

Title: Development of an injectable grout for concrete repair and strengthening

Author(s): Brás, Ana ^[1]; **Gião, Rita** ^[2]; Lúcio, Válder ^[3]; Chastre, Carlos ^[3]

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Abstract: This paper deals with the coupled effect of temperature and silica fume addition on rheological, mechanical behaviour and porosity of grouts based on CEMI 42.5R, proportioned with a polycarboxylate-based high range water reducer. Preliminary tests were conducted to focus on the grout best able to fill a fibrous network since the goal of this study was to develop an optimized grout able to be injected in a mat of steel fibers for concrete strengthening.

The grout composition was developed based on criteria for fresh state and hardened state properties. For a CEMI 42.5R based grout different high range water reducer dosages (0%, 0.2%, 0.4%, 0.5%, 0.7%) and silica fume (SF) dosages (0%, 2%, 4%) were tested (as replacement of cement by mass). Rheological measurements were used to investigate the effect of polycarboxylates (PCEs) and SF dosage on grout properties, particularly its workability loss, as the mix was to be injected in a matrix of steel fibers for concrete jacketing. The workability behaviour was characterized by the rheological parameters yield stress and plastic viscosity (for different grout temperatures and resting times), as well as the procedures of mini slump cone and funnel flow time. Then, further development focused only on the best grout compositions. The cement substitution by 2% of SF exhibited the best overall behaviour and was considered as the most promising compared to the others compositions tested. Concerning the fresh state analysis, a significant workability loss was detected if grout temperature increased above 35 degrees C. Below this temperature the grout presented a self-levelling behaviour and a life time equal to 45 min. In the hardened state, silica fumes increased not only the grout's porosity but also the grout's compressive strength at later ages, since the pozzolanic contribution to the compressive strength does not occur until 28 d and beyond. (C) 2012 Elsevier Ltd. All rights reserved.

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Reprint Address: Bras, A (reprint author) - Polytech Inst Setubal, ESTBarreiro, Setubal, Portugal

Addresses:

[1] Polytech Inst Setubal, ESTBarreiro, Setubal, Portugal

[2] IPL, Dept Civil Engn, ISEL, Lisbon, Portugal

[3] UNL, Dept Civil Engn, FCT, P-2829516 Caparica, Portugal

E-mail Addresses: ana.bras@estbarreiro.ips.pt; anareis@dec.isel.pt; vlucio@fct.unl.pt; chastre@fct.unl.pt

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