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Abstract

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Buildings designed with an energy-efficient Building envelope

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Abstract: The Kyoto Protocol, United Nations (1998), obligates signatory industrialized countries to reduce their emissions of greenhouse gases in the period between 2008 and 2012. For further improvements in the years to come, long-term efforts are necessary that focus on energy consumption in buildings, where the largest and most cost-effective potential for energy conservation lies. By focusing on the thermal envelope and individual building components both in new and existing buildings, a reduction of energy consumption for heating and comfort will lead to more sustainable buildings.

The paper will focus on air tightening of the building envelope and superinsulated building components. Principles for air tightening of the building envelope will be discussed and new principles for making superinsulated strip foundation of prefabricated lightweight elements will be introduced and demonstrated as an alternative to the strip foundation made of concrete as traditionally used.

The prefabricated elements, made of expanded polystyrene (EPS), can be used as the strip foundation of a house of up to two storeys. The EPS element is integrated into the insulation located underneath a house. This can constitute a foundation system that allows very little energy to be lost through the foundation element that combines the concrete floor slab and the outer wall.

The use of the introduced prefabricated EPS element will be demonstrated used as strip foundation for the base of a traditional single-family house. The house is a one-storey house with an exterior wall made as a traditional wood-stud wall with insulation. The design criteria for the EPS element will be outlined and methods for establishing stable non-freezing ground underneath the EPS element will be described. Furthermore it will be shown how the EPS element is handled on site. Two-dimensional finite difference calculations are used to demonstrate the performance of the principle and to estimate the temperature underneath the foundation.

United Nations. 1998. Kyoto protocol to the United Nations framework convention on climate change.
<http://unfccc.int/resource/docs/convkp/kpeng.pdf>