

JOURNAL OF TRANSPORT



ISSUE 3, 2024 vol. 1
ISSN: 2181-2438



RESEARCH, INNOVATION, RESULTS



**TOSHKENT DAVLAT
TRANSPORT UNIVERSITETI**

Tashkent state
transport university



JOURNAL OF TRANSPORT

RESEARCH, INNOVATION, RESULTS

ISSN 2181-2438

VOLUME 1, ISSUE 3

SEPTEMBER, 2024



jot.tstu.uz

TASHKENT STATE TRANSPORT UNIVERSITY

JOURNAL OF TRANSPORT

SCIENTIFIC-TECHNICAL AND SCIENTIFIC INNOVATION JOURNAL

VOLUME 1, ISSUE 3 SEPTEMBER, 2024

EDITOR-IN-CHIEF

SAID S. SHAUMAROV

Professor, Doctor of Sciences in Technics, Tashkent State Transport University

Deputy Chief Editor

Miraziz M. Talipov

Doctor of Philosophy in Technical Sciences, Tashkent State Transport University

Founder of the scientific and technical journal “Journal of Transport” – Tashkent State Transport University, 100167, Republic of Uzbekistan, Tashkent, Temiryo‘lchilar str., 1, office: 465, e-mail: publication@tstu.uz.

The “Journal of Transport” publishes the most significant results of scientific and applied research carried out in universities of transport profile, as well as other higher educational institutions, research institutes, and centers of the Republic of Uzbekistan and foreign countries.

The journal is published 4 times a year and contains publications in the following main areas:

- Business and Management;
- Economics of Transport;
- Organization of the Transportation Process and Transport Logistics;
- Rolling Stock and Train Traction;
- Infrastructure;
- Research, Design, and Construction of Railways, Highways, and Airfields:
- Technology and Organization of Construction, Management Problems;
- Water Supply, Sewerage, Construction Systems for Water Protection;
- Technosphere Safety;
- Power Supply, Electric Rolling Stock, Automation and Telemechanics, Radio Engineering and Communications, Electrical Engineering;
- Materials Science and Technology of New Materials;
- Technological Machines and Equipment;
- Geodesy and Geoinformatics;
- Car Service;
- Information Technology and Information Security;
- Air Traffic Control;
- Aircraft Maintenance;
- Traffic Organization;
- Operation of Railways and Roads;

Tashkent State Transport University had the opportunity to publish the scientific-technical and scientific innovation publication “Journal of Transport” based on the Certificate No. 1150 of the Information and Mass Communications Agency under the Administration of the President of the Republic of Uzbekistan. Articles in the journal are published in Uzbek, Russian and English languages.

R. Bozorov, S. Sattorov, Sh. Saidivaliev, D. Boboev, Z. Ergasheva

Modern state and prospects of high-speed passenger train movement on the railways of Uzbekistan108

S. Turdibekov, E. Abdusamatov

Experimental studies on the selection of spraying parameters of the spreader of technological materials and evaluation of their results116

M. Keldiyarova, S. Ruzimov

Analysis of energy management strategies for series hybrid electric vehicles121

Sh. Yuldashev, A. Abdunazarov

Determining the effectiveness of seismic barriers by varying their distance from buildings124

M. Rasulmuhamedov, Sh. Shukurova, Z. Mirzaeva

Formation of problems of elastoplastic deformation of three-dimensional bodies127

A. Adylkhodjaev, I. Kadyrov, B. Kudratov, D. Azimov

The effect of a multifunctional additive and a low-activity mineral filler on the formation of porosity and microstructure of a cement composite131

J. Choriev, E. Fayzullaev, A. Rakhmanov, N. Negmatov

Evaluation of the impact of automatic transmission vehicles on intersection capacity on urban arterial streets135

S. Uktamov, G. Pulatova, G.D. Talipova

Formation of strategic planning in improving the management system of Tashkent State Transport University140

I. Toshtemirov, R. Bozorov, D. Boboev

Checking traffic safety requirements for transportation of oversized cargo in railway transport (on 1520 mm railroad tracks)146



Determining the effectiveness of seismic barriers by varying their distance from buildings

Sh.S. Yuldashev¹, A.Sh. Abdunazarov¹

¹Namangan Engineering-Construction Institute, Namangan, Uzbekistan

Abstract: In the article, the impact of seismic surface waves on the building was determined using the finite element method (FEM) with the help of the Plaxis 3D software package. The amplitude of stress, displacement, velocity, and acceleration at each point was identified, and seismic barriers were employed to mitigate these effects. The effectiveness was assessed by varying the distance between the building and the seismic barrier. Seismic barriers, with a thickness of 1 meter and a height of 3 meters, were placed at distances of 24, 26, 28, and 30 meters from the center of the building. The results were compared with those in the absence of barriers, and the effectiveness was analyzed.

Keywords: the building, seismic surface waves, seismic barrier, finite element method, elasticity theory, and soil model

Binolarni seysmik to'liqlardan himoya qilishda seysmik to'siqning masofaviy joylashuvi samaradorligini aniqlash

Yuldashev Sh.S.¹, Abdunazarov A.Sh.¹

¹Namangan muhandislik-qurilish instituti, Namangan, O'zbekiston

Annotatsiya: Maqolada binoga seysmik sirt to'liqlarining ta'siri Plaxis 3D dasturiy majmuasi yordamida chekli elementlar usulini qo'llagan holda aniqlangan. Har bir nuqtadagi kuchlanish, ko'chish, tezlik va tezlanishning amplitudalari aniqlangan va kamaytirish maqsadida seysmik to'siq qo'llanilgan hamda seysmik to'siq bilan bino oraliq masofasini o'zgartirish orqali samaradorligi aniqlangan. Seysmik to'siqlar bino markazidan radiusi 24, 26, 28 va 30 metr uzoqlikda qalinligi 1 metr va balandligi 3 metrli qilib joylashtirilgan va to'siqsiz hol natijalari bilan taqqoslangan va samaradorligi tahlil qilingan.

Kalit so'zlar: Bino, seysmik sirt to'liqlari, seysmik to'siq, chekli elementlar usuli, elastiklik nazariyasi va grunt modeli

1. Kirish

So'nggi yillarda dunyoda talafotli zilzilalar soni ortib, ular aholi hayoti va mamlakatlarning ijtimoiy-iqtisodiy infratuzilmalariga jiddiy ta'sir ko'rsatayotganligi sababli seysmik xavfsizlikni ta'minlash va qurilayotgan bino-inshootlarning seysmik mustahkamligini ta'minlash hamda zilzilabardoshligini yanada oshirish bo'yicha bir qator ilmiy tadqiqotlar olib borilmoqda. Jumladan binolarga vibratsiya va seysmik sirt to'liqlarining ta'sirini aniqlash hamda seysmik to'siqlar yordamida so'ndirish katta ilmiy-amaliy ahamiyat kasb etmoqda.

2. Tadqiqot metodikasi

Palas Mandal va Surendra Nadh Somala [1] seysmik to'siqlar bilan oraliq masofani o'zgartirish orqali ularning samaradorligini aniqlash bo'yicha ko'plab tadqiqotlar o'tkazgan. Seysmik to'siqlarni tuproqning turli xususiyatlariga mos ravishda o'rnatish bo'yicha tavsiyalar bergan. Gruntning zichligi va namligining seysmik to'siqlarga ta'sirini o'rgangan.

Anastasios Sextos [2] seysmik to'siqlarni dizayn qilish va ularni binolar atrofida optimal joylashtirish bo'yicha ko'rsatmalar ishlab chiqqan. Tadqiqotlar shuni ko'rsatdiki, yumshoq va nam tuproqli hududlarda seysmik to'siqlarni binodan uzoqroqda joylashtirish, uning samaradorligini oshiradi.

Nakashima [3] tadqiqotlari seysmik to'siqlarni qanday qilib samarali joylashtirish orqali binolarni himoya qilish mumkinligini o'rganishga qaratilgan bo'lib, u yuqori seysmik faollik bo'lgan hududlarda seysmik to'siqlarni qayerda joylashtirish kerakligini aniqlagan. U bo'sh gruntlarda seysmik to'siqlarni binolardan 20-30 metr masofada joylashtirish kerakligi to'g'risida xulosaga kelgan.

Ko'rib chiqilayotgan masalada Reyle sirt to'liqining binoga ta'sirini kamaytirish choralari aniqlanadi va qiyosiy tahlil qilinadi. Sirt to'liqlarining elastik gruntga joylashgan ko'p qavatli binoga ta'siri masalasi ko'rib chiqiladi. Masala elastiklik nazariyasining uch o'lchamli masalasiga keltiriladi va uni yechish uchun chekli elementlar usuli qo'llaniladi. Ma'lumki sonli usullar chekli sohaga qo'llaniladi.

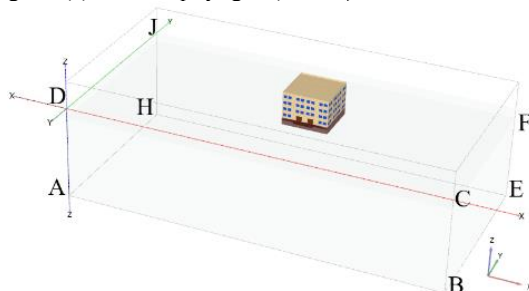
Masalada cheksiz yarim fazoni chekli soha bilan almashtiramiz. Bunda chegaralarda to'liqlarning cheksizlikka intilishini ta'minlovchi quyidagi shartlar

^a <https://orcid.org/0000-0002-3992-9066>

^b <https://orcid.org/0009-0003-1614-0913>



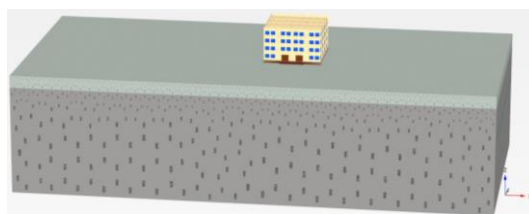
qo'yilgan. Ajratilgan parallelepipedning AHJD va BEFC yog'larida (a), ABCD va HEFJ yog'larida (b) hamda ABEH yog'ida (c) shartlar qo'yilgan (1-rasm).



1-rasm. Chegaraviy shartlar qo'yilishi

$$\left. \begin{aligned} \sigma_x &= \rho V_p \ddot{u} \\ \tau_{yz} &= b \rho V_s \dot{u} \\ \tau_{zy} &= b \rho V_s \dot{u} \end{aligned} \right\} \text{a) } \left. \begin{aligned} \sigma_y &= \rho V_p \ddot{v} \\ \tau_{xz} &= b \rho V_s \dot{v} \\ \tau_{zx} &= b \rho V_s \dot{v} \end{aligned} \right\} \text{b) } \left. \begin{aligned} \sigma_z &= \rho V_p \ddot{w} \\ \tau_{xy} &= b \rho V_s \dot{w} \\ \tau_{yx} &= b \rho V_s \dot{w} \end{aligned} \right\} \text{c) (1)}$$

Tanlab olingan model uzunligi 200 m eni 100 m va chuqurligi 50 m o'lchamlarga ega. Masalada yer osti suvlari borligi ham hisobga olinadi, yer osti suvlarining sathi 20 m chuqurlikda deb olingan. Bino 24 m uzunlikda, eni 24 m va balandligi 14.75 m, qavat balandligi 3,3 m, binoning yer to'la qismi esa 3 m chuqurlikda joylashgan. birinchi qatlami 5 metr qumloq (suglinka), ikkinchi qatlami 45 metr shag'alli (galichniy) grunt modellashtirildi (2-rasm).



2-rasm. Grunt modeli va turar joy binosini chekli elementlarga bo'lish

Tadqiqot sohasi 46739 ta chekli elementga va 85663 ta tugunlarga ajratilgan. Cheki elementlarning shakllari noto'g'ri tetraedr shaklida tanlanadi (1-rasm).

Harakat differensial tenglamalar sistemasining tartibi $85633 \times 3 = 256899$ ga teng.

Bu yerda x o'qi bo'ylab Reyle to'lqini harakatlanadi deb tasavvur qilamiz. Materialning fizik-mexanik xususiyatlarini hisobga olgan holda gruntndagi tugunlardagi ko'chish, tezlik va tezlanishlarini aniqlaymiz.

Dinamik yuk ta'siridagi diskret mexanik sistema harakatining differensial tenglamalar sistemasi quyidagicha ifodalanadi:

$$M\ddot{u} + C\dot{u} + Ku = F \quad (2)$$

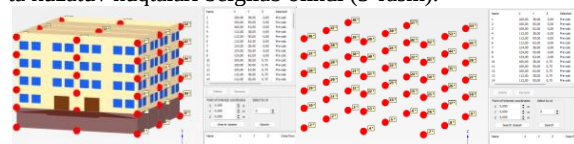
Bu yerda M – massalar matrisasi, C – so'ndirish matrisasi, K – birklik matrisasi va F – dinamik yuk vektor. u – ko'chish, $\dot{u}$ – tezlik va $\ddot{u}$ – tezlanishlar vektorlari vaqtning uzuluksiz funksiyalari deb olindi.

(2) tenglamalar sistemasini yechish uchun Nyumark usulidan foydalanamiz.

Dinamika masalasini raqamli ifodalashda vaqt iteratsiyasini shakllantirish hisoblash jarayonining barqarorligi va aniqligi uchun muhim omil hisoblanadi.

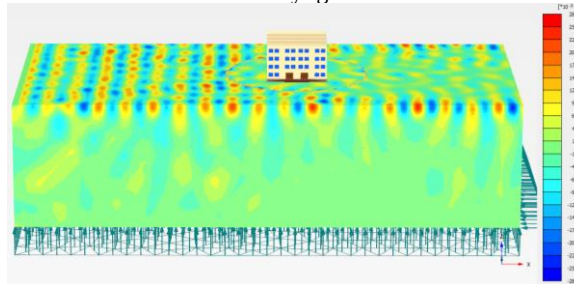
Nyumark usulining vaqt iteratsiyasi koeffitsientlarini $\alpha = 0.25$ va $\beta = 0.5$ deb qabul qilamiz. Grunt va bino materialining xususiyatlari 1 jadvalda keltirilgan.

Binoga ta'sir etayotgan seysmik sirt to'lqinlarni aniqlash va taqqoslash uchun binoning har qavatidan 9 ta jami esa 54 ta kuzatuv nuqtalari belgilab olindi (3-rasm).



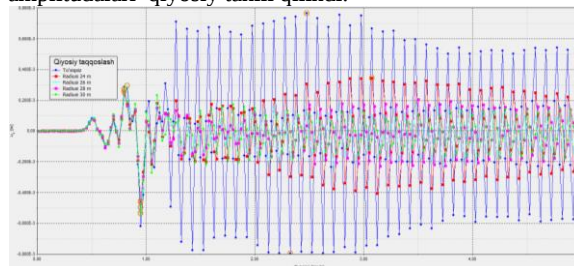
3-rasm. Kuzatuv nuqtalari

Seysmik sirt to'lqinlarni tarqalishini Garmonik kuch orqali hosil qilindi. Garmonik kuchning fazasi 0, amplitudasi 1 va chastotasi 10 Hz davomiyligi 5 sekund deb olindi.



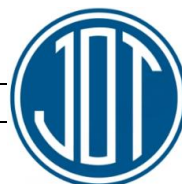
4-rasm. Seysmik sirt to'lqinlarni binoga ta'sir etish jarayoni

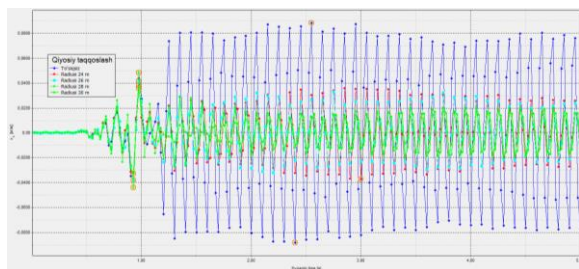
Binoga ta'sir etayotgan seysmik sirt to'lqinlarni kamaytirish va seysmik to'siqlarni afzalligini aniqlash uchun bino markazidan radiusi 24, 26, 28 va 30 metr uzoqlikda seysmik to'siqlar loyihalashtirilganda, binoning z o'qi bo'yicha ko'chishning belgilangan nuqtalaridagi eng yuqori amplitudalari qiyosiy tahlil qilindi.



5-rasm. 23-kuzatuv nuqtasidagi ko'chishni taqqoslash grafiki

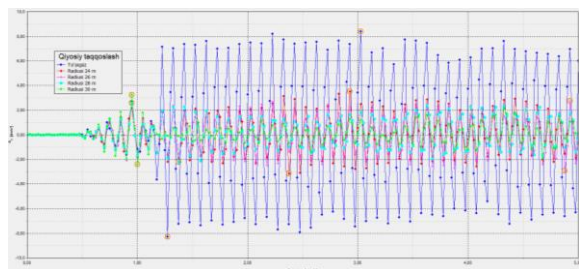
5-rasmda, atrofida xech qanday to'siq joylashmagan modeldagi binoning 23-kuzatuv nuqtasida seysmik sirt to'lqinning z o'qi bo'yicha ko'chishning maksimal qiymati $u_{zmax} = 0,797$ mm, radiusi 24 metrli seysmik to'siq joylashgan binoda $u_{zmax} = 0,496$ mm, radiusi 26 metrli seysmik to'siq joylashgan binoda $u_{zmax} = 0,534$ mm, radiusi 28 metrli seysmik to'siq joylashgan binoda $u_{zmax} = 0,458$ mm, radiusi 30 metrli seysmik to'siq joylashgan binoda 0,461 mm ni tashkil etdi. Qiyosiy taqqoslanganda, atrofida xech qanday to'siq joylashmagan holga nisbatan radiusi 24 metrli seysmik to'siq joylashganda binoning 23-kuzatuv nuqtasidagi ko'chish 37.7%, radiusi 26 metrli seysmik to'siq joylashgan binoda 32.97%, radiusi 28 metrli seysmik to'siq joylashgan binoda 42.48%, radiusi 30 metrli seysmik to'siq joylashgan binoda 42.14% ga teng bo'lgan seysmik to'siqlar samaradorligi qayd etildi.





6-rasm. 23-kuzatuv nuqtasidagi tezlikni taqqoslash grafiki

6-rasmda, atrofida xech qanday to'siq joylashmagan modeldagi binoning 23-kuzatuv nuqtasida seysmik sirt to'liqning v_z o'qi bo'yicha tezlikning maksimal qiymati $v_{zmax} = 8,83 \text{ sm/s}$, radiusi 24 metrli seysmik to'siq joylashgan binoda $v_{zmax} = 4,82 \text{ sm/s}$, radiusi 26 metrli seysmik to'siq joylashgan binoda $v_{zmax} = 4,15 \text{ sm/s}$, radiusi 28 metrli seysmik to'siq joylashgan binoda $v_{zmax} = 3,79 \text{ sm/s}$, radiusi 30 metrli seysmik to'siq joylashgan binoda $v_{zmax} = 3,58 \text{ sm/s}$ tashkil etdi. Qiyosiy taqqoslanganda, atrofida xech qanday to'siq joylashmagan holga nisbatan radiusi 24 metrli seysmik to'siq joylashganda binoning 23-kuzatuv nuqtasidagi tezlik 45,41%, radiusi 26 metrli seysmik to'siq joylashgan binoda 53,00%, radiusi 28 metrli seysmik to'siq joylashgan binoda 57,08%, radiusi 30 metrli seysmik to'siq joylashgan binoda 59,45% ga teng bo'lgan seysmik to'siqlar samaradorligi qayd etildi.



7-rasm. 23-kuzatuv nuqtasidagi tezlanishni taqqoslash grafiki

7-rasmda, atrofida xech qanday to'siq joylashmagan modeldagi binoning 23-kuzatuv nuqtasida seysmik sirt to'liqning a_z o'qi bo'yicha tezlanishning maksimal qiymati $a_{zmax} = 83,94 \text{ sm/s}^2$, radiusi 24 metrli seysmik to'siq joylashgan binoda $a_{zmax} = 35,28 \text{ sm/s}^2$, radiusi 26 metrli seysmik to'siq joylashgan binoda $a_{zmax} = 32,50 \text{ sm/s}^2$, radiusi 28 metrli seysmik to'siq joylashgan binoda $a_{zmax} = 29,20 \text{ sm/s}^2$, radiusi 30 metrli seysmik to'siq joylashgan binoda $a_{zmax} = 25,93 \text{ sm/s}^2$ tashkil etdi. Qiyosiy taqqoslanganda, atrofida xech qanday to'siq joylashmagan holga nisbatan radiusi 24 metrli seysmik to'siq joylashganda binoning 23-kuzatuv nuqtasidagi tezlanish 57,97%, radiusi 26 metrli seysmik to'siq joylashgan binoda 61,28%, radiusi 28 metrli seysmik to'siq joylashgan binoda 65,21%, radiusi 30 metrli seysmik to'siq joylashgan binoda 69,10% ga teng bo'lgan seysmik to'siqlar samaradorligi qayd etildi.

3. Xulosa

Binoga ta'sir etayotgan seysmik sirt to'liqlarni kamaytirish uchun va bino markazidan radiusi 24, 26, 28 va 30 metr bo'lgan aylana shaklida seysmik to'siq modellashtirib seysmik sirt to'liqlarni kamaytirish jarayoni ko'rib chiqildi.

Olingan natijalarga asoslanib, 5-7 rasmdagi grafiklardan ko'rinib turibdiki, atrofida xech qanday to'siq joylashmagan holga nisbatan bir xil koordinatada joylashgan bino markazidan radiusi 24 metr uzoqlikda joylashgan seysmik to'siqli binoda ko'chish o'rtacha 11,76%, tezlik 54,39% va tezlanish 46,34%, radiusi 26 metr uzoqlikda joylashgan seysmik to'siqli binoda ko'chish o'rtacha 18,90%, tezlik 55,25% va tezlanish 48,39%, radiusi 28 metr uzoqlikda joylashgan seysmik to'siqli binoda ko'chish o'rtacha 24,05%, tezlik 56,53% va tezlanish 50,13%, radiusi 30 metr uzoqlikda joylashgan seysmik to'siqli binoda ko'chish o'rtacha 26,13%, tezlik 57,57% va tezlanish 50,78%, ga teng bo'lgan seysmik to'siqlar samaradorligi qayd etildi.

Olingan natijalar, seysmik to'siqlarni joylashtirishning muhimligini tasdiqlaydi va binolarni zilzilga xavfidan himoya qilishda samarali choralar ko'rish zarurligini ko'rsatadi.

Foydalangan adabiyotlar / References

- [1] Mandal, P., & Somala, S. N. (2020). Periodic pile-soil system as a barrier for seismic surface waves. SN Applied Sciences, 2, 1-8.
- [2] Sextos, A. G., & Taskari, O. (2017). An intercontinental hybrid simulation experiment for the purposes of seismic assessment of a three-span R/C bridge. Dynamic Response of Infrastructure to Environmentally Induced Loads: Analysis, Measurements, Testing, and Design, 77-88.
- [3] Nakashima, M., Roeder, C. W., & Maruoka, Y. (2000). Steel moment frames for earthquakes in United States and Japan. Journal of Structural Engineering, 126(8), 861-868.

Mualliflar to'g'risida ma'lumot/ Information about the authors

Yuldashev Sharafiddin Sayfitdinovich	Namangan muhandislik-qurilish instituti, "Materiallar qarshiligi va mexanika" kafedrası professori, t.f.d. Sh.yuldashev1953@gmail.com Tel.: +998974275438 https://orcid.org/0000-0002-3992-9066
Abdunazarov Akbarjon Shamsuddin o'g'li	Namangan muhandislik-qurilish instituti, "Qurilish materiallari va buyumlari" kafedrası o'qituvchisi, Abdunazarovakbar16@gmail.com Tel.: +998911860505 https://orcid.org/0009-0003-1614-0913

