

Use of GRP in Daylight Façade Panels

L.H. Nielsen¹, J. Madsen¹, and S. Pavic¹

¹DTU Civil Engineering, Technical University of Denmark

INTRODUCTION

Due to the strict requirements in energy renovation of buildings, it is very obvious to investigate alternative methods to optimize energy consumption. Fibreglass panels can be used as a façade cladding, with good heat accumulability. By utilizing the sun's heat radiation on facades of small buildings, the heat accumulated result in a higher temperature on the outer edge, and the consumption requirements of insulation can be reduced.

Theory

From the year of 2035, the building stock in Denmark has to be CO2 neutral, which puts strict demands on energy consumption in buildings - new as old. Nearly 40% of our total energy consumption in Denmark goes to the existing building stock.

Together that calls for a need of energy optimizations. Especially in the large stock of single-family houses from the 60-70s, there is an inevitable need for energy renovation in the near future.

Energy renovations are mostly done, by improving the building's heat loss through increased insulation. With the Danish Building Regulations of 2020's strict requirements for energy improvements, this often results in thicker outer walls, which can be significant disadvantages to the existing construction. Roof overhang, the building footprint and window holes can be negatively affected. The building owner as well as architects, therefore seeks after alternative methods for energy renovations that do not compromise the building's expression.

Such an alternative can be the so-called daylight walls, derived from the theory behind solar walls. Together with the extra insulation, a translucent façade can be mounted. As the sun warms up the unventilated air gap behind the translucent plate during the day, it increases the temperature of the unventilated air gap behind the plate. The outer surface temperature of the insulation increases, and the insulation thickness can be reduced. The daylight walls are often clad with glass, but this project aims to prove that other translucent materials can be used.

Using fibreglass reinforced plastic as the translucent layer, results in a more insulating layer than glass, is more resistant to weather and wind, is fire resistant and also has a remarkable static property so the panels can cover large areas. The accumulative property of fibreglass panels results in a reduced amount of insulation thickness. Energy renovations may become more attractive to house owners, and together we can achieve the target for 2035 faster.