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ENHANCEMENT OF LIME-HEMP CONCRETE PROPERTIES USING DIFFERENT MANUFACTURE TECHNOLOGIES

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Abstract

The EU directive 2010/31/EU – created to address challenges of global warming and energy dependence – sets goals to reduce CO2 emission levels by 20% till 2020. As primary energy for households and construction industry is one of the largest manufacturers of CO2, a building material that can positively impact both these industries is topical and as such is tested in this paper. A lime-hemp concrete (LHC) is a material with negative CO2 balance, but is widely used only in low-story wood frame buildings and made on site. To achieve the goals set in EU directive a more industrialized product, that can also be used in insulation of existing buildings is needed, so methods of LHC slab and block manufacture are tested in this paper. Five different types of hemp shives are taken and numerous LHC mixes are prepared to assess the importance of hemp granulometrical distribution. To measure the effect of different preparation techniques mixes in two different mixers – drum and pan – were prepared to test the superiority of the latter as it is widely used in LHC production. Also two different compaction directions – parallel and perpendicular to payload – were tested, as well as 4 different drying methods – natural, with excess moisture, forced with temperature and with increased moisture and temperature. After complete drying physical and mechanical properties - density, thermal conductivity, compressive and flexural strength - were determined and compared to assess the most suitable materials and manufacture technologies for LHC blocks. The results allow to better understand the principles of how the material works and how it`s properties can be enhanced with various manufacture techniques. The results suggest that LHC blocks have the necessary properties and potential to become widely used in improvement of thermal insulation of existing buildings.

Keywords:

Lime-hemp concrete, LHC, hemp blocks

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