

Homes for tomorrow

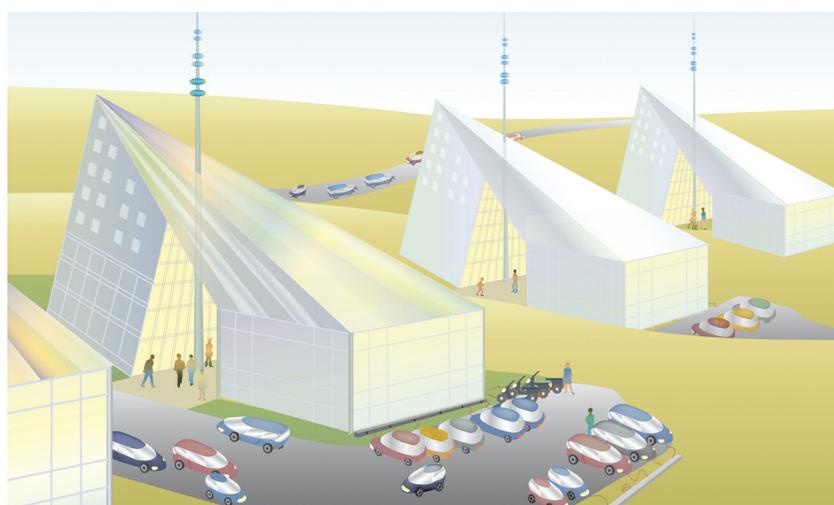
Building homes for a sustainable future...

A dedicated group of researchers within the Department of Civil Engineering at Chalmers University of Technology has recently been granted a strong research environment status by the Swedish Formas research council. The environment is named 'homes for tomorrow' (h42) and will deliver cutting-edge innovations for the building industry through interdisciplinary projects. These innovations will promote new approaches and applications in the transdisciplinary arenas (reality studies) with municipalities and the building sector.

The interdisciplinary research will demonstrate considerable reductions in ecological footprints for buildings through innovations in water systems, thin and active building envelopes, and new concrete composites. The research aims to provide a low material and energy intensity (environmental sustainability), combined with an understanding of the human experience of homes (social sustainability), while being competitive and realistic through the reality studies (economic sustainability).

The development of active multifunctional building envelopes is being led by Professor Carl-Eric Hagentoft.

Aerogel in woven and solid forms is being investigated as a highly efficient thermal insulation material that can be used in order to reduce heat transfer through the building envelope. It is thought that the reduction in thickness of insulation compared to traditional materials could be as much as eight times. Applications include the retrofit of older homes, where this would reduce the effect on the character of the building while raising the standard of the home.



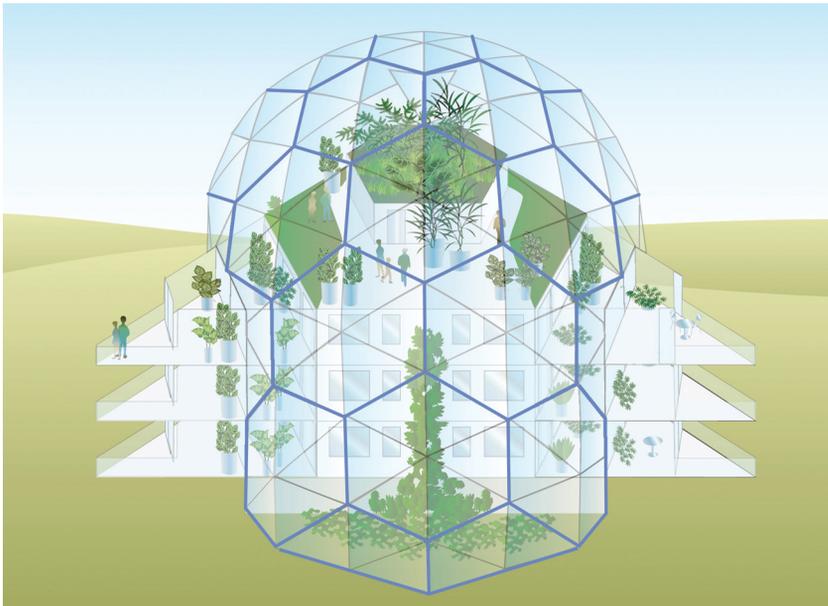
A further application is for slim, new homes with both a low material and energy intensity.

Thin structure is also a theme for Professor Kent Gylltoft, who is studying novel cementitious and geopolymer products for the prefabrication of components. New binders will be matrices for novel concrete composites and high performance composites will include the development of textile reinforced concrete. Meanwhile, Professor Tang Luping is investigating thermal energy storage in concrete through the development of an electrochemical cell, which is

a spin-off of corrosion prevention research. This research will result in an innovation to store electric energy in concrete structures.

Innovations in indoor water systems are being researched by Professor Greg Morrison. Household water circulation and water treatment systems are being developed that meet future requirements for drinking water quality by adapting and updating existing leading edge technology to obtain:

- Super high-quality drinking water from different mains delivered water qualities;



- Low energy technologies for recycling grey water within the home;
- Efficient collection and treatment of wastewater in-home by combining biological processes with nanotechnology.

While the environmental aspects are central to h42, it is also important that the home provides experiential qualities for human restoration after work. Professor Daniel Västfjäll is therefore carrying out research that aims to clarify the behaviour and psychology for humanising technologies and innovations for future homes. This research includes consideration of the potential and the limitations of new technical solutions in adaptive building envelopes and coupled to the transfer of air and daylight through the envelope, the distribution through the living space and the impact on occupants. This includes the use of transparent thermal insulations, optical fibre solutions, smart window technology, daylight chimneys and

fluorescent materials. The effects of variables on humans will be determined through psychophysical studies, which will provide multimodal indices of comfort and restoration.

The overriding aim for h42 is to bring together innovations and experiential findings to provide a transdisciplinary arena with the building industry for:

- Real-life references;
- Inspiration concept homes;
- Well-tested prototypes at scales from the detailed to the full scale.

An important feature of this arena is knowledge production and dissemination, both within academia and the building industry. For these external cooperative partners, the added value of h42 can be expressed in terms of: exploration of new technologies and processes, ideas for their ongoing projects, brainstorming for specific projects, as well as cultivating learning and competence developments for current employees and future employees who are our current students.

One reality study under discussion is a home development site on the grounds of a former paper factory. Here the old industrial buildings provide a cultural heritage for the former industrial era, with waterfalls and power the backdrop for the

development. The area will accommodate a mix of new and retrofit solutions, with the discussions of the stakeholders and researchers in h42 providing a research arena of value for both.

“Our vision is that the h42 research team will carry out research, in dialogue with external partners, that will underpin real building solutions that can feasibly be implemented in Sweden and abroad,” says Professor Greg Morrison, Director, h42.

The interest in h42 expressed by the building sector is because our research aims to provide: firstly, technical innovations with low material and energy intensity; secondly, new qualities for homes through studies of the human experience; and thirdly, competitive and realistic solutions through demonstration case studies.

An important characteristic of the strong research environment, h42, is the development of the research results on the transdisciplinary arena with stakeholders in the building industry, from the outset.

For further information, please contact homes for tomorrow on the details below.

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