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EARTHQUAKE RESEARCH OF ENERGY-SAVING WALLS

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Annotation. The article discusses the seismic resistance of energy efficient walled residential buildings and what innovations are being introduced in the Republic of Uzbekistan today.

Key words: energy saving, structures, design estimates, polystyrene concrete, dry construction mixtures, fiberglass composite pipes, vermiculite.

Аннотация. В статье рассказывается о сейсмостойкости энергоэффективных обнесенных стеной жилых домов и о том, какие инновации внедряются сегодня в Республике Узбекистан.

Ключевые слова: энергосбережение, конструкции, проектно-сметная документация, полистиролбетон, сухие строительные смеси, стеклопластиковые композитные трубы, вермикулит.

Аннотация. Мақолада энергия тежамкор деворли турар-жой биноларини зилзилабардошлигини таъминлаш ва Ўзбекистон Республикасида бугунги кунда қандай янгликлар қилинаётгани ҳақида ёритилган.

Калит сўзлар: энергия тежамкор, конструкциялар, лойиҳа-смета ҳужжатлари, полистиролбетон, қуруқ қурилиш қоришмалари, шиша толали композит трубалар, вермикулит.

Introduction. This article analyses the results of a wide-ranging study investigating the effects on energy performance of masonry buildings with historical/heritage value that have undergone typical seismic improvement interventions. The most frequently used techniques have been examined by analyzing, for each of them, the resulting effect on energy performances of the envelope in order to evaluate the variation of thermal properties of the materials employed for structures and finishes.

A significant part of Europe's building heritage is made up of old buildings constructed using poor quality insulation materials. Therefore, recent regulations, such as the EU Directive 2010/31 on buildings' energy efficiency, aim to increase energy efficiency standards, by considering both the single components and the entire building. In Italy, the energy improvement intervention regulated by the Legislative Decree takes into account the European Directive 2002/91/CE; actual regulations have been updated several times to comply with new European directives. The current energy saving standards have been recently integrated with a set of NZEB objective norms; last updates of 90/2013 law have been published in the Official Journal of the Italian Republic, 15 July 2015, n.39. However, the application of the aforementioned legislation is subordinate to Italy's own cultural conservation principles. Rules concerning the Italian energy performance certificate (APE), to check thermal installations, are still valid, whilst any other intervention must be evaluated by the local office of Ministry of Cultural Heritage and Activities and Tourism (MiBACT). The latter office evaluates, case by case, the adequacy of interventions. Despite their best intentions, current regulations have led to an increase in the gap in required performance between new buildings and historical buildings. Furthermore, a substantial absence of general rules about better compatibility among available energy retrofit technologies and other eligible interventions can lead to differences in treatment of similar cases in several contexts.

In recent years, a number of investigations have looked at energy saving and structural aspects. Different approaches have been adopted, ranging from holistic ones, dynamic simulations of entire buildings, to specific solutions such as the adoption of a thermal, vegetal based, insulating plaster.

An interesting multidisciplinary approach was investigated by Ascione et al., Mannella et al. and De Berardinis et al.: they proposed a replicable methodology for improving the performance

of historic buildings based on preliminary historical analysis, structural diagnosis and in-situ investigations. This multidisciplinary approach to building structural and energy diagnoses was applied to a case study obtaining a model to predict the structural safety of the building and its energy consumption. Tiberi and Carbonara explored aspects relating to retrofitting interventions for energy saving and the financial costs, introducing a case study and finding four solutions for the envelope; Calvi et al. presented an integrated approach to seismic resilience and energy efficiency assessments. Marques et al. and Calvi performed an in-depth cost–benefit analysis of the strengthening solutions, comparing the economic benefit gained by reducing the seismic damage against the intervention cost. More recently, smart and innovative integrated systems have also been designed in order to achieve important energy and environmental benefits regarding historical buildings.

The state of the art approach leans towards combined interventions and multidisciplinary approaches in the refurbishment process; however, it is important to understand the interactions going on. This study highlights how the execution of some of the most adopted typologies of structural improvement intervention on the outer walls typically cause an increase of the envelope thermal transmittance and, consequently, a general worsening of the energy performance of the building. However, an appropriate selection of materials and the techniques employed, with a very small increase in working times and costs, allows a rebalancing and even, in some cases, a notable reduction in thermal conductivity whilst respecting the original historical values of the buildings. The analyses carried out permit us to evaluate the impact of current regulation on energy efficiency in buildings that constitute Italy's cultural heritage.

The draft resolution of the President of the Republic of Uzbekistan «On additional measures to stimulate the production of energy-efficient and modern building materials» has been posted on the portal of discussion of draft regulations.

In accordance with this decision, the Association «Uzpromstroymateriallari» together with the Council of Ministers of the Republic of Karakalpakstan, regional and Tashkent city khokimiyats within three months conducted a complete inventory of all construction companies operating in the regions. form a database on the production capacity of structures and equipment.

The Ministry of Finance, the State Tax Committee, the State Customs Committee, the Ministry of Economy and Industry together with other relevant ministries and departments until July 1, 2019 to provide enterprises producing energy-saving, import-substituting and export-oriented construction materials, products, structures and equipment. , develops and approves the procedure for the application of benefits and preferences to design organizations, engineering companies and construction contractors for the rationalization of their use in the design and construction of facilities in urban planning.

According to the draft resolution, the Ministry of Economy and Industry of the Republic of Uzbekistan, the Ministry of Finance, the Association «Uzpromstroymateriallari» together with the relevant agencies and enterprises within three months in the regions in 2019-2021 to build energy-efficient, import-substituting It is planned to develop and submit to the Cabinet of Ministers of the Republic of Uzbekistan for approval a program for the creation of new capacities for the production of printing and export-oriented construction materials, products, structures and equipment. [1, 2]

Results. The impact on buildings' energy efficiency produced by structural improvement interventions is analyzed below focusing on conductivity and thermal transmittance of the envelope. This work analyzes some of the most common structural improvement interventions on various kinds of masonry and typically occurring in the historical buildings of central Italy (a territory characterized by important seismic events and by historical buildings, as shown in Figure 1). The investigated interventions are often used for the seismic retrofit of buildings damaged by earthquakes [23]. In general, restoration projects that include seismic improvements use several different types of intervention. Figure 2 illustrates the distribution of the principal interventions carried out on masonry buildings located outside the historical center of L'Aquila after the earthquake (Mw = 6.3) that occurred in the Abruzzi region on the 6 April 2009 [24,25]. Figure 2a shows the distribution of the most diffuse interventions and Figure 2b shows the distribution of secondary interventions: main intervention, for each building, refers to more widespread and costly work typology; secondary interventions, on the other hand, are complementary to the main ones.

The Ministry of Housing and Communal Services of the Republic of Uzbekistan, the Committee for Motor Roads under the Ministry of Transport of the Republic of Uzbekistan and the Association

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«Uzpromstroymaterialy» in the development of design estimates for housing, roads and drinking water networks on the basis of standard projects:

instead of traditional building materials (baked bricks, metal fittings, metal pipes, metal tiles, cement-sand plaster, etc.) energy-saving, import-substituting and new types of domestic building materials (polystyrene concrete, aerated concrete, foam concrete, foam rubber, composite reinforcement, gypsum board, cotton and reed-based slabs, dry building mixes, fiberglass composite pipes, vermiculite and other porous fillers, etc.).[4]

According to the proposals of the Ministry of Construction, the Ministry of Economy and Industry of the Republic of Uzbekistan and the Association "Uzpromstroymateriallari", the revision of existing national construction standards, taking into account new types of construction materials, products, structures, machines and mechanisms and construction technologies A scientific research institution will be established to conduct research on the harmonization of foreign normative and technical documents, as well as to conduct laboratory tests.[3]

The Ministry of Economy and Industry of the Republic of Uzbekistan, the Ministry of Innovative Development of the Republic of Uzbekistan, the Academy of Sciences of the Republic of Uzbekistan, Uzpromstroymaterials Association and other interested ministries and departments within three months to submit proposals on cluster production of construction materials, products, structures and equipment. develop.[5]

Conclusion. The Ministry of Innovative Development of the Republic of Uzbekistan develops priority issues based on the state scientific and technical program aimed at promoting innovative ideas, developments and technologies in the production of new types of energy-efficient, import-substituting construction materials and equipment.

From the analyses carried out on the masonry typology considered, structural interventions inevitably result in an increment of the thermal conductivity of the wall. This increment is significant in those cases (that are often very frequent) which utilize grout injections or grout injections and reinforced plaster. However, it is negligible when using reinforcement techniques that include insertion of artificial diàtonoi for increasing the connection between multi-leaf masonry walls.

It was possible to constitute a catalogue of outer walls that have up-to-date thermal properties in function of the structural intervention and of the energy efficiency improvement associated with it.

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МАВЖУД КАМ ҚАВАТЛИ ҚИШЛОҚ УЙЛАРИДА ПАССИВ ҚУЁШ ИСИТИШ ТИЗИМЛАРИНИ ТАДҚИҚ ҚИЛИШ НАТИЖАСИДА МАҚБУЛ ФАЗОВИЙ-ҲАЖМИЙ ЕЧИМЛАРНИ ШАКЛЛАНТИРИШ

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Аннотация. Мақолада кам қаватли қишлоқ уйларида пассив қуёш иситиш тизимларини тадқиқ қилиш натижасида мақбул фазовий-ҳажмий ечимларни шакллантириш усуллари мисоллар ёрдамида ёритилган

Калит сўзлар: қуёш энергияси, иссиқ яшик, қурилма, аккумуляция, эклептика, гелиоқурилма, йиллик аккумуляция.

Аннотация. В статье приведены примеры методов формирования оптимальных пространственно-объемных решений в результате исследования систем пассивного солнечного отопления в малоэтажных сельских домах.

Ключевые слова: солнечная энергия, горячий ящик, устройство, аккумулятор, эклиптика, солнечное устройство, годовой аккумулятор.

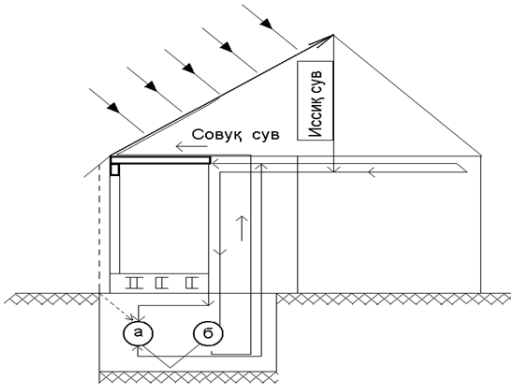
Annotation. The article provides examples of methods for the formation of optimal spatial-volumetric solutions as a result of the study of passive solar heating systems in low-rise rural houses.

Key words: solar energy, hot box, device, battery, ecliptic, solar device, annual battery.

Кириш. Ўзбекистоннинг иқлим шароитида ёз кунлари жуда иссиқ, қиш кунлар совуқ бўлади. Шунинг учун ёз фаслида хоналарни салқин қилиш ва қиш вақтида иситиш зарур бўлиб қолади. Кам қаватли қишлоқ уйларида иситиш ва совитиш ишларида қуёш энергиясидан фойдаланиш халқ хўжалигида муҳим аҳамиятга эга. Чукни, биноларни иситишга кўплаб қазилма ёнилғилари сарф бўлмоқда. Қуёш энергиясидан фойдаланиб, қазилма ёқилғиларини тежаш мумкин.

Қуёш энергиясидан фойдаланиб уйларни иситиш ва совитишда турли хил қурилмалар ишлатилади. Бу қурилмалардан қуёш сув иситгичларида фойдаланишни қараб чиқайлик.

Натижа. Уй томининг жанубга қараган нишаб томонига горизонтга 50^0 бурчак остида ўрнатилган иссиқ яшик типидаги қуёш сув иситгичи қуёш энергиясини иссиқликка айлантиришга хизмат қилади. Қуёш нурлари «иссиқ яшик»нинг ойнали томонидан қурилманинг ичига ўтиб, унинг қора рангга бўялган қозонида ютилади ва қозоннинг ичига оқиб кираётган температураси 12-14^{0}С бўлган сувни исита бошлайди. Бу сув уйнинг шипига ва деворларига ўрнатилган трубалардан оқиб ўтишида хоналар исийди. Сув иситгичдаги иссиқ сувнинг температураси 60-70^{0}С га тенг бўлади (1-расм). Агар хонани иситиш лозим бўлмай қолса, исиган сув уйнинг подвалига ўрнатилган бак аккумуляторда йиғила боради. Йиғилган иссиқ сувдан ҳаво булут бўлган кунларда ёки кечаси фойдаланиш мумкин.



Бак аккумулятор
а- иссиқ сув учун
б- совук сув учун

1- расм.

Ниҳоят қуёш энергияси сувни иситиш учун етарли бўлмай қолганда ёнилғи билан ишлайдиган қурилма ишга туширилади.

Ёз вақтида қурилма кундуз куни иссиқ сув билан таъминлаш ва бошқа турли эҳтиёжлар учун ишлатилади.

Кечаси қурилманинг ойна билан қопланган сиртидан юпқа қатлам қилиб сув оқизилади. Натижада, сув буғланаётганда совиб температураси 12-14 ^{0}C гача пасаяди (атроф температураси 20^{0}C дан ошиқ бўлсада) ва совуқ сув учун мўлжалланган бак-аккумуляторда тўпланади. Совиган сув насос ёрдамида биноларни совитиш системасига юборилади. Совитиш системаси сифатида уйнинг шипи ва деворларига ўрнатилган трубалардан фойдаланилади. Шундай қилиб қуёш қурилмасидан кечаси совитиш учун фойдаланилади. Аккумуляцияланган совуқ сувни кундузи насос орқали юқорига чиқарилиб, қишда хоналарни иситиш, ёзда совитишда фойдаланилади.

Тажрибалар кўрсатадики, қурилманинг 1 м^2 сиртидан йил давомида 550 х 10^3 ккал иссиқлик олиш мумкин. Бу эса 400 кг кўмирни ёққандаги ажралиб чиққан иссиқлик миқдорига тенгдир.

Қуёш энергияси миқдори катта бўлишига қарамасдан ундан амалий мақсадларда фойдаланишнинг бир қанча қийинчиликлари ҳам бор.

Биринчидан, қуёш нури ер шарининг бутун сатҳи бўйича сочилади. Унинг қувватини ошириш учун концентраторлар ёрдамида бирор кичик юзага йиғиш зарур. Иккинчидан, қуёш эклептика бўйича йил давоми кўринма ҳаракат қилади, натижада унинг оғиш бурчаги $\delta = +23^0\ 27^1$ дан $\delta = -23^0\ 27^1$ гача ўзгаради.

1-жадвалда унинг ойлар бўйича ўзгариши келтирилган.

Кунлар ва ойлар	22.XII	15/I	19. II	22. III
d	$-23^0\ 27^1$	$-21^0\ 30^1$	$-11^0\ 39^1$	$+0^0\ 37^1$

Кунлар ва Ойлар	30.IY	16.Y	22. YI	15. YII	18. YIII
d	$+14^0\ 45^1$	$+19^0\ 05^1$	$+23^0 27^1$	$+21^0 32^1$	$13^0 08^1$

Шуни айтиш керакки, қуёшнинг оғиш бурчаги ўзгариб турганлиги сабабли ер юзига тушаётган энергия миқдори ҳам ўзгариб туради. Бу эса ўз навбатида гелиоуйлар ва гелиотеплицаларни иситишга салбий таъсир этади. Иккинчидан, ёз ойларида кун узоқ бўлганлиги учун қуёшдан энергия тушиш даври ҳам кўп бўлади(13 соат давом этади). Қиш ойлари аксинча кеча узоқ, кун қиска (ер сирти 9 соат давомида ёритилиб турилади) бўлади.

Қиш ойлари қуёшнинг оғиш бурчаги манфий қийматларни олгани учун унинг баландлиги ҳам камаяди. Демак, энергия кўпроқ ўтсин учун уни қабўл қилувчи юзаларнинг горизонтга нисбатан қияликларини ўзгартириб туриш керак, яъни қуёш нурларига нисбатан тик ҳолатга келтириш зарур.

Агар гелиоқурилма тиниқ юзасининг горизонтга нисбатан қиялигини техник сабабларга кўра ўзгартириш имконияти бўлмаса, қиш пайтида ишлаш учун мўлжалланган гелиоқурилмалар, масалан, гелиоуйлар, гелиоиссиқхоналар тиниқ юзаларининг қиялик бурчаклари ўша жойнинг географик кенглигига қараб қишда $\alpha_1 = \varphi + \delta$, ёзда $\alpha_2 = \varphi - \delta$ олинади.

Ёз ойларида ишлашга мўлжалланган мосламаларни, жумладан, сув иситгичлар, мева қуритгичлар ва шўр сувдан чучук сув олиш курилмаларининг қиялик бурчаклари одатда кичик қилиб олинади.

Қуёш энергиясидан фойлананишнинг учинчи камчилиги унинг об-ҳавога боғлиқлигидир. Даставвал қуёш энергияси миқдорига атмосферанинг тиниқлиги таъсир этади. Атосферанинг қуёш нурларини ютиши, сочиши ва қайтаришини ҳисобга олиб ер юзасига тушадиган қисмини Qm га тенг деб оламиз. Агар қуёш доимийсини (атмосфера чегарасидаги миқдорини) Q0 десак, улар орасидаги боғланиш қуйидагича бўлади:

$$Q_m = K^m \cdot Q^0$$

К – атмосферанинг тиниқлик коэффициенти,

m – қуёш нури ўтадиган атмосфера массаси

Маълумки, атмосферанинг масса сони қуёшнинг горизонтдан баландлигига боғлиқ, ма-

салан, α=0 бўлганда (қуёш горизонтда) m=1 га тенг бўлади. $\alpha=30^0$ бўлса m = 2, $\alpha=90^0$ (қуёш зенитда) бўлганда m =35,4 ни ташкил этади.

Ер сиртининг географик кенглиги, иқлими, жойлашиши ва бошқаларига қараб жойларда булутли кунлар асосан тўла булутли кун, қисман булутли кунга бўлинади.

Гелиотехника нуқтаи назаридан, гелиоқурилмалар у ёки бу жойда очиқ ва ярим очиқ кунларнинг сони 320 ва ундан ортиқ бўлса, жуда яхши самара беради.

Ўрта Осиё республикаларида, жумладан, Ўзбекистоннинг жанубий худудларида шундай кунлар сони йилига 315-330 ни ташкил этади.

Ёз ойларида гелиоқурилмаларга салбий таъсир этадиган 4 –чи омил чанг-тўзонли шамолдир. Биринчидан, қуюқ чанг-тўзон кўтарилганда қуёш энергиясининг тиниқ юзаларга тушиши камаяди, иккинчидан, қурилманинг юзасига чанг ўтириб қолади. Чанг қатлами эса қурилма ичига қуёш энергияси ўтишига тўсқинлик қилади. Натижада қурилма хизматчиларининг кўп вақти шишани тозалашга сарфланади.

Қуёш энергиясидан фойдаланишда содир бўладиган қийинчиликлардан бешинчиси, унинг сутка давомида ўзгариб туришидир, яъни гелиоқурилмалар ичига кун давомида қуёш энергияси ўтиб турса-да, кечга яқин энергия ўтиши тўхтайди.

Қуёш энергиясини аккумуляциялаш муддати 4 га бўлинади: йиллик аккумуляциялаш, муддатли аккумуляциялаш, суткали аккумуляциялаш, даврий аккумуляциялаш.

Йиллик аккумуляциялаш иссиқ пайтларда қуёш энергиясини тўплаб совуқ пайтларда, муддатли аккумуляциялаш- кузда (3 ой давомида) қуёш энергиясини тўплаб, қишда (3 ой давомида) фойдаланишдан иборат.

Суткали аккумуляциялашда –қиш ва баҳор ойларида кундузи қурилма ичига ўтган қуёш энергиясининг бир қисмини тўплаб кечаси қуёш ботгандан сўнг фойдаланилади.

Даврий аккумуляциялашда 3-4 кун давомида қуёш энергиясини тўплаб, кечаси ва булутли кунларда ундан фойдаланиш, ташқи ҳаво температураси кўтарилганда эса аккумуляторни ажратиш ва зарур бўлганда яна қўшиш керак.

Қуёш иситиш системаларида асосан икки хил аккумулятордан фойдаланилади: 1) ўзига иссиқликни қабул қилиб олувчи – иссиқлик сиғимли аккумуляторлар, 2) кимёвий (изотермик) аккумуляторлар. Иссиқлик сиғимли аккумуляторларда иссиқлик тўловчи модда сифатида тупроқ, қайроқ тош, ғишт, сув, бетон, қум кабилар ишлатилади.

Келажакда, қуёш энергиясини аккумуляциялашнинг яна бир қулай усули уни маълум бир баландликка жойлаштирилган махсус сув ҳавзаларида тўплашдан иборат. Бунинг учун қуёш электростанцияси ишлаб чиққан энергиянинг бир қисми ҳисобида махсус насослар ёрдамида сув пастки ҳавзадан юкоридаги ҳавзага ташланади. Натижада сувнинг потенциал энергияси ошади. Кечаси, юкори ҳавзадан сув электрогенераторга уланган турбиналар орқали яна пастки ҳавзага қуйилади, генератор электр токи ишлаб чиқара бошлайди.

Тажрибадан маълум бўлишича, гелиоиссиқхона ва гелиоқуритгич жанубга қаратилган тиниқ юзалари бир қават шиша ёки полиэтилен плёнка бўлса, қурилма тезда совуб колади. Шунинг учун бундай гелиоқурилмаларнинг шимол томони бир неча қатламдан иборат иссиқлик химояси қатламдан, жанубга қаратилган тиниқ юзалари эса бир-биридан 5-10 см ҳаво зазордаги икки қават шиша ёки полиэтилен плёнкали қатламдан тайёрланади.

Гелиоиссиқхона – қуритгичладан йўқотиладиган жами иссиқли миқдори қуйидагича ифодаланади:

$$\Sigma Q_{й} = Q_m + Q_n + Q_ф + Q_Т,$$

бу ерда:

$\Sigma Q_{й}$ – жами йўқотиладиган иссиқлик миқдори;

Q_m – шиша юза орқали йўқотиладиган иссиқлик миқдори;

Q_n – иссиқхонанинг тиниқ бўлмаган юзаси орқали йўқотиладиган иссиқлик миқдори;

$Q_ф$ – фундамент орқали йўқотиладиган иссиқлик миқдори;

$Q_Т$ – тирқишлар орқали йўқотиладиган исиқлик миқдори.

Бундай ҳолларда жами юзаларнинг иссиқлик узатиш коэффициенти К = 1,2 – 2,9 $вТ/м^2$ х К бўлса иссиқлик йўқолиши минимал миқдорда бўлишига эришилади.

Тажрибалар кўрсатишича, гелиоиссиқхоналарнинг тиниқ юзалари орасидаги шиша қатлам қалинлиги 4 см ва 6 см ли полиэтилен пленка бўлганда иссиқлик ҳамда намлик режимлари нормал бўлишига эришилади.

Шундай қилиб, иссиқлик аккумуляторлари паст температурали гелиоқурилмалар учун,

хусусан гелиоуй, гелиоиссиқхона, гелиопарниклар учун муҳим роль ўйнайди.

Хулоса. Юқорида куёш энергиясидан кишлок хужалигида, турар жойларда, гелиоиссиқхона ва гелиоуйларда фойдаланиш сохасида мухим проблемалардан бири-кечаси ва булутли кунларда уларнинг ичидаги температурани оптимал даражада ушлаб туриш йуллари билан танишиб утдик.

Бу масала, биринчи навбатда, гелиокурилмаларда иссиклик аккумуляторларини жойлаштириш йули билан амалга оширилади. Демак паст температурали гелиокурилмаларнинг бир кисми учун иссиклик аккумуляторлари керакли ва зарур мосламалардан хисобланади, чунки юкорида мисол тарикасида келтирилган температура ва куритиш режимлари курсатишича, хакикатан хам, иссиклик аккумуляторлари, кечаси алохида иссиклик манбаи ролини уйнар экан.

Биринчидан, конкрет об-хаво шароитига, курилманинг ишлаш даврига, кайси максадларга мулжалланганлигига, хажмига, юзаларининг герметик холати ва бошкаларга караб танланади. Масалан, бахор ойлари ишлаш учун мулжалланган гелиоиссикхоналар учун тупрокли аккумуляторнинг узи етарли. Демак, барча холлар ва курилмалар учун умумий ягона типни тавсия этиш муаммо масаладир.

Иккинчидан, иссиклик аккумуляторларининг иктисодий томонларига алохида эътибор бериш зарур, жумладан, кечаси кайтиб олинадиган иссиклик микдори иссиклик ташувчи хавони мажбурий харакатга келтирувчи вентиляторга сарфланадиган энергиядан канча ортик булишини хисобга олиш зарур. Агар вентиляторга сарфланадиган энергия олинадиган энергиядан ортик булса, курилма самарли хисобланмайди.

Бу уринда шуни эслатиб утиш керакки, баъзи курилмаларнинг иссиклик аккумуляторларида, исиган хавонинг циркуляцияси табиий, вентиляторсиз булади. Шу сабабли, буларда иссиклик туплаш учун энергия сарфланмайди.

Учинчидан, курилма махсус иссиклик аккумуляторларини жойлаштириш учун сарф буладиган харажатларни хисобга олиш зарур.

Гелиоиссикхоналардан фойдаланувчи хужаликлар шуни эътиборга олишлари зарурки, каттик кишда бу курилмаларда, албатта иситиш воситаси электроколорифер булиши зарур, акс холда мулжалдан катта булган бир кунлик совук куп кунлик мехнатни зое кетказиши мумкин.

Шундай килиб, куёш энергияси ер юзасига узлуксиз тушаётган булсада, улардан фойдаланишда хали куп муаммолар мавжуд.

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INVESTIGATION OF SOUND INSULATION OF CURTAIN WALLS IN RESIDENTIAL BUILDINGS

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Annotation. The article describes the location of walls in residential buildings, the location of curtain walls and how to ensure their sound insulation.

Key words: curtain walls, construction, hemp fiber, aerated concrete, hollow transparent parts.

Аннотация. Мақолада турар-жой биноларида деворларнинг ўрни, парда деворларининг жойлашиши ва уларнинг товуш изоляциясини таъминлаш усуллари келтирилган.

Калит сўзлар: парда деворлар, конструкция, каноп толалари, ғовак бетон, ичи ковак шаффоф деталлар.

Аннотация. В статье описано расположение стен в жилых домах, расположение навесных стен и способы обеспечения их звукоизоляции.

Ключевые слова: навесные стены, конструкция, конопляное волокно, газобетон, пустотелые прозрачные детали.

Introduction. Architecture has long been known to strive to organize the ideas that exist in society, to meet the needs of the state and society, in addition to serving functional functions. Suffice it to recall the famous words of our ancestor Amir Temur: "If in doubt about our power, look at the buildings we have created."

In residential buildings, the walls, depending on their function and location, act as an internal and external barrier, that is, protecting the room from the external environment or separating the rooms from each other, at the same time they also serve as load-bearing.

Walls are divided into load-bearing and non-load-bearing types. Lifting walls carry the weight that falls from the structures, fixtures, furniture, and so on above. Both interior and exterior walls can be load-bearing. The barrier (curtain) walls that divide buildings into smaller rooms are considered load-bearing. Such walls may also be in the form of suspended walls placed on foundations or foundation beams, self-supporting and suspended on columns. Suspended walls will rest on horizontal elements at the height of each floor.

The result. The following rules should be followed when installing curtain walls to improve their soundproofing properties. First, curtain walls should not be installed directly on a clean floor level as well as on a floor lag. They are mounted on beams or on reinforced concrete interlocking slabs. In this case, the mixture is laid under the wall. A soft floor covering is also applied to the floor where the curtain is attached to the wall to reduce sound transmission.

Care is taken to ensure that the areas where the curtain walls are connected to each other or to the main walls are tightly bonded. To do this, hemp fibers are stuffed into the cracks and covered with mud. Curtain walls are made 10-15 mm below the ceiling, hemp fibers are plugged into the cracks and mud is applied 25-30 mm thick. To fasten the curtains to the ceiling, special rings or steel plates are inserted between the shutters. For this purpose, 10–15 mm deep grooves in the ceiling of the slab with hammers are fastened to the upper rail of the panel frame with nails or screws to install the plates. (Screws with screws are fastened to the ceiling or wall in 2–3 places on each side of the walls). If the middle of the curtain wall coincides with the seam between the intermediate cover plates, then one end of the steel wire is connected to the lifting ring on the curtain wall, the other end is passed upwards between the intermediate cover plate and fastened with anchors.

If the curtain walls are mounted steel plates on both sides of the progon beam, the plates are tightened using bolts. In most cases, methods of attaching the plates to the ceiling or wall structure using construction pistols are also used.

The vertical interior walls that separate the rooms from each other and are not load-bearing are called curtain walls.

In residential buildings, curtain walls are also used to support the load falling from the partitions. Such wall constructions will be based on separate foundations and their solution will be the same as the solution of load-bearing walls.

Curtain walls will be based on structures (hedges, slabs) that support the inter-storey coverings.

Curtain walls on the first floor and basement of buildings without basements are mounted on concrete or brick columns. Curtain walls cannot be installed directly on the floor. Curtain walls must meet the following requirements: strong, light, sound, vapor and gas impermeable, water resistant, non-flammable, prepared for surface painting or wallpapering, the surface should be free of bumps and pits. In residential buildings, curtains are divided into types based on the function of the walls, separating the rooms, separating the apartments and used in the sanitary rooms. Curtain walls can be fixed and sliding.

Curtain walls can consist of small or large elements. Curtain walls made of small elements are assembled at the construction site. Curtain walls, which consist of large elements, are made in factories and assembled at the construction site. Depending on the material of the curtain walls can be made of brick, hollow ceramic and lightweight concrete blocks, wood chipboard or wood chips, panels and blocks made of gypsum, gypsum chipboard, various lightweight and porous concrete, as well as glass blocks.[3]

The choice of curtain wall types takes into account not only the cost of construction and labor costs, but also the time spent on construction and the possibility of using local building materials. For residential buildings, their cost should be 8-10% of the total cost of the building, and the cost of installation work should be about 15% of the total cost of construction. Installing such a large panel curtain wall requires 1.5–2 times less labor than installing small-sized gypsum curtain wall tiles.

Conclusion. When panel curtain walls are used in multi-storey buildings, labor productivity increases and construction costs decrease.

Brick curtain wall thickness is ½ or ¼ brick thickness. Thickness ½ brick walls should not exceed 3 m in height and 5 m in length. If the height and length of the room is greater than the specified dimensions, then after every six rows it is reinforced with long steel sheets with a thickness of 1.5 mm and a width of 25 mm, located along the horizontal seams. The ends of such fittings shall be connected to the fittings of the main structure of the building. For curtain walls with a thickness of ¼ bricks, a wall with a grid of 525–525 mm is formed by means of fittings placed in horizontal and vertical joints, which increases the stability of the wall.[5]

Curtain walls with a thickness of 90 and 190 mm are made of slag-concrete stones, and ceramic stones are used for curtain walls with a thickness of 120 mm. In many public buildings, curtain walls are made of hollow transparent details with various patterns on the inner and outer surfaces.

Such blocks have a beautiful appearance and transmit light well by themselves. Cement mix and steel reinforcement are also used in the assembly of glass blocks. Profiled glass boards of various shapes are produced equal to the height of the floor of the building. These elements are poured between the lower and upper belts, and the seams are filled with special mastic.

The role of thermal insulation materials in ensuring the energy efficiency of buildings is invaluable. The use of heat-insulating materials reduces the thickness and weight of wall and barrier structures and saves the consumption of basic building materials (cement, metal, brick). According to the analysis, the use of heat-insulating materials in the barrier structures of panel and frame buildings reduces the consumption of steel 1.5-3 times, cement 3-4 times, 1 ton of mineral wool replaces 7.5 thousand bricks compared to buildings without heat-insulating materials [1]. . Weight reduction of structures is especially relevant in seismic areas, as it reduces seismic loads depending on the weight of the buildings.

In the selection of effective heat-insulating materials, attention is paid to their thermal insulation properties, environmental safety, cost, production volume in our country, technological properties, service life and other factors.

The analysis shows that a comprehensive approach to the selection of effective heat-retaining materials in the construction of energy-efficient buildings, and the use of a computer program is recommended. Therefore, to ensure the energy efficiency of buildings, it is very important to study new effective heat-retaining materials, especially those made on the basis of local materials and industrial waste.

Gypsum boards are widely used for heat storage in energy efficient buildings. They are used on walls and ceilings. Gypsum boards retain heat well and improve acoustic properties. Gypsum is used in buildings as a stand-alone material and various gypsum products: gypsum plasterboard, gypsum plasterboard, plywood, etc.

The possibilities of using gypsum materials and materials in construction are not yet fully

used and it is possible to increase their use in construction. Their widespread use in construction not only replaces the deficient cement, but also saves energy resources, increases the economic efficiency of binders and creates energy-saving technologies for their production [2].

Uzbekistan has large reserves of gypsum. Uzbekistan plans to extract 1.8 million tons of gypsum in 2025. The work of Uzbek scientists in the field of gypsum binders is recognized abroad. However, the production and application of gypsum binders and materials based on them is not sufficient. At the industrial level, mainly low-grade gypsum and a small amount for special purposes - high-strength gypsum and gypsum cement cement binder are produced. The market of construction materials is dominated by expensive gypsum products produced abroad.

Therefore, the issue of production of artificial decorative tiles from competitive composite materials using waste based on low-grade construction gypsum is very relevant.

Artificial fillers - slag, perlite, vermiculite, agliporite, polystyrene foam, etc. to reduce gypsum consumption in production conditions. used. The use of industrial and agricultural wastes instead of these fillers is economically and environmentally efficient.

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MODELING THE INTERACTION OF THE BUILDING WITH THE GROUND IN THE CALCULATION OF SEISMIC FORCE

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Аннотация. В статье изложена методика определения усилий, возникающих в элементах конструкции высотного здания при сейсмическом воздействии. С использованием стандартных вычислительных процедур метода конечных элементов в программном комплексе ПК SCAD Office SCAD Soft проведено численное моделирование нагрузок, возникающих в элементах конструкции пятнадцатиэтажного здания в результате сейсмического воздействия. Установлены закономерности распределения усилий и деформаций в элементах конструкции в зависимости от этажа здания

Ключевые слова: сейсмические нагрузки, метод конечных элементов, математическая модель, строи-тельный объект, моделирование.

Annotation. The article describes the methodology for determining the forces arising in the structural elements of a high-rise building under seismic action. Using the standard computational procedures of the finite element method in the SCAD Office SCAD Soft software package, the numerical simulation of the loads arising in the structural elements of a fifteen-story building as a result of seismic action was carried out. The regularities of the distribution of forces and deformations in the structural elements depending on the floor of the building have been established.

Key words: seismic loads, finite element method, mathematical model, construction object, modeling.

Annotatsiya. Maqolada seysmik ta'sir ostida ko'p qavatli binoning konstruktiv elementlarida paydo bo'ladigan kuchlarni aniqlash metodologiyasi tasvirlangan. SCAD Office SCAD Soft dasturiy ta'minot to'plamida cheklangan elementlar usulining standart hisoblash protseduralari yordamida seysmik ta'sir natijasida o'n besh qavatli binoning konstruktiv elementlarida paydo bo'ladigan yuklarning sonli simulyatsiyasi amalga oshirildi. Bino qavatiga qarab konstruktiv elementlarda kuchlar va deformatsiyalarning taqsimlanish qonuniyatlari aniqlangan.

Kalit so'zlar: seysmik yuklamalar, cheklangan element usuli, matematik model, qurilish ob'ekti, modellashtirish.

Introduction. Seismic zones with an earthquake intensity of 7-9 points make up about 30% of our country. In conditions of seismic activity, when choosing the parameters of buildings under construction, it is necessary to take into account the recommendations for choosing a construction site, design and planning solutions, which are reflected in the KMK set of rules [1,2].

The results of scientific research or adopted technical solutions must be confirmed in practice, experimentally. This is especially important when solving such a responsible and complex problem as determining the parameters of loads on structural elements of structures under seismic loads.

Natural experiments for modeling seismic processes are too expensive and do not always allow the required range of variation of factors to be realized.

In physical modeling, special stands are used, which significantly reduce the cost of conducting an experiment in comparison with field studies [3]. The parameters of the simulated objects and processes are determined on the basis of the theory of similarity and give adequate results. However, physical modeling also requires significant expenditures of both time and money in the study of new design solutions or significant changes in the parameters of existing models.

In addition, the physical implementation of seismic impacts is extremely difficult due to the high uncertainty of their parameters: spectral composition, duration of impact, direction, etc.

Computer modeling is more expedient, since it allows to reduce the labor intensity and cost of the experiment, to implement any parameters of seismic impact [4].

The calculation of seismic loads on buildings must be performed for two cases [5]:

a) calculation of buildings based on the condition of the absence of complete or partial loss of operational properties under seismic loads corresponding to the level of the design basis

earthquake. Deformations of structural elements must correspond to the elastic deformation area;

b) calculation of loads in load-bearing elements of structures in the area of brittle fractures under an impact corresponding to the level of the maximum design earthquake.

As a rule, seismic loads have a complex spatial direction. But for construction projects with simple design solutions, it is allowed to take into account seismic loads in the horizontal plane. The force corresponding to the *i*-th form of natural vibrations of the structure and applied to the *k*-th point of the design model in the direction of the *j*-th generalized coordinate of the system [5].

$$S_{ik}^{j} = K_0 K_1 S_{0ik}^{j}$$

$K_0 K_1$ – where and are the coefficients, respectively, taking into account the purpose and allowable damage to buildings [1];

S_{ik}^{j}- force of seismic action on a building in the elastic area of deformation of structural elements for the *i*-th form of natural vibrations of a construction object:

$$S_{ik}^{j} = g m_k^j A K_A \beta K_\varphi \eta_{ik}^{j}$$

g – where is the acceleration of gravity; gm_k^j – is the mass of a structural element of the structure reduced to point k along the j-th generalized coordinate; - coefficient depending on the design seismicity; - coefficient taking into account combinations of seismic intensity; - amplitude rise factor; - coefficient of energy dissipation by the building; - coefficient depending on the vibration mode and the point of load application in the direction of the j-th generalized coordinate [1].

Complex structural, planning and spatial forms of modern building objects complicate their mathematical modeling. The description of the behavior of such complex systems with a large number of degrees of freedom is possible using a system of differential equations of the appropriate order, the solution of which requires enormous computing power [6].

It is much more convenient to calculate complex spatial systems using computer programs that solve problems using the finite element method. Let's consider the calculation of seismic effects on a building in the SCAD Office SCAD Soft software package.

To calculate the parameters of dynamic processes occurring in a building under the action of seismic loads, it is necessary to build a three-dimensional model and break it down into finite elements [7, 8].

Then a set of parameters of seismic action and dynamic loads is determined, which determine the oscillatory processes, taking into account the inertial forces applied to the nodal points of the model. The direction of the applied forces and loads must correspond to the boundary conditions and degrees of freedom. As an example, consider a monolithic fifteen-story building with no beamed ceilings, the finite element model of which is shown in figure 1.

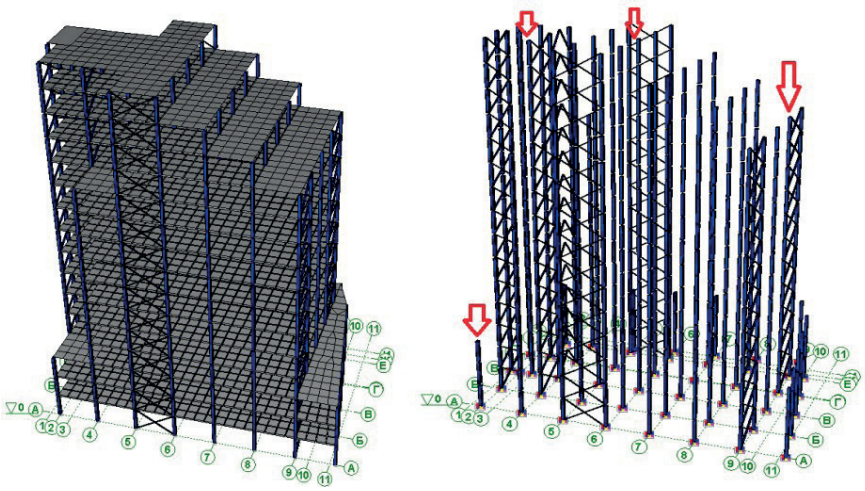

Figure 2 - Finite element model of a 15-storey building in the PC program SCAD Office SCAD Soft.

The building has a height of 52.5 m and consists of 48 free-standing columns and sections of stiffening diaphragms. The foundation is made in the form of a reinforced monolithic reinforced concrete slab 1000 mm thick. The thickness of the interfloor monolithic reinforced concrete floors is 200 mm. Stiffness diaphragms 200 mm thick, column section 500 × 500 mm. Reinforcing bars of class A400, concrete of class B25 are adopted as reinforcement elements. The outer walls are made of energy-efficient foam concrete blocks, are self-supporting and are not conventionally shown on the model.

The estimated intensity of seismic impacts ranged from 7 to 9 points. The design basis earthquake was taken to be the maximum level of seismic effects with a recurrence period of once every 100 years (map OSR-2012 A). The maximum design earthquake is the maximum level of seismic impacts with a recurrence period of once every 500 years (map OSR-2012 B).

The SCAD Office SCAD Soft software package allows you to visualize the calculation results (Fig. 3) using color data representation (heat map), thanks to which you can easily identify the most loaded structural elements.

The simulation results are shown in Fig. 2.

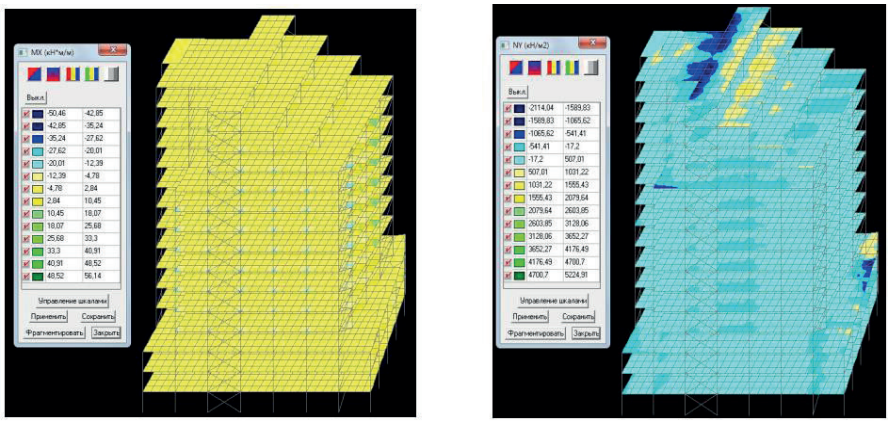

Figure 2 - Visual representation of stresses and displacements in structural elements using a heat map.

The analysis of the obtained dependencies shows that when a seismic effect occurs, the main efforts are taken by the first floor of the building. This allows us to conclude that it is necessary to structurally strengthen this part of the structure. A characteristic feature of the force diagram is the alternating nature of the loads in the structural elements, which is explained by their inertial characteristics.

An analysis of the displacements of structural elements across floors shows that the main displacements, and, consequently, deformations of structural elements occur on the first two floors of the building. Further change in displacements for all other floors of the building does not exceed 10%. Thus, the paper presents a methodology for determining the forces arising in the elements of the building structure under seismic action. Using the standard computational procedures of the finite element method in the SCAD Office SCAD Soft software package, the numerical modeling of the loads arising in the structural elements of a fifteen-story building as a result of seismic action has been carried out. The main efforts arise in the structural elements of the first floor, which determines the need for structural reinforcement of this part of the building. The main movements of structural elements occur on the first two floors of the building.

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DEVELOPMENT OF WAYS TO INCREASE THE ENERGY EFFICIENCY OF RESIDENTIAL BUILDINGS WITH REINFORCED CONCRETE EXTERIOR WALLS

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Annotation. Methods of developing ways to increase the energy efficiency of residential buildings with reinforced concrete construction of external walls are described.

Аннотация. Ташқи деворларни темирбетон конструкцияли турар-жой бинолари энергия самарадорлигини ошириш йўлларини ишлаб чиқиш усуллари ёритилган.

Калит сўзлар: атроф-муҳит, муҳандислик тизимлари, иссиқлик муҳофазаси, якка тартиб, деворларнинг периметри.

Аннотация. Описаны методы разработки способов повышения энергоэффективности жилых домов с железобетонной конструкцией наружных стен.

Introduction. We carried out the research of reinforced concrete columns without the transverse reinforcement to get experimental data about load bearing capacity, crack resistance and deformation of the following structures.

24 experimental samples were made and tested. The main factors, which influenced on the work of the elements under load, were: thickness of the concrete protective layer $\emptyset$2 cm, 5 cm and 7 cm; percent of elements reinforcement $\emptyset$=1.69% (4$\emptyset$22 A500) and μ=2.74% (4$\emptyset$28 A500); relative eccentricity of external force – e_O/h = 0 – central compression, e_O/h = 0.15 – off-center compression with the application of compressive force at the border of element's core of the section.

It is necessary to note, that when tested the samples without the transverse reinforcement, the fragile, explosion-like destruction was observed, then with the elements of the traditional structure. The results of the conducted experimental research allowed to analyze the influence of different factors on the bearing capacity of compressed reinforced concrete elements.

Increasing the eccentricity of external force, the bearing capacity of all experimental elements reduces. At the same time, the degree of the bearing capacity depends significantly on the percent of reinforcement and the thickness of the protective layer of concrete.

The experiments have shown, that the bearing capacity of reinforced concrete bars with the increased protective layer up to 5 cm and without the transverse reinforcement with the central compression of the columns reduced up to 16.2% (with the fittings 4$\emptyset$22 A500) and up to 15% (with the fittings 4$\emptyset$28 A500). The columns with increased thickness of the protective layer up to 7 cm and without the transverse reinforcement showed nearly a full alignment of the bearing capacity and the traditional structures. The columns, tested by the eccentricity eo/h=0.15, showed the same results. In the bars with μ=1.69% without the transverse reinforcement and with the thickness of the protective layer 5 cm there was a reduction of the bearing capacity for 11%, but with μ=2.74% the reduction was only 7%. (Table 1).

Table 1

Samples code	N_u,kN	$\frac{N_u}{N_{u(F)}}$	ε_{bu} x 10^5	ε_{bcu} x 10^5	$\frac{\varepsilon_{bcu}}{\varepsilon_{bu}}$	R_b,MPa
C3-22-0	3700	1	241	38	0.158	32.8
C5-22-0	3100	0.838	153	89	0.582	31.6
C7-22-0	3680	0.995	232	56	0.241	33.4
C3-22-0,15	2780	1	272	-	-	34.1
C5-22-0,15	2500	0.899	189	-	-	32.2
C7-22-0,15	2800	1.007	267	-	-	31.9
C3-28-0	4120	1	260	34	0.131	33.4
C5-28-0	3500	0.850	180	69	0.383	30.9
C7-28-0	4180	1.015	255	47	0.184	33.2
C3-28-0,15	2900	1	284	-	-	32.2
C5-28-0,15	2700	0.931	209	-	-	31.8
C7-28-0,15	2900	1	284	-	-	33.1

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The columns were of the square section with 300 mm high and wide. The length of the element is 1800 mm.

The experimental samples-columns were reinforced with rods, A500 grade, diameter 22 mm and 28 mm. For transverse reinforcement for traditional structures the fittings were used of Bp-500 grade, diameter 6 mm in the form of welded closed clamps. The whole longitudinal reinforcement in the elements of the traditional structures was situated near the elements edges with the protective layer of 3 cm, besides the transverse reinforcement in the form of closed clamps along the whole length of the column was installed. In other experimental structures (with increased protective layer of concrete) the transverse reinforcement was made in the form of nets from fittings 6 Bp500 only at the end section of the element. The longitudinal reinforcement (nets and clamps) was made by means of contact welding.

A set of architectural and technical measures to increase the energy efficiency of residential buildings provides rational solutions for spatial planning for homes, heat-treated design of external barriers, engineering systems, control and measurement devices, as well as the use of non-traditional heat sources.

Volumetric planning decisions of residential buildings have a significant impact on their energy efficiency. First of all, it is necessary to pay attention to the height (number of floors) of multi-storey buildings. Research by local scientists has shown that multi-storey residential buildings are exposed to special environmental influences that lead to an increase in heat loss.

Many architectural-planning solutions of individual projects of elite residential buildings and complexes provide 1-2 doors for access to apartments, which is in line with the recommendations. The additional door device not only provides proper ventilation regime, but also reduces heat loss by the rooms of the apartment and protects the population (residents) from excessive noise [1, 2].

Given the wind loads in low-rise buildings, in the urban decision it is advisable to install wind-resistant residential buildings with a decrease in the number of floors of residential buildings on the wind-protected side, which provides thermal protection of wind-resistant houses. The use of «indoor» courtyards for protection from wind, highways and street noise leads to heat savings [2, 3].

Low-rise houses are not considered heat-saving due to the size of the surface of the external barriers, as well as their specificity relative to the size of the buildings.

In this regard, modern normative documents include an indicator such as the coefficient of compactness, which is the ratio of the area of external barriers to the heated volume of the building. In addition, the standards distribute the allowable energy consumption for heating residential buildings depending on the multi-storey buildings. For these indicators, 9–16-storey multi-storey buildings are preferred [4; 64-p.].

With reasonable compactness, the so-called wide-body houses are described. Such houses can reduce heat loss, the microclimate in them is more stable, less sensitive to wind «blows» and cooling the rooms of apartments. Therefore, where possible, efforts should be made to expand the area of the designed residential building, as this will reduce heat loss due to the improvement of the compactness coefficient. In the development of individual projects, other architectural-planning solutions that ensure the thermal efficiency of the residential building can be proposed. In particular, there are planning solutions based on the radial arrangement (placement) of apartments for residential buildings. This method of planning allows you to place more apartments on the floor (8 to 12) without extending the communications outside the apartment. These solutions reduce the perimeter of the external walls per unit area of the total area of the house, reduce the length of external and internal engineering communications, increase the load on the elevators, resulting in energy savings. With this planning decision, non-residential main corridors or main corridors outside the apartment can be illuminated with additional light windows [4; Pp. 79-80].

As a planning solution that improves the comfort of living and allows you to keep the heat in the room, we can recommend reasonable proportions of the length and width of the room. It was found that the ability of a rectangular room to withstand the effects of external heat was reduced by half compared to a deep room. In an expanded (large area) room, the temperature regime and especially radiation (radiation) improves, but at the same time the natural lighting and ventilation deteriorate. Therefore, the appropriate ratio of the depth and width of the rooms of the buildings can be obtained in the range of 1.4-1.6. With this ratio, the temperature regime of the rooms

becomes more stable.

While studying the effect of low temperature on the human body during night sleep, scientists have proved that air temperature can drop to 14-15 ° C. Such temperature control is achieved by introducing room-based control of heat input to heating devices.

It is recommended to consider the construction of residential buildings with mandatory natural light, not with the placement of the stairwell on the outer wall, but with the internal location of the stairwells and elevator unit, as in the West. This method allows you to directly increase the number of light facades used for apartments, which in turn increases the number of apartments on the floors and changes the proportions of the enclosed space with the perimeter of the outer walls in favor of the latter. In addition, it reduces the heat loss of the building by eliminating uncontrolled heating space, such as stairs in our residential buildings.[5]

Arranging areas on the roof or on the last two floors of penthouses - separate cottages mounted on the roof of a multi-storey residential building - leads to a high consumption of heat. A mandatory attribute of the penthouse is access to the roof through a large terrace (porch) or large glazed (equipped with a window) area to look around. Because the apartments are located on the upper floors and are protected from the outside, in some homes glazing is done around the entire perimeter. Such glazing (glazing) in our climatic conditions leads to the waste of too much energy for heating and overheating of buildings in summer.

Most of the houses under construction are already being built with glazed loggias or balconies, which gives a holistic expression of the façade architecture of the house. Glazing of loggias and balconies allows to reduce heat consumption. However, it should be borne in mind that glazing worsens the insulation conditions, reducing the illumination of rooms with natural light by about 30 percent. In addition, the glazing of loggias deprives the room of direct ventilation. Opening part of the window does not provide full ventilation and ventilation effect.

To increase the thermal efficiency of residential buildings, it is recommended to use architectural methods such as building orientation to indoor areas, taking into account the predominance of cold wind of the building, maximum glazing of southern facades and minimum glazing of northern facades. The specified methods of design and planning should be used in the construction of low-rise housing. The specified construction techniques and planning solutions should be applied in the construction of low-rise housing.

In conclusion, it should be noted that in the development of energy-efficient buildings powered by solar energy, it is important to study in depth the impact of volumetric planning solutions on energy consumption, skillfully using the thermal protection properties of passive solar heating system elements.

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RESEARCH ON INCREASING ENERGY EFFICIENCY AS A RESULT OF CHANGING THE VOLUME HISTORICAL SOLUTION OF A MULTI-STOREY RESIDENTIAL BUILDING IN TASHKENT

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Annotation. The article presents ways to improve energy efficiency as a result of changing the volumetric historical solution of a multi-storey residential building in Tashkent.

Key words: highway, penthouse, volumetric-historical, elite, loggia, coefficient, environment, control and measuring.

Аннотация. В статье представлены способы повышения энергоэффективности в результате изменения объемного исторического решения многоэтажного жилого дома в Ташкенте.

Ключевые слова: магистраль, пентхаус, объемно-исторический, элитный, лоджия, коэффициент, среда, контрольно-измерительная.

Аннотация. Мазкур мақолада Тошкент шаҳридаги кўп қаватли турар-жой бинонинг ҳажмий тарҳий ечимини ўзгартириш натижасида энергия самарадолигини ошириш усуллари келтирилган.

Калит сўзлар: автомагистрал, пентҳаус, ҳажмий-тарҳий, элита, лоджия, коэффициент, атроф-муҳит, назорат-ўлчов.

Introduction. President of the Republic of Uzbekistan Sh. The new resolution signed by M.Mirziyoev on April 20, 2017 strengthens the spiritual and moral content of higher education, instills in the hearts and minds of students the idea of national independence, high spirituality and devotion to the traditions of humanity of the Uzbek people, their strong immunity and criticism of foreign ideas. implies the formation of. The resolution provides for the creation of a new generation of textbooks and their widespread introduction into the higher education system, the provision of higher education institutions with modern teaching materials and scientific literature. The textbook describes in detail the achievements of capital construction in the country, especially in the field of housing, the current state and future plans. Constructive systems of buildings and structures, volume-historical solutions, their importance and the basis of constructive design are covered in this direction, taking into account the experience of the construction industry of the Republic, developed foreign countries.[1]

The set of architectural and technical measures to increase the energy efficiency of residential buildings provides rational solutions for spatial planning for homes, heat-treated design of external barriers, engineering systems, control and measurement devices, as well as the use of non-traditional heat sources.

Volumetric planning decisions of residential buildings have a significant impact on their energy efficiency. First of all, it is necessary to pay attention to the height (number of floors) of multi-storey buildings. Research by local scientists has shown that multi-storey residential buildings are exposed to special environmental influences that lead to an increase in heat loss.

Many architectural-planning solutions of individual projects of elite residential buildings and complexes provide 1-2 doors for access to apartments, which is in line with the recommendations. The additional door device not only provides a proper ventilation regime, but also reduces heat loss by the rooms of the apartment and protects the population (residents) from excessive noise.

Given the wind loads in low-rise buildings, in the urban decision it is advisable to install wind-resistant residential buildings with a decrease in the number of floors of residential buildings on the wind-protected side, which provides thermal protection of wind-resistant houses. The use of “indoor” courtyards to protect against wind, highways and street noise leads to heat savings [2].

Low-rise houses are not considered heat-saving due to the size of the surface of the external barriers, as well as their specificity relative to the size of the buildings.

In this regard, modern normative documents include an indicator such as the coefficient of compactness, which is the ratio of the area of external barriers to the heated volume of the building. In addition, the standards distribute the allowable energy consumption for heating residential

buildings depending on the multi-storey buildings. For these indicators, 9-16 storey multi-storey buildings are preferred [4].

With reasonable compactness, so-called wide-body houses are described. Such houses can reduce heat loss, the microclimate in them is more stable, less sensitive to wind "blows" and cooling the rooms of apartments. Therefore, where possible, efforts should be made to expand the area of the designed residential building, as this will reduce heat loss due to the improvement of the compactness coefficient. In the development of individual projects, other architectural-planning solutions that ensure the thermal efficiency of the residential building can be proposed. In particular, there are planning solutions based on the radial arrangement (placement) of apartments for residential buildings. This method of planning allows you to place more apartments on the floor (8 to 12) without extending the communications outside the apartment. These solutions reduce the perimeter of the external walls per unit area of the total area of the house, reduce the length of external and internal engineering communications, increase the load on the elevators, resulting in energy savings. With this planning decision, non-residential main corridors or main corridors outside the apartment can be illuminated with additional light windows [3].

As a planning solution that improves living comfort and allows you to keep the heat in the room, we can recommend reasonable proportions of the length and width of the room. It was found that the ability of a rectangular room to withstand the effects of external heat was reduced by half compared to a deep room. In an expanded (large area) room, the temperature regime and especially radiation (radiation) improves, but at the same time the natural lighting and ventilation deteriorate. Therefore, the appropriate ratio of the depth and width of the rooms of the buildings can be obtained in the range of 1.4-1.6. With this ratio, the temperature regime of the rooms becomes more stable.

While studying the effects of low temperatures on the human body during night sleep, scientists have proved that air temperatures can drop to 14-15 ° C [5]. Such temperature control is achieved by introducing room-based control of heat input to heating devices.

It is recommended to consider the construction of residential buildings with stair rooms and the internal location of the elevator unit, as in the West, rather than by placing the staircase room on the outer wall with forced natural light. This method allows you to directly increase the number of light facades used for apartments, which in turn increases the number of apartments on the floors and changes the proportions of the enclosed space with the perimeter of the outer walls in favor of the latter. In addition, it reduces the heat loss of the building by eliminating uncontrolled heating space, such as stairs in our residential buildings [4].

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Most of the houses under construction are already built with glazed loggias or balconies, which gives a holistic expression of the facade architecture of the house. Glazing of loggias and balconies allows to reduce heat consumption. However, it should be borne in mind that glazing worsens the insulation conditions, reducing the illumination of rooms with natural light by about 30 percent. In addition, the glazing of loggias deprives the room of direct ventilation. Opening part of the window does not provide full ventilation and ventilation effect.

To increase the thermal efficiency of residential buildings, it is recommended to use architectural methods such as orientation of the building to the primitive areas, taking into account the predominance of cold wind of the building, the maximum glazing of the southern facades and the minimum glazing of the northern facades [6]. The specified methods of design and planning should be used in the construction of low-rise housing. The specified construction techniques and planning solutions should be applied in the construction of low-rise housing.

In conclusion, it should be noted that in the development of solar-powered energy-efficient buildings, it is important to thoroughly study the impact of volumetric planning solutions on energy consumption, skillfully using the thermal protection properties of passive solar heating system elements.

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THEORETICAL AND PRACTICAL EXPERIMENTAL STUDY OF SOUND INSULATION OF WOODEN FLOOR CIVIL BUILDINGS

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Annotation. The article presents the results of acoustic tests for uninsulated and mineral wool insulated floors. First, the study results were analyzed for single-digit acoustic isolations. These results were compared with the standards and findings described by other researchers. The conclusions described in this article allow an evaluation of the acoustic insulation system applied.

Key words: sealant, acoustics, panel edges, leveling, reconstruction, single-layer and multi-layer, anchors, slabs.

Аннотация. В статье представлены результаты акустических испытаний неизолированных и утепленных полов из минеральной ваты. Сначала результаты исследования были проанализированы на предмет однозначной акустической изоляции. Эти результаты сравнивались со стандартами и выводами, описанными другими исследователями. Выводы, изложенные в этой статье, позволяют оценить применяемую систему звукоизоляции.

Ключевые слова: герметик, акустика, ребра панелей, выравнивания, реконструкция, однослойные и многослойные, анкеры, плиты.

Аннотация. Мақолада изоляцияланмаган ҳамда минерал пахта билан изоляция қилинган поллар учун акустик синовлар натижалари келтирилган. Биринчидан, тадқиқот натижалари битта рақамли акустик изоляциялари бўйича таҳлил қилинди. Ушбу натижалар бошқа тадқиқотчилар томонидан тавсифланган стандартлар ва топилмалар билан таққосланди. Ушбу мақолада тасвирланган хулосалар қўлланиладиган акустик изоляция тизимини баҳолашга имкон беради.

Калит сўзлар: герметик, акустика, панел қовурғалари, ораёпмалар, реконструкция қилиш, бир ва кўп пролётли, анкер, плиталар.

Introduction. External walls, like all other envelopes in the building, including floors, are subjected to lateral sound transmission [1]. Acoustic insulation of buildings has an impact on the living comfort of people staying in these buildings. The said problem has been recently given more consideration along with the issue of heat transport, e.g. for mineral wool insulation [2]. Similar considerations regarding the correlation of thermal resistance and acoustic insulation were conducted by Nurzyński [3]. Apart from the acoustic insulation against airborne sounds, the comfort of people in buildings, including work and rest, greatly depends also on the acoustic insulation against impact sounds. The acoustic isolation against impact sounds is described by means of a single-number index describing a specific kind of "averaging" from all tertiary frequencies. It turns out, however, as described by Öqvist et al. [4] that even when the single-number rating by means of the $L_{n,w,R}$ index is positive, the sounds generated by walking, i.e. within the frequency range of 20–50 Hz, can be very wearying. Such problems can occur in light structures [5]. Since in many countries buildings with wooden floors are still used, the problem of acoustics is being investigated all the time. Therefore, the authors of this publication decided to present the impact exerted by the application of mineral wool on improving the acoustic insulation of wooden floors.

Acoustic insulation of the wooden floor.

Acoustic insulation of floors is determined both against airborne sounds and against impact sounds. For airborne sounds, we investigate the design index for the assessment of sound reduction, which is expressed by the following formula (1):

$$R_{A1,R} = R_{A,1} - 2 \text{ [dB]} \quad (1)$$

It is recommended to accept the value of RA,1 as determined on the basis of laboratory tests [6]. For impact sounds, we investigate the weighted index of normalized impact noise level Ln, w, R. On the basis of his own analyses and available Polish literature, Dulak in his work [6] described the values of sound reduction indexes of exemplary wooden upper floor solutions, as shown in figure 1.

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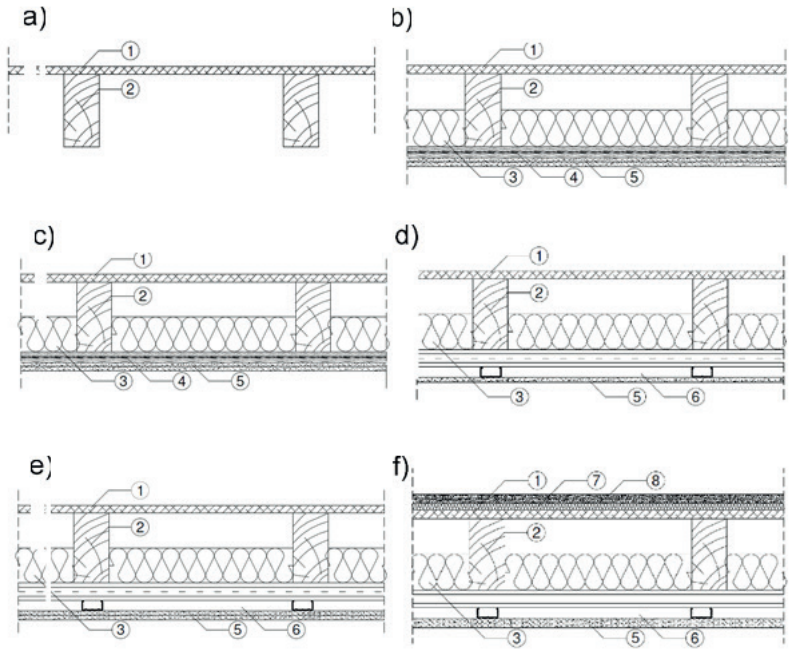

Figure 1. Exemplary solutions of wooden floors 1) particle board 22÷24 mm thick, 2) wooden beams, e.g. 120/180, 3) mineral wool in mats with the thickness of approx. half the height of the beams, 4) wooden battens, e.g. 50/30, 5) plasterboard, 6) cold formed sections grate on spring joints, 7) mineral wool of possibly the lowest dynamic rigidity, e.g. s'≤15 MN/m3, 8) dry screed, e.g. in the form of fiber-cement boards 2×12.5 mm.

The results of the research for the exemplary solutions presented in Figure 1 are quoted in the work [6]. Sound reduction indexes of the solution a) are respectively: *R*A1, R is within (20–25 dB), and *L*n, w, R within (93, 88 dB). For the solution b) A1, R 36, 41dB *R*Δ≈, n, w, R 78, 75dB *L* Δ≈. The solution presented in Fig1. c) has the values A1 2 dB *R* Δ≈ and n, w 2dB *L* Δ≈ as compared to the solution b). The solution d) yields the results A1, R 46, 50dB *R*Δ≈, which compared to the solution b) gives the average improvement of A1 10 dB *R* Δ≈ and n, w 8 15dB *L* Δ≈ −. The solution e) has the values A1 3 dB *R*Δ≈ and n, w 5dB *L* Δ≈ as compared to the solution d). The solution f) is within A1, R 42, 57 dB *R*Δ≈, n, w, R 52, 56dB *L*Δ≈.

Methodology. The sound insulation tests were carried out for the wooden floor between the first and the second store in a pre-war multi-family building in Gliwice (Fig. 2).

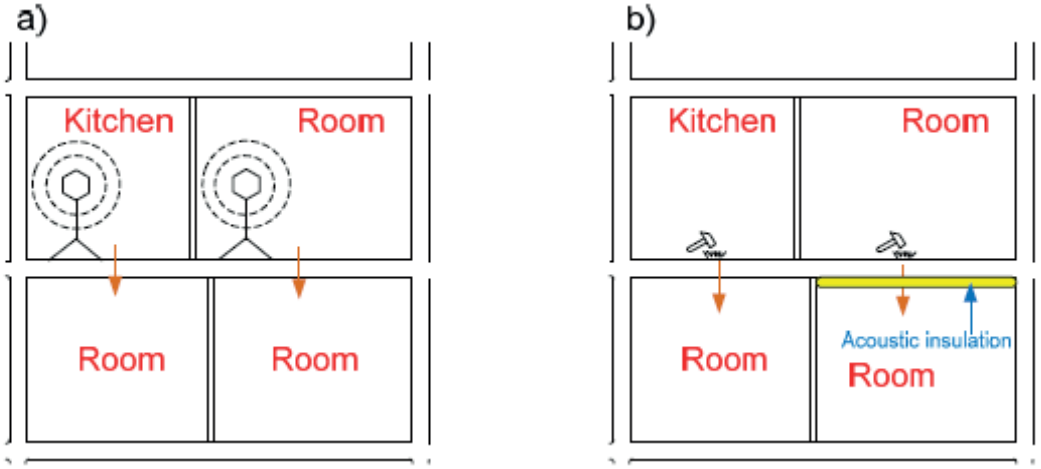

Fig. 2. Setup for the in situ tests of acoustic insulation against airborne sounds and impact sounds:
a) wooden floor b) wooden floor with mineral wool filling.

The research was carried out for two situations. The first situation involved the wooden floor whereof the cross-section is presented in Figure 2a. The second situation concerned the same floor,

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but with mineral wool thermal insulation of the thickness of 30 cm (Fig. 2b).

To provide the comprehensive evaluation, we present in Table 1 the results of acoustic insulation of the wooden floor without the adaptation and with the adaptation in the form of mineral wool as thermal insulation.

Table 1.

Results of acoustic insulation against airborne and impact sounds.

Floor	Measurement direction	Results
Wooden, without adaptation	↓	**$L'_{n,w}$ = 68(-1) dB R'_{A1} = 48 dB**
Wooden, with adaptation	↓	**$L'_{n,w}$ = 51(-1) dB R'_{A1} = 56 dB**

We can observe based on Table 1 that the acoustic insulation indexes involving the airborne sounds and impact sounds have improved significantly. The improvement of acoustic isolation against airborne sounds is on the level of A1 8 dB $R'\Delta\approx$ and against impact sound n,w 17 dB$L'\Delta\approx$. It should be noted that after the adaptation, the insulation indexes meet the requirements for buildings in Poland.

Conclusions Acoustic adaptation of wooden floors fulfills its function to a certain extent. We recommend introducing acoustic adaptation of the floor to attenuate noise in the range of low frequencies. The following conclusions can be drawn from this work: 1. The use of 15 cm thick mineral wool between the floor beams, lowering the ceiling and the use of another layer of 15 cm wool contributed to a significant improvement of the acoustic insulation of the floor against airborne sounds. 2. The use of the same adaptation as in point 1 allowed us to improve (reduce) the acoustic insulation index against impact sounds. 3. The improved insulation index against impact sounds does not allow for the exceeded values involving the sounds from low-frequency range (f <200 Hz). 4. An acoustic adaptation of the flooring should be applied to improve the indexes for low frequency sounds.

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UDK: 612.004

YOG‘OCH POLLI FUQARO BINOLARINING QAVATLARARO YOPMALARINING TOVUSH IZOLYATSIYASINI NAZARIY VA AMALIY EKSPERIMENTAL TADQIQ ETISH

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Annotatsiya. Maqolada izolyatsiyalanmagan hamda mineral paxta bilan izolyatsiya qilingan pollar uchun akustik sinovlar natijalari keltirilgan. Birinchidan, tadqiqot natijalari bitta raqamli akustik izolyatsiyalari bo‘yicha tahlil qilindi. Ushbu natijalar boshqa tadqiqotchilar tomonidan tavsiflangan standartlar va topilmalar bilan taqqoslandi. Ushbu maqolada tasvirlangan xulosalar qo‘llaniladigan akustik izolyatsiya tizimini baholashga imkon beradi.

Kalit so‘zlar: germetik, akustika, panel qovurg‘alari, orayopmalar, rekonstruksiya qilish, bir va ko‘p prolyotli, anker, plitalar.

Annotaцiya. V state predstavlenы rezultatы akusticheskix ispытaniy neizolirovannых i uteplennых polov iz mineralnoy vatы. Snachala rezultatы issledovaniya bыli proanalizirovanы na predmet odnoznachnoy akusticheskoy izolyaцii. Эti rezultatы sravnivalis so standartami i vыvodami, opisannыmi drugimi issledovatelyami. Vыvodы, izlojennые v эtoy state, pozvolyayut oцenit primenyaemuyu sistemu zvukoizolyaцii.

Klyuchevые slova: germetik, akustika, rebra paneley, vыravnivaniya, rekonstrukцiya, odnosloynые i mnogosloynые, ankerы, plitы.

Annotation. The article presents the results of acoustic tests for uninsulated and mineral wool insulated floors. First, the study results were analyzed for single-digit acoustic isolations. These results were compared with the standards and findings described by other researchers. The conclusions described in this article allow an evaluation of the acoustic insulation system applied.

Key words: sealant, acoustics, panel edges, leveling, reconstruction, single-layer and multi-layer, anchors, slabs.

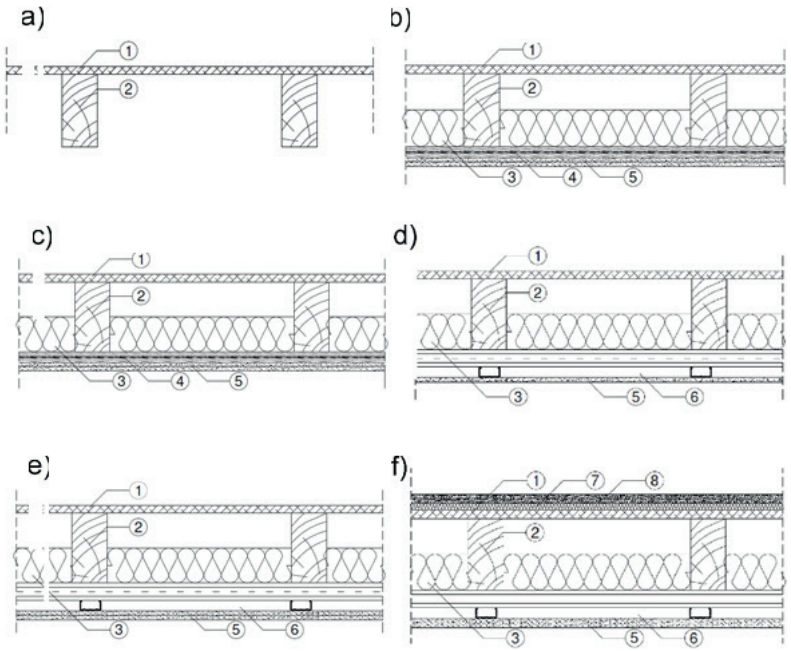
Kirish. Tashqi devorlar, binoning qavatlararo orayopmalari singari, pollarda ham tovush izolyatsiyalariga alohida ahamiyat berish kerak bo‘ladi [1]. Binolarning akustik izolatsiyasi ushbu binolarda turadigan odamlarning yashash sharoitlariga ta’sir qiladi. So‘nggi paytlarda issiqlik tizimi masalasi bilan bir qatorda masalan. mineral paxta izolyatsiyasini qo‘llash masalasiga ko‘proq ahamiyat berildi [2]. Issiqlikka qarshiligi va akustik izolyatsiyaning o‘zaro bog‘liqligi bo‘yicha shunga o‘xshash tadqiqotlarni Nurziski olib bordi [3]. Havodagi tovushlarga qarshi akustik izolyatsiyadan tashqari, binolarda odamlarning farovonligi, shu jumladan ish va dam olish, ta’sirli tovushlarga qarshi akustik izolyatsiyaga ham bog‘liq. Ta’sirli tovushlarga qarshi akustik izolyatsiya barcha uchinchi chastotalardan ma’lum bir “o‘rtacha” turini tavsiflovchi bitta raqamli indeks yordamida tasvirlangan. Ammo, Nurziski va boshqalarning ta’rifiga ko‘ra, [4] Ln, w, R indekslari yordamida bitta raqamli ko‘rsatkich ijobiy bo‘lsa ham, yurish natijasida hosil bo‘lgan tovushlar, ya’ni 20-50 Hz chastota diapazonida juda yuqori eshitilishi mumkin. Bunday muammolar engil qatlamlarda paydo bo‘lishi mumkin [5]. Ko‘pgina mamlakatlarda hali ham yog‘och polli binolar ishlatilganligi sababli, akustika muammosi doimo o‘rganib chiqilmoqda. Shu sababli, ushbu maqolada mineral pollarni qo‘llash natijasida yog‘och pollarning akustik izolatsiyasini yaxshilash usullarini ko‘rstaildi.

Yog‘ochli pollning akustik izolatsiyasi.

Pollarning akustik izolatsiyasi havodagi tovushlarga ham, zarba ta’siriga qarshi ham aniqlanadi. Havodagi tovushlar uchun biz tovushni kamaytirishni baholash uchun loyiha indeksini o‘rganamiz, bu quyidagi formula (1) bilan ifodalanadi:

$$R_{A1,R} = R_{A,1} - 2 \text{ [dB]} \quad (1)$$

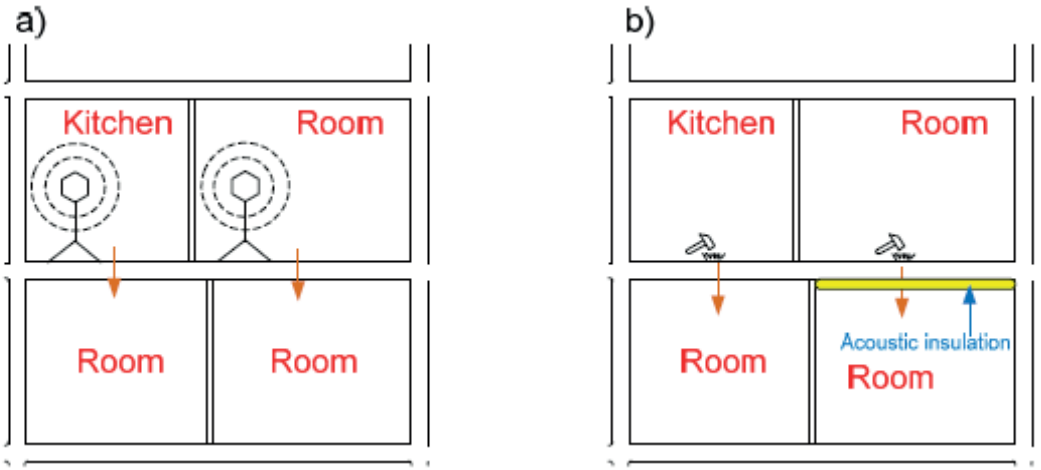
Laboratoriya sinovlari asosida aniqlangan RA, 1 qiymatini qabul qilish tavsiya etiladi [6]. Ta’sir tovushlari uchun biz normalizatsiya qilingan shovqin darajasi Ln, w, R. ning tortilgan indeksini o‘rganamiz, o‘zining tahlillari va mavjud bo‘lgan Polsha adabiyoti asosida Dulak o‘z ishida [6] namunali yog‘och ustki qismidagi tovushni pasaytirish indekslarining qiymatlarini tasvirlab berdi, natija 1-rasmda ko‘rsatilgan.



1-rasm. Yog‘ochli pollarning tovushni pasaytirish indekslari sxemasi 1) 22 ÷ 24 mm qalinlikdagi zarrachalar taxtasi, 2) yog‘och nurlar, masalan. 120/180, 3) qalinligi taxminan paspaslarda mineral paxta, 4) yog‘och to‘sinlar, 50/30, 5) gipskarton listlari, 6) prujinali bo‘g‘inlardagi sovuq shakllangan hududlar, 7) eng past dinamik qat’iylikka ega mineral paxta, s’≤15 MN / m3, 8) quruq to‘sin 2 × 12,5 mm tolali sement plitalari shaklida.

1-rasmda keltirilgan sxemalar bo‘yicha tadqiqot natijalari keltirilgan [6]. A) eritmasining tovushni kamaytirish ko‘rsatkichlari mos ravishda: RA1, R (20-25 dB) ichida, Ln, w, R (93, 88 dB). Qaror uchun b) A1, R 36, 41dB RΔ≈, n, w, R 78, 75dB LΔ≈. 1-rasmda keltirilgan sxema bo‘yicha c) A1 2 dB R Δ≈ va n, w 2dB L Δ≈ qiymatlarga ega b) eritma bilan taqqoslaganda. D) eritma A1, R 46, 50dB R the natijalarni beradi, bu eritma bilan taqqoslaganda b) o‘rtacha A1 10 dB R Δ≈ va n yaxshilanadi, w 8 15dB L Δ≈ -. E) eritma d1 eritma bilan taqqoslaganda A1 3 dB R Δ≈ va n, w 5dB L Δ≈ qiymatlarga ega. F) eritmasi A1, R 42, 57 dB RΔ≈, n, w, R 52, 56dB L within ichida.

Natija. Ovoz izolyatsiyasi sinovlari ko‘p xonadonli binoda birinchi va ikkinchi qavatlar orasidagi yog‘ochli polllar uchun o‘tkazildi (2-rasm).



2-rasm. Havodagi tovushlar va zarba tovushlariga qarshi akustik izolyatsiyani in sinov uchun o‘rnatish: a) yog‘ochli pol b) mineral paxta bilan to‘ldirilgan yog‘ochli pol.

Tadqiqot ikki holat bo‘yicha o‘tkazildi. Birinchi holat, uning 2-rasmidagi kesmada ko‘rsatilgan yog‘ochli pol bilan bog‘liq. Ikkinchi holat xuddi shu qavatga tegishli bo‘lgan ammo 30 sm qalinlikdagi mineral paxta issiqlik izolatsiyasi bilan bog‘liq (2b-rasm).

Keng qamrovli baholashni ta’minlash uchun biz 1-jadvalda yog‘ochli polning akustik

izolatsiyasini moslashtirmasdan va issiqlik tizimi sifatida mineral paxta qatlamlarini qo‘yishda hosil bo‘ladigan natijalarini taqdim etamiz.

1-jadval.

Havodagi va zarba tovushlariga qarshi akustik izolyatsiya natijalari

Pollar	O‘lchov yo‘nalishi	Natijalar
Yog‘ochning moslashuvchanligi	↓	**$L'_{n,w}$ = 68(-1) dB R'_{A1} = 48 dB**
mineral paxta qatlamlari	↓	**$L'_{n,w}$ = 51(-1) dB R'_{A1} = 56 dB**

Biz 1-jadval asosida havodagi tovushlar va zarba tovushlarini o‘z ichiga olgan akustik izolyatsiya ko‘rsatkichlari sezilarli darajada yaxshilanganligini kuzatishimiz mumkin. Havodagi tovushlarga qarshi akustik izolyatsiyani yaxshilash A1 8 dB R’Δ≈ darajasida va n, w 17 dBL ‘ impact ta’sirli ovozga qarshi. Shuni ta’kidlash kerakki, moslashgandan so‘ng, izolyatsiya indekslari Turar-joy binolariga qo‘yiladigan talablarga javob beradi.

Xulosa. Yog‘ochli polning akustik moslashuvi o‘z vazifasini ma’lum darajada bajaradi. Past chastotalar oralig‘ida shovqinni pasaytirish uchun polning akustik moslashuvini joriy qilishni tavsiya etamiz. Ushbu loyihadan quyidagi xulosalar chiqarilishi mumkin: 1. Pol orasida 15 sm qalinlikdagi mineral paxtani ishlatish, shiftni tushirish va 15 sm paxtali boshqa qatlamdan foydalanish polning akustik izolatsiyasining sezilarli darajada yaxshilanishiga havodagi tovushlarga qarshi yordam beradi. 1 va 2-rasmlardagi sxemalarda ko‘rsatilgan tarzda foydalanish bizni zarba tovushlariga qarshi akustik izolyatsiya indeksini yaxshilashga (kamaytirishga) imkon berdi. 3. Ta’sirli tovushlarga qarshi izolyatsiyaning yaxshilangan ko‘rsatkichi past chastotali diapazon (f <200 Hz) tovushlarini o‘z ichiga olgan haddan tashqari qiymatlarga, xarajatlarga yo‘l qo‘yilmaydi. 4. Past chastotali tovushlar ko‘rsatkichlarini yaxshilash uchun polning akustik moslashuvi qo‘llanilishiga erishiladi.

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APPLICATION OF SOUND INSULATION OF WALLS WITH SINGLE FRAME CONSTRUCTION CURTAIN

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Annotation. The article describes the types of curtain walls, methods of their application and sound insulation processes. The experience of foreign scientists is cited as an example.

Key words: fixed curtain wall, movable curtain wall, sound insulation index, vibrated curtain wall, harmonic curtain wall, pantograph.

Аннотация. В статье описаны виды навесных стен, способы их применения и процессы шумоизоляции. В качестве примера приводится опыт зарубежных ученых.

Ключевые слова: несъемная навесная стена, подвижная навесная стена, показатель звукоизоляции, виброкатаная навесная стена, гармоническая навесная стена, пантограф.

Аннотация. Мақолада парда деворлар турлари, уларнинг қўлланиш усуллари ҳамда шовқинга қарши изалация қилиш жараёнлари келтирилган. Шунингдек, хорижий олимларнинг тажрибаси мисол қилиб кўрсатилган.

Калит сўзлар: Қўзғалмас пардадевор, қўзғалувчан пардадевор, товуш изоляцияси индекси, вибропрокат пардадевор, гармонсимон пардадевор, пантограф.

Introduction. Since the 90's curtain walls have taken on a role that goes beyond that of a simple curtain closing: they act as a "selective filter" between the internal and external environment; various typologies were developed, such as double skin (double ventilated façade), with or without heat recovery, or front solar photovoltaic, to characterize the architectural design and to obtain energetic advantages aswell. Nowadays curtain walls are used both in new buildings and in renovations, especially in offices or multifunctional buildings, by the replacement or integration of new volumes, thanks to the use of glasses which have various properties (colored and insulating glass, reflective and selective glass, etc.). Recent studies show that acoustic problems may arise in the joint of the façade with other building structures. As a result, sound insulation between rooms separated by partitions mounted up to the curtain walls is often reduced. The lack of airborne sound insulation between rooms can influence the fulfillment of the legal requirements and affect privacy, which is fundamental for dwellings andoffices.

Description of the case study. The case study concerns a multipurpose management center, designed for businesses, offices, medical clinics and kindergarten. The main structure is made of reinforced concrete floors with both pillars and supporting partitions of precast concrete, covered with weakly ventilated facing brick. The glazing consists of curtain wall structures, with aluminum frames and double glass windows. Like many others, this type of curtain wall have good thermal insulation properties [1]. In this case the heat flow control is governed by double glazing with cavity filled with Argon gas (10 mm glass /14 mm Argon gas/66.1double layer glass with single layer of PVB, total thickness: 36 mm), having a transmittance value of about 1.1 W/m2 K.The control of the solar radiation is made exclusively by the use of selective glasses of green colour having a solar factor g = 22%, a light transmission Wl=48% and a colour rendering index IR = 91%. Despite very good performance in terms of façade sound insulation, curtain wall systems frequently show problems with the acoustic insulation between adjoining rooms: direct and flanking structural transmissions can occur both vertically and horizontally [2, 3, 4] through the mullions of the curtain wall. For this reason, flanking transmission is a characteristic that has to be declared in accordance to the product standard for curtain walls described by prEN 13830 [5].

The vertical interior walls that separate the rooms from each other and are not load-bearing are called curtain walls. In residential buildings, curtain walls are also used to support the load falling from the partitions. Such wall constructions will be based on separate foundations and their solution will be similar to the solution of load-bearing walls. Curtain walls will be based on structures (hedges, slabs) that support the inter-storey coverings. Curtain walls on the first floor and basement floors of buildings without basements are mounted on concrete or brick columns. Curtain walls cannot be installed directly on the floor. Curtain walls must meet the following requirements: strong, light, sound, vapor and gas impermeable, waterproof, non-flammable, prepared for surface painting or wallpapering, the surface should be free of bumps, dents. In residential buildings,

curtains are divided into types based on the function of the walls, separating the rooms, separating the apartments and used in the sanitary rooms. Curtain walls can be fixed and sliding (collapsible). Curtain walls can consist of small or large elements. Curtain walls made of small elements are assembled at the construction site. Curtain walls, which consist of large elements, are made in factories and assembled at the construction site.

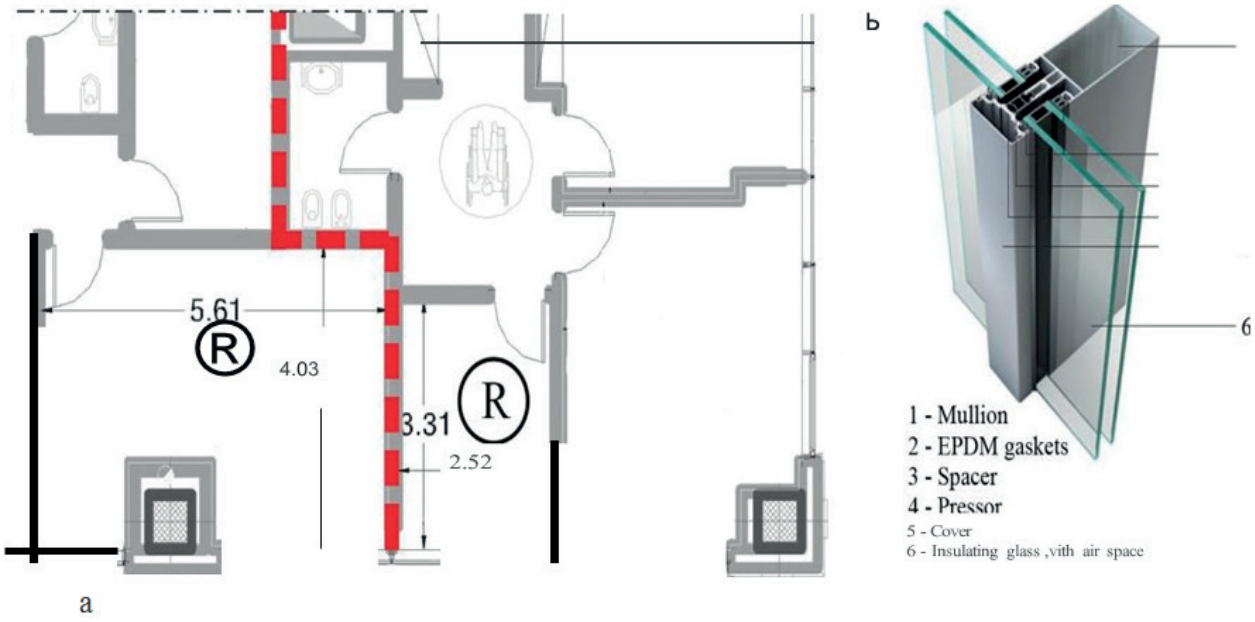

Fig. 1. (a) Plan portion of the building under test where: S = source room, R = receiving room, dashed line is the limit of two distinct properties; (b) detail of the curtain wall structure.

To better characterize the sound transmission through a curtain wall, the Apparent Sound Reduction Index of the partition between the adjoining rooms shown in Fig. 1.a was measured according to the procedure described by EN ISO 16283-1 [6], while velocity vibration measurements were carried out according to EN ISO 10848.

Depending on the material of the curtain walls can be made of brick, hollow ceramic and lightweight concrete blocks, wood chips or wood chips, panels and blocks made of gypsum, gypsum, various lightweight and porous concrete, as well as glass blocks. The choice of curtain wall types takes into account not only the cost of construction and labor costs, but also the time spent on construction and the possibility of using local building materials. For residential buildings, their cost should be 8-10% of the total cost of the building, and the labor cost of installation should be about 15% of the total labor spent on building construction. Such a large panel curtain wall installation requires 1.5-2 times less labor than the installation of small-sized gypsum curtain wall tiles. When using panel curtain walls in multi-storey buildings, labor productivity increases and construction costs decrease. Brick curtain wall thickness is ½ or ¼ brick thickness. Thickness ½ brick walls should not exceed 3 m in height and 5 m in length.

If the height and length of the room are greater than the specified dimensions, it shall be reinforced with long steel sheets 1.5 mm thick and 25 mm wide, located along the horizontal seams after each of the six rows. The ends of such fittings will be connected to the fittings of the main structure of the building. For curtain walls with a thickness of ¼ bricks, the wall stability is increased by creating a net with a grid of 525-525 mm using reinforcement placed in horizontal and vertical joints.

Structural solutions of curtain walls When installing curtain walls, the following rules should be followed to improve their soundproofing properties. First, curtain walls should not be installed directly on a clean floor level or on a floor lag. They are mounted on beams or on reinforced concrete interlocking slabs. In this case, the mixture is laid under the wall. A soft floor covering is applied to the floor where the curtain is attached to the wall to reduce sound transmission (Fig. 58). Care is taken to ensure that the areas where the curtain walls are connected to each other or to the main walls are tightly bonded. To do this, hemp fibers are stuffed into the cracks and covered with

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mud. The curtain walls are made 10-15 mm below the ceiling, the formed cracks are filled with hemp fiber and 25-30 mm thick mud is spread over them. To fasten the curtain walls to the ceiling, special rings or steel plates are used, which are inserted between the shutter plates.

For this purpose, grooves with a depth of 10-15 mm in the ceiling of the slab with hammers are fastened to the upper rail of the panel frame to install the plates using nails or screws. With this tip, the curtain is fastened to the ceiling or wall in 2-3 places on each side of the walls. If the middle of the curtain wall coincides with the seam between the intermediate cover plates, then one end of the steel wire is connected to the lifting ring on the curtain wall, the other end is passed upwards between the intermediate cover plate and fastened with anchors. If the curtain walls are mounted steel plates on both sides of the progon beam, the plates are tightened using bolts. In most cases, methods of fixing the plates to the ceiling or wall structure using construction pistols are also used.

In the paper direct and flanking transmission in partitions mounted up to curtains walls was investigated. It was shown that, following a bad joint design, intervention is difficult and not entirely effective. The vibration velocity measurements show that flanking transmission through opaque elements (lateral walls, floor, ceiling) in this kind of structures can be insignificant, compared to the ones observed over the main partition, when excited by a sound source. The main sound insulation gap is due to the mullion of the curtain wall, which has very high Lv. A good practice on curtain wall building design could be a better spatial distribution of rooms, to reduce flanking sound transmissions: walls separating independent units should be placed, when possible, in correspondence of concrete pillars, avoiding connection with the façade mullion.

Part of this work attempts to calculate R' from vibration velocity measurements, modifying the EN 12354-1 model on σ estimation. The higher emissivity of stiffened elements is considered and σ evaluated for a free vibration field instead of a forced one. A good agreement between R' calculated from velocity and R' measured in respect of the EN ISO 16283-1:2014 was found.

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МАРКАЗИЙ ОСИЁ ШАРОИТЛАРИ УЧУН ИЧКИ МИКРОИҚЛИМ МУҲИТИНИНГ ҚУЛАЙЛИГИ МЕЪЗОНЛАРИ БЎЙИЧА БИНОЛАРНИНГ ҲАЖМИЙ-ТАРИҲИЙ ВА КОНСТРУКТИВ ЕЧИМЛАРИНИ ОПТИМАЛЛАШТИРИШ

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Аннотация. Мақолада Марказий Осиё шароитлари учун ички микроиқлим муҳитининг қулайлигини инобатга олиб, биноларнинг ҳажмий-тарҳий ва конструктив ечимлари ҳақида маълумотлар ёритилган.

Калит сўзлар: жадаллашув, механизациялаштириш, экологик мурраккаблик, микросейсмораён, радиация.

Аннотация. В статье представлены объемно-исторические и конструктивные решения зданий с учетом удобства внутренней микроклиматической среды для условий Средней Азии.

Annotation. The article presents the volumetric-historical and structural solutions of buildings, taking into account the convenience of the internal microclimatic environment for the conditions of Central Asia.

Ҳозирги кунда амалга оширилаётган катта ҳажмдаги капитал қурилишлар, қурилиш конструкцияларидан самарали фойдаланиш ривожининг жуда тез жадаллашувига туртки бўлди — конструкцияларнинг турлари ва улардан тайёрланадиган хомашёлар тўхтовсиз такомиллашиб бормоқда. Шу боисдан уларни ҳисоблаш, лойиҳалаш ва тиклаш усуллари ҳам такомиллаштирилмоқда. Қурилишнинг самарадорлигини ошириш йўлларидан бири — унинг ҳажмий-тарҳий схемаларини ихчамлаштириш асосида, иложи борича кўпроқ тайёрлигини ошириш бўлса, иккинчиси — бу иморатларни рақобатбардош, юқори сифатли, шинам ва вазифавий қулай бўлишини таъминлашдир. Шу туфайли механизациялаштирилган ва автоматлаштирилган технологик жараёнлами қўллаш билан бир қаторда қурилиш майдончаларида бажариладиган ишларга кенг имкониятлар очиб берилди [1].

Марказий Осиё республикаларида ҳаёт фаолиятига доир муаммолар ва уларнинг ўзига хос хусусиятлари мавжуд. Булардан республикада катта аҳамиятга эга экологик мурраккабликни чақирадиган бир нечта салбий омиллар ҳаёт фаолиятини кескинлаштириб келмоқда. Шулардан асосийлари қуйидагилардир:

— зилзила;
— атмосфера ҳолати, ҳароратнинг йил давомида кескин ўзгариши;
— қуёш радиацияси;
— сизот сувларининг кўтарилганлиги;
— Тупроқ қатламининг сертузлиги;
— ҳавонинг ифлослиги;
— ҳавонинг кескин қизиши, инсолация;
— ҳавода химикатларнинг кўплиги;
— шовқиннинг салбий таъсири;
— ёнғин хавфи;
— сув босиш ҳолатлари;
— ер кўчиши ва ҳ.к.

Республикадаги юқорида кўрсатилган салбий омиллар қурилиш учун ер танлаётганда иморат ва иншоотлар лойиҳаланаётган даврда, қурилиш ҳамда бинолардан фойдаланиш жараёнида кескин ва сезиларли таъсир қилади ҳамда уларга қарши маълум тадбирлар кўрилишини тақозо қилади. Масалан, ер қимирлашига қарши, яъни иморатни зилзилабардош қилиб лойиҳалаш, қуриш ва ундан фойдаланишда турли илмий ва амалий асосланган тадбирлар кўриш, тегишли техник-меъёрий ҳужжатларда (ҚМҚ - зилзилавий ҳудудларда қурилиш) бадастур кўрсатилган. Бунинг учун лойиҳалашнинг ҳар бир бўғинида қўшимча тадбирлар кўзда тутилади [2].

Янги бинонинг қурилиши лозим бўлса, аввал қурилиш режалаштириладиган туманда микросейсмораёнлаштириш харитасига асосан шу жой қандай зилзилавий кўрсаткичга

келтирилганлиги аниқланиб, шу кўрсаткичга мос конструктив ечим танлаш, ерости тупроғини қўшимча ўрганиш ва уни тайёрлаш, иморатни лойиҳалашда маълум рационал форма танлаш, сейсмик талабларга мос меъморий-конструктив ечимлар ишлаб чиқиш мақсадга мувофиқдир. Бундан ташқари, зилзилага қаршилик кўрсатадиган бир неча тадбирлар, яъни деформатсия чокларини киритиш, иморат фазовий бикрлигини ратсионал тақсимлаш, конструкциялар бирлашган тугунларни зилзилабардошлигини таъминлаш ва ҳ.к. Бундай тадбирларга, аксарият, катта харажат қилишга тўғри келади ва тажрибага биноан ҳар бир балл сейсмик зилзилага қарши тадбирлар учун бинонинг нархидан 8—12% қўшимча харажатлар қилишга тўғри келади. Республикада ташқи ҳароратнинг кескин ўзгариши, атмосферанинг ҳолати катта рмираккабликлар келтириб чиқаради[3]. Масалан, Тошкент шаҳрининг, йиллар давомида олинган статистик кўрсаткичларга биноан, қишдаги ўртача ҳисобий ҳарорат «—18» градус, ёзда эса «+40» даражага этади. Бир йил давомида умуман республикада қиш ва ёз орасидаги ҳароратнинг фарқи ўртача 50 даража, баъзи вилоятларда (Қорақалпоғистон Республикаси, Хоразм вилояти ва ҳ.к. ларда) ҳароратнинг оғиши баъзи йиллари 50—65 даражага етади ва баъзида ундан ошиб ҳам кетади. Бу атмосферанинг кескин ўзгаришига, қурилиш конструкцияларининг маълум ўзгаришига, айниқса, инсон организмига катта салбий таъсир кўрсатади. Республика тарихига қаралса, баъзи йилиарда ёзги температура 50 даражадан ортиб кетадиган ҳоллар ҳам услирайди ва радиатсия хавфи кескин ортади. Шунинг учун республикада бу омилларга катта эътибор берилади. Шаҳарлар, туманларва микротуманлар бош тарҳларида истиқболдаги (20 йилдан сўнг) ижтимоий-иқтисодий, архитектура-қурилиш, санитаргигиеник ва муҳандис-техник масалалар инобатга олинади. Бу лойиҳада айниқса, турар-жойларни ижобий жойлашишига, юқорида кўрсатилган салбий омилларга катта аҳамият берилади [4]. Республика хусусиятларидан бири бўлмиш тупроқ намлигининг юқорилиги, ерости сувларининг юқори юриши ва тупроқламинг чўкувчанлиги. қолаверса, ерости тузларининг кўплиги қурилиш амалиётига катта салбий таъсир кўрсатади. Бу мураккабликни енгиш учун маълум тадбирлар, янги пойдеворлар сувларни қочирувчи ерости қувурлар, деформатсия чоклари каби чоралар кўришга тўғри келади. Республикада бир нечта газ, нефт ва бошқа фойдали қазилмалар кўплиги ҳамда уламинг ташқи муҳитга таъсирлари биноларни қуриш жараёнида кескин сезилади. Ундан ташқари, шаҳарларда, айниқса, катта шаҳарларда (Тошкент, Самарқанд. Андижон, Жиззах, Хоразм, Нукус каби) ҳавони кескин ифлосланиши сезилмоқда. Бу шаҳарларда бир неча омиллар, яъни транспорт тутуни, завод ва корхоналардан ташқарига чиқаётган тутун ва ҳидлар, ахлат ва турли салбий омиллар шаҳар экологиясини бузиб келмоқда. Иморатни лойиҳалашда уларга катта эътибор бериш зарурлиги кўриниб турибди. Шунинг учун уйжой, жамоа ва фуқаро ҳамда соғломлаштириш бино ва иншоотларини лойиҳалашда тегишли тадбирлар кўришга тўғри келади. Республиканинг қишлоқ жойларида, айниқса. пахта экиладиган ҳудудларда бир неча ўн йиллаб кимёвий моддалардан фойдаланиш натижасида тупроқ структураси бузилиб, заҳарланиш даражаси кескин ортган [5]. Уни озиқлантириш, дефолация қилиш учун катта миқдорда кимёвий моддалар келтириш ва уларни аҳоли яшаётган жойларда сақлаш, улардан турли кўринишда фойдаланиш инсон соғлигига катта салбий таъсир этиши ва хунук натижаларга олиб келиши аллақачон ҳаммага аён бўлган. Шунинг учун қишлоқ жойларда қуриладиган турар-жой ва фуқаро биноларини лойиҳалашда, биноларга ер ажратилаётган даврда кўрсатилган омилларга биноан камроқ зарар келтирувчи тегишли ечимлар қабул қилиш даркор. Албатта, бинолар кимёвий моддалар фойдаланиладиган жойдан камида 1000—1200 м нарида қурилгани маъқул. Шаҳарларда катта салбий кучга эга бўлган омиллардан бири бу шовқин, салбий товушлардир. Бу омил табиий ва сунъий манбалардан келиб чиқиб, инсон соғлиғига кескин салбий таъсир этиши мумкин. Бинокорликда оловбардошлик ва ёнғин хавфларини инобатга олган ҳолда лойиҳалаш ишлари ва тадбирларига доимо амал қилиш талаб этилади. Масалан, бинолар орасидаги масофалар камида бинонинг оловбардошлига қараб, I, II даражали оловбардошликда 6—10 м, III — 8—10 м, IV, V — 10—15 м этиб тайинланади [6]. Салбий омиллар манбаларидан турар-жойлар санитар муҳофаза зоналари орқали чегараланади. Санитар зоналари меъёрий ҳужжатларда, саноатда беш синфга бўлинади. Саноатда атроф-муҳитни ифлослантирувчи корхоналар мавжуд бўлиб, бундай манбалар ва қурилиш орасида санитар-муҳофаза зоналари қуйидаги ўлчамларга тенг бўлиши лозим. Масалан I синф манбадан - 1000 м, II синфдан - 500 м. III — 300 м, IV — 100 м, V- 50 м дан иборат майдон қолдирилади. Ёнғин ва унинг оқибатлари ер юзини ларзага

ва ортиқча ташвишга солиб келадиган салбий омиллардир. Иморатлар ёнғинида унда яшаётганлардан ташқари, атрофдаги ҳаёт фаолиятига ва, қолаверса, атроф-муҳитга салбий таъсир этади. Шунинг учун бино ва иншоотлами лойиҳалашда ёнғин таъсири инобатга олинади. Ҳамма иморатларда ёнғинга қарши тадбирлар ва ёнғиндан сақланиш масалалари ҳал қилинади. Иморатлардан ходим ва яшовчиларни, ёнғин ҳолатида, тезлик билан ташқарига чиқазиш учун алоҳида йўлакларва хоналар, эшиклар, зиналар ва йўллар, бино лойиҳасидагидек инобатга олинади [7]. Баъзи антиқа, инсонлар кўплаб йиғилиши мумкин бўлган меҳмонхона, театр, концерт заллари, цирк каби биноларда, ундан ташқари, кўплаб саноат обектларида, алоҳида стратегик аҳамиятга эга бўлган обектларда ёнғинга қарши автоматик ишга тушадиган замонавий ускуналар ўматилади. Республика хусусиятларидан келиб чиққан ҳолда кўп шаҳарларимиз (Ғазалкент, Чирчиқ, Каттақўрғон. ва бошқ.), тураржойлар сунъий сув ҳавзалари таъсирида сув босиш хавфига эга. Шундай хавфлар, албатта, шаҳарсозликда бош режаларда асосий омиллар қаторида ҳисобга олиниши ва ҳар қайси лойиҳада таҳлил қилиниши даркор.

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STUDYING A MATHEMATICAL MODEL OF HEAT LOSS THROUGH A TRANSPARENT BARRIER CONSTRUCTION OF A BUILDING

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Abstract: The article provides information on the current state of heating in residential and public buildings, the creation of comfortable conditions, the use of modern heat-insulating materials outside and inside the premises to prevent excessive heat loss from the premises.

Key words: housing, building, comfortable conditions, external barrier, construction, modeling, slabs.

Аннотация: Мақолада ҳозирги кунда турар жой ва жамоат биноларини иссиқлик билан таъминлаб, комфорт шароитни яратишда, аввалом бор бино қурулган бинонинг иқлими талаб даражасида бўлиши, хонадан ортиқча иссиқлик йўқолишини олдини олиш учун хонанинг ташқи ва ички томонидан замонавий иссиқлик изоляция материаллари билан қопланиши тўғрисида мисоллар ёрдамида маълумотлар келтирилган.

Калит сўзлар: турар жой, бино, комфорт шароит, ташқи тўсиқ, конструкция, моделлаштириш, плиталар.

Аннотация: В статье представлена информация о современном состоянии отопления жилых и общественных зданий, создании комфортных условий, применении современных теплоизоляционных материалов снаружи и внутри помещения для предотвращения чрезмерных потерь тепла из помещения.

Ключевые слова: жилье, здание, комфортные условия, внешний барьер, конструкция, моделирование, плиты.

With the adoption of high-efficiency thermal insulation materials and production methods in modern homes today, we will be able to achieve a reduction in heat lost through external material and operating costs and the cost of heating equipment. If we compare two external walls protected by different heat-insulating materials but with the same transmission resistance, without considering their different design and structural characteristics, a wall made of efficient material has a relatively small size and is cheaper. Thus, the more modern and efficient the quality of thermal insulation materials for the building, the more we will be able to save costs in the process of heating the house.[1]

In public buildings, the comfort of a person in a room is determined by many factors, including his age, health status, working condition and other similar parameters. The human body senses the environmental conditions that surround it, such as the temperature on the inner surface of the structures that surround the room, the amount of moisture in the air, and the speed of the air in the room. The average surface temperature of the human body is 306 K (32-33 0S). If the temperature of the objects around a person is lower than 291-297 K (18-24 0S) (comfort conditions), the heat transfer of the human body begins to increase.

The heat demand of a building is affected from the time it is designed, partly due to the rational placement of the building, the more the building is exposed to wind, the higher the heat loss from it. The presence of greenery and others around the building protects it from the wind and reduces heat loss.

Most of the buildings are close to each other, they are built as a ball. This situation was due to the unfavorable weather conditions and the small area of the building's exterior surfaces exposed to wind. Such measures remain important in modern construction design. The main priority in the placement of houses should be to protect the rest of the houses from the wind, taking into account the direction of the wind. The relief of trees or land around the first-row house, which is located in the most inconvenient place, can be artificially compensated.

For all types of buildings, it is advisable to install a drum to prevent heat loss. The drum is most effective when the outer door is open or when the inner door is closed when it is open. If there is no drum, heat is lost through the total volume of the vestibule as the entrance door is opened. The

air volume in this room is about 30 3 m, the air volume in the drum is only 8,3 m. If the air in the room cools from 293 0K (20 ^{0}S) to 283 0K (10 ^{0}S) with the door open for a long time with the door open, 108 W is required to compensate for this heat loss without discomfort, with the drum installed - only 29 W: 73% less will be.[2]

Excess of window faces increases heat loss despite having 2 layers. In terms of thermal protection, in corner rooms it is preferable that the window is installed on only one external wall. Otherwise, heat loss will also increase as air permeability increases. The thermal protection of a room depends on the resistance of the surrounding (wall covering) heat transfer, which is radically different in modern modern buildings. They are made of different materials, so they perform special functions. Each material has its own thermal conductivity l and the accepted rational thickness d resistance to thermal conductivity. Surrounding structures include windows and doors. Their resistance to thermal conductivity is small compared to other constructions.

The ratio of the surface area of the open areas to thermal protection has an additional effect on the surface of the solid walls. The larger the surface of the outer wall (surrounding structures) surrounding the room, the more noticeable the heat loss through the outer surface, and the smaller the heat loss through the internal structures, so the thermal protection of the room depends on its geometry and location in the building.

In construction, partial thermal insulation materials consist of solid particles in different systems and air between them, so the thermal conductivity of the material is at the boundary between the thermal conductivity of the material particle and the thermal conductivity of the air. When P = 0.1 MPa at = ^{0}S, l = 0.0242Vt / (m ^{0}S)).[5]

Accumulation of heat. This concept is the heat transfer as a result of the heating of a substance or structure. The magnitude of the amount of heat collected depends on the difference in air temperatures surrounding the structure (substance) (the higher the difference, the greater the amount of heat collected), the greater the specific heat capacity and the mass of the structure.

In order to create a good microclimate in the bedroom and working rooms during the summer, the ability of the structure to collect heat, especially the ability to collect inside the room, the ratio of window area to the surfaces of internal structures is of particular importance. The internal heat tolerance of a building in summer depends not only on the thermal inertia of the surrounding outer walls. At the base of the barrier will be under the strong influence of outside air temperature and sunlight (depending on the location of the building). The heat falling through the window is not completely absorbed through the wall, so the surface of the barrier structure must be made of a material that has the property of collecting heat.

It can be concluded that the window installation on the south-facing wall is more rational than the south-west, south-east and west in terms of heat protection. Air layer. Unlike solid building materials, the thermal conductivity of the air layer is determined by different heat transfer paths. If λ= const for solids, the heat transferred by convection in the air layers varies depending on the thickness of the air layer, the heat transferred by radiation changes depending on the surfaces of the 2 layers forming the air layer. It is also important to note that hot air always rises to the top, so it is important to consider the direction of heat flow.[4]

Under the influence of sunlight, a sharp rise in temperature and cooling in the evenings are felt as discomfort. The cause of the phenomenon in both cases is the result of the process of heat exchange through the external structures. When the air in the room is heated in summer, the structure does not have a state of heat accumulation.

Under the influence of sunlight, a large amount of heat is transferred into the structure, so the temperature on its outer surface rises slowly Qn remains low; many compared to a structure that is small Once the sunlight has stopped falling, the accumulated heat moves again in the evening from the center of the structure to its surface, which in turn ensures a gradual decrease in surface temperature. Thus, a structure with high external heat collection capacity is less affected by the deformation of a large number of daily temperatures. In determining the temperature deformation, first of all, it is the most important time for the existing outer layers.

The impact radiation energy is quickly introduced into the thickness of the structure and (if the internal heat collection capacity is small or the heat flux intensity is high) quickly passes to the inner surface of the structure and heats it. It is not advisable for the indoor air temperature to rise as a result of such heating.

This shortcoming can be mitigated through the application of a number of measures. The most

familiar is the installation of screens with a ventilated air layer. As a result, the temperature of the layer on the wall surface and behind the screen decreases. The installation of the screen is also welcome in vapor diffusion. As mentioned above, the total heat capacity is $Q = Q_n + Q_v$. It follows that the internal heat accumulation corresponds to a low value of heat accumulation Qn except for a high value of Q_v. If we compare the advantages and disadvantages of the two options, Q_v i.e. internal heat storage capacity is crucial. Its external heat collection capacity is higher than Q_n in relation to the shortcomings noted before evaluating its value. It can be concluded that we can achieve a reduction in heat loss by covering the building with good thermal insulation from the outside and inside to keep the internal temperature of the building in a comfortable environment while saving energy.

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USE OF SOLAR ENERGY FOR HEATING RURAL HOUSES

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Аннатация. На основе научных исследований и практического опыта показаны преимущества использования пассивной солнечной системы отопления в сельских домах. Показано, что скворечник, спроектированный на базе типового 3-комнатного загородного дома для климатических условий Узбекистана, потребляет до 10 раз меньше энергии, чем обычные дома. Пассивные солнечные системы отопления дают возможность в будущем полностью отказаться от традиционных систем отопления.

Ключевые слова: энергоэффективность, состав, экономичность, рентабельность, каркас, газобетон, инновационный.

Annatation. Based on scientific research and practical experience, the advantages of using a passive solar heating system in rural houses are shown. It is shown that a birdhouse designed on the basis of a typical 3-room country house for the climatic conditions of Uzbekistan consumes up to 10 times less energy than ordinary houses. Passive solar heating systems make it possible in the future to completely abandon traditional heating systems.

Key words: energy efficiency, composition, efficiency, profitability, frame, aerated concrete, innovative.

Аннатация. Олиб борилган илмий тадқиқотлар ва амалий тажрибалар асосида қишлоқ уйларида пассив қуёш иситиш тизимидан фойдаланишнинг афзаликлари келтирилган. Ўзбекистон иқлимий шароити учун 3 хоноли намунавий қишлоқ уйида асосида лойиҳаланган қуш уйи оддий уйларга нисбатан 10 баробаргача кам энергияни сарфланиши кўрсатилган. Пассив қёш иситиш тизимлари келажакда оддий иситиш тизимларидан мутлақо воз кечиш имкониятини беради.

Калит сўзлари: энергоэффективлик, композицион, самарали, иқтисодий тежамкорлик, каркас, ғовакли бетон, инновацион.

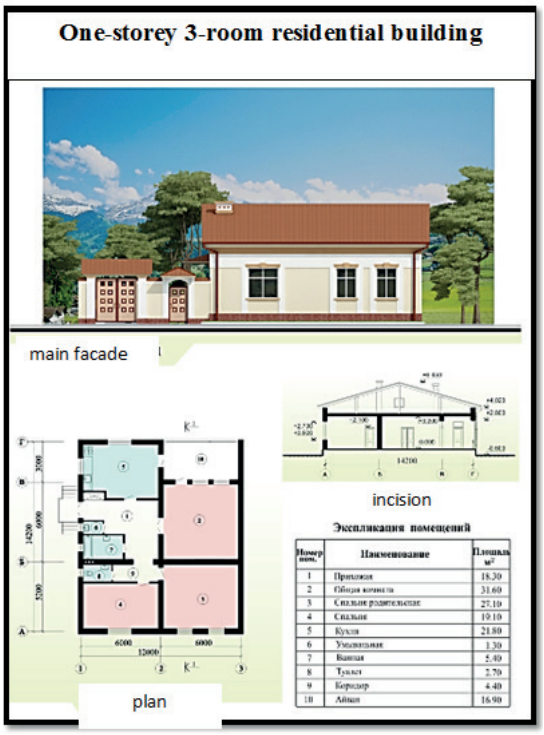
Our institute, together with Kishlokkurilishloyiha LLC, is implementing the GKNT KA4-003 project to develop promising types of rural housing with low and ultra-low energy consumption. In the research «Fundamentals of the development and implementation of design solutions for exemplary energy-efficient rural residential buildings based on the results of experimental studies of the first solar house built in the Tashkent region.»

The main idea of the project is to find and identify promising areas of energy saving in buildings. In particular, economically sound solutions to improve the energy efficiency of one-story rural houses of a higher comfort class using passive solar heating technology.[1]

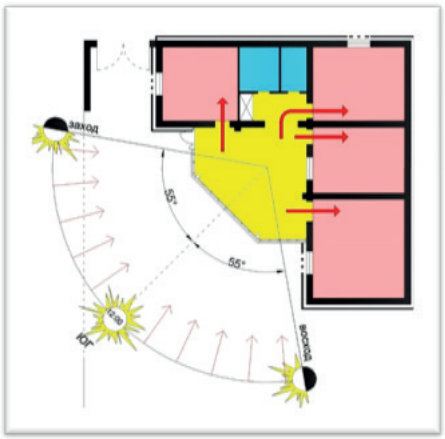
Based on the results of experiments carried out in a heliodome built in the village of Burchmulla, Tashkent region, solar engineering requirements for the design of a rural residential building with a passive solar heating system have been developed. In particular, the project applied measures to ensure the required thermal stability of the building and passive solar heating technology. A glazed aivan (veranda) is used as a receiver of low-temperature solar heat. This method, in our opinion, and it has been experimentally proven, is the most acceptable solution for the conditions of low-rise housing construction for the natural and climatic conditions of Uzbekistan. Glazed aivan in front of living quarters is the most frequently encountered compositional solution of public housing.

To obtain comparable results, 3, 4 and 5-room residential buildings, which are widely under construction in rural regions, are taken as a basis for standard projects of the 184 series of an

increased comfort class. The basis is a 3-room residential building with a heated area of 127 m^2. The parameters of the premises, including its height of 3.2 m, have been saved in the heliodoma project. The area of the glazed aivan is taken as 39m^2, it satisfies the solar heating conditions, providing the required glazing area of the aivan with a southern orientation, and corresponds to the total area of the veranda, front hall and corridor of the standard design, that is, the condition of comparability is met.[3]



Rural house project 184 series used as a baseline for comparing the energy efficiency of solar heating.



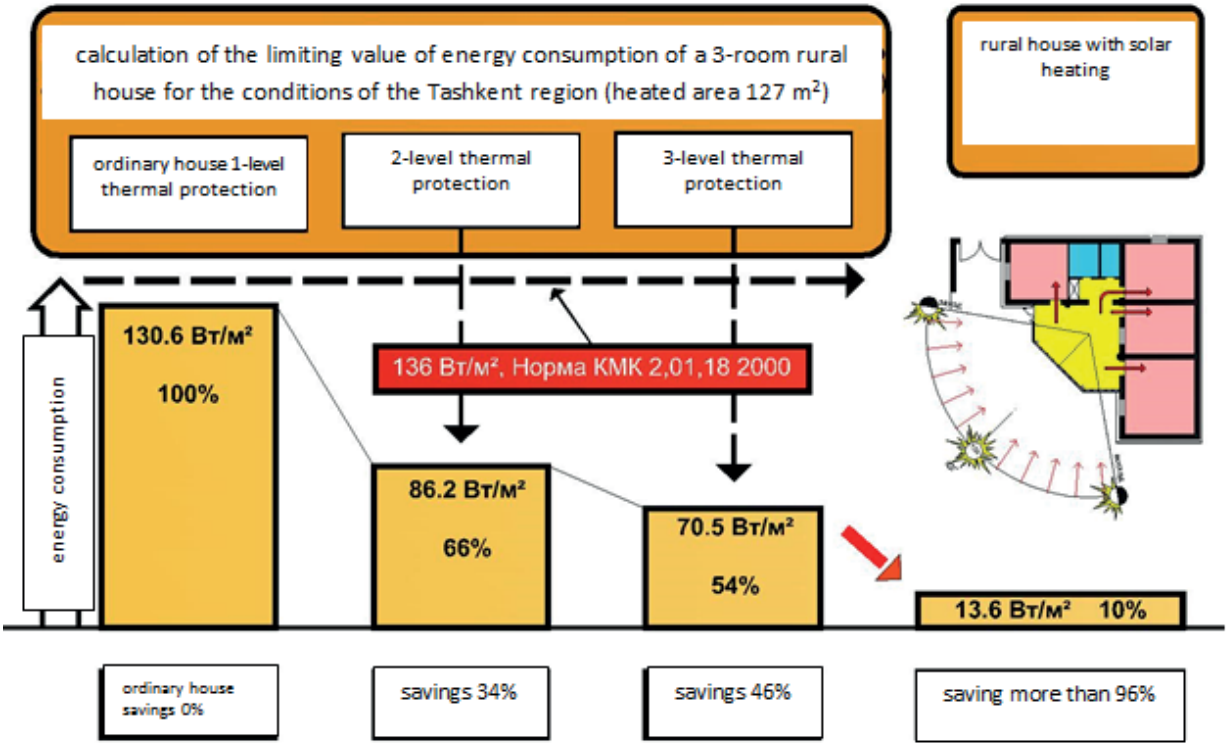
Project proposal for a 3-room rural solar house.

Within the framework of the GKNT KA4-003 Project, computational and theoretical studies were carried out using the ENSI EAB software (Norway) to determine the energy efficiency of solar heating.[4]

A 3-room rural house of 184 series used as a basic version for conditions of -140C outside air consumes thermal energy for heating 15,000 W, specific heat consumption 123.9 W / m^2 at a standard rate of 136 W / m^2. The annual specific consumption of heat energy for heating is 235 kWh / m^2 per year.

In the proposed rural solar house project, in terms of the totality of the measures taken, a high energy saving potential is laid down, which allows to reduce fuel consumption for heating by 10 times, unit heating costs are reduced to 24 kWh / m^2 per year and this object belongs to buildings with ultra-low energy consumption.[5]

DOI http://doi.org/10.37057/A_7



In the future, after the construction of several pilot demonstration facilities and experiments to improve the system, there is a real opportunity to completely abandon the traditional natural gas heating system. Small amounts of natural gas and other fuels will only be used for cooking.

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ECONOMIC SCIENCES

ПРОБЛЕМЫ БЕДНОСТИ В СОВРЕМЕННОМ МИРЕ

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Аннотация. В этой статье подняты вопросы: о трактовке понятия бедность, концепции изучения и изменения бедности, об основных группах бедных и их признаках, о содержании и критериях неравенства

Abstract: This article raises questions: about the interpretation of the concept of poverty, the concept of studying and changing poverty, about the main groups of the poor and their characteristics, about the content and criteria of inequality

Ключевые слова: бедность, черта бедности, прожиточный минимум, хроническая бедность.

Keywords: poverty, poverty line, cost of living, chronic poverty

Известно, что бедность была вечным спутником человеческой цивилизации. Она сопровождала человека во все времена, но особенно масштабный характер приобретала в периоды природных ка¬таклизмов (землетрясений, наводнений, засух), социальных потрясений (войны, революции), а также во времена экономических, политических кризисов. Но несмотря на различия ее проявления и уровня в разных странах, во все периоды человечества она имеет общие черты. Бедность — это лишение лю¬дей элементарных условий жизни, необходимого набора продуктов питания, которые обеспечивали бы ему нормальный уровень жизнедеятельности. Кроме этого, есть также социальные, психологиче¬ские аспекты данной проблемы, так как бедность унижает человеческое достоинство, делая его чело¬веком, не способным в полной мере осуществлять свое истинное предназначение — быть нормаль¬ным гражданином государства и полноценной личностью цивилизованного общества. Поэтому борь¬ба с бедностью, стремление как можно больше сократить ее уровень должны быть приоритетами в любом цивилизованном современном государстве.

Проблема бедности волновала лучшие умы человечества с давних пор. При этом она получала у разных ученых самые различные трактовки. Еще с периода древности во многих теориях прослежи¬валась мысль о том, что пока живо человечество, всегда будет существовать неравенство. Например, великий философ Платон рассматривал государство как сообщество людей, порожденное самой при¬родой. Он впервые высказал мысль о неизбежности деления его населения на две части: богатых и бедных. Однако при этом Платон утверждал, что научно организованное общество должно осущест¬влять принципы справедливости, обеспечивать социальную стабильность и внутреннюю дисциплину. Именно таким он представлял общество, руководимое идеальными правителями.

Размышлял о стабильности государства и другой философ — Аристотель. Он призывал думать о бедных, так как, по его мнению, бедность порождает бунты и преступления. То государство, где нет среднего класса, а бедных — большинство, обречено на гибель.

Однако при этом он выступал как против власти бедняков, лишенных собственности, так и про¬тив власти правления богатой аристократии. Он считал, что лучшее общество формируется на основе именно среднего класса.

В XIX в. представители социальных теорий считали, что основными причинами бедности чело¬века являются исключительно его индивидуальные качества, такие как лень, нежелание трудиться, стремление к бродяжничеству и т.д. Теория Спенсера, Мальтуса предписывали государству не под¬держивать бедных, так как, по их мнению, они сами виноваты в своем бедственном положении.

В советское время о бедности как о социальной проблеме не говорилось, так как

считалось, что в Советском Союзе ее нет. Все многочисленные аспекты проблемы бедности скрывались под термином «малообеспеченные группы населения». Официально считалось, что в Советской стране обеспечение разумных потребностей основной массы населения уже достигнуто. Однако бедность была серьезной проблемой уже к приходу М.С.Горбачева к власти, а в годы его правления, по мере сокращения про¬изводства, неуклонно нарастала.

В советской обществоведческой литературе термины «бедность», «черта бедности» появились только в период перестройки. Во время перехода к рыночным отношениям происходит уже открытое признание бедности как крупнейшей и самой болезненной социальной проблемы. Тогда же со всей остротой встал вопрос о механизме социальной защиты населения от негативных проявлений пере¬ходного периода.

В Докладе о развитии человека за 2003 г., посвященном Декларации тысячелетия, было отмече¬но: «Для борьбы с нищетой нужно понимать ее причины... В 90-е годы обсуждения тематики разви¬тия были посвящены в основном трем блокам проблем. Первый блок — это проблемы, связанные с необходимостью экономических реформ для обеспечения макроэкономической стабильности. Вто¬рой — потребность в эффективных институтах и управлении для обеспечения господства права и борьбы с коррупцией. Третий — необходимость достижения социальной справедливости и вовлече¬ния населения в процессы принятия решений, влияющих как на жизнь отдельных людей, так и на жизнь целых общин и стран...» [4]. В данном докладе признается, что 90-е годы стали для многих стран десятилетием отчаяния. В начале 2000-х годов 54 страны стали беднее, чем в 1990 г., в 21 стра¬не от голода страдает большая часть населения, в 34 странах сократилась ожидаемая продолжитель¬ность жизни. В Докладе указывается, что более 1,2 млрд. человек на планете живут на средства, со¬ставляющие менее 1 доллара в день.

На мой взгляд, стоит обратить внимание на стратегии нижеуказанного Компак¬та, чтобы ускорить процессы снижения уровня бедности в стране.

Первое — массированное привлечение инвестиций в здравоохранение и базовое образование, что способствовало бы созданию устойчивых предпосылок для экономического роста. В свою оче¬редь, экономический рост может обеспечить занятость и увеличить доходы, что позволит, в свою очередь, вновь направлять дополнительные инвестиции в образование и здравоохранение.

Второе. Актуальным для многих стран в том числе и для Узбекистана является такой стратегический компонент, как созда¬ние максимально благоприятных условий для увеличения производительности труда мелких сель¬скохозяйственных производителей путем микрокредитования, привлечения внимания соответствую¬щих международных организаций к нуждам села, оказания всемерной поддержки жителям села со стороны государства и т. д.

Третье. Улучшение базовой инфраструктуры дорог, энергосистем, средств связи в целях сокра¬щения производственных издержек и преодоления географических препятствий.

Четвертое. Разработка грамотной политики промышленного развития, стимулирующей пред¬принимательство и способствующей диверсификации экономики с перспективой преодоления ее за¬висимости от экспорта сырьевых товаров, при активном участии малых и средних предприятий.

Пятое. Поощрение демократического управления и действенной реализации прав человека в це¬лях ликвидации всех видов дискриминации, обеспечения социальной справедливости и повышения уровня благосостояния всего населения.

Шестое. Обеспечение в стране экологической устойчивости и рационального управления го¬родским хозяйством для достижения устойчивых позитивных сдвигов в области развития. Несо¬мненно, вышеуказанные стратегии слишком масштабны, и страна, которая будет стремиться их реа¬лизовывать в своей политике, не сможет с ними справиться самостоятельно. Для этого необходима инвестиционная поддержка других стран, но, с другой стороны, важное значение имеет также и мо¬билизация внутренних ресурсов.

Подчеркнем еще один немаловажный факт. Никакие усилия государства не будут эффективны¬ми, если они не найдут поддержки у подавляющего большинства населения. Необходимо привлече¬ние средств массовой информации, системы образования для проведения воспитательной, агитаци¬онной работы, направленной на мобилизацию населения для реализации основных направлений стратегии по сокращению уровня

бедности в стране. При этом необходимо убеждать людей, что одни из главных причин их бедности — это пассивность, неуверенность в собственных силах и возможно¬стях. Необходимо побуждать людей рассчитывать не только на поддержку государства, но и на свои собственные силы. Для этого в средствах массовой информации необходимо всемерно и наглядно освещать положительные примеры деятельности людей, своими силами, своим трудом добившихся положительных изменений в своей жизни.

В этой связи не лишним было бы выразить следующую мысль. В истории человечества на раз¬ных ее этапах было немало примеров, когда страны, находившиеся в кризисных ситуациях, самыми различными путями решали проблемы преодоления кризиса, подъема благосостояния граждан. Ду¬мается, что необходима мобилизация сил ученых-обществоведов, которые могли бы исследовать по¬добные примеры. Нужны организация и проведение различного рода научно-практических конфе¬ренций, других научных форумов, на которых ученые, специалисты, обсудив проблемы бедности в различных странах, могли бы выработать, предложить более конкретные пути решения этой важной проблемы. Опыт других стран может оказаться крайне полезным и преемлемым и для нашего госу¬дарства.

Несомненно, совершенно искоренить бедность пока не по силам любому, даже самому благополуч¬ному государству, однако стремление к сокращению ее уровня, обеспечению благосостояния граждан должно стать одним из важнейших направлений политики любого цивилизованного общества.

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PHILOLOGICAL SCIENCES

ИНГЛИЗ ВА ЎЗБЕК ТИЛИ ЮКЛАМАЛАРИДА СИНОНИМИЯ

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Аннотация: Ушбу мақолада юкламалар лексик маъно англатмаса-да, ўзи каби ёрдамчи сўз бўлган боғловчи ва кўмакчилар, бир юклама иккинчи бир юклама, сифат туркумига оид айрим сўзлар билан синонимлик ҳосил қилиши ҳақида фикр юритилган.

Калит сўзлар: юклама, маъно, синонимия, кўмакчи, боғловчи, сифат.

Юкламаларнинг ифодалайдиган маъно нозикликлари доираси анча кенглиги, улар нейтраллик даражаси, маъно ифодалаш кучи ва услубий қўлланишига қараб ўзаро синонимлик қаторини ҳосил қилиши кўрсатилган. Юкламаларда синонимия кенг тарқалган. Улар: 1) ўзи каби ёрдамчи сўзлар, яъни боғловчилар ва кўмакчи; 2) бир юклама иккинчи бир юклама; 3) сифат туркумига оид айрим сўзлар билан синонимлик ҳосил қилади. Юкламаларда синонимия кенг тарқалган. Улар, айниқса, боғловчилар билан кўпроқ маънодошлик ҳосил қилади. Шунинг учун боғловчи-юклама атамаси ҳам ишлатилади. Бунда боғловчи ўрнини юклама, ёки аксинча, юклама ўрнини айрим кўмакчи ёки боғловчи эгаллаши намоён бўлади. Лекин боғловчи ва юкламалар, бир юклама иккинчи бир юклама билан синонимлик ҳосил қилса-да, улар ўртасида услубий маъно нозикликлари сақланиб қолади.

-ки/-ким, -у, -ю, -да, -ми каби аффикссимон юкламалар шаклан юклама бўлса-да, мазмуни ва вазифасига кўра боғловчиларга тенг кела олиши жиҳатидан вазифадош боғловчи ҳисобланиб, боғловчилар туркумига ҳам киритилади. Шунинг учун уни тўппадан-тўғри *боғловчи-юклама* номи билан ҳам учратиш мумкин.[1] Бу юкламаларнинг боғловчи вазифасида келиши анча кенг тарқалган ҳодисадир. Масалан, *-ми* қўшимчасимон сўроқ-таажжуб юкламаси ҳам боғловчилик хусусиятига эга. Буни "*Бола йиғладими, мушук чийилладими, кампир фарқлай олмади"* типидаги гаплар тасдиқлайди. Кетирилган гапда қўлланган *-ми юкламаси* аслида *сўроқ* юкламаси бўлса-да, таъкид маъносини воқелантирган бир неча содда эргаш гапли мураккаб қўшма гап қисмларини бир-бирига боғлаб келмоқда.

-да кучайтирув-таъкид юкламаси шарт майлидаги феъллардан ҳамда келишик қўшимчаларидаи сўнг қўлланиб келганда тўсиқсизлик маъносини англатиб, *ҳам* кучайтирув-таъкид юкламаси билан маънодошлик ҳосил қилади ва иккаласи ўзаро синоним сифатида қаралади.

Ҳам юкламаси такрорийлик маъносини ифодаловчи пресуппозицияга ишора воситаси бўлиб келганда у, асосан, пайт ҳолига боғланиб, кесимдан англашилган иш-ҳаракатнинг такрорийлигини кўрсатиш орқали пресуппозицияни юзага келтиради. Фақат бу ***ҳам*** юкламаси орқали яширин тушунилади. Масалан: *Директор бугун кечгача ҳам чақирмади.* Аниқ пропозиция – *Директор бугун кечгача ҳам чақирмагани.* Пресуппозиция – *директорнинг чақиришини кутгани; директор чақирмаётганининг давом этаётгани, олдинги кунлардаги ҳолатнинг қайта такрорланганлиги.*

Бунга *ҳам* юкламаси ва пайт билдирувчи "бугун кечгача" сўзи ишора қилаяпти. Мазкур гапда яна кутиш маъносидаги пресуппозиция ҳам англашилмоқда. Бунда кесимдан англашилган иш-ҳаракатнинг олдин ҳам юз берганлигига ишора қилувчи *бугун* пайт равиши орқали ва *ҳам* юкламаси билан бирга такрорийлик маъносидаги пресуппозицияни юзага келтирган. Бу гапда қўлланган "бугун кечгача" сўзи "бутун"нинг "қисм"и, чунки бугун – бутун бир сутка бўлса, кеч унинг қисмини англатиши жиҳатидан пресуппозиция юзага келган. Бунда *ҳам* юкламаси пресуппозицияга ишора қилувчи восита бўлган. Шунинг учун гап таркибидан *ҳам* юкламаси тушириб қолдирилгудай бўлса, такрорийлик маъноси ифодаланмай қолади.

[1] Асқарова М. Ўзбек тилида боғловчи-юкламалар ҳақида // Ўзбек тили ва адабиёти. – 1962. – 5-сон.

Такрорийлик маъносини ифодаловчи пресуппозицияни *ҳам* юкламасидан ташқари ***яна, тағин*** каби юкламалар ҳам юзага келтириши мумкин. Масалан: *Директор бугун кечгача яна чақирмади. // Директор* тағин б*угун кечгача ҳам чақирмади.*

Маълумки, инглиз тилидаги *this, that* сўзлари ўзбек тилида *бу, шу, ўша, ана шу, ана ўша, мана шу* каби кўрсатиш олмошларига муқобил келади. Бироқ *ана, мана* сўзлари баъзан юклама, баъзан кўрсатиш олмоши сифатида ҳам қабул қилинади. Кўрсатиш олмошлари юклама ёки кўмакчилар билан келса, пресуппозиция юклама ёки кўмакчига таллуқли бўлади.

Аниқлов юкламалари саналувчи ***худди, нақ*** юкламалари чоғиштириш (қиёслаш, ўхшатиш) маъноларини билдириб келганда отларга қўшиладиган **-дек, -дай** луғавий шакл ясовчи қўшимчалар ёки ***каби, сингари*** кўмакчилари билан синонимлик қила олади.

Ўзбек тилида яратилган матнларнинг инглиз тилига таржимаси жараёнида қўшимча кўринишидаги *-гина* айирув-чегаралов юкламасининг инглиз тилида *only – фақат* маъносидаги сўз юклама билан алмаштирилиши мумкинлиги кузатилади. Масалан: "Бироқ бу можаронинг асл сабабини икки киши***гина*** биларди: ерда думалаб ётган анови *арбобу еру кўкка сиғмай юрган ўзинг!*"[1] ("But ***only*** two people knew the reason behind this row: you and the official lying on the floor".

Юқоридаги матн аслиятида берилган "арбоб***у*** ер***у*** кўкка сиғмай юрган ўзинг" уюшиқ бўлакларини бир-бирига боғлашга хизмат қилаётган ***"-у"*** юкламаси бу ўринда тенг боғловчи вазифасида иштирок этган. Шунинг учун таржимада ҳам у тўппадан-тўғри *and* бириктирув боғловчисига алмаштирилган. Фақат бунда *"еру кўкка сиғмай юрган ўзинг"* бирикмасида сифатловчи аниқловчи вазифасида келтирилган ибора тушириб қолдирилгани учун унинг таркибидаги ер ва кўк сўзларини боғлаб келган ***"-у"*** юкламаси ҳам сақланмаган. Шунингдек, аслиятдаги ҳис-ҳаяжон, ундов оҳанги ва шакли ҳам йўқолган, яъни аслида ҳис-ҳаяжон (ундов) гап таржимада оддий гап кўринишида берилган. Буни унинг ундов белгисиз берилаётганидан ҳам илғаш мумкин.

[1] Аъзам, Эркин. Шовқин: роман, қисса, ҳикоялар – Т.: O'zbekiston, 2011. – Б.178.

МИРТЕМИР ШЕЪРЛАРИДА ДЕОПОЭТОНИМЛАРНИНГ БАДИИЙ-УСЛУБИЙ ҚЎЛЛАНИШИ

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Annotation: The article focuses on the names of deopoetonyms - natural phenomena mentioned in the poems of the Uzbek poet Mirtemir. The poet's poems speak about the artistic and methodological possibilities of deopoetonyms. Their symbolic nature is defined.

Key words: nature, naturalphenomena, depoetonym, fog, dew, symbol, emblem.

Деопоэтонимлар ўзи атаб келган табиат ҳодисалари номларини бир-биридан ажратиб кўрсатиш, уларни индивидуаллаштириш ва идентификация қилиш учун хизмат қиладиган сўз ва иборалар бўлиб, бадиий асарларда бошқа онимонимлар каби муҳим ўрин тутади. Улар ижодкорнинг ниятини, асарнинг асосий ғоясини очиб беришга, бадиий матнни шакллантиришга хизмат кўрсатади.

Табиий ҳодисаларнинг тилда мавжуд бўлган номлари бадиий матнларда кўпинча кўчма маънода келиб, экспрессивликни юзага келтиради. Бундай деопоэтонимлар, хусусан, шеъриятда муҳим экспрессив вазифаларни бажариб келади. Масалан, Миртемирнинг "Шудринг" сарлавҳали шеърида лирик қаҳрамон бошидан кечирган ички ҳолатлар тасвири учун шудринг ҳодисаси муҳим лингвопоэтик восита бўлиб келган. Шоир шудрингни "гўзал япроқларда, кўкатларнинг баргида, чечакларнинг бағрида, шўх сой қирғоқларида, ниҳоллар куртагида сал эпкинда симобдай қалтираб ялтираган лак-лак инжуга; келинлар тақинчоғи – кўзмунчоққа; бўй-бўй дилрабо қизларнинг узуги кўзларига, кечаси билан тағин йиғлаб чиққан онаси кўз ёшларига ўхшатган. Айниқса, шоирнинг шудрингни она кўз ёшларига менгзаши жуда таъсирли чиққан. Шоир она ҳолатини, характер-хусусиятини очиб бериш учун асосий юкни табиат ҳодисаси номи – шудринг деопоэтонимига юклаган. Бу ўринда шудринг ва кўз ёш ҳодисалари кўриниши ўртасидаги ўхшашлик уларни маъновий жиҳатдан ҳам яқинлаштириб, бири учун иккинчисини тасвир объекти сифатида танлашга замин яратган.

Миртемирнинг "Суҳбат" шеъри халқнинг шамол қўшиғи "Ё Ҳайдар" оҳангида битилгани билан эътиборни тортади:

Ҳайдар! Бошла сўзингни, юрак тўлқинланади,
Киприкларим пирпираб, кўзим ўтдай ёнади.[1]

Юқоридаги сатрларда шамол сўзи тилга олинмаётган эса-да, ундаги Ҳайдар номи шамолга мурожаат этилаётганлигини билдиради. Чунки қадимги туркий халқлар қатори ўзбек халқи орасида ҳам шамол пири сифатида Ҳайдар культига сиғиниб, шамол чақириш («Ё Ҳайдар») маросими ўтказиб келинган. Мана шу жараёнда Ҳайдар номи билан боғлиқ эътиқодий инончлар тизими асосида шамолнинг афсонавий ҳомийси – Ҳайдар ёки Мирҳайдар номи тилга олинган. Миртемирнинг ушбу сатрлари шу қарашлар асосида яратилган. Шамолнинг эсиши лирик қаҳрамон туйғуларини жунбушга солади. Шоир унинг эсишида эзгуликларини, яхшиликларни кўради. Демак, Миртемир халқнинг шамол чақириш қўшиғи қаҳрамони Ҳайдар номини талмеҳ сифатида қўллаб, ўзига хос сир сақлаш баробарида поэтик фикрни таъсирчан ифодалашга ҳам эришган.

Шоирнинг 1940 йилда ёзган "Барака томчилари" номли шеърида "туман" ҳодисаси образлантирилган:

Оқ туман оқади юксак тоғ бошидан,
Шамол қувлаётир водий устига.
Ҳайратда боқаман ясси оқ тошидан,
Бир зумда кўк кирар мармар тусига...[2]

Ушбу шеърда табиат ҳодисасининг иккита кўриниши: бири туман, иккинчиси эса

[1] Миртемир. Асарлар. 3 жилдлик. 1-жилд. – Т.: Ғ.Ғулом номидаги Адабиёт ва санъат нашриёти, 1971. – Б.52.

[2] Ўша китоб, 176-бет.

шамол номлари кетма-кет келтирилиши натижасида таносиб санъати вужудга келтирилган. Иккинчидан, шеърда “оқ” сифатловчиси туман сифатланмиши билан бирикиб, “оқ туман” аниқловчили бирикмаси ҳосил бўлган. Бу ўринда “оқ” сифати орқали эпитет – сифатлаш бадиий санъати юзага чиққан. Учинчидан, туман “оқади”, шамол эса қувлаётир каби ҳаракат номини билдирувчи феъллар билан келтирилиши натижасида жонлантириш санъати пайдо бўлган.

Миртемир кўпгина шеърларида табиат ҳодисалари номини қатор қилиб санаш орқали таносиб санъатини яратгани кузатилади:

Осмон – зумрад қубба, жуда ғуборсиз.
Ўртасида тўлин ой, осилган қандил янғлиғ...
Еллар ҳар қадамда ўйинга тушар орсиз.
Қуюн, қор ўйинлари шўх бормикин ел янғлиғ?

Шоирнинг маҳорати туфайли ел (шамол), қуюн, қор каби табиат ҳодисалари жонлантириш санъати асосида ифода этилаётир. Хусусан, “зумрад қубба”дек ғуборсиз осмондан эланиб тушаётган шўх ва ўйноқи қор зарраларининг рақс тушаётгандек шамолда тебраниб тушаётгани инсон ҳиссиётларига хуш таъсир кўрсатиб, завқини оширади. Осмон қандилидек кўринаётган тўлин ой ёғдусида бу манзара янада жозибадорлик касб этади. Маҳоратли шоир Миртемир табиат ҳодисалари номини восита қилиб, мана шундай бетакрор ўхшатишлар яратган. Шоирларнинг инсон ҳаётидаги у ёки бу ҳолатни, қувонч ё қайғуни табиат ҳодисаларига қиёсан очиб бериши бадиий ижодда поэтик усул – параллелизм санъати ҳисобланади.[1]

Хулоса қилиб айтганда, бадиий адабиёт тилида учрайдиган деопоэтонимлар ҳам поэтонимнинг бошқа турлари сингари асарнинг маъновий-услубий имкониятларини таъминлашда муҳим восита саналади. Улар парадигматик хусусиятларга эга адабий онималар сифатида тил ва нутқ хосликларини англашда катта аҳамият касб этади.

[1] Ўраева Д. Ўзбек халқ қўшиқларида параллелизм. – Т.: Наврўз, 2019. – 176 б.

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