BME Faculty of Architecture
Dept. of Building Constructions

Building Constructions 3
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2020/21 school year, 2nd semester

PRACTICAL CLASS OUTLINE

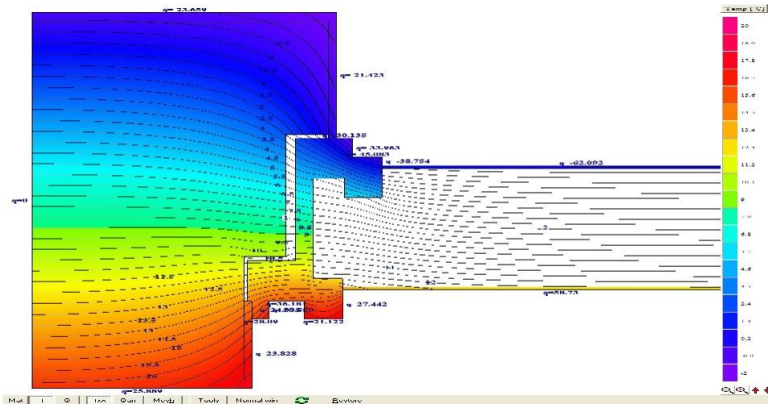
to the 3rd workshop exercise of the Building Constructions 3. class

Double Sash Window and its Renewal

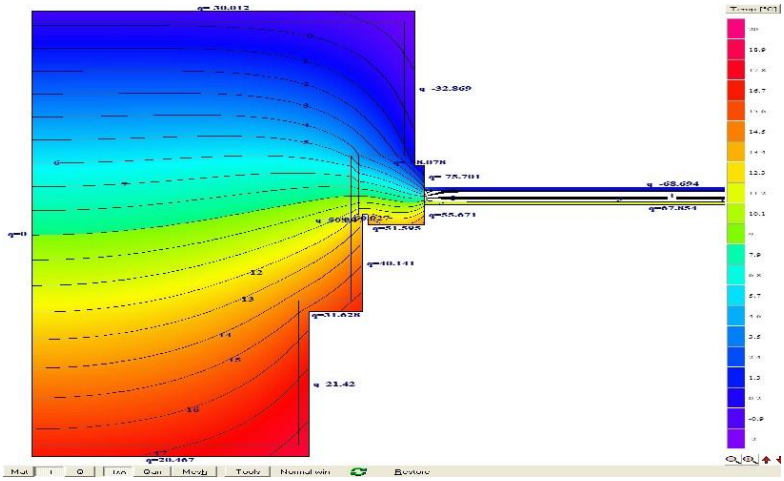
The purpose of the workshop exercise: the detailed introduction of the traditional double sash type window and a case study of window renewal. In order to understand the renewal process it is essential to understand the structure of the double sash window.

Several existing buildings have double sash windows in Hungary. Exchanging these windows to up-to-date plastic or wooden windows usually deteriorate the aesthetic appearance of these buildings. The picture below shows an art deco style building with a new plastic window installed.

Exchanging traditional double windows to contemporary single window types only improves the thermal properties of the external building shell if subsequent thermal insulation is added to the elevations, at the same time. The thermal bridge effect at the window reveal connection to the up-to-date narrow window frames increases due to the good thermal conductivity of the solid brick wall. This phenomenon is illustrated by the thermal bridge simulation snapshots, below:



1st picture. Thermal bridge simulation of built in double sash window



2nd picture. Thermal bridge simulation of a single sash, up-to-date window replacing the traditional double window

It is well visible that, at the internal corner of the window reveal, the lowest temperature is 15 ºC for the original window, while this temperature decreases to 12 ºC in case of the up-to-date window.

The first two workshop drawings display the general horizontal section detail and sill detail of a simple double sash window. This window type was the most common Hungarian solution from the end of the 1800s until the end of the 1970s. The most important characteristics of these windows are:

- Installed the same time the minimum 38 cm thick wall with double reveal is constructed.
- The double reveal construction was sufficiently air-tight thank to the sealing made of bitumen- saturated hemp fleece.

- Internal venetian blinds and later external roller blinds were the typical auxiliary shading devices of the double sash window.
- Subsequent surface finishing was applied, typically paint and lacquering (oil based primer, surface rendering putty, two coats of paint and external lacquering).
- Critical detail: the bottom horizontal water deflector. Driving rain may penetrate the horizontal connection at the bottom corners of the window. If the accumulated water is not removed from the bottom casement the structure gets damaged due to the excess moisture (the structure requires maintenance). The paint and material of the bottom horizontal water deflector also deteriorates more quickly than other parts of the window.
- Glazing: usually 3 mm thick, but often the 2 mm thick rolled glass can still be found on older buildings, which is much less resistant to mechanical impacts. This glass type is fixed to the sash by putty and glazier's nails from the outside and its surface appears uneven.
- There is a decompression groove cut into the external frame, along the frame-to-sash connection, to reduce the wind pressure that drives the rain into the joint.
- The size of the sash dividers is determined by the weight of the glass, therefore, in case of single glazing, thin profiles are sufficiently strong for the purpose of bracing.
- The sashes are braced by inset L-shaped steel angles at the corners.
- The external window panes are fixed in an open position by the catches. The internal window pane is fixed by a spacer that holds the distance between the external and internal window panes, thus one sufficiently placed catch is enough to keep both panes in an open position.

The workshop exercise also presents a solution for the renewal of a double sash window. The overall U-value of this window type is 3,0 – 3,5 W/m^{2}K, so it is not up to today's standards. Replacing these windows with contemporary types is usually not a good solution from an architectural point of view, because the wider profiles of the up-to-date windows, with thermal insulating glazing, reduce the overall glazed ratio of the total window surface and alter the external appearance of the historic building facades.

The example presents a solution where the internal part of the double sash window is changed to the up-to-date thermal insulating window made of glued-laminated Euro profiles. This window type provides a double sash-to-frame joint with an external elastic and an internal solid connection. The overall glazed ratio remains the same and the elastic sealing at the internal sash-to-frame joint is sufficiently damp-proof to keep the moisture out from between the two window panes and thus avoid the condensation on the external side of the thermal insulating glazing. The different geometry of the new window requires the repositioning of the catch. The cavity between the wall and the casement at the window sill may be filled with PUR foam (make sure to apply the volume filler and not the pressure generating PUR foam type).

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