

DEVELOPMENT OF HYBRID FIBRE-CEMENT ROOFING TILES: A CASE STUDY OF EDGE CRACKS

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Abstract.

The use of hybrid fibres-cement roofing tiles reinforced with cellulosic pulp and synthetic fibres have increased exponentially in recent years, especially in developing countries, such as Brazil. The principal challenge is identify important factors that cause edge cracks in this product. This work presents a case study in order to make a map of the influence of some raw materials and natural weathering on the appearance of edge cracks in the hybrid fibre-cement roofing tiles produced by the Hatschek process. Different formulations with polyvinyl alcohol (PVA) and polypropylene (PP) fibres, as well as the combination of the two fibres, and without and with silica fume were evaluated. The hybrid fibre cement roofing tiles were submitted over 24 months of natural weathering exposure in rural area located in Pirassununga, Brazil (21° 59'S of latitude and 627 m of altitude). The tiles orientation also take into account the location of landscape features, which determines the amount of solar radiation it receives. The observation of the evolution of edge cracks and flexural strength of the roofing tiles, as well as physical and mechanical characterizations of fibre-cement specimens extracted from the roofing tiles were analysed in consecutive intervals of 3 months. This work was conducted evaluating 1200 hybrid fibre cement roofing tiles. The results show that the highest incidence of cracks is located on the north face of the roofing tiles. However, fibre cement tiles reinforced with PVA fibre and without silica fume presented less edge cracks if compare to other formulations evaluated in this work. Consequently, it was observed that silica fume does not contribute to mitigate edge cracks on hybrid fibre cement roofing tiles. It was found that edge cracks do not have a significant effect on the flexural behavior of the hybrid fibre cement roofing tiles. The physical and mechanical characterizations suggest an acceptable performance of the fibre cement material extracted from roofing tiles over 24 months of natural weathering exposure.