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The effect of steel and polypropylene fibers on the chloride diffusivity and drying shrinkage of high-strength concrete

Vahid Afroughsabet, Luigi Biolzi, Paulo J.M. Monteiro



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1 The effect of steel and polypropylene fibers on the chloride diffusivity and drying
2 shrinkage of high-strength concrete

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4 Vahid Afroughsabet^{1,2}, Luigi Biolzi¹, Paulo J.M. Monteiro²

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6 **Abstract**

7 This paper presents an experimental study that investigates the influence of the low fiber content
8 of polypropylene and hooked-end steel fibers on the properties of high-strength concrete. The
9 study variables include fiber types and fiber contents. The effect of combining both fibers with a
10 total fiber content of 1.0% was also studied in some mixtures. Silica fume, as a supplementary
11 cementitious material, was used at 10% of the cement weight in all fiber-reinforced concrete
12 mixtures. Compressive strength, modulus of elasticity, longitudinal resonant frequency, rapid
13 chloride migration and free drying shrinkage tests were performed for different curing ages. The
14 results show that replacement of the cement weight with 10% silica fume improved all of the
15 characteristics of the concrete evaluated in this research study. It was observed that the inclusion
16 of fibers, particularly steel fibers, enhanced the mechanical properties of concrete. It was found
17 that the incorporation of polypropylene fibers resulted in a reduction of chloride diffusivity,
18 while introducing steel fibers significantly increased the chloride diffusivity of concrete. Finally,
19 the results showed that hybridization of two types of fibers was an effective way to improve the
20 properties of concrete and specifically reduce the drying shrinkage compared with that of the
21 plain concrete.

¹ Department of Architecture, Built Environment and Construction Engineering, Politecnico di Milano, Italy.

² Department of Civil and Environmental Engineering, University of California, Berkeley, USA

Corresponding author: Vahid Afroughsabet, Tel: +39 392 4355 232; Email: vahid.afroughsabet@polimi.it

Email addresses: luigi.biolzi@polimi.it (L. Biolzi), monteiro@ce.berkeley.edu (P.J.M. Monteiro)

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