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LARGE PANEL HOUSING BUILDING IN EUROPE PROBLEMS AND SOLUTIONS

Paper deals west European countries experiences related to existing multi dwelling building stock made of large panel technology in second half of last century. The actual problems and applied technical solutions are presented.

Though for east Europe discussed problems partially are not important now, in coming years could be more significant, and the proposed solutions might become useful.

Introduction – the problems. Large panel housing building, developed in European countries form 60th to 80th of the last century was a response to the great "dwelling demand" raised after II WW high population growth. Now, after about 50 years of service, many problems occurred, not only related to technical condition of this building stock, but also due to increase of urban, architectural and social needs. Of cause, particular problem are different in different countries, but many common issues can be found and the reaction or solutions can be interesting especially for east European countries.

The paper was prepared based on

Considering the scale of problems, following could be distinguished:

- the urban planning – referring to whole estate,
- the architectural and functional – plan of the building, and
- the technical - problem of the building parts.

In the urban scale, the dominant of planning principles in the "large panel era" was the idea of constructing free standing, well oriented huge or long building blocks that allowed air, light and sunshine into every apartment accordingly to CIAM (*Congrès International d'Architecture Moderne*) principles.

Fig. 1 Shtschukino living district in Moscow (Russia)

Now this concept is generally valued as outdated. Social problems that occur in such estates are based on anonymity of inhabitants. These are vandalism, high crime rate and lack of respect and responsibility for surrounding infrastructure and environment. These problems occur and run with different speed in particular cases, but usually with feedback and, in high developed western countries, led to depreciation of building and

even whole districts, leading in special cases to abandon by middle class inhabitants. It seems probable, that in not distant future this process can start in east European countries as well. Another problem, important to all countries, is a lack of parking places for rapidly grown number of personal cars.

Mentioned about problems refers also to architectural and functional aspects in scale of particular buildings, but the others are even more important too.

First of all, most of the dwelling were small, due to fulfill as much as possible high urban population growth as a effect of high post war birth rate, migration to the cities and, especially in western Europe, immigration from other countries. This do not meets actual needs because generally (referring to Western Europe) housing problem is already satisfied.

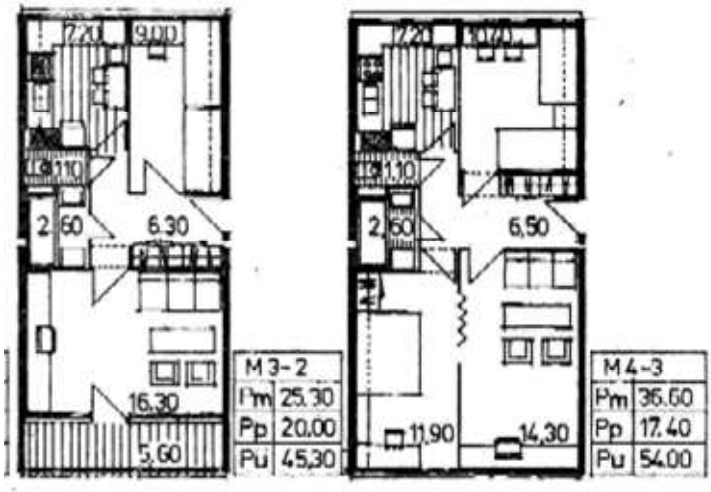

Fig. 2 Examples of dwelling arrangement in large panel buildings (Poland)

Also dwelling arrangement with small compartments do not allows to arrange space according to modern needs and trends.

The third problem refers to accessibility to the buildings and dwellings for elder or disabled inhabitants, whose number relatively have grown in recent years.

Concerning third level of problems related to technical equipment standard and condition of structure and installations. Particular problem are different in different countries, regions and depends as well as on building systems. Some groups can be pointed out:

- Physical problems

General problem for European countries with cooler climate is insufficient thermal insulation of both external walls and windows. Significant limitation of U-values started after 1973 – the year of global oil crisis - and gradually, with different speed, reached the actual values valid for particular countries and regions. Moist problems resulting from insufficient impermeability of facades and roofs are reported from Poland and France, and resulting from the lack of ventilation can be found all over Europe, as well as “thermal bridge” cases. Any excess of moist in dwellings results in condensation, dampness and mould, can lead to serious health threads to the occupants.

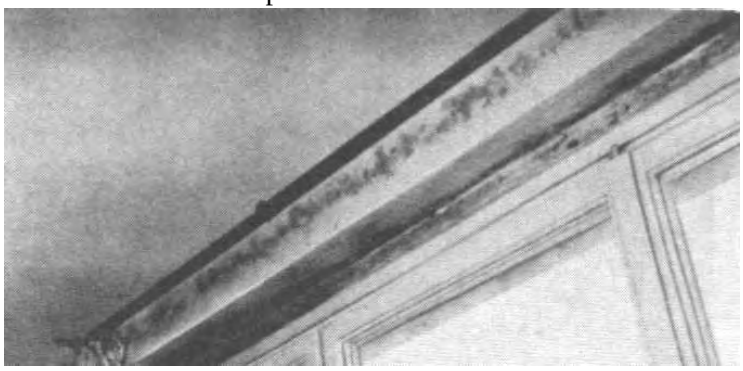

Fig. 3 Frost penetration effects (moulds) due to thermal bridge above the window in large panel building (Poland)

The lack of appropriate requirements and structure of building elements constructed in years 1960 – 1980 resulting in high noise transmission both from inside (by structure) and outer airborne (by windows), now is seen as the significant problem.

- Structural problems

In general, the considered European building stock seems to be structurally sound. But some particular problems resulting from service time can be mentioned. Damages of balconies and galleries structure due to frost and water penetration (Fig. 4), or cracking along element joints and contacts. Especially in eastern Europe poor quality of building materials, elements and construction works now is distinctly seen as factor decreasing object value (Fig. 5). Special problem in Poland is the condition of steel hangers connecting façade layer to the structure in large wall panels.

Fig. 4 Balconies after 50 years of service (Poland)

Fig. 5 Typical condition of panels joints (Poland)

- Technical equipment problems

The common problem is the ventilation system, generally not sufficient in present conditions with improved thermal insulation and tight windows. Poor quality of piping and wiring after ca 50 years of service is typical for eastern countries as well.

Solutions – the review of main ideas. The town planning and open area between the housing blocks was generally laid out without significant variety. To modify this uniformity, large range of actions can be undertaken. At the district level some principle solutions are:

- To favour urban integration, links and anchorages with the neighbourhood and the city have to be found and architecturally distinguished.

- By mixing housing programs (private and public), varying the building functions for services and offices, and filing the open spaces not only with direct services (shops, schools) but also with important public services used at the same time by people coming from outside the district.
- The estate areas used as parking areas, lawns with trees and some playgrounds – often with poor design and a lack of maintenance - now are rearranged with cooperation of tenants for wide range of purposes, for example: ball fields, barbeque areas and modern playgrounds attracting children as well as grown-ups.

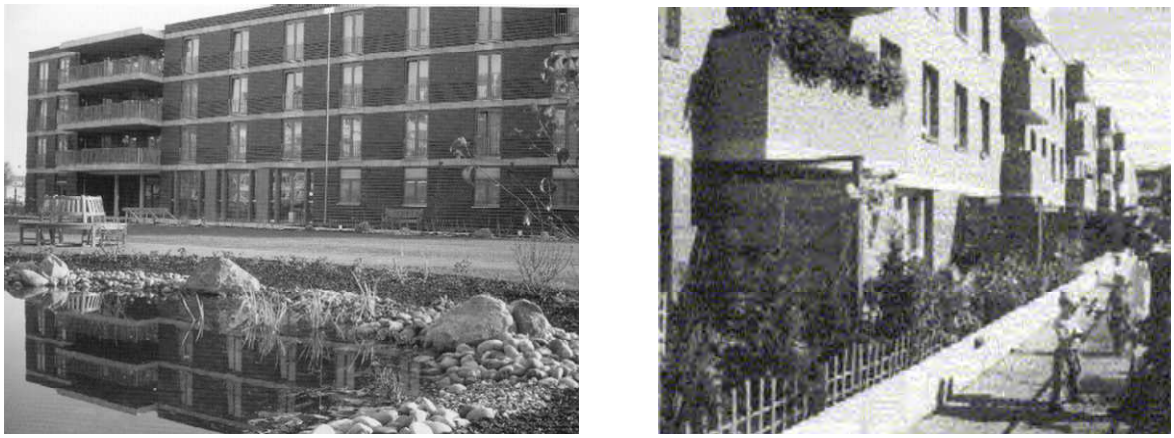

Fig. 6 Rearrangement of estate areas (Germany)

The special attention shall be put to architectural rearrangement of buildings with major structural intervention. The idea is to introduce more individuality to monotonous buildings in many cases almost identical. This could be done in two ways: adding new buildings with mixed functions (as described above) or “reshaping” the existing ones.

Fig. 7 Renewing of the facades (Denmark)

Application of mentioned above ideas as well as proposals limited to building itself, lead to following solutions of lay-out changes pointed-out below:

- common refurbishment actions mainly aimed to improve the thermal insulation of envelopes as adding new insulation layer to existing façades and installing new windows with better acoustic and thermal performance, often combined with repair of balconies and entrances. Usually these action are finalized with renewal of facades colours and texture,

- changing of façades lay-out by adding new elements (balconies, winter gardens, jutties),

Fig. 8 Renewing and new elements of facades (Germany)

- reshaping of roofs, often with adding new stories or rearranging of the top ones (studios, penthouses),

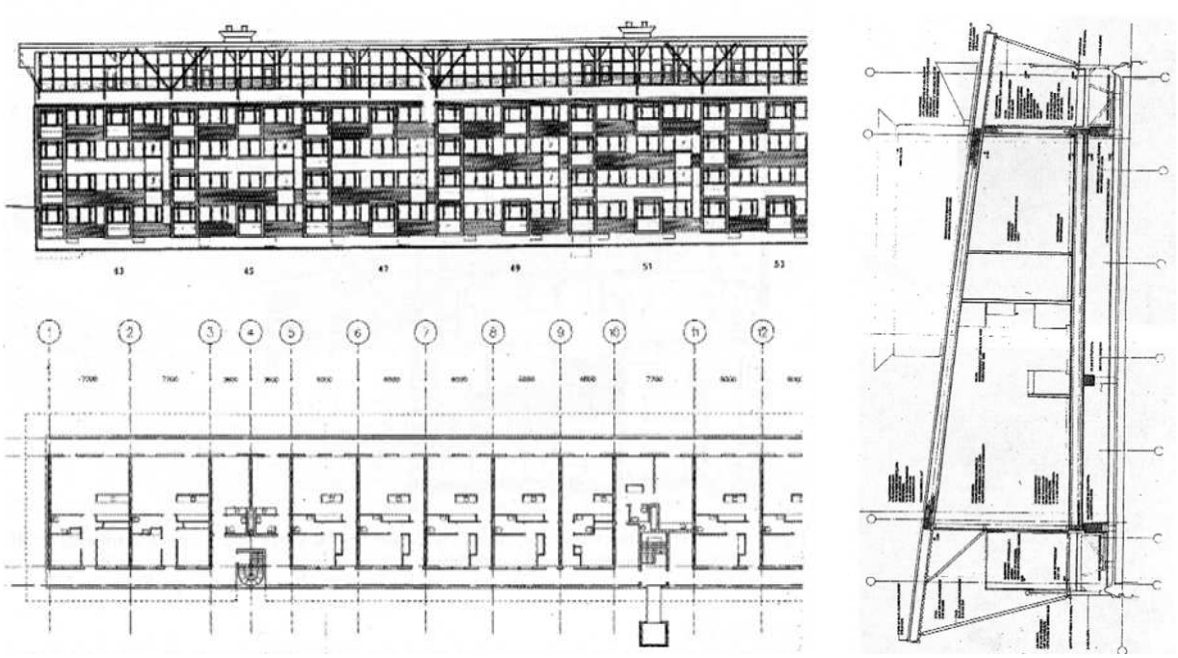

Fig. 9 Additional story with new roof (Denmark)

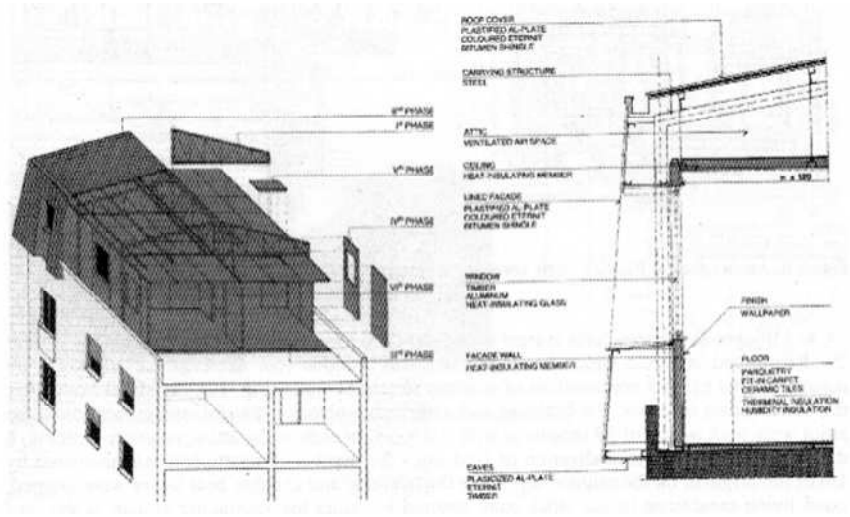

Fig. 10 Living space in new roof (Yugoslavia)

- the biggest scale of intervention can even completely change building shape and scale, by adding or removing several numbers of stories, “cutting-out” a part of the building, etc.

Fig. 11 Old school in new look (Germany)

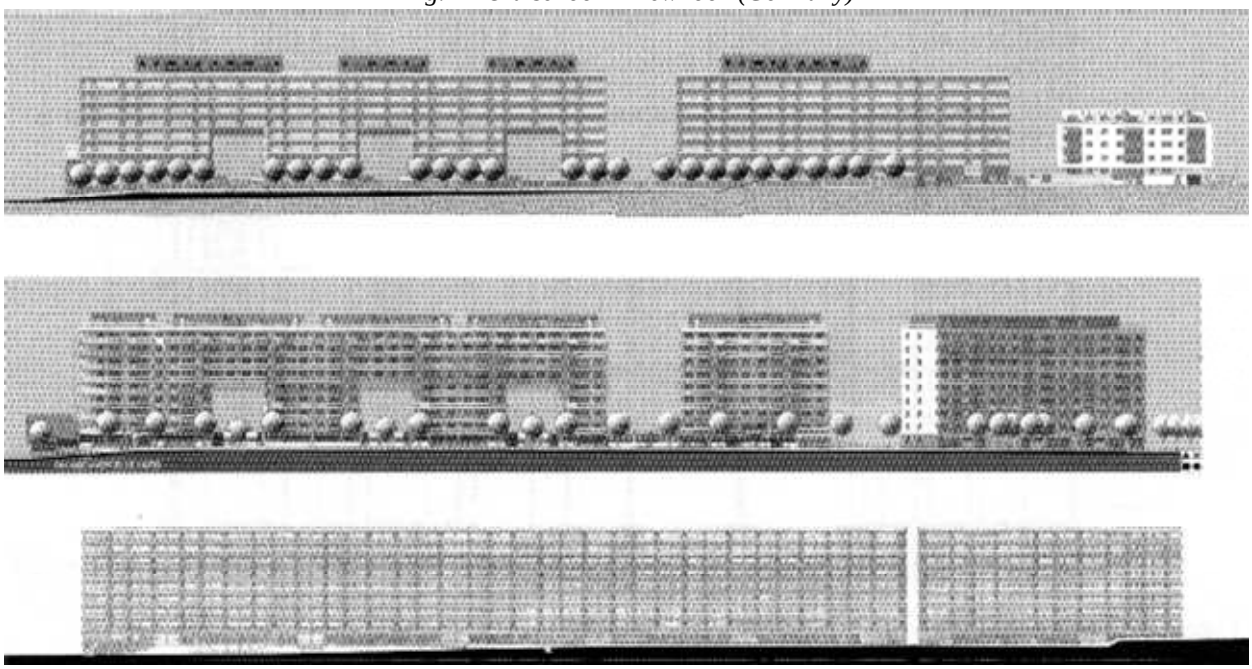

Fig. 12 Concepts of long building reshaping (France)

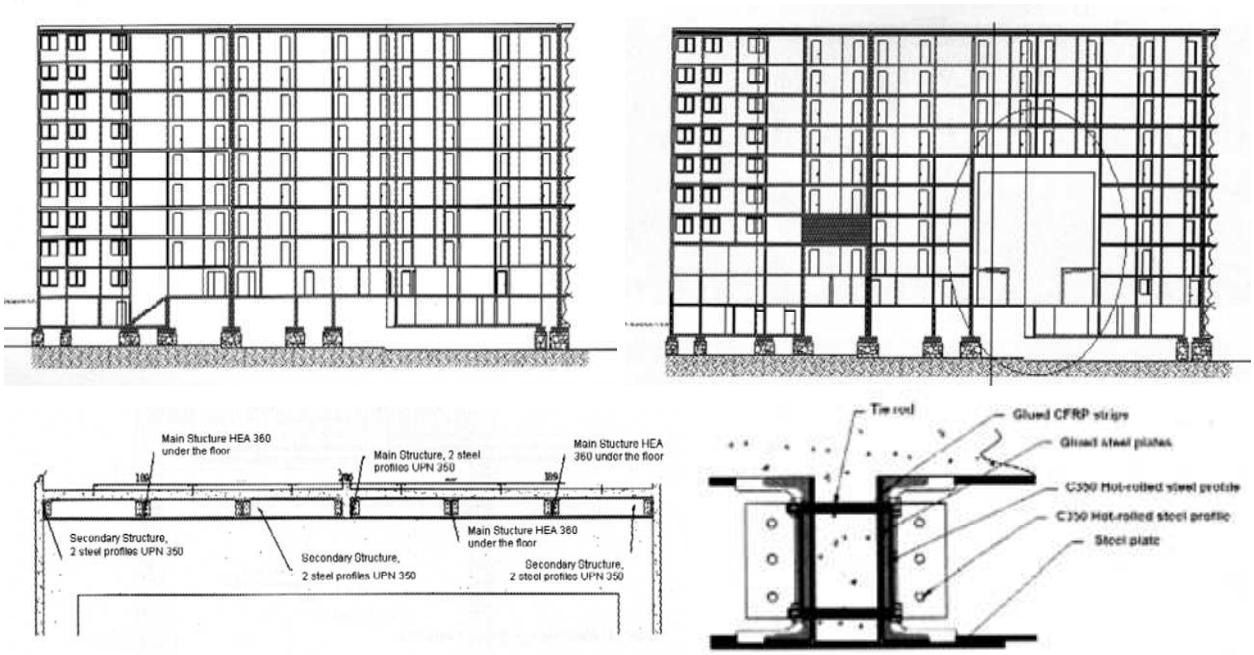

Fig. 13 Structural solution of large building opening (France)

Considering architectural and functional changes inside the building, following actions can be listed:

- rearranging of apartments and floor plans leading to enlarging the apartments area resulting with reducing of their number, in some cases arranging two story apartments,

Fig. 14 Arrangement of two story apartment in large panel building (Germany)

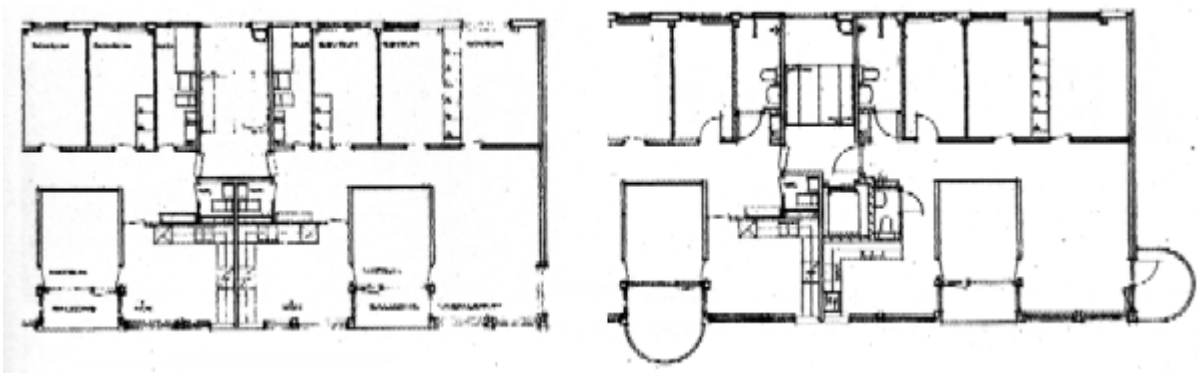

Fig. 15 Lift location in existing building (Sweden)

- introducing new functions to the building (mainly in the ground floor: services, offices, shops etc.),
- installing lifts to provide accessibility for less able-body inhabitants

In most cases listed above examples have influence on building lay-out and very often actions from both groups are undertaken simultaneously.

Acknowledgment. Presented problems and solutions are based on activity in European Project of Cooperation in Research named "Improving the quality of existing urban building envelopes" (COST Action C16) and refers to the Final Conference papers (TU Delft, Netherlands, April 2007) listed below:

Verhoef L. and oth, (Eds), COST C16, Improving the Quality of Existing Urban Building Envelopes; Vol. 2: State of the Art; Vol. 3: The Needs; Vol. 4: Structures; Vol. 5: Facades and Roofs. IOS Press, UT Delft, the Netherlands, 2007.

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INVESTIGATION OF STIFFNESS OF CABLE AND W-FORM ROAD GUARDRAILS

Introduction. The development of motor vehicle transport is obviously a positive point if viewed in terms of social and economic benefits it brings. The penetration rate of motor vehicles is increasing every year and, based on the projections appearing here and there in press, it will only continue to grow. Though viewed within society as a positive trend, this growth of motor vehicle penetration rate, unfortunately, brings about a number of negative factors, too, with the rate of traffic accidents [1–3] standing as the most critical one. Based on the world-wide statistics [1, 2], each year, about 700 thousand people perish and another 20 million get injured in traffic accidents. In Lithuania, the Traffic Police records about 6 thousand road accidents per year [1–4] which appear in the official statistics under any of the following categories: *vehicle striking a pedestrian*; *vehicle striking a bicyclist*; *collision of running vehicles*; *vehicle rollover*; *collision of vehicle with an obstacle*; *vehicle crashing into another standing vehicle*; *other road accidents*.

According to the same statistic data [4], the *collision of vehicle with an obstacle* accounts for about 11 % of all traffic accidents recorded in Lithuania. In this case, the *obstacle* may be represented by a road guardrail, lighting pole, railway switch, tree, gate or any building structure standing close to the road, etc.

One of the means to raise traffic safety is to increase investments into the roads, including the increasing of road surface quality, their maintenance, change of old road guardrails by new ones. The ideal road guardrail is the guardrail with small and equal stiffness along the road guardrail length. Under interaction of motor vehicle with road guardrail its kinetic energy is transformed into potential strain energy of road guardrail and heat; inertial loads getting by passengers during this process do not exceed the allowed standards.

Mainly road guardrails are installed on main roads, made as horizontal band of W-form attached to the low poles from rolled steel (Fig. 1). The distance between low poles is from 1 to 4 m (it depends on the danger degree of road section). The height does not exceed 0,75 m.