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MAIN AREAS OF ENERGY CONSERVATION IN THE SERVICING OF APARTMENT BUILDINGS

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Key words and phrases: development of new types of enclosures; energy conservation; improving architectural concepts and space-planning decisions; increase in efficiency of heating; ventilation and air-conditioning systems; optimal use of natural light; new development; reconstruction and complete overhaul.

Abstract: The paper considers the main areas of energy resources conservation. The classification of possible ways of reducing energy consumption used both for servicing and renovating of buildings is completed.

Conservation of energy and resources is an important area of technical policy in the Building Industry. This is related firstly, to reducing production in main spheres of the fuel energy complex (Fig. 1), and secondly, to reducing the general consumption of energy resources, where over 40 % of the whole production is consumed in providing heating, ventilation and hot water supply for residential, commercial and public buildings.

High consumption of energy resources for the servicing of buildings, results from the fact that Russia is the coldest country in the earth. For example, northern cities in Canada are situated on the same latitude as Kursk, and the south Siberian city Novosibirsk is situated just south of the capital of Denmark. In Denmark, however, the isothermal line for January is about 0 °C, but in Novosibirsk it is –20 °C. Because of this, in order to sustain the same living conditions, it is necessary to use two or three times more energy per person in Russia compared to Western Europe. This order of consumption would require the production of about 19 tons of conventional fuel per person per annum, which is three times the amount that the country produced in an economically good year, such as 1990.

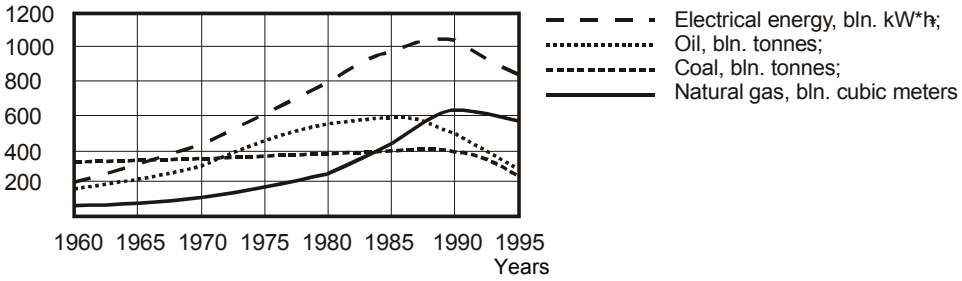

Fig. 1 Dynamics of the volume of output in main spheres of the fuel energy complex of Russia

There are two ways to lessen the deficiency of energy resources, used for servicing of buildings. Firstly, by increasing the production of energy, and secondly, by undertaking energy conservation measures in both new developments, and in renovation projects (e.g. reconstruction and complete overhaul). It should be noted, that the complete elimination of the energy deficiency can be achieved only through joint implementation of these two aspects.

The first way is based on the development and the reconstruction of reprocessors and distribution networks of the fuel energy complex. It is also based on increasing the production of both non-renewable energy resources (e.g. oil, gas, coal, wood, nuclear materials), and renewable resources (e.g. solar energy, water power, power of wind, of straits, of geothermal waters, of biomass, etc.). The main emphasis should be placed on using the latter, as their supply is unlimited. By having the correct approach to converting renewable resources into energy, it is possible to reduce the effect on the environment, which has become very important in the recent years because of the detrimental effect on the world's ecology.

The second method involves improving architectural concepts, space-planning decisions and structural schemes as well as installations. It is essential to consider these trends in the architectural design of whole developments as well as their interiors and separate building elements. For this reason a classification has been put together, which outlines the main ways of energy conservation in the residential buildings. It might be useful during the preparation of architectural designs (fig. 2).

Considering building design procedures, it is possible to mark four main areas for improvement of energy conservation. These are (1) improving architectural concepts and space-planning decisions of buildings and internal layout of rooms; (2) development of new types of enclosures, which have higher heat-shielding index; (3) increase in efficiency of heating, ventilation and air-conditioning systems; and (4) optimal use of natural light. Expected annual savings after implementing these improvement is as follows – (1) 8…10 %, (2) 8…20 %, (3) 10…30 %, (4) 6…8 %.

Improvements in architectural concepts and space-planning decisions of buildings and room layout may comprise, for example, more compact development of residential districts and areas; extension of the length and the width of buildings (extension of the length of a building from 4 to 10 units reduces the specific heat consumption for heating by 5…7 %, and extension of the width of a building from 12 to 15 meters – by 9… 10 %); optimisation of the number of storeys (increase of the number of storeys in a building from 5 to 9 saves heat by 3…5 %); relative reduction of the perimeter of a building (for example, by reducing the number of loggias); dense arrangement of duplicate types of buildings (kindergartens, schools, shops, etc).

Another way of energy conservation involves development of new types of enclosures, which have higher heat-shielding index [1]. These enclosures are window and balcony claddings, walls, the ground floor slab, roof space & roof coverings, entrance of a building.

Increase in efficiency of heating, ventilation and air-conditioning systems can be achieved by waste heat recovery of the ventilated air and by using automatic control systems.

Another way of energy conservation in apartment buildings is through optimal use of natural light, which can be achieved by managing the insolation of premises and dwellings, and the correct choice and positioning of artificial lighting.

It is established that every year consumption of conventional fuel for heating new housing space increases by about 0.9% compared to yearly consumption for heating existing buildings. It allows us to conclude that construction of new buildings, designed with consideration for present energy conserving technology, gives little benefit. Therefore, more attention should be given to energy conservation in the existing housing space [2]. This is reflected in the classification shown (fig. 2).

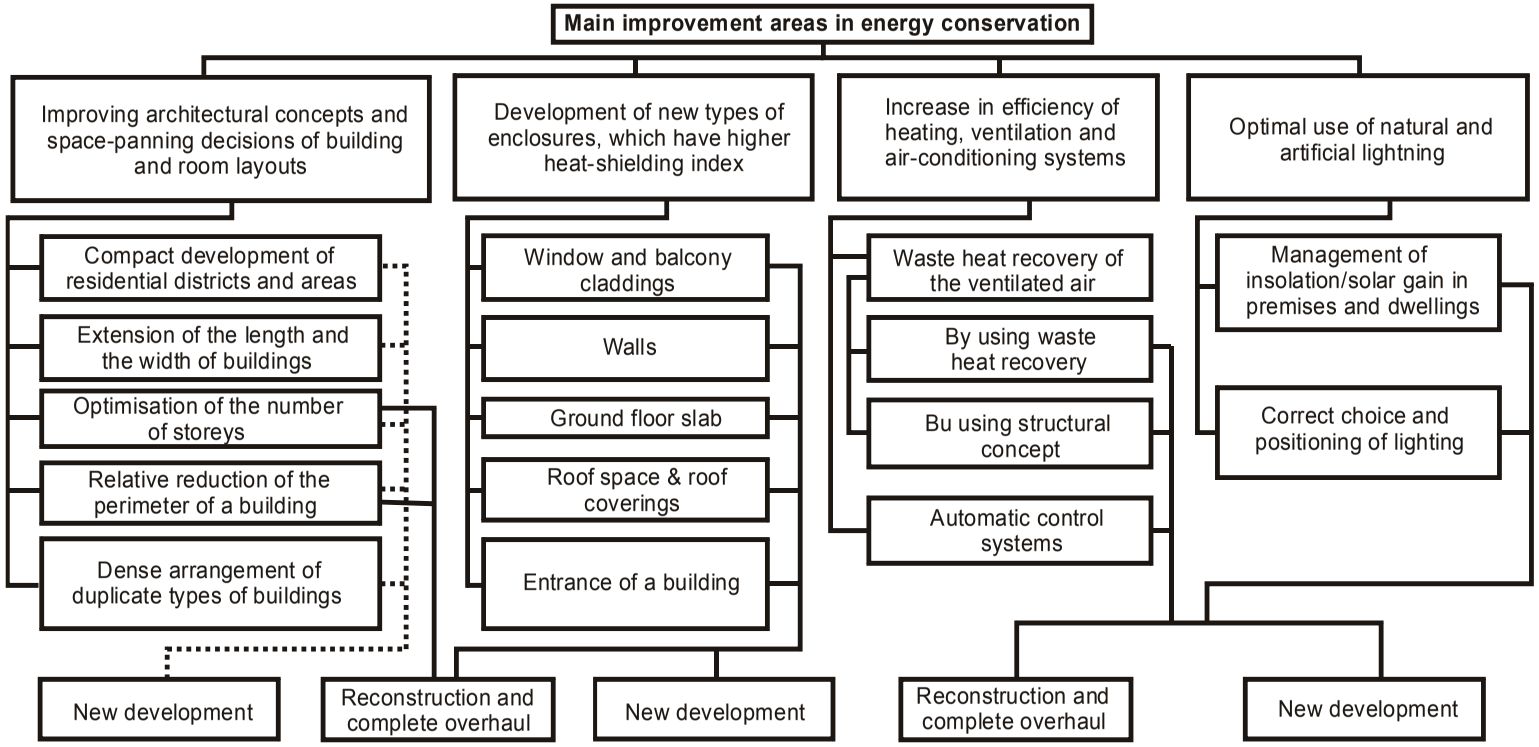

Fig. 2 Classification of the main improvement areas in energy conservation

Bearing in mind the fact that these measures can mainly be implemented only in the long term, a second shorter-term measure can be taken immediately by explaining the principle “turn the lights off when leaving” to the people, e.g. to follow the simplest rules. Just by doing this, we can save 5…7 % of overall energy generated in Russia.

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Основные направления энергосбережения в области эксплуатации жилых зданий

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Ключевые слова и фразы: архитектурные и объемно-планировочные решения; вентиляции и кондиционирования воздуха; естественное освещение; ограждающие конструкции; новое строительство; реконструкция и капитальный ремонт; системы отопления; экономия энергии.

Аннотация: Рассматриваются основные направления экономии энергетических ресурсов. Составлена классификация возможных путей снижения расхода энергии, идущей на эксплуатацию зданий, как в новом строительстве, так и при реконструкции.

Hauptrichtungen des Energiesparens auf dem Gebiet der Ausbeutung der Wohngebäuden

Zusammenfassung: Es werden die Hauptrichtungen der Einsparung der Energievorräte betrachtet. Es ist die Klassifikation der möglichen Wege der Senkung der Energiebenutzung, die auf die Ausbeutung der Gebäuden wie im neuen Bau als auch bei der Rekonstruktion ausgenutzt wird.

Principales directions de l’économie de l’énergie dans le domaine de l’exploitation des bâtiments d’habitation

Résumé: Sont examinés les principales directions de l’économie de l’énergie. Est présentée la classification des voies possibles de la diminution du débit de l’énergie pour l’exploitation des bâtiments ainsi que pour la reconstruction des ceux-ci.