 Performances

6.1 Standard GRC (spray or premix processes)

The following values are average values based on tests carried out on sample boards.