



## Ryesgade 30 A-C

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Extra layer of glass on the inside



## Windows

### *What is the solution?*

Original preservation worthy wooden windows from before 1950-60 with one layer of glass can be energy improved by adding a coupled frame with low energy glazing internally. If the window already has a coupled frame, energy improvement can be achieved by replacing the glazing in the coupled frame with new low energy glazing. Alternatively, new coupled frames can be made with room for low energy glazing. Windows with initial signs of degradation should be completely refurbished or replaced with new windows with coupled frames and energy glazing. Alternatively, the windows can be replaced by new ones taking into consideration the architecture of the house. If the window has no coupled frame to begin with, this would be considered a medium impact solution.

### *Why does the solution work?*

The extra glazing increases the internal surface temperatures, i.e. warm moist air cannot get to the colder surfaces of the original window. Therefore, the solution has a high level of moisture safety and at the same time, it reduces heating requirements significantly. An added benefit is the improvement of the indoor climate since the solution significantly reduces draft and cold surfaces for the users. The solution will typically not be visible from the outside and it

can therefore be used in many situations where maintaining the exterior appearance of the facade is necessary.

*Description of the context:*

This solution would typically be used in situations where the look of the original facade needs to be maintained and when the existing windows are still in good shape. The existing windows should be painted and maintained before adding the coupled frame.

*Pros and cons of the solution:*

Adding a coupled frame on the internal side of the existing window will significantly lower the heat loss through windows and could, to some extent improve air tightness at the same time. This will also result in warmer internal surfaces and therefore reduce the risk of condensation, draughts and downdraft, resulting in an overall increased comfort and better indoor climate.

*Type of data available:*

This solution was used in the Ryesgade 30 project. The original windows had 1 pane of glass and a U-value of 4.20 W/m<sup>2</sup>K. The new windows had 1 + 2 panes of glass. The 2-pane section has krypton gas filling and the total U-value of the windows is 0.89 W/m<sup>2</sup>K. Due to the building's status as conservation-worthy, the renovation could not change the facade expression. However, the municipality accepted that the windows were replaced with new windows that were constructed like the old windows. The new windows were specially developed for the project with drawn glass in the outer layer of the pane to give the window the same expression and mirroring quality as the original ones from 1896.

*Available pictures or publications of the solution:*

|                      | Existing window | Refurbished window                              |
|----------------------|-----------------|---|
| Type                 | Single window   | Single window coupled with new low energy glass |
| Glazing – Inner      |                 | Double  |
| Glazing - Outer      | Single          | Single  |
| Shading/shutters     |                 |   |
| U <sub>window</sub>  | 4.2             | 0.89  |
| U <sub>glazing</sub> | 5.8             | 0.8   |
| U <sub>frame</sub>   | 2.3             | 2.3   |
| g-value              | 0.86            | 0.50  |
| Air tightness        | Single sealing  | Double sealing                                  |
| Installation year    | 1953            | 2009  |

Table. Basic energy properties for the windows in Ryesgade 30 before and after renovation.



Before renovation the windows gave rise to condensation, draught and had a very negative effect on the indoor climate. Source: "Resultater og erfaringer fra energirenovering af Ryesgade 30", Source: Leif Rönby



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Source: Leif Rönby

*Link to best practice example (Hiberatlas):*

<https://www.hiberatlas.com/de/ryesgade-30-a-c--2-143.html>