

# How to interpret fibre dosage in standard EN 14889-2: 2006

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#### CE standard for polymer fibres

In the standard *EN 14889-2: 2006 'Polymer fibres—Definitions, specifications and conformity*, the technical committee has summarized all harmonized characteristics (mentioned in *Annex ZA*). A manufacturer needs to test and provide these characteristics in order to sell his fibres on the European market.

These tested harmonised characteristics are summarized on one official document called DOP (Declaration Of Performance).

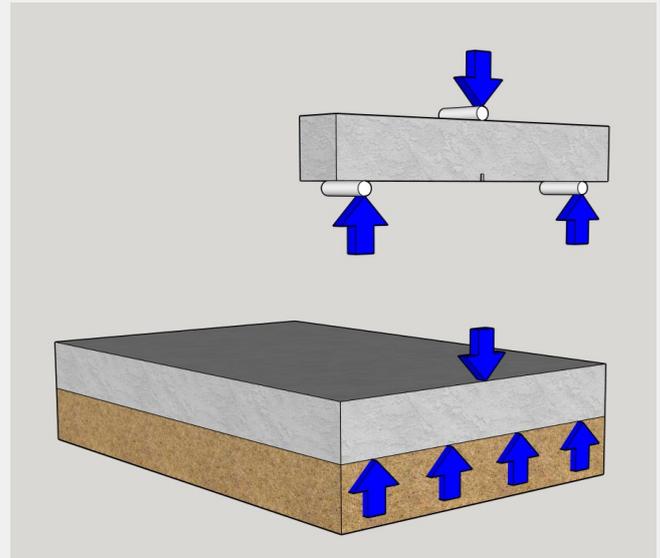
#### Effect on strength of concrete

One of the harmonised characteristics is set in place to determine the effect of fibres on the strength of concrete. In this way a client is able to compare the performance in

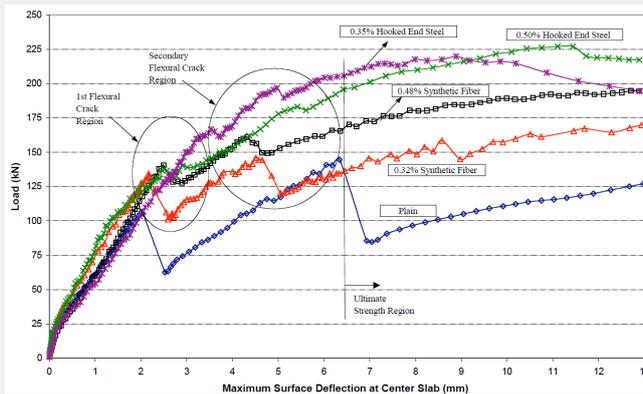
concrete of one fibre to another. The effect on the strength of concrete is described in chapter 5.8 as follows: "The effect on strength shall be determined according to EN 14845-2 using a reference concrete conforming to prEN 14845-1. The unit volume of fibres in  $kg/m^3$  shall be declared by the manufacturer that achieves a residual flexural strength of 1.5MPa at 0.5mm CMOD (equivalent to 0.47 central deflection) and a residual flexural strength of 1MPa at 3.5mm CMOD (equivalent to 3.02 mm central deflection)."

This is clearly to determine the effect of the fibres on the strength of the concrete at a given dosage. Nowhere in the standard a MINIMUM dosage has been defined. This is simply not possible because the test method is a beam test. This beam has a given bending moment and length, which is the same for all tests. If one changes the section of that beam, the results will be different so the residual flexural strength will be different.

Moreover a concrete slab cannot be assimilated to a two points supported beam. The subgrade has a certain bearing capacity and is therefore also considered in the design.



**A concrete slab cannot be assimilated in a two points supported beam. The bearing capacity of the subgrade is to be considered in the design.**



**Beam test according to EN 14845-2**

### Designing with FRC (fibre reinforced concrete)

The section of the concrete is determined by the design and therefore the required bending moment is always calculated and depends on the thickness of the slab, the bearing capacity of the soil, the strength of the concrete, the amount of fibres, the loading, etc.... So the minimum amount of fibres valid for all applications can therefore not be set in the standard as this depends on to many parameters.

The beam tests are necessary to determine the  $R_{e,3}$ -value of the polymer fibre. The  $R_{e,3}$ -value is the ratio between the equivalent flexural strength  $f_{e,3}$  of FRC and the modulus of rupture (MOR) of plain concrete. The  $f_{e,3}$  is proportional to the area under the load –deflection curve up to a central beam deflection of 3mm.

The TR34 design guidelines use a yield-line analysis and  $R_{e,3}$  to modify the ultimate moment capacity of plain concrete slabs. The increase in the flexural capacity of concrete slabs with fibres has also been linked to the beam  $R_{e,3}$  value. The  $R_{e,3}$  value depends on the fibre type, geometry, and volume fraction.

### Conclusion

Our designs are based on an apparent flexural toughness provided by the addition of the fibres to a particular strength of concrete.

The apparent flexural toughness is determined by the flexural