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Jomaas, Grunde; Dragsted, Anders ; Fynholm, Peder ; Markert, Frank

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On the use of Bio-based Building Products in Denmark – Fire safety regulations, research and future challenges

Grunde Jomaas¹, Anders Dragsted², Peder Fynholm³ and Frank Markert⁴

¹ Technical University of Denmark, Department of Civil Engineering, Brovej, 2800 Kgs. Lyngby, Denmark, grujo@byg.dtu.dk

² Danish Fire and Safety Institute, Jernholmen 12, 2650 Hvidovre, Denmark

³ Danish Technological Institute, Gregersensvej 1, 2630 Taastrup, Denmark

⁴ Technical University of Denmark, Department of Management Engineering, Produktionstorvet, 2800 Kgs. Lyngby, Denmark

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The Danish building tradition includes the use of bio-based materials, and timber-framed buildings with thatched roofs can be found throughout the country. However, devastating city fires in the 18th century led to prescriptive regulations that demanded the use of stone walls towards streets, yards and neighbours in cities. In addition, strict distance requirements were implemented for houses with thatched roofs and timber frames. These historically rooted requirements are still influencing the current building style, and although the current performance-based building regulations in Denmark technically allow for timber buildings of any height, there are no tall timber buildings in the country. This strongly suggests that there is a significant need to improved knowledge and dissemination of this knowledge in order to convince the authorities having jurisdiction that timber buildings can be meet the performance-based fire safety requirements.

Despite the generally small contribution of forestry and manufacturing of wood and wood articles to Denmark's Gross Value Added (GVA) [1], there is an increased interest in the use of timber for construction in Denmark, as exemplified by the Innobyg Spireproject focusing on enabling densification of the built environment with lightweight materials [2]. Furthermore, a PhD project with collaboration between several industrial partners, including The Danish Institute for Fire and Safety Technology, entitled "The tectonic potential of wooden constructions for implementation in industrially manufactured building systems" is to commence in August, 2015.

Due to the relatively limited forest resources in Denmark, as compared to the rest of Europe, both due to the low forest percentage and due to the small land area in general [3], the focus on bio-based materials for the built environment has been on demonstration projects for alternative building materials such as concrete containing hemp, cellulose fibres, cork, thatched roofs and

fibreboards with various bio-based components. Figure 1 shows examples of such fibreboards from a project at the Danish Technological Institute.



*Figure 1: Different bio-based building products created in a project at the Danish Technological Institute [4].
Top left: Eelgrass, Top Right: Seaweed waste, Bottom left: Tomato stems, Bottom right: Straw*

The goal is that we in the future will be able to move beyond the use of our own examples and tradition and be willing to learn from others. Through the collaboration in COST FP1404, we aim to obtain the knowledge needed to address current challenges, such as connections (fire resistance), flammability (reaction to fire) and the approval process. In the end, the overall goal will be to educate all stakeholders to a level that enables the decisions on using timber and bio-based products to be based on a cost-benefit analysis that involves sustainability considerations, rather than it being a decision rooted in historical fire incidents.

References

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