roof spans can reach 50 metres. In car parks, precast concrete enables greater parking densities because of the large span possibilities and more slender column sections, for example, a double-parking bay and driveway may use 16m-long prestressed slabs of a minimum depth of 400 millimetres. In high-rise buildings, an additional storey can be added thanks to thin, precast flooring solutions at the same total height of the building. In office buildings, the trend is to construct large open spaces, separated by demountable partitions. Precast concrete offers not only flexibility in the building but extends its lifetime because of greater adaptability. In this way, the building retains its commercial value over a longer period.

The major benefit for building structures is an improved structural efficiency that allows for more slender products and the optimum use of materials. Another positive aspect is improved resistance to frost and chemicals. The greatest advantages are achieved for vertical components, especially load-bearing columns, where the load bearing capacity increases by between 100% and 150% for concrete strengths ranging from 30 to 90 N/mm².

Flexibility in use. Certain types of buildings are required to frequently adapt to the user's needs; this is especially the case with office buildings. The most suitable solution to this effect is to create a large, free internal space without any restriction to possible subdivisions with partition walls.

Adaptability. In the past and even today buildings are conceived for a clearly defined purpose that does not truly take future developments and possible refurbishments into account. However, over the course of time, buildings no longer respond to their users' changing requirements or are not suited to new occupants and this results in complex renovations or even demolition. These latter solutions are expensive, time-consuming and environmentally unfriendly. In future, they will become even more problematic because of the likelihood of stricter regulations on the creation of noise, dust, demolition waste, traffic congestion and other inconveniences.

The solution to this problem can already be found at the design stage of a new building. The preliminary study should anticipate future renovations or repurposing so as to eliminate the necessity to demolish the structure. The basic idea is to clearly differentiate between the structural part of the building and its finishing. The structural part comprises all principal functions such as the load-bearing structure, principal circulations, principal conduits, load-bearing façades, and so forth. The finishing comprises partitions, technical equipment and non-load-bearing façades, amongst others (Fig. 7).

Today precast concrete structures are already being conceived using this approach. One of the mainstays of prefabrication is the large span capacity it allows for beams and floors and this leads to large open spaces inside the structure.

Fire-resistant construction. Precast building structures in reinforced and prestressed concrete normally have a fire resistance of 60 to 120 minutes or more. This is easily obtained by adjusting the concrete cover to the reinforcement. In general, production processes in precast factories allow for a more efficient and better controlled use of rebar spacers than in site-cast concrete.

Environmentally friendly construction. The precast concrete industry is making headway in environmentally friendly construction by reducing material use by up to 45 per cent, energy use by up to 30 per cent and waste at demolition by up to 40 per cent. Several plants recycle all fresh and hardened concrete waste; many precast plants will work as a closed production system in which all waste material is processed and reused.

Appearance and surface finishing. Precast concrete elements can be produced with a wide variety of finishes. These range from carefully moulded surfaces to high-quality visual concrete. Considerable architectural freedom and range of expression can be obtained by using beams and columns with special shapes and with high quality finishes. The designer can inspect and accept the units before they are transported to the site and fixed in place. Precast architectural concrete offers a wide range of top quality finishes in an array of colours and textures, such as limestone or granite, complex brickwork detailing and masonry profiles reproduced in reconstructed stone or simulated stone – all features which would be prohibitively expensive if carried out on site using conventional methods (Fig. 8).

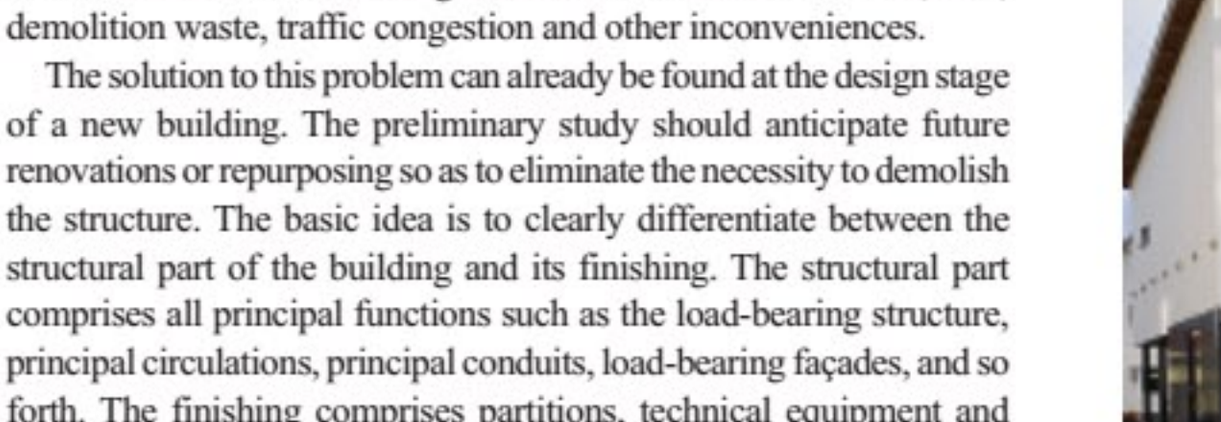

Fig. 7. A residential project in the Netherlands. The shape, layout and colour of the project illustrate the versatility of precast concrete and its adaptability to the requirements of the builder and the architect

a)

b)

Fig. 8. The restoration of a traditional, classical natural-stone-masonry façade with architectural concrete elements in Brussels (a). There is no visual difference between the new façade in precast concrete and the traditional neighbouring façades; A precast single-family house in Finland (b)