

Historical Buildings between Thermic Renovation and Conservation

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ABSTRACT

In the field of monument preservation we are faced with two major but apparently irreconcilable problems – the legal requirement to preserve monuments in an authentic manner on the one hand and the high targets of reducing energy consumption on the other. Is it possible to preserve the Austrian monument landscape in a genuine manner while reducing energy consumption? The Federal Office for the Preservation of Monuments is currently faced with this question and together with partners from the fields of science and politics is paying great attention to this matter.

In the preservation of monuments measures have to be taken, with regard to energy efficiency, which use the existing fabric, such as drying, optimised interior insulation or heating of building components be used. The restoration methods which are used, have to be evaluated and, if necessary, adapted. Only in this way can the level of knowledge and wealth of experience grow continually and preserve our monumental heritage from irreversible damage.

Historical buildings in the controversy between thermal rehabilitation and their protection

“Energy-saving” is an urgent challenge for Europe’s future and one that calls upon each one of us to make our own contribution to dealing with it. Large numbers of individuals from a broad section of the population have now committed themselves to taking responsibility. It is a challenge that can only be met with appropriate measures and with activities that in part have to be radical in character.

Those involved in the conservation of historical monuments and the protection of the environment are bound to share the common goal of long-term, sustainable progress. This means that we have to be extremely careful in the way we handle not only the resources available to us but also our historical monuments, which are by their very nature “non-renewable”; and ideally we also have to take measures that promote both the best possible energy-related technology and also the goal of authentic conservation. Fig. 1



Figure 1. External insulation absorbs a historical building

In Austria the Federal Office for the Protection of Monuments (Bundesdenkmalamt) has now been carrying out committed work in this field for almost two years, with the Department for Architecture and Building Technology (Abteilung für Architektur und Bautechnik) bearing responsibility for the coordination and development of suitable measures for historical monuments.

The question of the thermic renovation of our historical buildings occupies an important place in the public discussion on energy-saving measures. Large grants of public money are made in order to bring about reduction in energy consumption in this field.

With respect to this aim, those active in the conservation of historical buildings are faced with two obviously mutually exclusive challenges. On the one hand it is their job to ensure the authentic conservation of the historical monuments in their charge – and on the other hand they are also required to ensure large reductions in energy consumption. In our opinion, however, this contradiction between conservation and energy efficiency is only apparent. On the contrary, we can look back upon a long tradition of resource-saving building and energy-saving lifestyles.

However, the customary standardized measures are not applicable to listed buildings, which have to be treated with sensitive and individually designed measures. And progress in the achievement of the two incompatible goals is only possible if there is close cooperation with the owners of the historical monuments and with the various relevant partners in the fields of business, science, and politics. The intention is to demonstrate that it is nevertheless possible to bring about a significant increase in the energy efficiency of the buildings in question. Firstly, however, a little information about Austria's historical monuments.

Austria's historical buildings are notable for great diversity in the following respects:

- In size and scale: they range from single buildings to whole rural or urban complexes;
- In their character and significance: they range from the wooden constructions located in high Alpine areas to the Gothic cathedrals and Baroque palaces and country seats of the lower-lying areas;

- In their architecture: they range from small medieval town houses to workers' housing estates, from farmhouses to detached houses and blocks of flats dating from the first half of the twentieth century.

In comparison with other countries, Austria's historical monuments contain a larger proportion of secular buildings still in everyday use.

In all, Austria has a total of around 80,000 historical buildings, of which about 40,000 are protected by law at the present date. About half of these 40,000 are thermally conditioned. The present discussion is thus concerned with around 1% of a total of two million buildings in Austria. Fig. 2

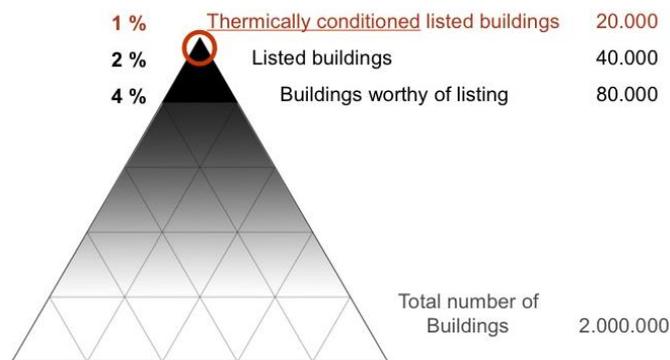


Figure 2. Austrian historical buildings

Before we look to the future, we should first take a look back in time in order to shed a different light on our historical buildings. As has already been emphasized, traditional building techniques have always been oriented towards maximum suitability to the local climate and minimum use of materials. In Austria this often meant taking account of the exceptional climatic conditions of the Alpine region with its extreme temperatures, high levels of precipitation, and strong winds. As a result, the passage of the centuries saw the development of building techniques optimally adapted to the climatic conditions of the various regions and the materials available in the respective areas. Fig. 3



Figure 3. Traditional optimization

However, the twentieth century saw a radical transformation in the behaviour and expectations of those living in our historical buildings. Economic growth and the Industrial Revolution brought about great changes in the levels of comfort. The price paid for this change in lifestyle was an explosive growth in energy production. The blame for our enormously increased energy requirements is thus not to be laid on the buildings but on their users, that is to say ourselves.

Now that our energy resources are running out and man is accepting responsibility for having caused climate change, measures are now being taken to reduce the amount of carbon dioxide being discharged into the atmosphere. It is generally considered that the most effective way of doing this is to ensure that the energy used for heating and cooling is preserved as long as possible within the building, so that as little as possible additional energy needs to be used to replace it. The most highly developed and thus least expensive method of doing this is the additional application of external insulation.

As the energy consultants and their colleagues in politics and business consider the insulation of the external surface of the building and the replacement of the windows as universal remedies, these methods are widely implemented. The user of the building is given to understand that a sick building has been restored to good health and that an appropriate contribution has thus been made to the reduction of greenhouse gases.

Ultimately, however, the energy problem cannot be solved by purely technical measures without changes in lifestyle. It is not “the house” that uses the energy, but the user. Fig. 4



Figure 4. Sick buildings or user behaviour?

The controversial and conflicting views and demands of the users, planners and official authorities and of those who carry out the measures regularly lead to disagreements.

When these disagreements occur, we again and again find it necessary to present and explain the basic principles of the conservation of historical monuments. As for

many of us these form an essential and familiar part of our daily work, I will restrict myself to reminding you of the most important goals:

- The core task of any official body concerned with the preservation of historical monuments is to preserve the monument in question and not to change it.
- The value of a historic building does not depend on whether the facade is richly decorated or unadorned. The most important matter is its authentic preservation.
- However, the notion of preserving historical monuments relates not only to the exterior, but to the entire building. The protection guaranteed is comprehensive in character. Fig. 5



Figure 5. Preservation = Use = Repairs = Adaptation

These factors make it unthinkable for us to hide a building under a new skin. What matters is the original, not a copy.

The most important goal for the future is thus to find and lay down standards and guidelines that are calculated to protect our historic buildings from irreversible mistakes. Fig. 6



Figure 6. The right standard? The right method?

General Principals

The introduction to the “Guidelines” presents the basic principles for the optimization of energy consumption in historic buildings, drawn up in accordance with the demands of our task as conservators:

1. The highest goal in the protection of historical monuments is the conservation of the original.
2. In the case of historic buildings, which are usually heterogeneous in character, plans for measures are not to be drawn up until an analysis has been made of the state of the building, with the purpose of providing complete knowledge of its statics and constructional techniques.
3. This will make it possible to elaborate an all-embracing project for the building that will be comprehensive in character and not simply composed of a number of isolated measures.
4. The setting up of goals for a project related to a historic building cannot be based on standardized factors in the way Energy Performance Certificates are. Goal-setting has to be done in the light of the specific behaviour of those who use the building.
5. The first measures to be taken are to include the elimination of existing defects, the carrying out of repairs, and the reactivation of original functional concepts. The object of eliminating defects is to restore the best possible insulation and heat storage qualities in the building's existing materials. In other words, rehabilitation has to have priority over change and replacement.
6. Additions carried out in order to restore completeness are to be made in the same material as the original.
7. As historical buildings are generally not ideal objects either with respect to the way in which they have been built or to the way in which they have been used, the importance of reducing risk makes it of absolute importance to use error-tolerant constructions.
8. As historical buildings do not require standardized solutions but, rather, a selection of individual, custom-designed solutions, it is certainly the case that they call for more elaborate planning.
9. In the case of historical buildings, exaggerated or untested measures should be avoided in order to reduce risks. Historical buildings cannot be used as guinea pigs. What is called for is restraint, following the principle: Better to do little without risks than to do much with risks.
10. All planning should be based on long-term thinking, in order to continue the optimization and adaptation that has gone on over the centuries in the case of most historical buildings.

These general principles are followed by a discussion of the individual measures. A simple traffic-light system makes it clear whether the measure in question can be approved or not. This checklist is intended to help all involved parties to make their decisions.

Traffic-light System



GREEN means no or little change to the fabric (Fig. 7),

i.e.: approval is normally possible

- Reduction of the use of the building through conscious changes in the behaviour of the user
- Remedying of defects (repairs to windows, doors ...)
- Improvement of insulation properties through adequate drying
- Insulation of the uppermost ceiling
- Insulation of the lowest ceiling
- Insulation of the heat distribution system
- Changing of the heating technology or other energy source

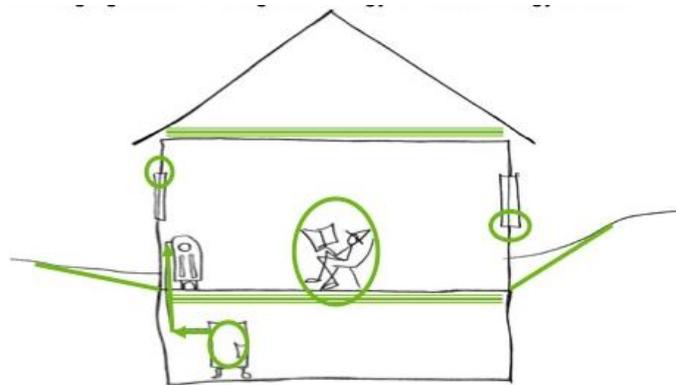


Figure 7. Little change



YELLOW means little to great changes to the fabric (Fig. 8),

i.e., approval is possible in certain circumstances. These measures call for more elaborate planning.

- Insulation of constructional parts with contact to the earth
- Insulation inside walls
- Additional insulating material in the plaster (insulating plaster)
- Insulation of the roof (in the case of attic conversions)
- Upgrading of windows (changing of glass-material, or introduce a second window-layer)
- Changeover to radiant or radiant panel heating
- Automatic ventilation systems

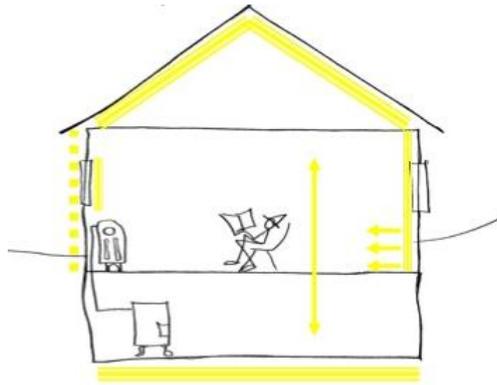


Figure 8. Great changes



RED means great to serious changes to the fabric (Fig. 9),

i.e., approval is not provided for and can only be given in extreme and exceptional cases.

- External insulation of walls
- Destruction of existing and installation of new windows and doors
- “Visible” installation of solar collectors
- Horizontal barriers in walls (slots, metal sheets, injections)



Figure 9. Serious changes

This short survey makes it clear that there is indeed scope for adapting historical buildings and that conservators are not to be regarded as absolute opponents of all change. On account of its schematic character, however, the survey does bear within it the danger of generalization and of leading to standardized solutions. It are thus followed by the basic rules and technical principles followed by conservators and, in a third section, by explanatory notes on these specifications.

Every historical building must be regarded as an individual case and accorded precise and well-thought-out consideration. Noticeable results and long-term progress are not produced by standardized solutions but by packages of measures that are specifically designed for the historical building in question.

To summarize, it is perfectly possible to subject historical buildings to thermic and technical optimization. When done properly, furthermore, this process also serves the cause of the preservation of the building in the longer term.

This form of cautious optimization for historic buildings is a complicated path to follow but a perfectly feasible one, especially as the buildings for which we are officially responsible only make up one per cent of Austria's entire total and are thus only of marginal significance in the context under consideration.

However, this evaluation of measures for the raising of energy efficiency is intended to benefit all Austria's buildings – the renovation concepts are valid not only for the historic buildings but also for the remaining 99% of the country's thermally conditioned building fabric.

Furthermore, the obligatory implementation of specific packages of measures must be enforced with national regulations outside the field of application of the Law on Protection of Monuments. Fig. 10

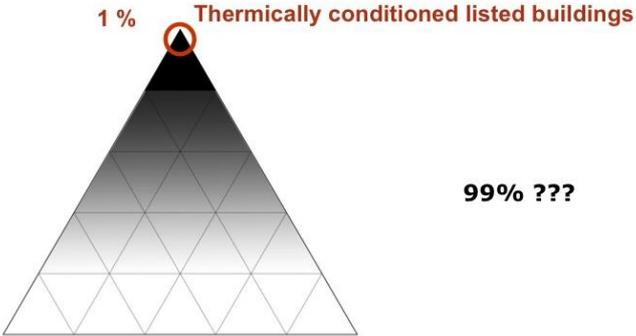


Figure 10. Thermally conditioned listed buildings in Austria