Session 3: Cost analysis an planning

Building Construction and Maintenance in Croatia

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Summary

In the first part of the paper, there is the description of the pre - transition situation with the analysis of construction, maintenance and the conditions of using the apartment buildings data. The property structure is also analysed as well as the space owner's attitude towards the rent payment and building maintenance. In the second part of the paper, there is a short survey of the housing fund demolition during the war in the Republic of Croatia. The third part of the paper gives the analyses of the privatisation conditions as well as their influence on the building infrastructure which has already been constructed. In this part, there are some information about the model and the structure of the privatised apartment buildings. The authors mentioned some law changes and the new model of maintenance building infrastructure.

1.Pre-Transition Period

During this period construction of new buildings had to symbolise the advancement of society, for which the ruling political party took credit. Housing buildings in particular played a key role in the philosophy which stated "every worker has to have a flat". Every year waiting lists were created and workers were ranked according to their employment and social status and then money for purchasing flats or crediting was distributed accordingly. It was common practice for companies and organisations in large cities to purchase flats and then to distribute them to employed personnel and their families with lifetime rights for usage of the real estate, with only a minimum charge of 10-30 DEM / month / flat. Building construction was consistently oriented on multi storey city housing buildings. Waiting lists were always long and construction was never able to keep up with the necessary demand for dwellings for workers.

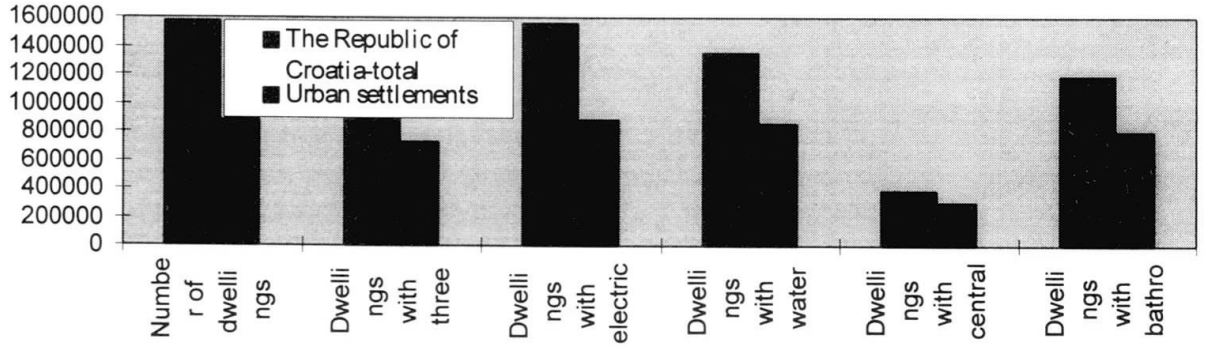

Figure 1 Housing fund according to number of rooms, installations and the other rooms-1991 census

Due to the extremely low amount of rent that was paid by tenants of government owned buildings, and the even lower maintenance fees paid by private owners (about 35%), the organisations responsible for proper maintenance of buildings were able to only provide last measures for the emergency repair of rundown housing buildings.

2. Wartime Damage Inflicted Upon The Housing Fund

After the holding of multi-party elections, significant political changes occurred in the Republic of Croatia. During these changes, various republics within the former Yugoslavia voted (acting legally within their rights according to the Yugoslav constitution) for independence. The central government, supported by the Yugoslav army, started a war of aggression. Approximately 145 000 flats or houses were damaged or destroyed, and approximately 200 000 people were left without a home. The government of the Republic of Croatia has begun a program of reconstruction. By the end of 1996, the program will have received approximately 1 billion DEM, of which 99% of the funds will be from the national budget. Average costs of reconstruction stand at 700 DEM/m2 on approximately 20 000 houses or flats (up to 1996).

3. Transition

In the occurring transition, privatisation of the housing fund is being carried out. The basic rule that is applied to the privatisation program is that every citizen living in a government owned flat has the right, along with his family, to buy one government owned flat. A rating system has been developed for the valuation of buildings and flats. The index provides an estimate for the material value of dwellings in Croatian Kuna, or German Marks. Values per square metre vary in function with the age of the flat, location, area size, structural type, level of furnishing, and position. These factors are used to create a foundation for the cost of the flat which is then adjusted by several other factors. According to these regulations, the average cost of a flat runs between 100 DEM and 350 DEM/m^2. In 1997, the government of the Republic of Croatia passed a law which obliges owners of flats in housing buildings to finance the maintenance of their buildings by themselves. The market has seen the formation of many new companies which provide services exclusively oriented to the maintenance of buildings. Owners of flats in every housing building must sign a contract with a company of their choice and must elect a building manager. The building manager manages the communal spaces and funds. In Table 1, conclusive data about the methodology used in determining costs of maintenance is shown.

Housing Fund of The City of Zagreb	
for a housing fund with a duration of 65 years.	
for total costs of maintenance forming 65%	***for total costs of maintenance forming 70%***
1.15% annually	*1.23% annually*
for a housing fund with a duration of 80 years.	
1.23% annually	*1.32% annually*
for a housing fund with a duration of 100 years.	
1.16% annually	*1.25% annually*

Table 1 Average annual costs of maintenance of communal parts and items of housing buildings

For determining the average cost per m^2 of space there exist offical sources. The amounts range from 765 to 953 DEM/m^2.

Humanisation and Modernisation of Substandard Housing Estates

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Summary

The housing estetes built in Poland during the sixties and seventies are now estimated as substandard, cultural and social degraded. Using as an example Piasta Estate in Białystok, where we live, we would like to prove that rehabilitation of such estates is possible. Our proposition of humanization and complex modernization contains:

- modernization of existing buildings (improvement of dwelling standard and enrichment of architectural impression),
- transformation of urban composition in order to create legible urban interiors,
- structuralization of space (seperation of public and semi-public spaces),
- enrichment of functional program.

1. Functional, spatial and social value of Piasta Estate

Piasta Estate in Białystok is a typical Polish housing estate designed and realized in seventies in conditions of a socialist country. Firstly - it is characterized by a huge space and demografic scale - this estate occupies the territory of 60 hectares and 22 thousands inhabitans live there. Secondly - its functional and spatial conception is a result of ideological statements of 'social estate' and modernistic doctrine of town planning. And thirdly - all housing buildings located on the territory of this estate were built using large-size board prefabrication technology 'OWT-67', that was the only one obligatory in this region.
Dwelling architecture of Piasta Estate is an example of extreme uniformization and unification, manifested not only by external form buildings, but also by apartments' structure limited to seven types, copied thousand times. Moreover, the utility standard of flats is very low: the most popular 3-rooms apartment of 48 m^2 area.

2. Proposal for humanization and modernization of Piasta Estate

Our design concerns part of Piasta Estate, named Piasta II, which seems the most neglected. In our modernization idea we can distinguish two directions:

- transformation of existing buildings and their close environment,
- transformation of functional - spatial structure of the estate and its connection with surroundings.

Transformation of existing buildings and their environment has following goals:

- improvement of dwelling standard of apartments,
- enrichment of architectural expression of the buildings,
- improvement of technical standard of the buildings, mainly referring to better insulation properties of exterior walls,
- creation of 'intermediary zone' between private interior of houses and outside common space.

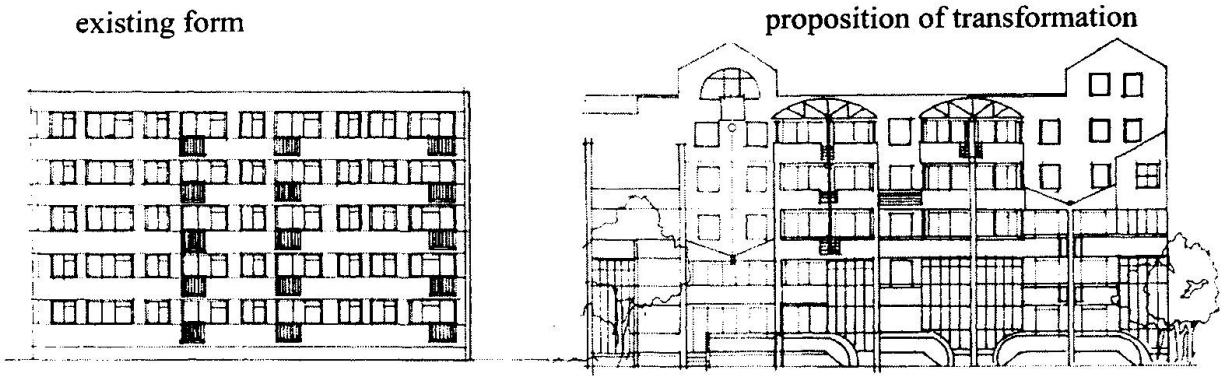

Fig. 1 : Transformation of existing building - an example

Transformation of functional and spatial structure of the estate concerns:

- separation of semi-public spaces for definite groups of residents,
- creation of attractive public (social) space,
- transformation of estate composition in order to create clear urban interiors,
- enrichment of functional program and achievement of higher comfort of the vehicle service.

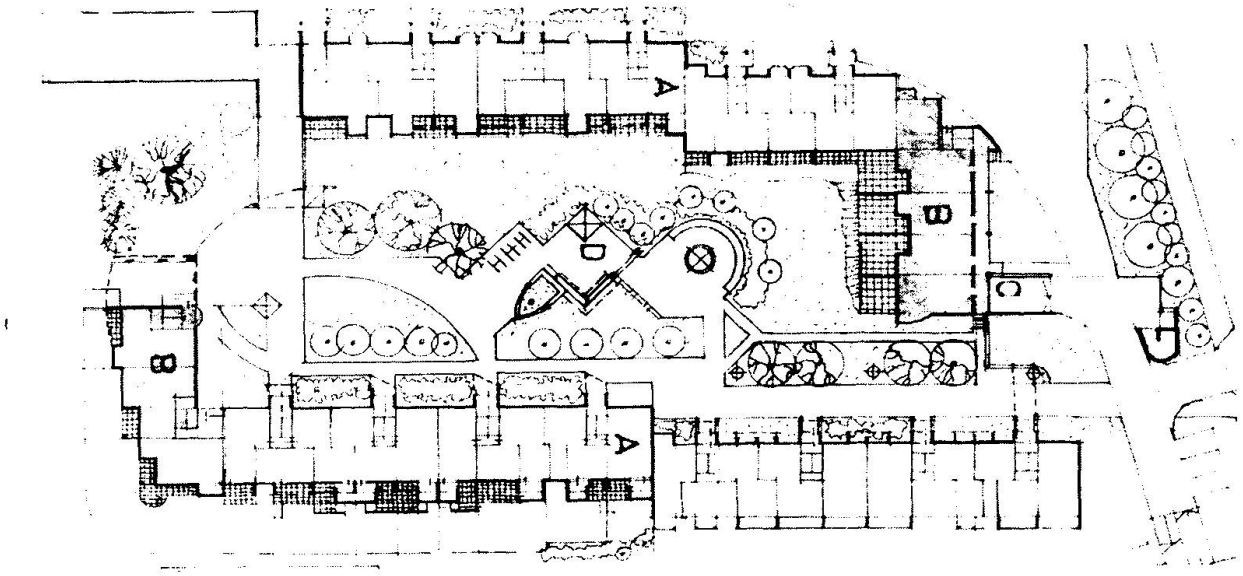

Fig. 2 : A courtyard between apartment houses - an example of semi-public space, A - existing buildings after transformation, B - added buildings, C - garage under new house, D - playground.

Prefabricated Housing and Colours

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Summary

The necessary rehabilitation and modernization of a great number of prefabricated buildings in Eastern Germany offers the possibility and the need to improve them not only technically but also aesthetically. Colouring is an important instrument to reach this goal. To avoid mistakes, as sometimes made in the past, it is indispensable to become acquainted with the principles of chromatics and the effect of colours.

Repair Works on Prefabricated Housing

Approximately 2.4 million appartments located in Eastern Germany were industrially produced. The need of their rehabilitation presents the challenge and the chance to improve the houses not only from the technical point of view, but also aesthetically.

About half of the flats were subject to repair work until now. Architects found many positive solutions, but also many unsatisfactory examples of facade design appeared. Therefore some concrete hints to be considered by colour designers will be introduced.

The Effect of Colours

Colouring is an important issue and the right choice of colours influences our sense of harmony and even our psychological state. Evidently everybody is touched and formed by the colours of his/her sorroundings.

The primary function of us architects and colour designers should be to harmonically integrate our buildings in the "world of nature".

Colour is one of the best and fastest natural means of communication. A possibility to recognize its meaning offers the so called "semantic reference system", which means the connection between the terminology and the different colours or coloured ensembles. It is important to state that the meaning of a colour (presumed there is one) cannot be determined to only one interpretation. It is though totally insufficient to quote an established signification for an isolated colour, as the isolated colour, detached from its surroundings, has no entire meaning. Only if that colour is considered in its relation to other colours and to the context of its exact application, its meaning becomes perceivable and can be defined.

We react intuitively to colours. Colours produce a certain atmosphere, they are able to disturb our emotional balance in the long run and can even lead us to lose our bearings.

What exactly are the capacities of colour?
Colour can make a great difference, optically as well as psychologically.
Colour can add structure, providing depth and weight.
Colour can bring things closer or relegate them to the background.
Colour can have stimulating or calming effects.
Colour can produce feelings of warmth or cold.

Aim of Design

Applied to the aesthetic design of panel buildings the psycological effect of colours can impress on living and working conditions of its residents decisively. Colour influences volumetric structures, particulary the impression of their size and height.

Most panel buildings create "dark" feelings as chill, heaviness, solitude, loss of orientation. The harmonic unity, where warmth, safety and joy dominate, is missing completely in many cases. Once the importance and the effect of colour has become obvious, it should and must be the goal of every architect and colour designer to impart a harmonic, "holistic" style on the prefabricated housing developments.

The residential environment has to be considered too, the height, shape and colour of adjacent buildings. And - depending on whether a particular street should be visually opened or closed - colour accents should range from light to dark or vice versa.

Colour design is also an excellent orientation tool. Entrance areas are ideally suited to being differentiated by colour.

Additional care has to be taken to retain the look typical of a prefabricated building - the goal is to upgrade only the structural properties and appearances of the building, base structures, knee walls and entrance areas should be accented by colour and, if possible, through different building materials. The simple elegance of a building is due to e.g. the use of soft-hued colours and wellplaced colour accents around balconies and loggias, as well as the entrance areas.

Nevertheless we should always regard to avoid an excessive use of colour, which leads to stress, shrillness, even to a chaotic impression. This is one area where more often than not, less is more.

In the case of large housing estates it would be expedient to prepare a specific design concept for each residential area to be introduced to the tenants. After all, any building, any ensemble, any architectonic space serves the respective residents and has to answer their requirements. Architectonic order principles and colour design solutions have the declared aim to maintain or to advance the mental comfort of the inhabitants and the acceptance of their environs.

With the general state of economy and of construction technology, each colour accent will be perceived as a symbol of change and, if done well, can serve to instill a positive feeling about life.

In closing a brief reminder that prefabricated buildings represent a part of architectural history; they may not be examples of the most striking body of architecture, but they are certainly habitable. Furthermore, they have been widely accepted by the respective residents. It is our job to improve their general atmosphere which can also be measured by how their inhabitants feel about their lives. It really is quite simple to incorporate the concepts of aesthetics into prefabricated buildings; after all, aesthetics is nothing more than the science of the general laws of the possible aesthetics relationships between humans and reality and the general laws of artistic development.

Production and Action Oriented Model for Renovation Projects

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Summary

The paper presents a product and action oriented model from the tenants' and customers' point of view in renovation projects for prefabricated apartment buildings. The basic idea is to extend and utilise the concept of industrialised building methods but also to take into consideration the individual needs of each project. To take into consideration the condition of the building, damage and amenity valves as well as needs of owners and tenants. The system is based on co-operation between all parties in the project and on considering each step taken on the building to carry it out as a complete project.

1. Introduction

The system has been created for renovation which embraces the whole process of renovation from inspecting damage to the implementation of construction work. The system is based on the methods of finding the right measures according to the damage to the building, the needs of the building owners and the wishes of the tenants related to the possibilities of financing. The system also embodies a technique for determining the right working methods and inhabitant - friendly implementation.

The system is based on the 'Entra Philosophy', which is to go through the whole process from the research to the implementation. The basic idea of the philosophy is to divide the building in smaller parts according to the decision - making process. With 24 different material producers and subcontractors, 53 solutions have been created for different parts, with different levels of renovation solutions. There are proposals so that the client can choose from a variety of different solutions.

Entra 2000 is also an example of co-operation with material producers in a big company where the information for different solutions and the cost estimating system is created as a system for project managing, marketing and implementation. The system includes:

- marketing and information material for different solutions
- PC-based supporting system for project management, planning and implementation
- measure - based cost estimating method.

2. Background

The industrialisation of Finnish society had a strong impact also on the housing sector. Half of the apartments at present are in prefabricated buildings built 1965-1975. Because of the fast implementation and technical solutions, many of the buildings have problems in their facades, roofs, energy efficiency and technical systems. Also because the housing stock is relatively new, maintenance and overhauling culture has not been developed.

A special aspect is also the ownership method of the buildings. The owners of every single apartment have to decide on action jointly. That means they have to think the same way and also have the same financial situation. Otherwise deciding is difficult and the decisions are 'low level'. This is why there has been a need to create a system which is easy to understand and graphic, where the marketing in the project has greater meaning.

3. 'ENTRA Philosophy'

The ENTRA philosophy is based on the idea of an industrialised building. The prefabricated buildings are quite equal in the point of view of different rooms, building parts, technical systems, envelope, etc. The method separates building parts, rooms and technical systems according to the decision making system. (See figure 1)

Building part or technical system	measure level		
	maintenance (light renovation)	renovation (medium renovation)	refurbishment (extensive renovation)
Room	DEM DEM	DEM	DEM
Technical system	DEM DEM	DEM	DEM
Envelope	DEM		DEM DEM DEM
Total	ca 500 DEM/m2	... 800 DEM/m2	... 1200 DEM/m2

Fig. 1: The concept of the ENTRA 2000 system

Cost-Effective Modernisation of Housing in Panel Structures

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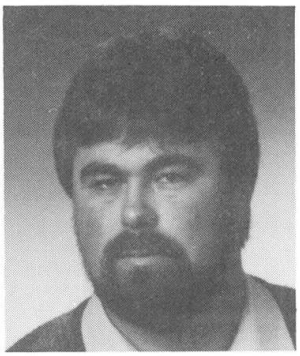


Andreas Rietz, born 1956, concluded his architectural course at the Technical University of Brunswick, Germany as a qualified engineer in 1988. Since 1992 he has been working in the field of building economics as a building research scientist at the Institute for Maintenance and Modernisation of Buildings e.V. (IEMB) in Berlin.

Summary

The Institute for Maintenance and Modernisation of Buildings has recorded and evaluated completed modernisation projects according to its individual technical and economic measures. The measures of rehabilitation can be categorised according to cost as well as standard of repair and modernisation.

From this analysis fundamental conclusions can be developed which permit systematic planning of the modernisation and repair from an economic point of view with the aim of offering attractive and diversified housing in the slab construction estates at justifiable cost.

1 Cost survey

Altogether existing housing in the new lander consists of approximately 2.28 million apartments in blocks of conventional construction as well as in one- and two-family houses, 2.58 million in multiple dwellings of conventional construction as well as 2.17 million in prefabricated construction. To date approximately 50 % of block and slab construction buildings have been rehabilitated or at least partly rehabilitated. To maintain their share of the housing market rents after modernisation have to be kept within a socially agreeable framework. To achieve this the lowering of rehabilitation cost plays a decisive rôle.

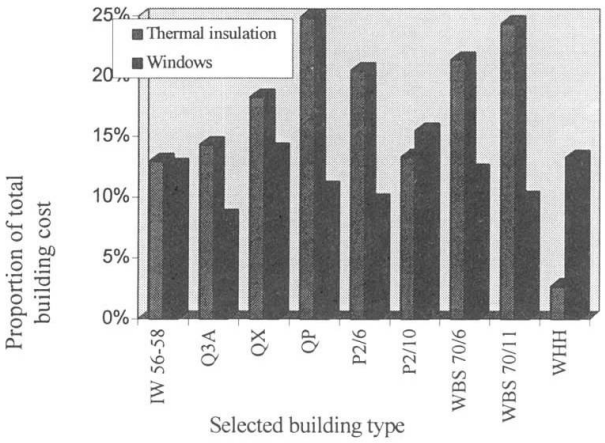
The basis of any rehabilitation forms a detailed survey despite of the standard type series we are dealing with. After assessing the deficits with regard to structure, energy, function and aesthetics, the repair and modernisation cost of the specific building is determined. Experience shows that through the application of the correct and cost effective solution cost is saved.

2 Evaluation

The repair of the enclosure (roof, façade, loggias, windows) and the building services installations (heating, sanitary, ventilation, electrical) in connection with energy conservation measures comprises of the largest portion of the costs of fundamental rehabilitation by far.

Technical solutions for these measures are for this reason to be optimised under economic considerations, as cost changes in this regard have far reaching effects on the financing of the overall measure.

Fig. 1 Proportional cost of thermal insulation and windows with selected building types



The individual rehabilitation measures are represented at very different proportions of the various type series. This can be demonstrated by the individual measures of the energy relevant thermal insulation and the window rehabilitation (see figure 1).

Here the cost for the actual thermal insulation of buildings and the modernisation of the building services themselves must with regard to the lowering of the running costs to a large extent be rated worthwhile, provided the required measures are carried out together with the repairs that are required anyway and that only the required additional expense is included in the calculation.

3 Cost frame

The evaluated rehabilitation measures can under the aspect of calculated costs be represented in three groups:

- Cost frame 1:
  Building costs of DM 300 to DM 500/m² of living area. This comprises rehabilitation measures with which repairs predominate, while modernisation measures are carried out only to a limited extent.
- Cost frame 2:
  Building costs of approximately DM 750 to DM 1,200/m² of living area. This comprises rehabilitation measures with which basic repairs as well as modernisation measures of a medium standard are carried out.
- Cost frame 3:
  Building costs of approximately DM 1,200 to DM 2,000/m² of living area. This comprises rehabilitation measures with which basic repairs as well as large scale modernisation measures (e.g. lift installation or plan changes) are carried out.

It becomes apparent that already repairs and modernisation measures of a medium standard without structural changes of the existing building quickly reach or exceed the frame of DM 40,000/m² apartment. Here the correct selection of rehabilitation methods demonstrated in the lecture through specific examples makes a start in order to lower the costs of repair and modernisation.

Saving and Restoring Technical Documents of Large Panel Buildings in Hungary

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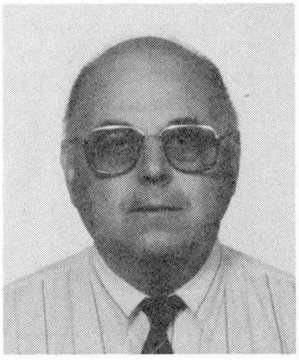

Summary

In Hungary the number of residential buildings is sufficient, however, a significant number of them are in a deteriorated state and their heat insulation is not satisfactory. Quality requirements justify the building of 25-30 thousand residences every year. The Government has initiated financial support for on the one part renovation, modernisation of residences, and on the second part for the energy saving, value increasing renovation of residences built with prefabricated materials technology. The Building Maintenance R+D Foundation can provide significant help to the owners and entrepreneurs with, on the one hand, the prefabricated building computer plan store, and on the other hand with the determination of the planned heat insulation of the buildings and building diagnostics.

1. Introduction

The Building Maintenance R+D Foundation was founded by the Home Ministry, the Ministry of Industry Trade and Tourism, the Environmental Protection and Area Development Ministry, the Budapest Local Authority, the National Technical Development Committee and the National Association of Building Maintainers. The objective of the Foundation: protection and economic operation of the country's building property, the preservation of our building environment within the framework of Hungarian and international co-operation. The Foundation Innovation Bureau has prepared the Government program entitled "The energy saving, value increasing renovation of residential buildings built with industrialised, primarily prefabricated technology".

2. General Data of Residences in Hungary

In Hungary with a population of 10 million there are nearly 4 million residences. This number consists mainly of family houses, furthermore multi-storey, traditional buildings, town terraced houses and multi-storey buildings built with industrialised technology. Of this 508 thousand were built with large panel, building factory technology, and 286 thousand with other industrialised technology (precast concrete wall units, tunnel shuttering, and other cast wall building methods).

The characteristic heat insulation values, heating systems, ventilation, warm water supply, expected life and ownership right breakdown is contained in detail in table No. 1.

Distribution of the housing stock according to thermal insulation, installations and ownership form						
1992		Type of building				Total
		family house	multi-storey traditional	row of houses	multi-storey ind.	
Number of dwellings		2,365,000	577,700	201,600	794,300	3,938,600
Abandoned dwellings		109,400	40,000	9,900	6,000	165,300
amount of heat insulation	U>1.3 W/m^{2}K	1,865,000	57,800	157,300	-	2,080,100
	0.7<U <1.3 W/m^{2}K	350,000	433,300	40,300	635,400	1,459,000
	U<0.7 W/m^{2}K	150,000	86,600	4,000	158,900	399,500
heating method	per room ind.	1,681,400	374,900	66,200	166,900	2,289,400
	per residence central	682,600	173,000	44,400	-	900,000
	per building central	-	28,800	61,200	17,200	107,200
	district	1,000	1,000	29,800	610,200	642,000
ventillation	natural	2,635,000	577,700	151,200	166,900	3,087,500
	gravitat.	-	173,300	50,400	389,100	612,800
	mech. exhaust	-	-	-	238,300	238,300
domestic hot water	no supply	765,000	20,000	15,000	-	800,000
	individual	1,600,000	545,200	155,600	220,300	2,521,100
	central	-	11,500	20,000	-	31,500
	district		1,000	11,000	574,000	586,000
expected lifetime	less than 10 years	373,000	-	-	-	373,000
	10 to 30 years	275,000	-	25,000	-	300,000
	more than 30 years	1,717,000	577,700	176,600	794,300	3,265,600
ownership	priv. (priv., condo.)	2,365,000	577,700	122,800	558,000	3,623,500
	state, local authority	-	-	78,800	236,300	315,100

Table 1.

About 10% of the residences are in very bad technical condition and their expected life is 10 years. The energy saving renovation of these residences is not justified, as the cost of this is higher than that of the construction of new residences. 91% of the residences in Hungary are in private ownership and 9% in mainly local authority and some in state ownership.

In Hungary 1,350,000 people live in prefabricated residences, and 750,000 live in residences constructed with other industrialised procedures. The condition of these residences directly affects more than 1/5 of the population of the country, nearly 2,100,000 people. The condition of the residences constructed with industrialised, primarily prefabricated technology is at the moment mostly satisfactory, but their mass renovation and modernisation will become due in the near future.

Planning and Management of the Reconstruction of Historical Buildings

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Summary

The process of reconstruction of historical buildings has several specific questions and problems which must be solved in the planning and management stage of the building process - from the architectural and art-historical significance, via the future purpose of use of the building, links to the surrounding buildings, environmental questions, questions of cost, time analysis and quality assurance problems. A lot of these problems can be solved by the help of a computer model of the flow of rehabilitation and reconstruction of the building created by a construction technology network diagram. The CONTEC integrated project planning, management and quality control system based on these diagrams has been used for bidding, planning and management of the reconstruction process of several significant historical buildings in Prague.

Keywords: project management, planning, quality assurance, reconstruction, historical buildings, network diagram, construction technology, building process, network analysis, mathematical model

On computer modelling of the reconstruction process of historical buildings

During planning and management of the reconstruction process of historical building there are some specific questions and problems which must be - from the architectural and art-historical significance, via the future purpose of use of the building, links to the surrounding buildings, environmental questions, to the cost, time analysis and quality assurance problems. A lot of answers to these problems can be obtained by the help of a computer model of the rehabilitation and reconstruction of the building. The model must be based on the construction technology analysis of the reconstruction process and must reflect all of the main points of view and architectural, technical, technological and economical links of the building process. Several historical buildings reconstructed recently in Prague have been planned and controlled by the CONTEC integrated project planning, management and quality control system. The system is based on modelling of the building by use of network diagrams created by an original construction technology network diagram method. This method enables to create and then to use different typical network diagrams as sequences of the construction processes and their linkage for different sorts of buildings as computer files, which can be modified according to the spatial structure of the actual building. In case of reconstruction of buildings there is usually difficult to use the typical network diagram as it is, because each reconstruction process of a certain building is unique. The model created on the typical base has to be modified according to the facts known about the building and the flow or the reconstruction process. Databases of the main data about all construction processes and their quality checks are available. The system includes the linkage to different quantity and cost estimation computer systems. The system enables to print the calculated network diagram in

different forms (technological standards, bar chart, line-of-production graph, resource allocation graphs of cash flow, labour consumption, need of work force etc. and quality assurance checklists.).

The system enables to create these documents for planning, technical and organisational control of reconstruction of the building according to the main point of view of minimum costs and maximum utilisation of labour during the whole reconstruction process. Resulting documents answer not only the price question, but also the optimum reconstruction and maintenance processes flow, cash and resource flow and the quality assurance question. All documents can be easily updated according to the actual completion of construction processes on site at a certain term. In case of a delay, the system suggests what measures are to be done to be able to keep the final deadline of the project.

Examples from site

The mentioned system has been used for managing reconstruction of many significant structures and buildings in Czech Republic and Slovakia (e.g. Civic House in Prague, Czech Savings Bank Headquarters, Czech Parliament building, Toskán Palace, Ungelt area and Hybernia Palace in Prague and many others). Two of the most interesting buildings that have been reconstructed recently are the Civic House in Prague and the Hybernia Palace. The Civic House is a huge cultural complex with the famous Smetana concert hall, see fig. 1, originally built in the l'art nouveau style at the beginning of the 20th century. A model of the reconstruction process of this complex was worked out for the bid. The former exhibition hall in Hybernia Palace, fig. 2, originally built in the classic style at the beginning of 19th century which is being rebuilt to a musical theatre, a particular model of the reconstruction process control was created. As some parts of the load bearing structure are to be changed and replaced by a steel construction, there were lots of problems with the sequence of demolition processes and the erection of different parts of the new load bearing construction. The network diagram managed to model all linkages according to static requirements. Nowadays the model is regularly updated according to the state of construction.

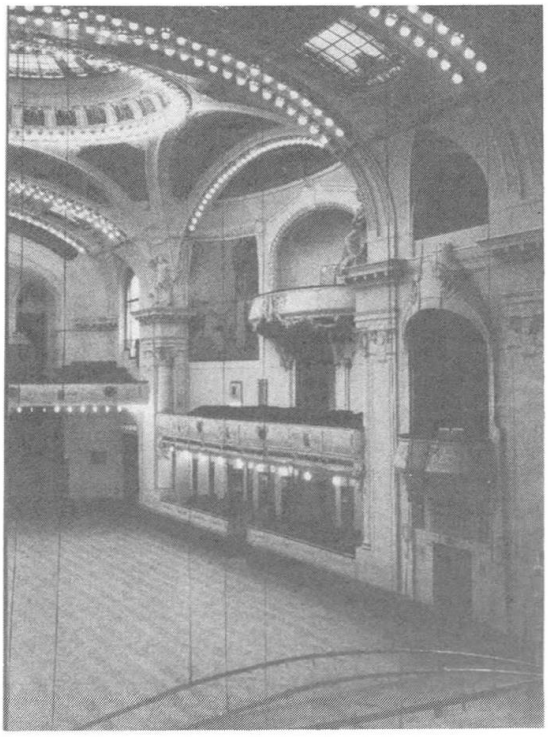

Fig. 1: Interior of the Civic House

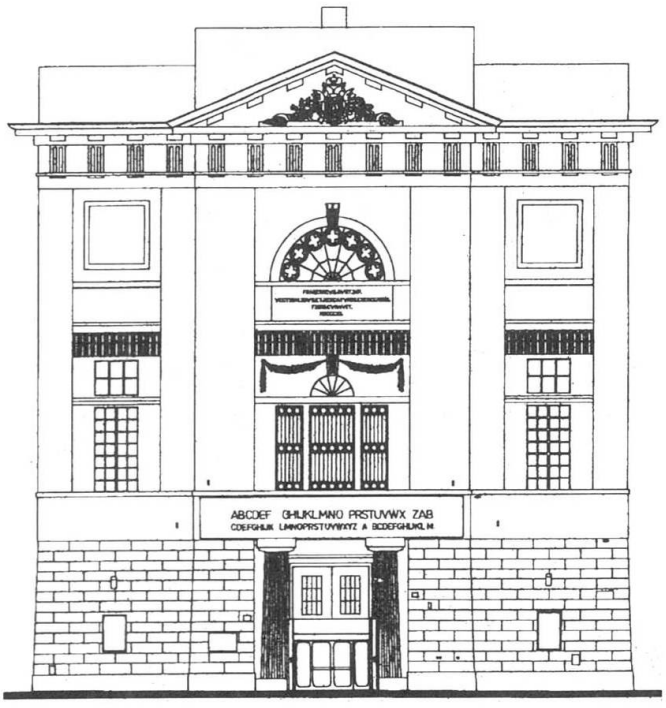

Fig. 2: Hybernia Palace, western façade

Standardised Specifications Handbook for Prefabricated Block Buildings

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Summary

This paper will present a guideline of standardised services for repair and rehabilitation of residential panel buildings in former eastern Germany as a result of a co-operation between representatives of housing companies and public building authorities, planning engineering offices, builders and contractors, the industry and research faculties under general management of BMBau and the IEMB

1. The Handbook (StLB)

As early as in 1991 the Federal Ministry for Regional Planning, Construction, and Urban Design (BMBau) felt obliged to order the development of a new series of "branches of work" for the handbook of standardised services (StLB). The reason for that was the significant number of precast block slab buildings in the "neuen Bundesländer" (New Federal States) and in the eastern part of Berlin which mounts up to 2,17 Mio apartments, i.e. one third of the grand total of apartments, and the enormous efforts necessary for restoration and modernisation of these buildings.

For the acquirement of the descriptive texts of standardised specifications working groups were formed consisting of representatives of housing companies and public building authorities, of planning engineering offices, of builders and contractors, of the industry and of institutes like the German Institute for Construction Technology, Institute for Window Technology Rosenheim, Institute for Rehabilitation and Modernisation of Buildings (IEMB). The general management of this operation was taken over by the BMBau and the IEMB.

The working groups were instructed to include in the handbook only solutions that are generally applicable, neutral in aspects of brands and products, and particularly economical. Table 1 shows which branches of work have been acquired so far and which branches are actually under consideration.

Differing from the classification of the former handbook into branches of work (LBs), which are categorised according to "Trades", the General Technical Contractual Terms (AVT) and the German Contract Procedure in the building Industry (VOB) Part C, the new branches of work refer to measures of restoration and modernisation of buildings, as for instance

- curtain walls,
- restoration and renewal of balconies and loggias,
- entrances of houses and apartments,
- reconstruction of runs (kitchen and bathroom),

- reconstruction and renewal of roofs with covering,
- reconstruction and renewal of roofs with sealing.

Moreover proceeding and following processes are included into the branch of work. Thus the works for the restoration of a part of a building can be described completely by one branch of work. Of course, the new branches of work of the series 500 as well as the other series of the handbook of standardised specifications are in conformity with the VOB. But they were acquired in a modified systematic of the handbook. The text parts that make up a complete position text are reduced to three parts (T1 to T3) as opposed to five parts (T1 to T5) in the traditional handbook. Beside this new aggregation of text parts to T1 through T3 the new systematic achieved, that only technically correct combinations can be chosen for one position; false combinations are excluded by the way the texts are formulated.

For the acquirement of the new branches of work the form and working method of the standard handbook that have proven good are applied. The standard handbook is elaborated by the Joint Commission for Electronics in Construction (Gemeinsamer Ausschuß Elektronik im Bauwesen GAEB) together with the German Contract Committee for the building Industry (Deutscher Verdingungsausschuß für Bauleistungen DVA). It is edited by the German Institute for Standardisation (Deutsches Institut für Normung DIN) with Beuth Publishers. In past, present and future, parallel to the new branches of work of the series 500 explanations as supplements to the specific branches of work are elaborated as a joint effort of the IEMB and the BMBau and the working groups, they are also edited with Beuth Publishers. These supplements should help practitioners to get acquainted with the respective branches of work; besides basic explanations, examples and definitions of specialised terms they comprehend hints at:

- German Contract Procedure in the Building Industry (Verdingungsordnung für Bauleistungen VOB)
- construction details of standardised types of precast block slab buildings
- basic material.

What are the advantages of the new branches of work?

1. They cover the demand of competitive tendering actions for the high amount of restoration and modernisation of prefabricated block buildings
2. With the existing offer of standardised specifications texts about 80 per cent of the total of work involved can be described in competitive tendering actions. Further complementary texts and additional descriptions are possible.
3. They consider the state of the art in technology; they go conform with DIN and VOB. They contribute substantially to the qualitative execution of construction work at tolerable costs. The consideration of the actual manual of directions in the formulation of the texts of standardised specifications is guaranteed through the involvement of the working groups into the work of the German Institute for Standardisation, of the German Contract Committee for Construction Work and of the Joint Commission for Electronics in Construction.
4. Through the joint work of clients and contractors in the working groups a consensus is acquired concerning the definition of economical solutions.
5. They contribute to the reduction of costs by clearly defining the work and thus evading substantial follow-up claims.
6. The reliability of construction contracts is substantially improved by the quality of wording and of the definitions in the specifications. This is true for the whole process from contract preparations in one phase of the competitive tendering action to the settling of the accounts. The texts of the handbook of standardised specifications are the concise execution of the order and contract conditions for construction work (VOB) - that have proven good in the past - into object specific applicable descriptions of work.

Rehabilitation of Recent Multiapartment Houses in Croatia

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Summary

Multiapartment houses in Croatia, built between 1945. and 1985., represent a specific and quantitatively very prominent category. Nowadays, they are in a bad condition as a result of partly substandard construction and insufficient maintenance so that their constructive rehabilitation is really necessary. The interventions that are indispensable for technical reasons, mainly on facades, offer the opportunity for an artistic rehabilitation at the same time and at the same expense. Due to the actual circumstances in Croatia - the transition period and the inheritated difficulties in management of houses, as well as the inability of making investments - the cost of this rehabilitations will have to be devided between the users and the social community.

1. Housing capacities in Croatia - condition, causes, potentials

The housing architecture in Croatia is also important from various aspects. Beside a high investment value which, for an adequate apartment, engages the biggest part of the whole life income of an individual or a family (up to 50% of an income compared with the developed countries where that percent is 5 to 10 times smaller), construction of apartment housea induces up to 20% of national production. Operation costs, which are higher when the buildings are of poor construction and bad maintenance (up to 5% of the investment value annually) represent a significant expense item. Having a disposable apartment is also an elementary social question, and with regard to their frequency and prominence, the apartment buildings are ambiental, artistic and city-forming elements.

The recent political and economic changes will be reflected on the construction of apartment houses as well. There will be no more planned and politically motivated ventures typical for the former period. Now the houses will be built in accordance with the real possibilities of investors and of the relative constructive environment. Instead of constructing completely new settlements, the interpolations in narrow urban area will take place, but they will be of a considerably higher technical and artistic quality than the previous constructions. This will establish new estimations for the existing apartment houses and accentuate the already obvious necessity for their technical and artistic rehabilitation.

2. Some specific characteristics of the recent multiapartment buildings in Croatia

The lack of finantial assets and other difficult circumstances were not equally manifested in all constructive aspects. For example: the constructive safety of these multiapartment buildings is relatively very correct. The supporting construction is made in accordance with the existing static standards and regulations. It has been controled and tested and then approved by the corresponding attestations necessary for issueing the licence for use. The functional solutions of flats, although of small surfaces and less "room space" than in the western averages of the time, have been also correct. The value of applicability of singilar flats, if they would be used for the anticipated number of lodgers, is satisfactory from the functional aspects. Namely. these solutions have depended more on the designer's ability than on some material conditions. The critical side of these realizations is the finalization. After the rough construction works and after the correct execution of the supporting construction, final works on the skin of the building (facade and roof), on windows and doors, on the interior walls and floors were not properly realized and there was no quality level determined. Very often these final works were badly organized, causing mutual damages, and lasted unproportionally longer than these works had been included in the total price of the building. Regulations concerning the constructive physics required only a low level of the physical protection which is insufficient according to the today's regulations in force.

3. Rehabilitation of the "skin" of multiapartment houses

The skin (or membrane) of a building includes roofs and facades i.e. the exterior surfaces (structures) which are very much exposed to damages. Due to the previously mentioned reasons, these structures in the after-war apartment houses were poorly built and have been damaged during the time - the damage which requires a constructor's intervention. Most of these buildings have flat roofs which have been leaking in spite of numerous repairs and the sloping roofs had to be added (although not designed). As the waterproofing layers and other layers of these roofs have been of a poor quality and insufficient, the subsequent addition of sloping roofs can be accepted under the condition that the new roof is elaborate in architectural terms and only on those buildings where the shape/desig allows it. It is recommended to use the attic (which would rent the construction), provided that the new roof surfaces are correctly constructed from the physical and artistic point of view. The question of facade improvement from the architectural point of view, is even more exposed. Beside repairing damages, it should include the physical improvement according to the recent and more strict physical regulations, and the artistic improvement at the same time.

All these questions are out of organisational or financial reach of the tenants or even of their community, and they will have to be solved by the society/government both from the architectural and investment point of view. Rehabilitation of the "skin" of these buildings is evaluated to 5 to 10% of their investment value.

Roof Repair in Croatia Applying Modern Technologies

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Summary

Extensive repair works on collective housing buildings need to be undertaken in Croatia, a Central European transition country. The adjustment of national building codes to the market economic management of residential buildings is being speeded up. The results of the cost analysis show that the largest share of the investments can be expected for the repair of roofs (flat and mildly pitched), since their quality currently does not meet the ISO and EN standard requirements. It is concluded that the scientific knowledge and available state-of-the-art technologies and materials are not sufficient guarantee for the establishment of an integral quality management and control system in the repair project without the dedicated involvement of all relevant factors. Furthermore, the paper discussed the personal experience of the authors, as designers, supervisors and contractors, acquired on roof repair works in Croatia.

Keywords: construction, maintenance, rehabilitation, roofs, waterproofing, thermal insulation, materials and technology

1. PRIVATE OWNERSHIP - BASIS FOR GOOD MAINTENANCE

The task of building maintenance should be approached by taking into account the interests of the investor (user), organisational dynamics of the maintenance system, environmental and legislative aspects, and the scientific and professional developments. The user normally oversees the factors influencing the quality of the building's functioning and its protection against gradual decline. The investor evaluates the loss of the investment value of the invested capital. The criterion of the return of invested capital should be selected between the two extremes which, for instance, can be found in *Porfilio* or *Facility* management. The following should be always considered:

- The dynamics of the maintenance system organisation should envisage possible modifications on the existing building to meet future needs of the user, either periodical (planned) modifications, or even final demolition and erection of a new building on the same location. Here, the functional life of the building (within which a satisfactory functioning is maintained without the replacement of structural elements) should be clearly

differentiated from its technical life (within which the building still meets all designed technical characteristics and conditions). Due to the expected increasing needs of the user for comfort in usage, as well as the developments in the legislature which set more strict additional conditions on protection and safety in a building and its surroundings, it is realistic to expect an increased level of general technical properties of a building during its usage. Here, the economical life of the building, within which it is still a sound investment or where the income (rent) is higher than the maintenance costs, must seriously be taken into account.

- The general environmental public consciousness of the need to preserve the natural resources and the environment encourage the enactment of positive legal measures which "force" the owners of buildings to continuously care for them. This postpones their end of life or the need for their complete removal and eventual erection of a new and more profitable building.
- Scientific and professional developments include new maintenance strategies, normativisation and decision making systems. This primarily implies the introduction of the ISO and EN quality control systems, which modern types of artificial materials completely meet.
- Rapid development of the information technology and its increasing presence in this field contributes to the creation of new (and faster) decision making models based on the balance between quality and maintenance costs, and their eventual optimisation based on quality databases of the available buildings park.

2. BUILDINGS MAINTENANCE SYSTEM AND ROOF REPAIR IN CROATIA

Croatia, as a relatively young country, in the transition of its social and economic relationships, strives to develop its own national legislation, respecting the positive European guidelines and experience, and increase the level of public care for maintenance, consciously directing the management of buildings towards a market economy. In a short period of only several years, numerous laws have been enacted, regulating the issue of the mandatory quality of the primary technical characteristics of each building, the transformation of business entities and the privatisation of ownership, the right of purchase of state-owned flats, economical management of buildings, and environmental protection. The aim of this approach, as in the majority of Central and East European countries in transition of their political systems, is the return of the institution of ownership and the creaion of the legal prerequisites for their management and maintenance using economically realistic sources for a maximal upgrading of their quality of usage. According to the current conditions and practice, in Zagreb, Croatian capital and central sample for the whole country, and based on 1996 data provided by the Municipal Housing Enterprise (currently the only one), a total of amount of some 31.5 mil. DEM were spent on buildings maintenance, of which approximately 39% for extensive renewals, of which 53% on different types of roof repairs. After the enactment of the new Law which regulates the buildings management issue, at least 4 time more money will be collected to enable a higher level of maintenance of residential and office buildings, particularly their roofs, applying state-of-the-art materials and technological procedures of renowned international manufacturers. It is particularly inportant to establish a strictly controlled renewal cycle involving manufacturers, designers, contractors, supervisors and investors, with the enforcement of ISO and EN quality management systems. Authors' rich experience in the application of modern technologies on numerous repairs of flat and mildly pitched roofs points to possible flaws which can occur in newly established European markets.

Strategic Decisions about Rehabilitation of Buildings

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Summary

An important phase in the rehabilitation programme for the retrofitting and upgrading of the existing building stock is making decisions on the need to preserve or demolish the buildings. The time is an important factor in evaluating the future structural stability of the building and making strategic decision on repair and strengthening. Two-basic stages that must be taken in order to decide on the structure which is to be rehabilitated are described.

Keywords : rehabilitation, decision, building stock, time

1. Introduction

Many countries have adopted programmes for the retrofitting and upgrading of the existing building stock, which provide procedures for the systematic survey and rehabilitation of old buildings, and establish a priority system for a building review and determine whether rehabilitation works are needed. These programmes are very important because many old buildings may be vulnerable to damage due to a variety of conditions.

Time is an important factor in evaluating the future structural stability of the building and making strategic decisions on repairing and strengthening in accordance with the trend in standards of rehabilitation. Therefore any of the decisions must be established in accordance with the time related to the future service life and the vulnerable degrees of the buildings for an intervention from the urgency view point.

In many cases, old types of construction are just not covered in a current code requirements.

Upgrading an old building to comply with current standards for new constructions is generally extremely difficult and costs as a full upgrading often requires extensive demolition and reconstruction and its economic impact can result in the abandonment of a rehabilitation programme.

2. Informational Aspects

With a view of creating a comprehensive image about the existing building stock, from the point of view of structural safety, it is first of all necessary to take into account the following aspects:

- the different categories of buildings, from the point of view of functional destination and beneficiaries
- the verification of structural adequacy
- the general development strategy of the existing building stock as part of investments and systematisation actions.

The putting into safety of the existing building stock includes two main aspects: the evaluating of extend situation and the organising of the necessary adequate actions.

The gathering of the main information about the existing building stock includes three main aspects: the inventory, evaluation and classification of buildings.

The purpose of the inventory is to identify and to make a preliminary assessment of the present condition of the existing building stock through picking up the necessary dates for the identification of the buildings (situation, property, functional destination, age, dimensions) and the framing in some categories.

The evaluation represents an exact technical action which must conclude with the engineering information having as a result of the possible as performance of the buildings exposed to a variety of possible loading and environment aggressive conditions.

The classification represents the final framing of the existing building stock in some categories in accordance with some criteria (future service life, vulnerable degrees intervention from the urgent view point).

The evaluation problem of the present condition of the existing building stock, the establishment of the adequacy of the structures, the development of improved methods and technologies about the resistance capacity and the safety level, constituted preoccupations for a large number of countries in the last decades.

3. Decisional Aspects

An important phase in the rehabilitation of building stock is making decision on repair and strengthening.

Any of the decisions must be established in accordance with the time related to the future service life and the vulnerable degrees of the building for the intervention from the urgency view point.

For the putting on safety the existing building stock it is necessary to grind the decisions and adequate emergency measures with a view to the upgrading of safety level or the extensive demolition.

Methods of Reconstruction of Standard Five-storey Built-up Areas

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Summary

The report describes a complex approach of reconstructing standard five-storey urban housing built in Ukraine in the 50-ies and 70-ies. This housing is noted for relatively low dwelling density as well as satisfactory environment in terms of ecology together with developed infra-structure and closeness of labour and recreation zones. The methods of both inventory-making of the existing dwelling built-up area and its complex reconstruction have been worked out. They give an opportunity taking into account for all peculiarities of built-up area under reconstruction including social and other problems to create highly comfortable up-to-date housing and to give 30-45 % increase in the housing space.

Reconstruction of the 5-storey standard dwelling built-up areas constructed in the 50-ies and 70-ies comes out as a most important problems of modernization and improvement of the existing housing in Ukraine. Such problem can be solved only provided a complex approach is applied with municipal engineering, ecological, spatial-planning, structural, architectural design, economical, social, organizational, technical, managerial and other tasks.

Many former outskirts of cities generally represented by standard five-storey dwelling built-up have acquired enormous urban value due to the fact that most of them are characterized by relatively normal ecological conditions, adequate network of urban transport system including underground communication, social commercial and public service, closeness of labour and recreation zones and, which is especially important, have a relatively low density of dwelling built-up area. All of these provide highly efficiently updating and reconstructing the existing built-up area. The complex method of five-storey building concentration developed by our organization will allow to increase the existing dwelling area in the above-mentioned territories which in many cases adjoin historical or planed centres of cities or centres of large planed or existing residential areas by 30-45 % without any practical need of demolition of the existing buildings and withdrawal of agricultural, recreation and other areas.

In particular, the complex method implies erection of tower and other buildings ranging from 2 to 16 floors in height on vacant plots of land or on grounds previously occupied by shabby dwelling buildings or other yard installations. The residents of surrounding five-storey dwelling buildings could be fully or partially moved to these new buildings. The vacated five-storey dwelling buildings could be heightened by 1-2 or 4-10 floors depending on their physical wear, normative requirements, structural concepts and a number of other factors. In the former case, the method of heightening being now referred to as the "attic heightening" implies resting of the heightened portion on the bearing structures of the building, while in the latter case the heightened portion is intended to be rested on the sub-frame (supporting structure beneath the superstructure). The latter method is based on the idea according to which the frame studs or other bearing structures are arranged on independent foundations (e.g. bored foundations) along the walls of buildings being heightened with the superstructure bearing components resting on the above studs above the level of the roof of the building. The structural concepts pertaining to the sub-frame and superstructure may vary depending on numerous factors.

It is also implied that in the process of superstructure erection the overhaul repair of the existing building will be carried out with the purpose of removal of moral and physical wear which would include modernization of the spatial-planning structure of the building, warmth-keeping jacketing, reconstruction of utilities, millwork, provision of water, gas, electricity meters in each apartment.

The experience concerning the development of design proposals for five-storey built-up area reconstruction has revealed a great variety of potential approaches to provision of highly comfortable dwelling conditions (one-, two- and even three-level apartments, large balconies, loggias, galleries, greenhouses, arts and other workshops, etc.).

Thus, in addition to mansard-type building-on, erecting a multi-storey one on independent foundations is proposed. It will widen the range of means which affect the formation of the most rational environment. In particular, variable-storey building-on will allow not only to improve architectural expressiveness of the five-storey dwelling built-up area but also to increase its density. All these promote reliable basis for most efficiently using space in the most prestigious city areas.

Today it is difficult to evaluate general efficiency resulted from reconstructing five-storey dwelling built-up areas, whose space is about 6,8 billion square metres only in Kharkov. However, according to our draft feasibility study, densening five-storey built-up areas via the proposed approach will bring about an increase in the existing housing of about 30-45%. Thus, it will yield some 3 billion square metres of total dwelling space what will save over 700 hectares of both rural land and expensive urban areas.

The value of additional areas gained by the method of heightening and annexing new dwelling spaces does not exceed 80 % of the cost of dwelling in newly-constructed buildings.

To manage the reconstruction, one should accomplish a complex inventorying of all the standard five-storey housing in the area according to the proposed approach. It will allow to work out zoning for every bunch of buildings being reconstructed.

Now measures to solve social problems resulting from the reconstruction are being considered what is of key importance in implementing any reconstruction project.

Improvement of Operating Buildings and Structures in Ukraine

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Summary

This report gives a review of the building industry of Ukraine. There is also pointed out a problem of considerable moral and physical depreciation of operating buildings and structures. Special attention draws to the necessity of dwelling-houses modernization and to the obligatory certification of building materials and constructions, using on the territory of Ukraine.

In the course of last years building industry in Ukraine is in the state of crisis. Many plants of building industry practically do not work , building organizations are kept busy only partially. The builders are in the serious position and in addition to this, economic situation in the country became worse than it was on previous years, enterprises and people have no money for construction of dwelling-houses, the priorities in the sphere of dwelling-houses construction are changed.

Special feature of buildings and structures construction in Ukraine is in the fact that a great part of the country's territory is under the dangerous geological processes with the tendency to their spreading. Nearly 65 per cent of the territory of Ukraine is loess; processes of voids formation, including zones of active voids are in develpoment; 50 per cent of settled hillsides is subjected to landslips; 10 per cent - seismic; subsidence of the earth's surface occurs over mineral workings; soil erosion has place too.

In many areas two and more dangerous geological processes have place at the same time.

Building fund of Ukraine (administrative, industrial buildings and structures, dwelling houses) forms by the cost more than 60 per cent of fixed assets of the country's economy. The abrasion value of the building fund depending on the branches of industry and elements of social sphere, fluctuates within 50-70 per cent.

In many cases buildings deterioration defines not so much by the strength indicators of load-bearing constructions as by the heat-insulation properties of exterior walls and by the state of their facade surface. Moreover, units which were built in sixties-seventies need reconstruction nearly everywhere because of their exterior features.

In many towns of Ukraine there is a great number of buildings, including dwelling-houses, which moved up to the type of uncompleted construction. It is necessary to note that in the majority of cases "the temporarily closing" of buildings, construction of which was stopped on different reasons, was not held. It lead to the fact that many elements of the buildings are subjected to the influence of atmospheric precipitation and alternating freezing and defrosting.

In the first place there is a breaking of brick walls and concrete core units of floors and creation of unfavourable conditions for basements functioning; display of uneven buildings sags, appearance of cracks and progressing breaking of building constructions are possible too.

Difficult situation with the fuel-power resources in Ukraine required the guarantee of energy economy and carrying out the policy of energy conservation. In the nearest future increasing of electric power use in the economy of Ukraine can be achieved only at the expense of its economical consumption.

New thermotechnical standards for dwelling-houses and administrative buildings complicate the restoration of the construction scope, since the "warm walls" considerably increase the cost of it (construction).

Poor quality of buildings materials and bad maintenance of available housing is a considerable problem for modernization of dwelling-houses in Ukraine.

Physical state of constructions requires special evaluation for every concrete case, since even in one building there may be considerable distinctions between physical safe of exterior walls - the most unsatisfactory maintenance characteristics may be observed on the basement and ground floors, the formation of cracks - in the butt-ended walls. That is why the modernization of buildings should have two interconnected results - increasing of wall heat insulation level and improvement of building exterior features in common.

At the present moment the Ukrainian market is filled with building materials produced abroad which in a number of cases do not meet the Ukrainian normative standards and in this connection do not provide required longevity.

Compalsory certification of building materials produced in our country and abroad will be held in Ukraine from the first of July, 1997, which gives an opportunity for considerable raising of buildings maintenance terms and will promote the improvement of their exterior features.

Taking into consideration the great potential of Ukraine as a state, scientific and engineering worlds try to improve building industry workers qualifications, quality and longevity of construction by the way of organization of exhibitions and scientific-technical seminars, elaboration of new normative documents and etc.

A great role in the increasing of buildings consumer (maintenance) properties play large foreign companies participating in seminars, conferences and exhibitions.