Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.191	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 8.100	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 6.004	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2026 **Issue:** 03 **Volume:** 155

Received: 28.03.2026
Accepted/Published: 30.03.2026 https://T-Science.org

Issue Article

Ismail Adilbaev
Karakalpak State University
isa.adilbaev121@gmail.com

Ruslan Bekbauliev
Karakalpak State University
Nukus, Uzbekistan

PROJECTING BUILDINGS AND STRUCTURES IN THE CONDITIONS OF KARAKALPAKSTAN: INNOVATIONS IN CONSTRUCTION, CONSTRUCTIVE AND SEISMIC SAFETY

Abstract: *The article examines modern principles for the design of buildings and structures in the conditions of Karakalpakstan, taking into account innovative construction technologies, requirements of structural reliability, and seismic safety. The natural-climatic and engineering-geological characteristics of the region that influence the selection of structural solutions are analyzed. Particular attention is given to the application of modern construction materials, digital design methods, and anti-seismic measures aimed at improving the stability and durability of buildings and structures. The necessity of a comprehensive approach to design is substantiated in order to ensure safety and sustainable development of the construction sector in the region.*

Key words: *Buildings and structures, construction innovations, structural safety, earthquake resistance, anti-seismic measures, BIM technologies.*

Language: *English*

Citation: Adilbaev, I., & Bekbauliev, R. (2026). Projecting buildings and structures in the conditions of Karakalpakstan: innovations in construction, constructive and seismic safety. *ISJ Theoretical & Applied Science, 03 (155),* 234-236.

Soi: https://s-o-i.org/1.1/TAS-03-155-18 ***Doi***: https://dx.doi.org/10.15863/TAS.2026.03.155.18

Scopus ASCC: *2200.*

Introduction

Modern construction is characterized by increasingly stringent requirements for the safety, energy efficiency, and reliability of buildings and structures. These requirements are particularly significant for regions with complex natural, climatic, and seismic conditions. Karakalpakstan is among such regions, where the design of buildings and structures must take into account the effects of seismic forces, aggressive soils, sharp temperature fluctuations, and various environmental factors.

Under such conditions, the design of buildings and structures requires the introduction of innovative technologies, the use of modern construction materials, and the application of advanced calculation and analysis methods. The aim of this study is to analyze modern approaches to design that incorporate innovations in construction, as well as to ensure structural and seismic safety.

1. Natural-Climatic and Seismic Conditions of Karakalpakstan

The climate of Karakalpakstan is characterized by aridity, high summer temperatures, strong winds, and significant temperature fluctuations throughout the year. The engineering-geological conditions of the region include the presence of loess, saline, and collapsible soils, which significantly affect the stability and bearing capacity of building and structure foundations.

In addition, the territory is located within zones of seismic activity, which requires mandatory consideration of dynamic loads during the design process. Insufficient attention to these factors may

lead to a decrease in structural reliability, the formation of cracks and deformations, and in some cases even emergency or failure conditions of buildings and structures.

2. Innovations in Modern Construction

Innovative technologies in construction are aimed at improving the quality of design solutions, reducing construction time, and lowering operational costs. One of the key directions is the introduction of digital technologies into the design process, including BIM modeling. These technologies make it possible to create three-dimensional information models of buildings, perform accurate load calculations, and predict the behavior of structural elements under seismic effects.

The use of modern construction materials also plays a significant role, including high-strength concrete, fiber-reinforced concrete, composite and fiberglass reinforcement, as well as energy-efficient enclosure structures. The application of lightweight and high-strength materials allows for a reduction in the self-weight of buildings, which positively affects their earthquake resistance.

3. Structural Safety of Buildings and Structures

Structural safety is one of the fundamental requirements in the design of buildings and structures. It is ensured through the rational selection of structural systems, accurate calculation of load-bearing elements, and strict compliance with established design standards and regulations.

Under the conditions of Karakalpakstan, spatial frame systems, rigidity diaphragms, monolithic reinforced concrete structures, and combined structural schemes are of particular importance. These solutions ensure the uniform distribution of loads and enhance the stability of buildings under the influence of external factors.

In addition, the reliability of foundations is also essential. When designing foundations, it is necessary to consider the properties of the foundation soils, potential settlements, and the effects of seismic vibrations.

4. Seismic Safety and Anti-Seismic Measures

The seismic safety of buildings and structures is achieved through a set of structural and technological measures. These include the implementation of anti-seismic design solutions, the use of damping and energy-dissipating devices, as well as ensuring the symmetry of planning solutions and the spatial rigidity of structural systems.

The seismic analysis of buildings must be carried out in accordance with current design standards, taking into account the design-level earthquakes. Particular attention should be given to the joints of structural elements, as they are the most vulnerable parts under dynamic loading and are more susceptible to damage or failure during seismic events.

5. Prospects for sustainable construction in the region

The comprehensive implementation of innovative technologies, modern materials, and anti-seismic solutions is creating the conditions for the sustainable development of Karakalpakstan's construction sector. An increased level of design will help reduce emergencies, extend the service life of buildings, and improve the quality of the urban environment.

Further developing the digitalization of construction, using energy-saving technologies, and adapting international best practices to regional conditions are considered promising directions.

Conclusions

1. The design of buildings and structures in Karakalpakstan should be based on a comprehensive consideration of natural, climatic, and seismic factors.
2. Innovations in construction contribute to increasing the structural reliability and seismic safety of buildings.
3. The use of BIM technologies and modern materials allows for the optimization of design solutions and reduces the risk of damage.
4. Ensuring structural and seismic safety is a key condition for the sustainable development of the construction sector in the region.

References:

1. Suleymanov, A., & Xamrabayeva, N. (2023). Issledovanija aktual`nyh problem obespechenija sejsmicheskoj bezopasnosti recipientov v Uzbekistane. *Bino va inshootlarning seysmik xavfsizligi*, № 1, 2023, 21-25.
2. Mahmudov, S., Samiyeva, Sh., & Islomova, N. (2023). Energiya tejamkor binolarni loyihalashning tizimli tahlili. *Bino va inshootlarning seysmik xavfsizligi*, № 1, 2023, 340-348.

3. Xodjaev, S. (2023). Nauchno-tehnicheskij uroven` i sobludenie trebovanij stroitel`nyh norm — osnova obespechenija sejsmobezopasnosti zdanij. *Bino va inshootlarning seysmik xavfsizligi*, № 1, 2023, 11-18.
4. Habibullayev, Sh. (2023). Qurilishni tashkil etishda BIM axborot modellashtirish xususiyatlari. *Bino va inshootlarning seysmik xavfsizligi*, № 1, 2023, 130-132 b.
5. (2024). Problemy proektirovanija i stroitel`stva zdanij i sooruzhenij v sejsmicheskih rajonah, na slabo uvlazhnjonnyh glinistyh i osadochnyh lessovyh osnovanijah. *International Journal of Scientific Trends*, Vol. 3 № 2, 2024.
6. (n.d.). *Normativ hám metodikalıq materiallar: ÓZBEKSTAN RESPUBLIKASÍ QURÍLÍS NORMALARÍ HÁM QAǴÍYDALARÍ* (SHNK, QMQ hám basqalar) - elektron maǵlıwmatnama. norma.uz.
7. (2025). *Ózbekstanda imarat hám obektlerdiń seysmikalıq shıdamlılıǵın arttırıw boyınsha jańa ilajlar tastıyıqlandı.* KUN.UZ (qurılıs jańalıqları hám normativler, 2025).
8. (2025). *Ózbekstanda imarat hám obektlerdiń seysmologiyalıq qorǵalıwı kúsheytilmekte*. UzDaily.com, noyabr, 2025.
9. (n.d.). *Ózbekstanda 10 mıńǵa shamalas kóp qabatlı turaq jaylar seysmikalıq qáwipsizlikten ótkerildi.* UzDaily.com (o proverkax sootvetstviya seysmobezopasnosti).
10. (n.d.). *Seysmologiyalıq joybarlaw boyinsha xalıqaralıq standartlar* (misalı, ASCE 7, Eurocode 8).
11. (n.d.). *Qurilis seysmologiyası hám injenerlik seysmikasi boyinsha sabaqlıqlar* (Chopra "Dynamics of Structures," Kramer "Geotechnical Earthquake Engineering").
12. (n.d.). *BIM modellestiriw boyinsha qollanba*.