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ARCHAISM AND UP-TO-DATENESS VALUE-ADDED REFURBISHMENT OF WINDOWS ON A HISTORIC BUILDING KÁROLYI PALACE, BUDAPEST

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Abstract

Harmonizing preservation of historic values with technical performance is a complex issue at renovation of historic buildings. Through the example of the design and permitting process of the Károlyi Palace historic windows' refurbishment the authors demonstrate how authentic appearance can be combined with today's requirements.

Keywords: historic building, renovation, window refurbishment.

Introduction

Following a planned, authorized but unrealized programme in 1990, the renovation of the building envelope of the former Károlyi Palace in Budapest, that time the Petőfi Literature Museum, today House of Hungarian Literature, took place in 1996-97.

As designer and site supervisor of the revived reconstruction programme the authors had to cope with several interesting questions of profession, protection of historic buildings and renovation techniques. The professionally most challenging was the refurbishment of the windows.

1. Method and Principles of Survey and Diagnostics

As dealing with a historic building the basic targets of the survey works were:

- typology of the windows and external doors,
- survey and systematization of window profiles and fittings (hinges, locks, handles, etc.),
- detailed dimensional survey of different window and door types and
- detailed, documented diagnostics of the existing status.

Fig. 1. The Károlyi Palace in Budapest – building envelope refurbished in 1996-97 – design and supervision by authors

32 different window types have been identified throughout the building. The survey extended to documenting the structural elements, typical details, variations and deviations within types.

With systematizing analysis of the surveyed details authors managed to identify which structures are probably *originals*, which are *later but identical* ones, and what *former repairs, partial or full replacements* have been carried out.

The *documenting of the existing status* was made with pictures, detailed description of typology and one-by-one individual diagnostics.

The authors classified the windows into three categories:

- plank-case / carpenter-type windows (2 single glazed leafs, outside one opened outwards, inside one inwards);
- sash-window (2 single glazed, vertically sliding leafs)
- joined window (2 single glazed leafs both opened inwards).

The *plank-case* windows and balcony doors have been identified as originals. A few windows of the library were converted into *sash-windows* (the former hinges of the plank-case are still visible) most likely following the journey of counts István Széchenyi and György Károlyi to England in 1834, based on the experience gained there.

The *joined windows* were installed later, during the opening of a new façade of the palace, following the demolition of a smaller building attached to the palace from South and creating today's Henszlmann Street.

Within the three basic types 32 sub-types have been identified by shape, dimension and divisions (number of leafs).

The target of the *individual, detailed diagnostics* on one hand was to identify and check *individual dimensions* within the forming future renovation concept, and to provide *general conclusions, statements of diagnostics* as basis for the *renovation concept* on the other hand by analysing the detailed documentation of technical status.

The following general conclusions of diagnostics can be highlighted:

- sagging of leafs, repair by planing, decrease of air-tightness, sound insulation and resistance to rain as consequence;
- loosened hinges;
- loosened corner joints on window leafs, deformation of leafs, deflection from plane;
- aging and drop of putty.

The outside leafs of the plank-case windows were replaced in 1972 using undecorated profiles not matching the remaining windows, made of poor quality timber. These leafs were found in very bad condition (though were only 20 years old).

1.1. Renovation Alternatives and Their Analysis

As a first step the authors elaborated refurbishment / replacement modes (on basis of the typology, the surveyed details and results of diagnostics) that bring the required results, are feasible and acceptable from point of historic buildings' protection. These alternatives required evaluation from different aspects:

- protection of historic buildings;
- technological possibilities, demand of labour and budget;
- expected technical result, with special emphasis on thermal properties and acoustic insulation.

For the plank-case window, most typical by number, three alternatives have been outlined:

a) *full structural replacement with identical geometry and profile system* can annul the diagnosed structural problems and can provide a new-quality window within frames of the structure (with a calculated average U-value of 3,0-3,5 W/m^{2}K), but it *conserves* the old structural system and affects all the joining internal finishes, with all its supplementary works.

b) *Replacing the outside frame and leaf with identical profiles and single glazing and renewing the inside leaf* would also re-build the original structure, would not affect the joining internal wooden finishes, but is weaker than alternative a).

c) *Replacing the outside frame and leaf with a new individual structure*, built of profiles matching the original windows in appearance, incorporating *insulating glass* would not hurt the historic appearance, and is up-to-date in technical performance (e.g. thermal and acoustic insulation, withstanding striking rain), answering today's demands in energetics, noise reduction and other requirements, with moderate additional costs. The calculated average U-value of this structure is 1.9 W/m^{2}K.

The thermal analysis was carried out using *Frame*4*plus*, a software of 2-dimensional final differential numeric method (*Figs. 2, 3* and *4*).

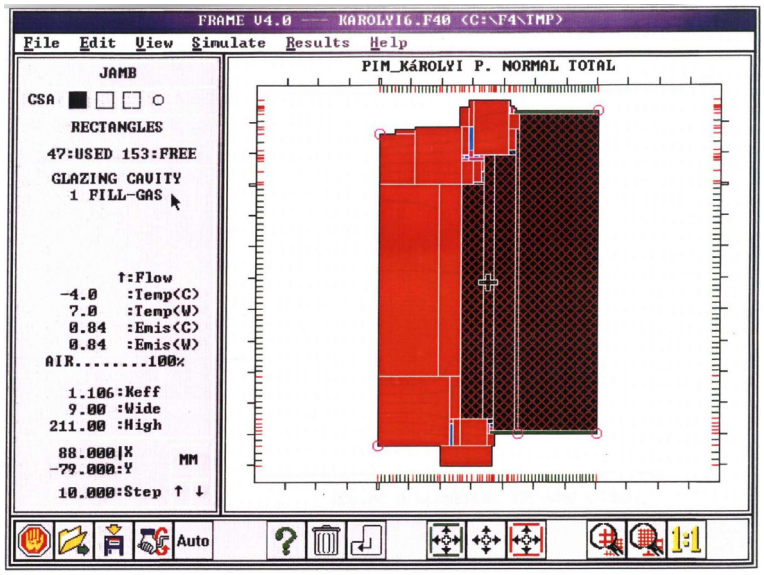

Fig. 2. Analysis of thermal insulation: Alternative c) – structural model

Similar analysis was made for the joined type windows as well.

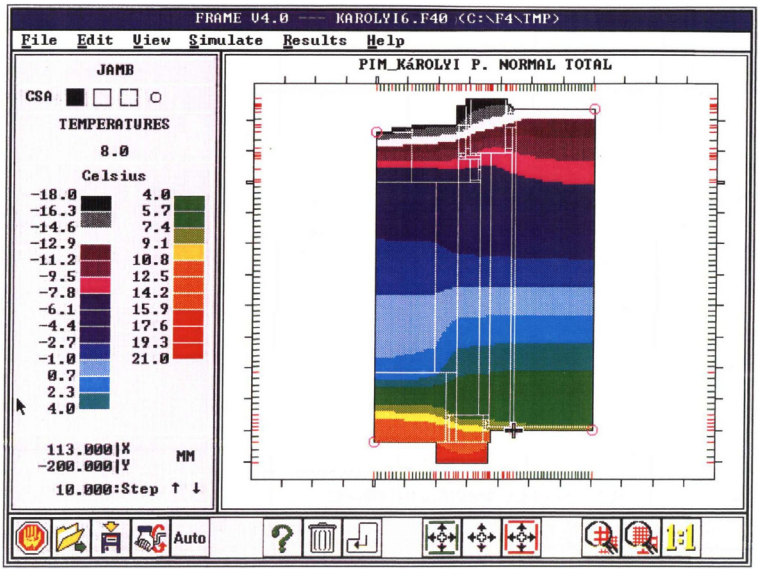

Fig. 3. Analysis of thermal insulation: Alternative c) – temperature distribution

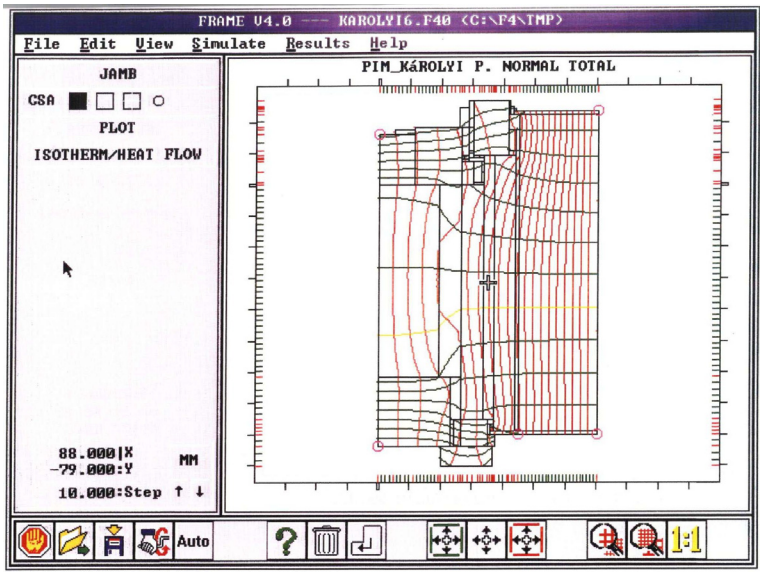

Fig. 4. Analysis of thermal insulation: Alternative c) – isotherms and heat flow

2. Negotiating with the Authority of Historic Buildings and with the Contractor

The authors have negotiated the outlined alternatives with the Office for Protection of Historic Buildings. The authority first rejected any alternatives using non-identical structure, but having the details and the analysis introduced they turned to be a creative partner supporting the preparation of the renovation.

Following the design, which was almost a *product development*, *sample leafs* were manufactured and installed. After certain corrections alternative c) with insulating glass gained acceptance in second version. The process took 3 months, and the supporting and developing attitude of the contractor was exemplary.

3. Manufacturing and Installation

Having had the decision the shop-drawings were worked out (*Fig. 5*) and manufacturing the frames and leaves of 158 windows, individual in dimensions and belonging to 9 type classes, started.

The structure was made with *triple connection* between frame and leaf, sealed with *foam rubber strip* at the middle one, with the required *ventilating (de-watering) holes* drilled both on frame and leaf, with *silicone seal* on both sides of the insulating glass. The divided leafs were glazed by *one insulating glass unit* for higher stiffness, providing the authentic appearance with external *division profiles* on both sides of the IG unit.

The *insulating glass* composition is 3-8-3 mm (of annealed clear float), using a spacer non-metallic in colour and surface: the black *TREMCO Swiggle*® spacer. This spacer is hardly visible and therefore recommended for historic applications in several European countries.

The fittings were manufactured individually, according to the type of opening, and providing authentic appearance. The conventional-looking locks though provide a proper closing onto the rubber gasket seal.

4. Aspects of Operation

The future operation aspects brought the authors towards a decision in favour of higher performance windows. The total heat loss of the building is not indifferent (especially considering the narrow budget of the institution). Further, the acoustic insulation could be critical for certain literature performances to exclude the significant traffic noise of Károlyi Street.

The manufacturing and construction took place in 1996–97. The authors have lately checked the technical status of the windows, after 7 years in operation, and were informed about proper functioning (*Fig. 6*). These technical performances can be kept in even longer terms with carefully planned and executed maintenance.

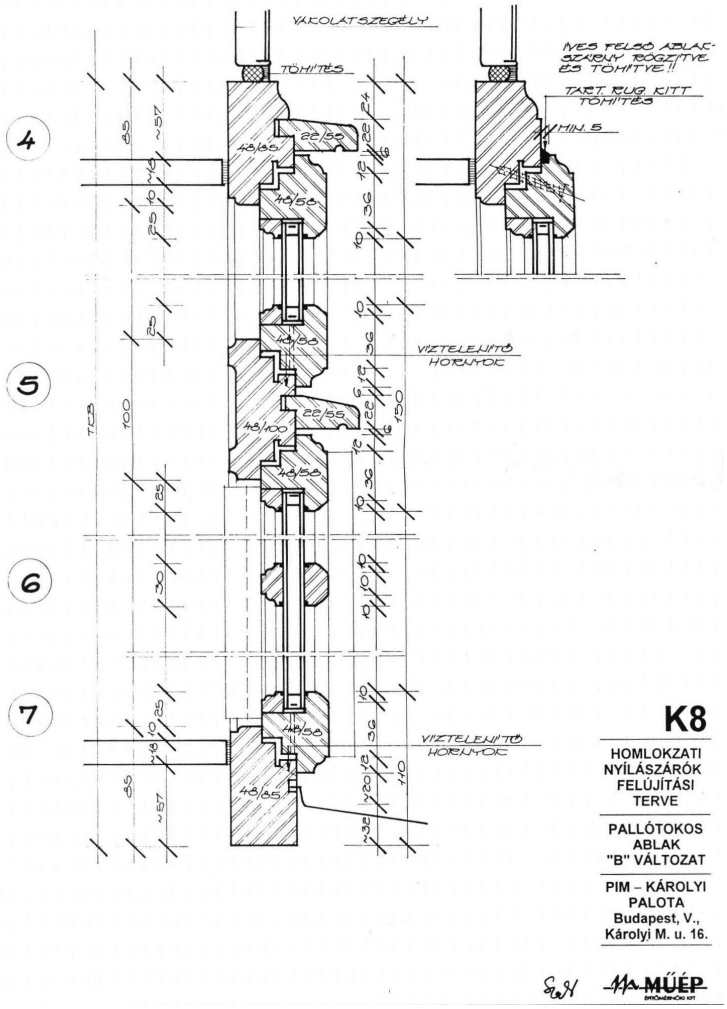

Fig. 5. Individual profile system for IG unit, with authentic appearance, resulting in value added reconstruction

5. Conclusion

The authors have designed the renovation with individual windows on the Károlyi Palace targeting high technical performance while maintaining good architectural

Fig. 6. The window manufactured according to *Fig. 5* drawings in 2004 (age: 7 years)

and historic appearance. The improved thermal and acoustic insulation, the withstanding of rain, etc. brings clear advantages to the building owner, however did not require significant cost addition.