

# When is a window not a window?

When it's a well-insulated wall. The DEI Demonstration project aims to give us back our windows – when we need them. A key driver behind this project is to think about sustainable ways for living in and using buildings

## Project

DEI Demonstration

## Project coordinator

Professor Stephen Gage, UCL

## Project partners

Make Architects, Haque Design+Research;  
Max Fordham, Douglas Stephen Partnership

## Website

[www.deployable.org.uk](http://www.deployable.org.uk)

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'We're re-thinking the ways in which windows operate,' says project coordinator Professor Stephen Gage. 'Building regulations have obliged designers to reduce window sizes to minimise heat loss. Based on the observation that internal spaces are frequently unoccupied, we're turning windows into well-insulated walls when the space behind them isn't in use, or when it's dark. There is little point, as we move towards a low energy future, in windows that lose heat in winter and gain excess heat in summer.'

Gage's response is the idea of Deployable External Insulation (DEI) in the form of solid insulated external shutters that respond to external temperature and sunlight intensity,

acting as both insulating and shading devices. 'This system has the potential to be three to nine times better than a standard window at conserving heat energy,' says Gage. 'We think it has great potential for reducing heat loss in both new and existing buildings.'

DEI as a concept puts the spotlight on building use and occupancy patterns. Inhabitants have choices: whether to be either hot or cold, to have light or to stay in the dark. 'We need to re-think the way we heat and light our spaces – and also, in the context of low carbon living, the clothes we wear and our desired room temperatures,' says Gage. 'Technology provides options, but it's people that come up with solutions.'

## Key points to date

### Patent on wax piston technology

filed by UCL (UCL Business) March 2008. Interest from potential manufacturers and users is being actively investigated

### The container is now at Trinity Buoy

Wharf, overlooking the Thames, and is being monitored for a six-month period

### More information, including videos,

simulations, diagrams and background data, is available on the project website: [www.deployable.org.uk](http://www.deployable.org.uk)

### Data from performance monitoring of

the DEI system will provide the basis for academic papers and journal articles to raise awareness of these systems



### Testing the prototype: future plans

To share our ideas and our knowledge, and to persuade people that this is an idea worth thinking about, the DEI team created a 6m-long functional prototype out of a shipping container. The UrbanBuzz-funded prototype was on show to the public during London's Festival of Architecture, and is now undergoing six months of further testing and monitoring on a rooftop at Trinity Buoy Wharf, East London. Following the exhibition, there is already one Government department potentially interested in using DEI to develop a sustainable coastal tourism project in the UK.

There are plans to make DEI commercially available in future, but there is still much work to be done. 'We'll need to go through a step change operation with a manufacturer. We need more data on performance to satisfy architects, designers and building control officers. We need to do further numerical analysis. And we need to refine the actuators.'

'As for performance, so far data suggests that for 1sqm of single glazing, compared to 1sqm of a DEI single glazing and shutter system (when the shutter operates to admit daylight at all times when space is occupied), building heat losses in a residential sector would be reduced by one-third or more on an annual basis. For commercial sector buildings, the reduction of heat losses would be six and a half or more annually.'

### Occupancy patterns

As a final thought, Gage reflects again on building use. 'There's a conversation to be had about a behavioural trade-off in the context of zero carbon,' he says. 'We're also looking at



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the link between occupancy and the notion of an annualised heat loss. A building must be considered in terms of its occupancy pattern when we look at climate change. Leading on from that is the idea of passive and modified passive activation in buildings. It could become possible to target active strategies for zero carbon on a space-by-space and building-by-building basis. I'd like to look more at that just to see how far we can push it.' ♦

The DEI concept consists of two elements; a thermally insulating shutter that opens and closes over a window and a drive mechanism to operate it (inset). The drive mechanism is designed to open the shutter when conditions are favourable and close the shutter when it is too hot or too cold outside. The mechanism operates using the phase-change of wax, which responds to the outside temperature and heat from sunshine to melt and expand during the day and freeze and contract during the night.

A manual override, using very little energy, allows users to control the shutters. The prototype uses fixed glazing, but shutters could also be fixed over ventilators to help mitigate the occupancy heat gain typical in highly insulated buildings – there are three roof ventilators with shutters, driven by external temperatures, on the prototype's roof. The converted shipping container shown here is the test cell for a prototype of the thermal insulation shutters and the UCL-patented drive mechanism technology.

