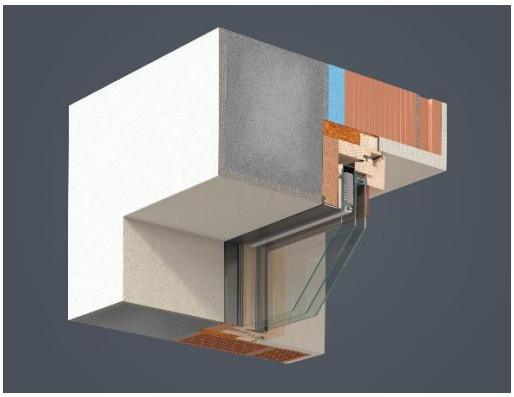
Windows in step-by-step retrofits – windows first, then insulation



Keeping costs in mind, thermal bridges, optimisation of solar gains, windows and façades should be retrofitted at the same time. If this is not possible, then the following should be considered:

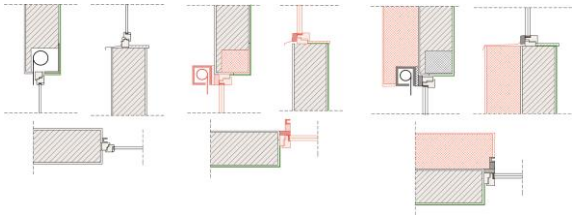
The position of the window matters

The Component Award 2015 recognised solutions which are low-cost and functional with regard to investment and energy costs when considered over the entire life-cycle of the windows.
The result is surprisingly easy: the window is mounted flush with the masonry on the outside and the resulting gap is carefully sealed using an elastic sealant. An integral frame in which the frame covers the sash is ideal for this purpose. Passive House window frames are a prerequisite for this position. Using standard frames can lead to critical temperatures at the interior connection of the window. Insulation can be extended over the window frame without much effort later on when the façade is modernised.

Other positions have proved to be disadvantageous: if the frame is installed deeper in the reveal, the thermal bridge in the final installed state will be significantly greater. Reveal insulation results in additional costs and shading by the reveal increases. Although positioning within the prospective insulation layer is advantageous with regard to the installation thermal bridge and the reveal shading, mounting in front of the wall incurs additional costs and sealing the resultant bay is difficult. The Component Award 2015 jury also assessed the solution with the bay as unacceptable in terms of the design.

Shading/roller shutters

Roller shutter boxes constitute one of the biggest weak points in the building envelope: As a rule these are not airtight and in existing buildings it is very difficult to seal these airtightly, which leads to high heat losses. Extended insulation over the roller shutter hardly changes anything because the roller shutter box contains cold outdoor air.
Recommended solution: the old roller shutter should be removed along with the old window, and the roller shutter box should be filled with insulation and airtightly sealed on the outside and a new shading element or blind should be foreseen. This can be a front-mounted roller shutter or a Venetian blind which can be integrated into the new insulation later on. To minimise the installation thermal bridge, thermal decoupling should be foreseen between the frame and the front-mounted roller shutter. A shading element in the air space between outer single-glazing and inner insulating glazing is an even better option, as the Component Award 2015 showed. The investment costs for this type of shading are less than half of those for a Venetian blind.



Left: Window of an existing building. Centre: New window as an intermediate energy retrofit step. Right: Retrofitting with new windows and façade insulation.

Additional advantages include weather protection for the shading/darkening element, less thermal bridges and simplified installation and therefore shorter installation times. A disadvantage is that the upper facing frame width is enlarged due to the stack of lamella or the screen. The air space between the panes may become dirty due to the passage of outdoor air through the air space. It is possible to avoid additional cleaning by the use of filters. Known as a "coupled window", this solution is usually only offered for turn-and-tilt windows.

Further information and sources
www.passipedia.org | http://europhit.eu
Krick, B. and Vahalova E.: Windows in a step-by-step retrofit. In: Feist, W. (Publisher) Conference Proceedings of the 20th International Passive House Conference, Darmstadt 2016.