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Optimization of Hemp Fiber Reinforced Concrete for Various Environmental Conditions

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Abstract : The purpose of this study is to evaluate the incorporation of hemp fibers (HF) in concrete. Hemp fiber reinforced concrete (HFRC) is becoming more popular as an alternative for regular mix designs. This study was done to evaluate the compressive strength of HFRC regarding mix procedure. Hemp fibers were obtained from the manufacturer and hand-processed to ensure uniformity in width and length. The fibers were added to the concrete as both wet and dry mixes to investigate and optimize the mix design process. Results indicated that the dry mix had a compressive strength of 1157 psi compared to the wet mix of 985 psi. This dry mix compressive strength was within range of the standard mix compressive strength of 1533 psi. The statistical analysis revealed that the mix design process needs further optimization and uniformity concerning the addition of HF. Regression analysis revealed the standard mix design had a coefficient of 0.9 as compared to the dry mix of 0.375, indicating a variation in the mixing process. While completing the dry mix, the addition of plain hemp fibers caused them to intertwine, creating lumps and inconsistency. However, during the wet mixing process, combining water and hemp fibers before incorporation allows the fibers to uniformly disperse within the mix; hence the regression analysis indicated a better coefficient of 0.55. This study concludes that HRFC is a viable alternative to regular mixes; however, more research surrounding its characteristics needs to be conducted.

Keywords : hemp fibers, hemp reinforced concrete, wet & dry, freeze thaw testing, compressive strength
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