Improving of (energy) performance of existing (heritage) buildings

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Abstract

For heritage buildings, energy consumption and sustainability were not always in focus or scope during time of erection. The commonly assumed life span of 25-30 years for facades is only a portion of the primary structure, and this remains true even if the service life of facades is doubled. Demolition and recycling of the whole structure and erection of a new building following the actual state of the art is usually not an option – and from point of holistic view taking into consideration grey energy does not make sense either. So special care has to be taken to combine improved energy performance and historic appearance – just adding insulation is not acceptable. Glass as a transparent material is an important element in facades, first a general overview especially on glass related questions is given, followed by examples of rehabilitation of classified historic buildings.

Keywords: listed historic buildings; glass types; façades; energy performance; safety; design.

1 Introduction

A large part of the carbon emissions come from the operation of existing buildings, for heating and cooling. At the same time, the buildings themselves store a large amount of gray energy and thus CO2. In this respect, demolition and new construction is not an option as a contribution to limiting the climate crisis; rather, the energy balance of existing buildings must be improved. The building envelope, i.e. in particular the facade with the windows, plays an important role here. With regard to glazing, there have been many developments in recent decades to contribute to energy savings, and the façade construction has also developed further, e.g. thermally separated profiles to avoid thermal bridges. The above also applies to listed buildings - even if exceptions are sometimes made here with regard to the energy balance requirements. First, the special features of glass as the most important element of facades and windows will be discussed in more detail. Only with the appropriate knowledge, the right decisions can be prepared. Examples of executed projects of listed buildings illustrate the challenges in the conflicting areas of monument protection and current requirements for safety and function.

2 Glass elements for facades

2.1 Introduction

Glass as a transparent element is also an important element in listed buildings. Historically, there was a development regarding the production technology of the basic glass as well as the finishing or processing to coated glass, safety glass, laminated glass or insulating glass units (IGU). Associated with these production methods are questions regarding several important aspects:

- Size
- Surface
- Safety
- Strength
- Solar and energy performance

In the following, the development and its implications for an application are considered for

https://doi.org/10.2749/newdelhi.2023.0649