

‘BUILDUP SERV’ LLC
CALCULATION-BASED VERIFICATION REPORT
021/23

**Report on the structural calculation of the ‘UN House Moldova’ building located
on 131, 31 August 1989 str., Chisinau Municipality:**



Administrator:

R. Chiperi-Ivasenco

Civil Engineer:

N. Barcari

Chisinau, 2023

Structural Calculation Report

021/23

**Report on the structural calculation of the ‘UN House Moldova’
building located on 131, 31 August 1989 str., Chisinau Municipality**

This Structural Calculation Report was developed under the contract signed by the ‘Parties’, the terms of reference prepared based on the request of the beneficiary.

Beneficiary:

‘UNDP Moldova’

Civil Engineer:

N. Barcari

(certificate series 2022-ET, no.0904 dated 12.10.2022, fields 4a,b,d)

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 - Report on cadastral works of the building located on 131, 31 August 1989, str., Chisinau municipality on the land plot with cadastral no. 01005200.040.

1. INTRODUCTION

This Calculation Report was developed with the aim of assessing the reserves or shortage of the bearing capacity, determining the efforts, stresses, displacements due to static and dynamic actions (seismic action and wind action) of existing constructions with cadastral no.:

- 01005200.040.01 – unit no. 1;
- 01005200.040.02 – unit no.2, consisting of body A (main) and body B (secondary).

The Calculation Report was prepared based on:

- the Contract between the ‘Parties’ on the preparation of this Structural Calculation Report;
- on-site inspection of the structural elements of the existing buildings;
- the Laboratory Test Report no. 763 of 04.10.2023 prepared by the RESEARCH AND LABORATORY TEST CENTRE of the Institute of Scientific Research in Construction ‘INCERCOM’ S.E.;
- the Laboratory Test Report no. No. 763/1 of 10.10.2023 prepared by the RESEARCH AND LABORATORY TEST CENTRE of the Institute of Scientific Research in Construction ‘INCERCOM’ S.E.;
- the Detailed Design for the building with cadastral no. 01005200.040.02, prepared by ‘BINOM’ T.A.M. (year 1996, ob.no.057-1) and verified in the prescribed manner;
- the Report on cadastral works of the building located on 131, 31 August 1989 str., Chisinau municipality on the land plot with no. 01005200.040;
- the Geotechnical Study developed by ‘GEOLUX PRIM’ in 2015 for the location concerned, geological engineer – Bet.N.
- the Technical Expert Examination Reports previously developed for the building concerned.

2 . REASON OF THIS CALCULATION REPORT

According to the assignment set by the beneficiary, taking into account the static and dynamic actions in accordance with the construction regulations in force in 2023, the resistance structure of existing buildings shall be recalculated in order to assess the seismic resistance of the buildings, including to ensure that the key requirements are complied with:

- A - ‘resistance and stability’;
- B - ‘safety in operation’, according to Law on quality in construction no. 721-XIII of 02 February 1996 (as subsequently amended).

3. BASIS OF THE CALCULATION REPORT

The Calculation Report was prepared based on the following normative and legislative framework:

1. Law on quality in construction No. 721–XIII of 02 February 1996 (as subsequently amended);
2. Standard SNiP 2.01.01-82 ‘Construction climatology and geophysics’;
3. Standard SNiP II 7-81* ‘Construction in seismic areas. design standards’;
4. Standard SNiP 3.01.07-85 ‘Loads and actions. design standards’;
5. Normative document NCM 02.02:2006 ‘Calculation, design and construction of monolithic reinforced concrete building elements’;
6. Normative document NCM F.03.02-2005 – ‘Design of buildings with masonry walls’;
7. Normative document CP E.01.04:2019 ‘Actions in construction. Assessment of the level of seismic protection of existing constructions’;
8. Normative document NCM E.01.02:2019 – ‘Regulation on the establishment of construction importance categories’.

As part of this work, on-site visits were made for the inspection of the existing construction and participation in sampling of materials used for the construction of the units, in order to determine their physical and mechanical features.

The study of the overall structure of resistance of the building and separate structural elements was developed to assess the possibility of modelling in the finite element calculation software. The values of stresses, efforts, displacements were analyzed. The sections of the elements necessary to ensure the strength and integral stability of the building, which were compared with those existing in the detailed design, as well as the laboratory tests carried out.

4. STUDY OF THE DETAILED DESIGN, CORRESPONDENCE WITH THE ON-SITE INSPECTION OF THE BUILDING, BASED ON CADASTRAL MATERIALS, SURVEY AND LABORATORY TESTS OF MATERIALS

4.1. Unit no.1 with cadastral no. 01005200.040.01.

The building under examination was built according to an individual design, in the period 1950-1952, with a height limit type – S+P+E. The building has a regular shape in plane view with dimensions of – 12.65x21.50m. Floor height: basement – 2.60m; ground floor – 3.60m, first floor – 3.75m.

Building layout – load-bearing walls made of mixed masonry (thickness – 600mm). In the longitudinal direction there are 4 load-bearing walls, in the transverse direction there are 5 load-bearing walls, which are discontinuous in height.

The structural elements have the following composition:

- Foundations – raw stone masonry (M100 – according to laboratory tests) on lime and sand mortar (M4) – standard strength – 15kg/cm²;
- Floor above the basement – monolithic reinforced concrete slab with confining beams on the load-bearing walls and secondary beams;
- Floors between building levels and covering floors – wooden load-bearing beams with a circular section and filling of a mixture of slag and clay, plastered with lime and sand mortar on wooden battens, lined with a suspended ceiling.
- Walls – raw stone masonry (M100 – according to laboratory tests) on lime and sand mortar (M4) – standard strength – 15kg/cm², plastered on both sides with lime and sand mortar;
- Indoor stairs – monolithic reinforced concrete, faced with natural stone slabs;
- Partition walls – M100 brick masonry on lime and sand mortar and plasterboards on a frame of galvanized steel elements;
- Roof – truss-type roof with a load-bearing structure of wooden elements.

Non-conformities detected in accordance with the requirements of NCM F.03.02-2005 ‘Design of buildings with masonry walls’:

Structural scheme:

- Tab.4, point 2 – at the estimated seismicity rate higher than or equal to 7, the structural scheme must be made with the structure in frames filled with masonry.

Foundations. Walls.

- Tab.2 – the material used (raw stone) in the construction of foundations allows construction of buildings with a height limit up to one floor, with location of the area of seismic intensity of 8 (eight) – inadequacy of the material used;
- Point 5.2.3.1 – in buildings made of masonry and reinforced masonry, earthquake-resistant confining beams must be provided on all structural walls, at the level of all floors between floors and the roof floor;
- Point 5.2.5.1 – in case of single-storey buildings with an estimated seismicity rate of 6...7 and a distance between walls of maximum 6 m, it is allowed to make wooden (roof) floors with metal or wooden beams, unless this is contrary to the fire safety requirements;

- the distances between the gaps in the external walls do not meet the requirements of point 5.2.2.15, tab.13.

During the period of operation, the building sufficiently withstood the seismic stresses caused by the earthquakes of 04 March 1977, 31 August 1986 and 31 May 1990 with a magnitude of 7.4; 7.0 and 6.70 accordingly, due to the massiveness and dense network of the interior and exterior walls.

The resistance structure of the building does not have critical deformations in the structural elements such as uneven settlements, penetrating cracks and inadmissible deflections.

We also note that the term of operation of some structural elements (floors made of wooden elements) is exceeded and highly worn. The structural scheme, the materials used do not comply with the normative provisions in force.

4.2. Unit no.2 with cadastral no. 01005200.040.02.

The building under examination was built according to the individual detailed design (developed by ‘BINOM’ T.A.M., year 1996, ob.no.057-1), with a standard height limit – P+2E+M. The building has an irregular shape in plane view; it is an L-shaped building. The dimensions of the main part are – 17.80x10.40m, the dimensions of the secondary part (functional gallery – height limit – P+E) – 3.50x7.10m. The height of the floors: ground floor – 3.50m; 1st and 2nd floors – 3.30m each, attic – variable.

Building layout – load-bearing masonry of small limestone blocks (thickness – 390mm) in monolithic reinforced concrete frames. Resistance to dynamic actions is ensured by the rigid nodes between the vertical and horizontal elements (columns and beams), formation of a rigid disk at the level of reinforced concrete floors, spatial interaction of elements in the transverse and longitudinal directions.

The structural elements have the following composition:

- Foundations – monolithic reinforced concrete slab (B20) with a section of 400mm, with stiffness ribs at the top; reinforced with reinforcement mesh at the top and bottom with Ø12AIII pitch 250mm; the ribs are reinforced with a spatial shell consisting of 4 longitudinal bars of Ø22AIII, transverse reinforcement with stirrups Ø8AI pitch 300mm;
- Columns – square elements of monolithic reinforced concrete (B15) with a cross section – 400x400mm, reinforced with 4 bars Ø18AIII and stirrup – Ø6AI pitch 300mm.
- Beams – ‘L’-shaped elements – marginal ones, ‘T’-shaped elements – central ones, of monolithic reinforced concrete (B15) with a height of 400mm.
- Floors – prefabricated hollow slabs of reinforced concrete type ‘IHK’ (series 1.141 B1,2), with monolithic reinforced concrete sectors;
- Walls – M35 limestone blocks on M50 cement and sand mortar, thickness – 390mm;
- Indoor stairs – prefabricated reinforced concrete elements;
- Outdoor stairs – load-bearing structure of metal profile elements;
- Partition walls – M100 brickwork on cement and sand mortar M35;
- Roof – truss-type roof with a load-bearing structure of wooden elements.

During the operation of the building, vertical movement was censured by means of the elevator. The resistance structure of the elevator shaft is made up of metal profiles on an isolated foundation of monolithic reinforced concrete slab. The elevator shaft structure is divided by a deformation-settlement joint along its entire height, with stability ensured by flexible nodes from the main building.

In accordance with ‘SNIIP II 7-81* - ‘Construction in seismic areas. Design standards’ point 1 - ‘if buildings are located in seismic zones, it is usually recommended to adopt symmetrical structural schemes with even distribution of masses, stiffness and loads per floor.

According to NCM F.03.02-2005, point 5.2.4.3, the execution of columns in frames is allowed exclusively from monolithic concrete, having a minimum class of B15. The results of laboratory tests of the column in the G-3 axis, 1st floor, it was established that the concrete class is B7,50.

As a result of the structural calculation of the building, it was established that the dimensioning of the structural elements is compliant and does not require additional consolidation and can be operated subject to the functional purpose.

Unit no.2 (annex) with cadastral no. 01005200.040.02.

The building under examination was subsequently built according to an individual design with a height limit type – P (ground floor). The building has a regular shape in plane view with dimensions of – 6.0x6.10m. Ground floor height – 3.50m.

Building layout – a mixed-type load-bearing structure, consisting of load-bearing masonry of small limestone blocks (thickness – 390mm) in monolithic reinforced concrete frames.

The structural elements have the following composition:

- Foundations – continuous, made of monolithic reinforced concrete;
- Columns – square elements made of monolithic reinforced concrete with dimensions of 400x400mm.
- Beams – made of monolithic reinforced concrete in the transverse and longitudinal directions.
- Covering floor – monolithic reinforced concrete slab;
- Walls – M35 limestone blocks on M50 cement and sand mortar, thickness – 390mm;
- Roof – usable flat roof with bituminous membranes.

The annex is divided along its entire height from unit no. 1 and unit no. 2 by a deformation-settlement joint.

As a result of the inspection and the materials presented by the beneficiary, including the execution of the structural calculation of the annex, it was established that it complies with the requirements and technical regulations in force and does not require additional strengthening, therefore it can be operated subject to its functional purpose.

5. STRUCTURAL CALCULATION FOR STATIC AND DYNAMIC ACTIONS.

To determine the state of stress and deformation, the structure of the units was modelled using the finite element software – ‘Robot structural analysis 2023’.

The columns and beams were modelled as linear elements, the floor, the walls were modelled as ‘shell’ elements which were subsequently discretized. The concrete characteristics were defined according to the presented laboratory tests. The modulus of elasticity of the concrete was reduced taking into account that the concrete section works in cracked stage.

Concrete characteristics of vertical elements:

Определение материала ? X

Сталь Бетон **Алюминий** Дерево Другой

Имя: Описание:

| Упругие характеристики | | Сопротивление | |
|-------------------------|---|---|---|
| Модуль Юнга, E: | <input type="text" value="187628,00"/> (кгс/см ²) | Характеристический <input type="text" value="112,17"/> (кгс/см ²) | |
| Коеф. Пуассона, ν : | <input type="text" value="0,2"/> | Образец: | <input type="text" value="Кубический"/> |
| Модуль сдвига, G: | <input type="text" value="97719,40"/> (кгс/см ²) | | |
| Удельный вес: | <input type="text" value="2,50"/> (т/м ³) | | |
| Коеф. темп. расширен.: | <input type="text" value="0,000010"/> (1/°C) | | |
| Коеф. затухания: | <input type="text" value="0,15"/> | | |

Concrete characteristics of horizontal elements:

Определение материала ? X

Сталь Бетон **Алюминий** Дерево Другой

Имя: Описание:

| Упругие характеристики | | Сопротивление | |
|-------------------------|---|---|---|
| Модуль Юнга, E: | <input type="text" value="140721,00"/> (кгс/см ²) | Характеристический <input type="text" value="112,17"/> (кгс/см ²) | |
| Коеф. Пуассона, ν : | <input type="text" value="0,2"/> | Образец: | <input type="text" value="Кубический"/> |
| Модуль сдвига, G: | <input type="text" value="97719,40"/> (кгс/см ²) | | |
| Удельный вес: | <input type="text" value="2,50"/> (т/м ³) | | |
| Коеф. темп. расширен.: | <input type="text" value="0,000010"/> (1/°C) | | |
| Коеф. затухания: | <input type="text" value="0,15"/> | | |

Seismic action

The building was calculated in accordance with the requirements of SNiP II 7-81* ‘Construction in seismic areas. Design standards’.

The seismicity of the land according to the seismic micro-zoning map of Chisinau municipality – 8 degrees.

The design seismicity of the building – 8 degrees.

Параметры СНиП II-7-81

Нагрузка: Сейсмика СНиП II-7-81 Направление_X Y

☐ Вспомогательное нагружение

Категория грунта (табл. 1)
☐ I ☒ II ☐ III

Тип сейсмичности района (табл. 1)
☐ 7 ☒ 8 ☐ 9

Категория грунта
 8

А
 0.2

Параметры
 K1 (табл. 3) 0.35
 K_Psi (табл. 6) 1
 mkr (табл. 7) 1

Определение направления

Фильтры

OK Отменить Справка

Т а б л и ц а 3*

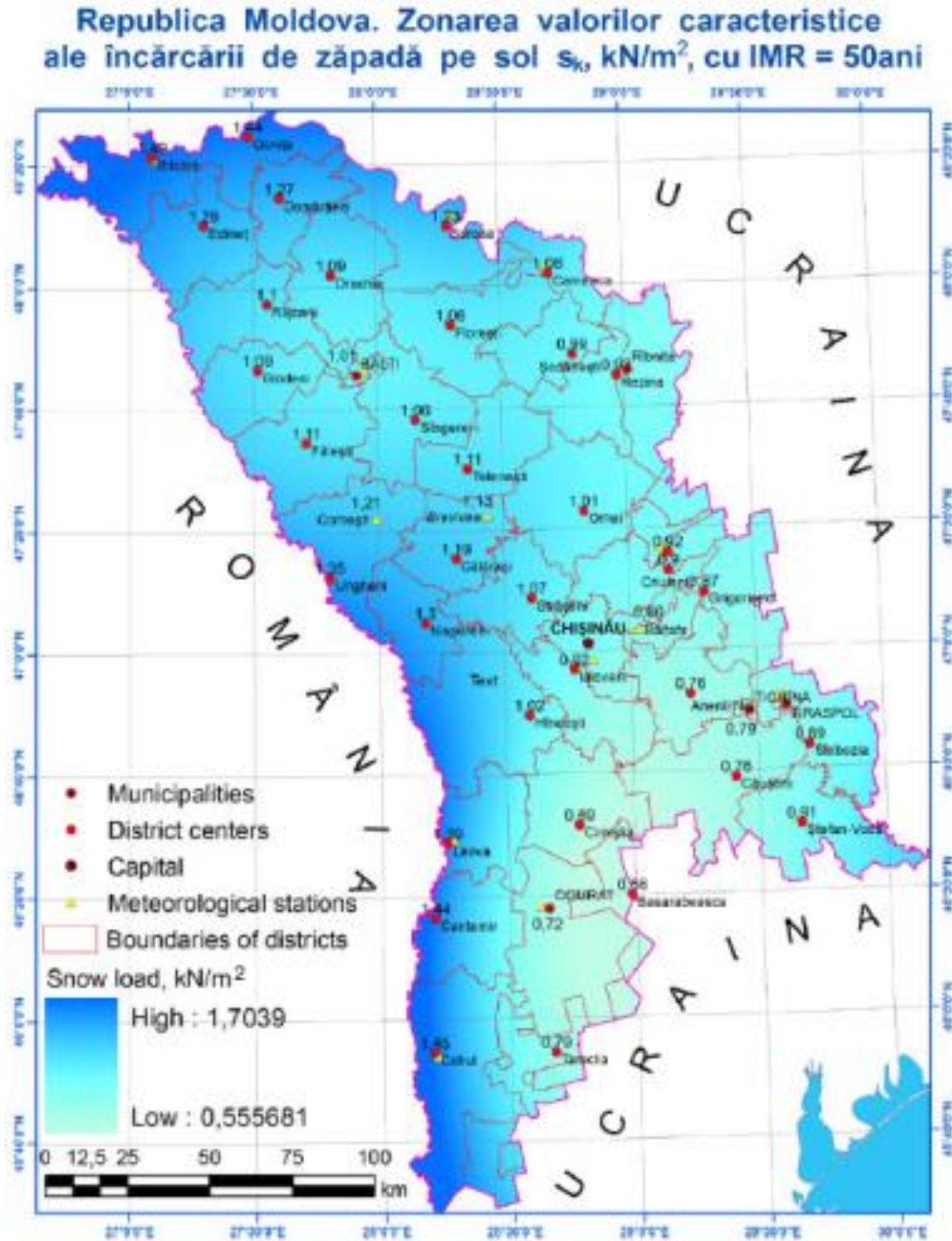
| Тип здания или сооружения | Значения K_1 |
|--|----------------|
| 1. Здания и сооружения, в конструкциях которых повреждения или неупругие деформации не допускаются | 1 |
| 2. Здания и сооружения, в конструкциях которых могут быть допущены остаточные деформации и повреждения, затрудняющие нормальную эксплуатацию, при обеспечении безопасности людей и сохранности оборудования, возводимые: | |
| из железобетонных крупнопанельных или монолитных конструкций | 0,22 |
| со стальным каркасом без вертикальных диафрагм или связей | 0,25 |
| то же, с диафрагмами и связями | 0,22 |
| <u>с железобетонным каркасом без вертикальных диафрагм или связей</u> | <u>0,35</u> |
| то же, с диафрагмами или связями | 0,25 |
| из кирпичной или каменной кладки | 0,35 |
| 3. Здания и сооружения, в конструкциях которых могут быть допущены значительные остаточные деформации, трещины, повреждения отдельных элементов, их смещения, временно приостанавливающие нормальную эксплуатацию при обеспечении безопасности людей | 0,12 |

Т а б л и ц а 7*

| Характеристика конструкций | Значения $m_{кр}$ |
|--|-------------------------------|
| При расчетах на прочность | |
| 1. Стадные, деревянные, железобетонные с жесткой арматурой | 1,3 |
| 2. Железобетонные со стержневой и проволочной арматурой, кроме проверки на прочность наклонных сечений | 1,2 |
| 3. Железобетонные при проверке на прочность наклонных сечений | 1,0 |
| 4. Каменные, армокаменные и бетонные: | |
| при расчете на внецентренное сжатие | 1,0 |
| при расчете на сдвиг и растяжение | 0,8 |
| 5. Сварные соединения | 1,0 |
| 6. Болтовые и заклепочные соединения | 1,1 |
| При расчетах на устойчивость | |
| 7. Стальные элементы гибкостью свыше 100 | 1,0 |
| 8. То же, гибкостью до 20 | 1,2 |
| 9. То же, гибкостью от 20 до 100 | От 1,2 до 1,0 по интерполяции |
| П р и м е ч а н и е. При расчете стальных и железобетонных конструкций, подлежащих эксплуатации в неотапливаемых помещениях или на открытом воздухе при расчетной температуре ниже минус 40 °С, следует принимать $m_{кр} = 0,9$, в случае проверки прочности наклонных сечений $m_{кр} = 0,8$. | |

Snow action

According to the zoning map of the characteristic values of the snow load on the ground, sk from “Încărcarea zăpezii pe sol și presiunea dinamică de bază a vântului estimate în baza teoriei valorilor extreme” (*Snow load on the ground and basic dynamic wind pressure estimated based on the theory of extreme values*) – Authors: Valentin Raileanu, Maria Nedea, Gheroghe Croitoru, Olga Crivova, Rodica Cojocari – 2017, Chisinau, is characterized by a value of $s_k = 1.0 \text{ kN/m}^2$ – the characteristic value of the given snow load.

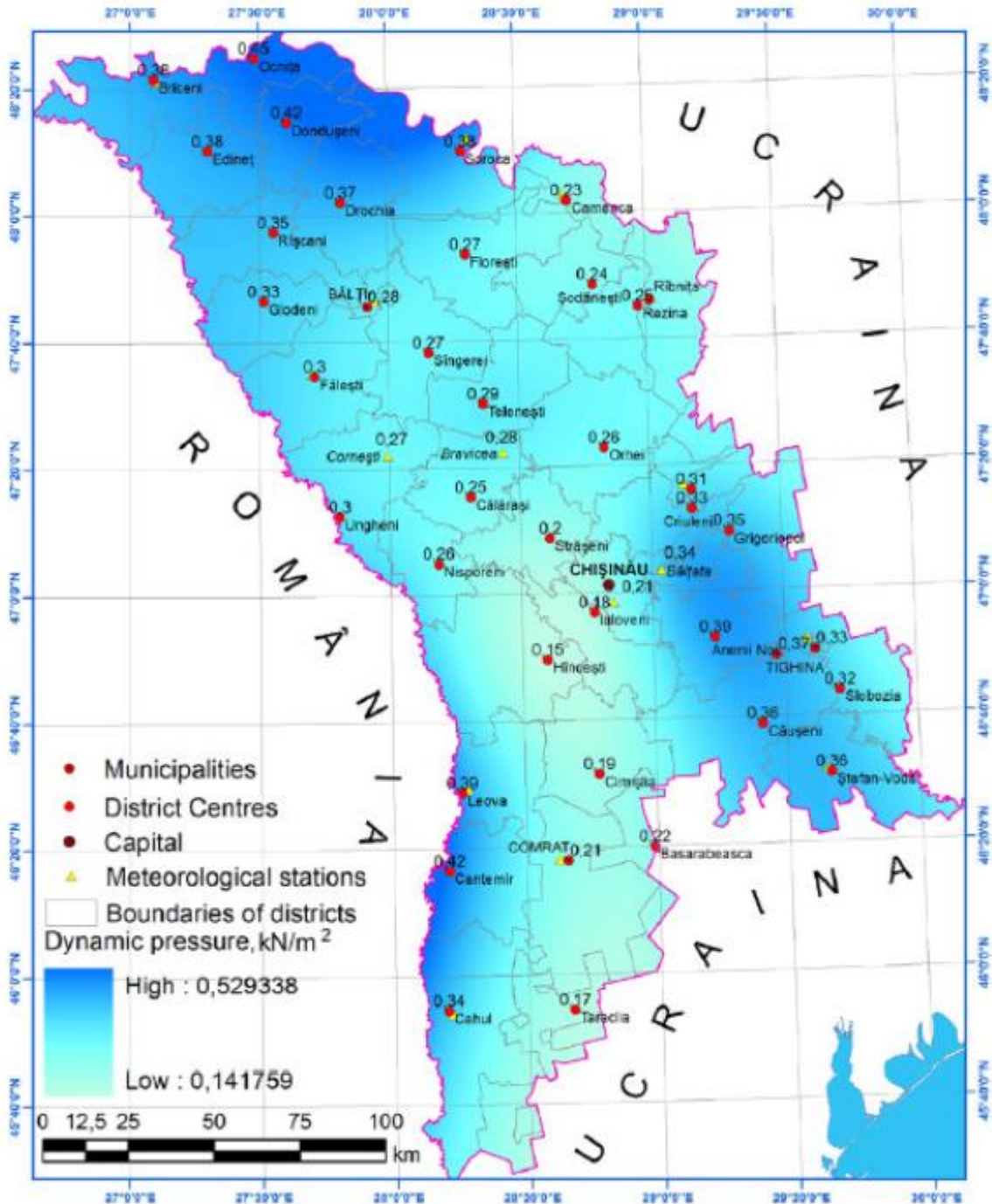


Zoning map of the characteristic load at the soil level s_k on the territory of the Republic of Moldova.

Wind action

According to the zoning map of the reference values of the basic dynamic wind pressure q_b from “Încărcarea zăpezii pe sol și presiunea dinamică de bază a vântului estimate în baza teoriei valorilor extreme” (*Snow load on the ground and basic dynamic wind pressure estimated based on the theory of extreme values*) – Authors: Valentin Raileanu, Maria Nedelcov, Gheroghe Croitoru, Olga Crivova, Rodica Cojocari – 2017, Chisinau city, is characterized by a value of $q_b=0.21$ kPa – the reference value of the basic dynamic wind pressure.

Republica Moldova. Zonarea valorilor de referință ale presiunii dinamice a vântului, q_b în kN/m², având IMR = 50 ani

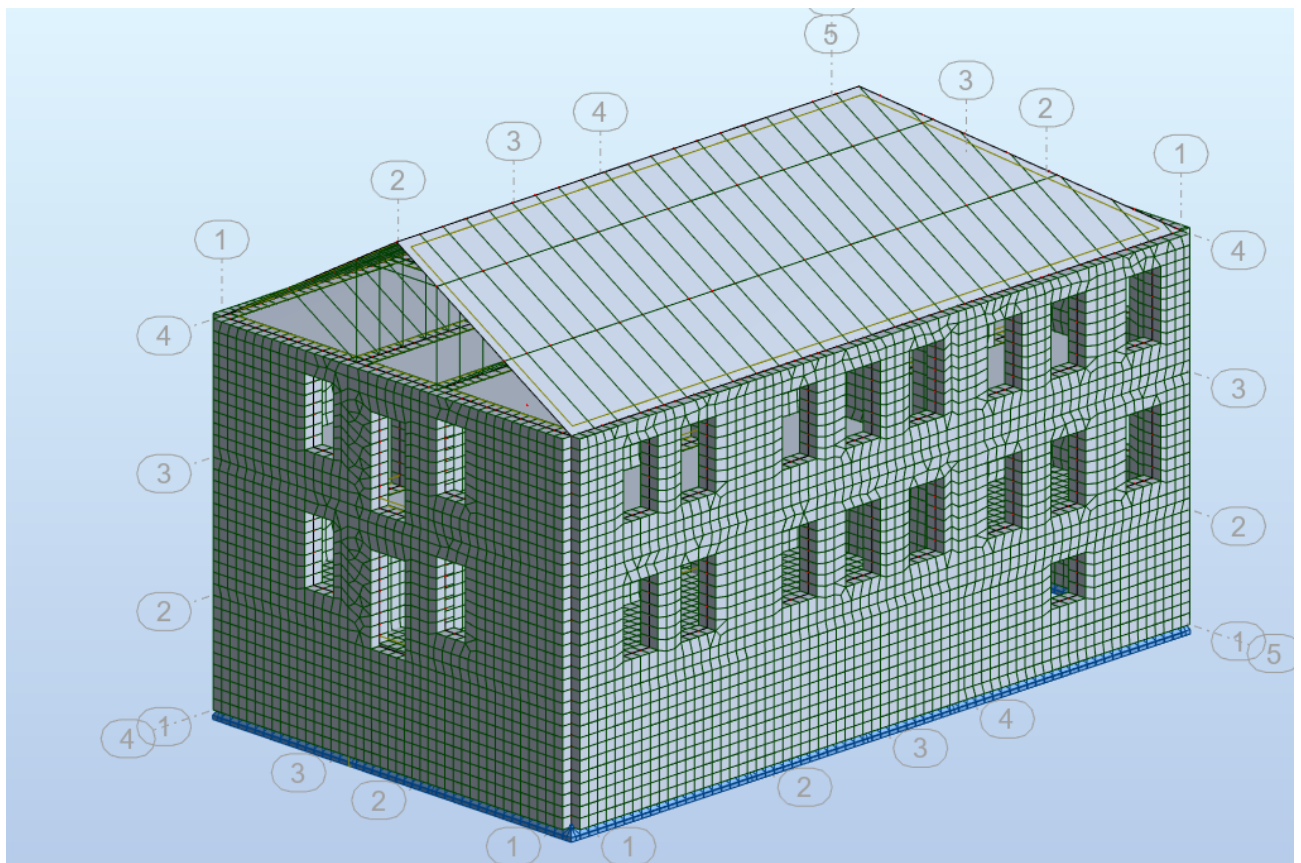
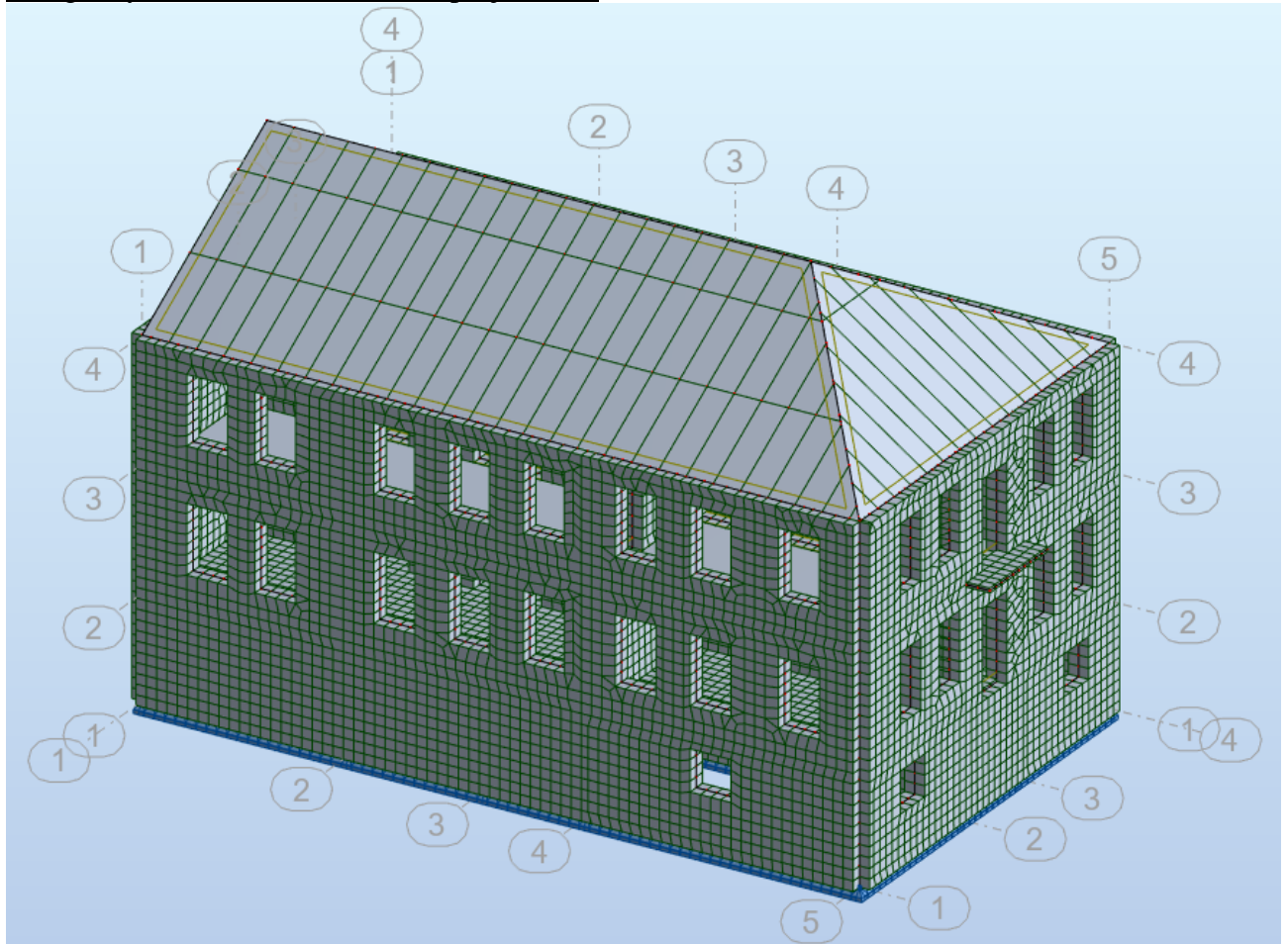


Zoning map of reference values of basic dynamic wind pressure q_b on the territory of the Republic of Moldova

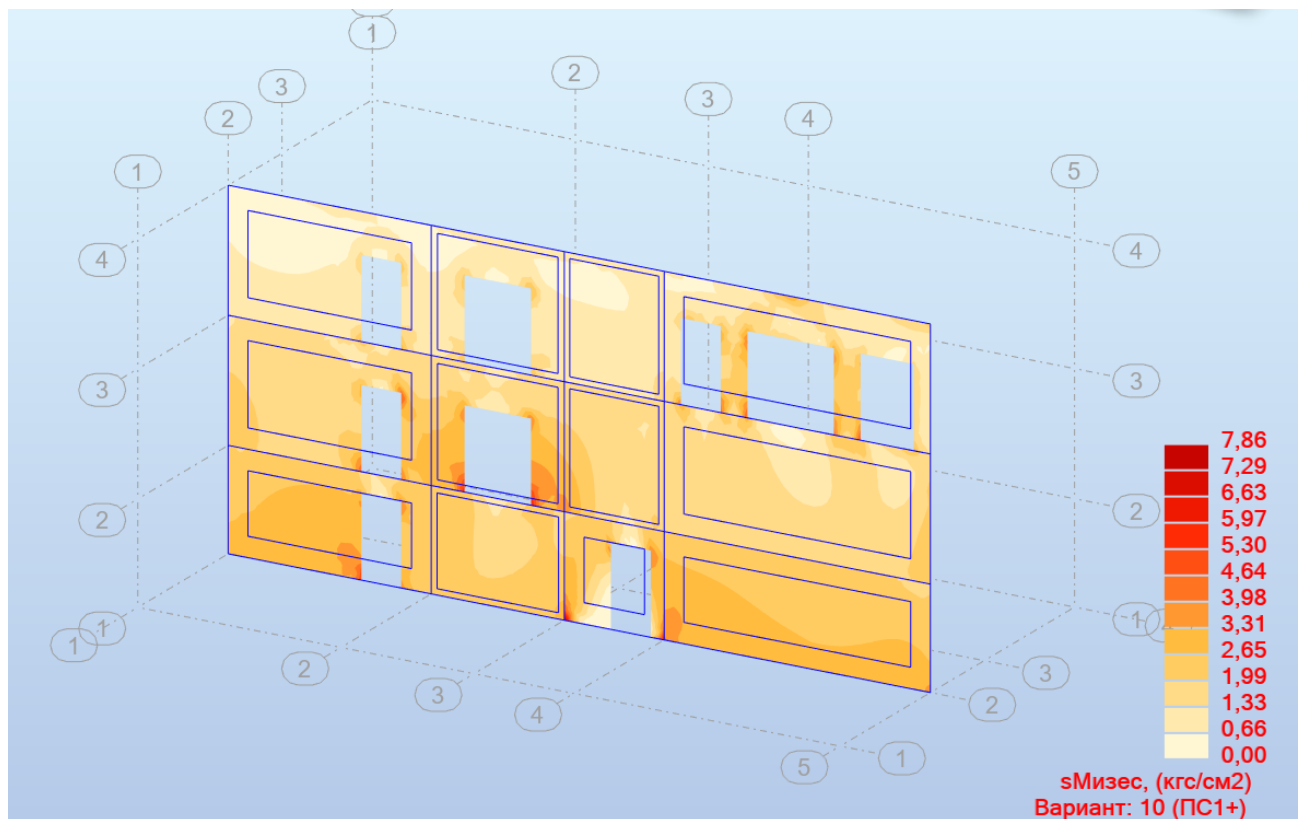
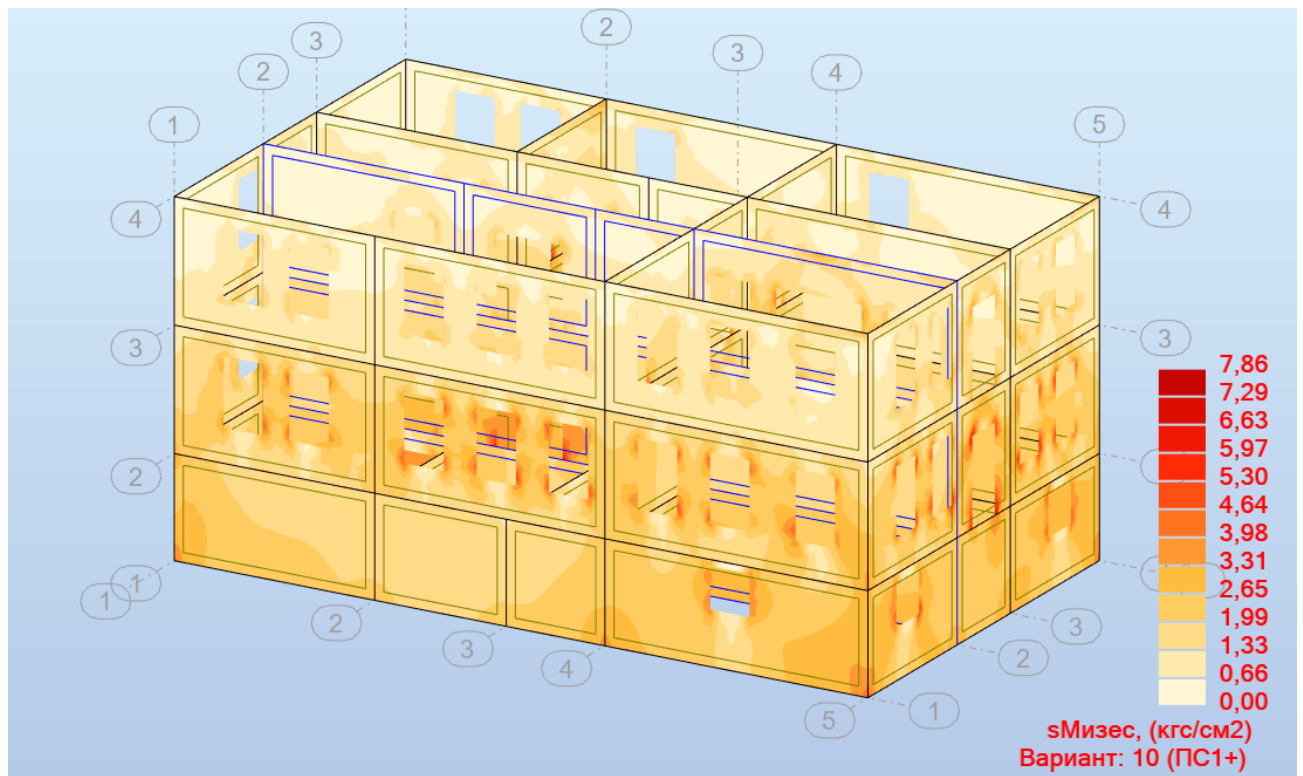
Loads acting on the resistance structure, adopted in the spatial calculation:

1. Self-weight of reinforced concrete structures with coefficient 1.1 according to the requirements of ‘SNiP 2.01.07-85’ ‘Loads and actions’.
2. Load from floor – 200kg/m^2 (0.2t/m^2).
3. Load of partition walls on the entire floor area of the building level was adopted as 150 kg/m^2 (0.15t/m^2).
5. Short-term load from snow action – 100kg/m^2 (0.10t/m^2).
6. Dynamic wind actions according to the requirements of ‘SNiP 2.01.07-85’ – ‘Loads and actions’ in the X direction.
7. Dynamic wind actions according to the requirements of ‘SNiP 2.01.07-85’ – ‘Loads and actions’ in the Y direction.
8. Dynamic seismic load actions according to the construction location were adopted as 8(eight) degrees according to MSK64 in the X direction.
9. Dynamic seismic load actions according to the construction location were adopted as 8(eight) degrees according to MSK64 in the Y direction.
10. Dynamic seismic load actions according to the construction location were adopted as 8(eight) degrees according to MSK64 in the Z direction.

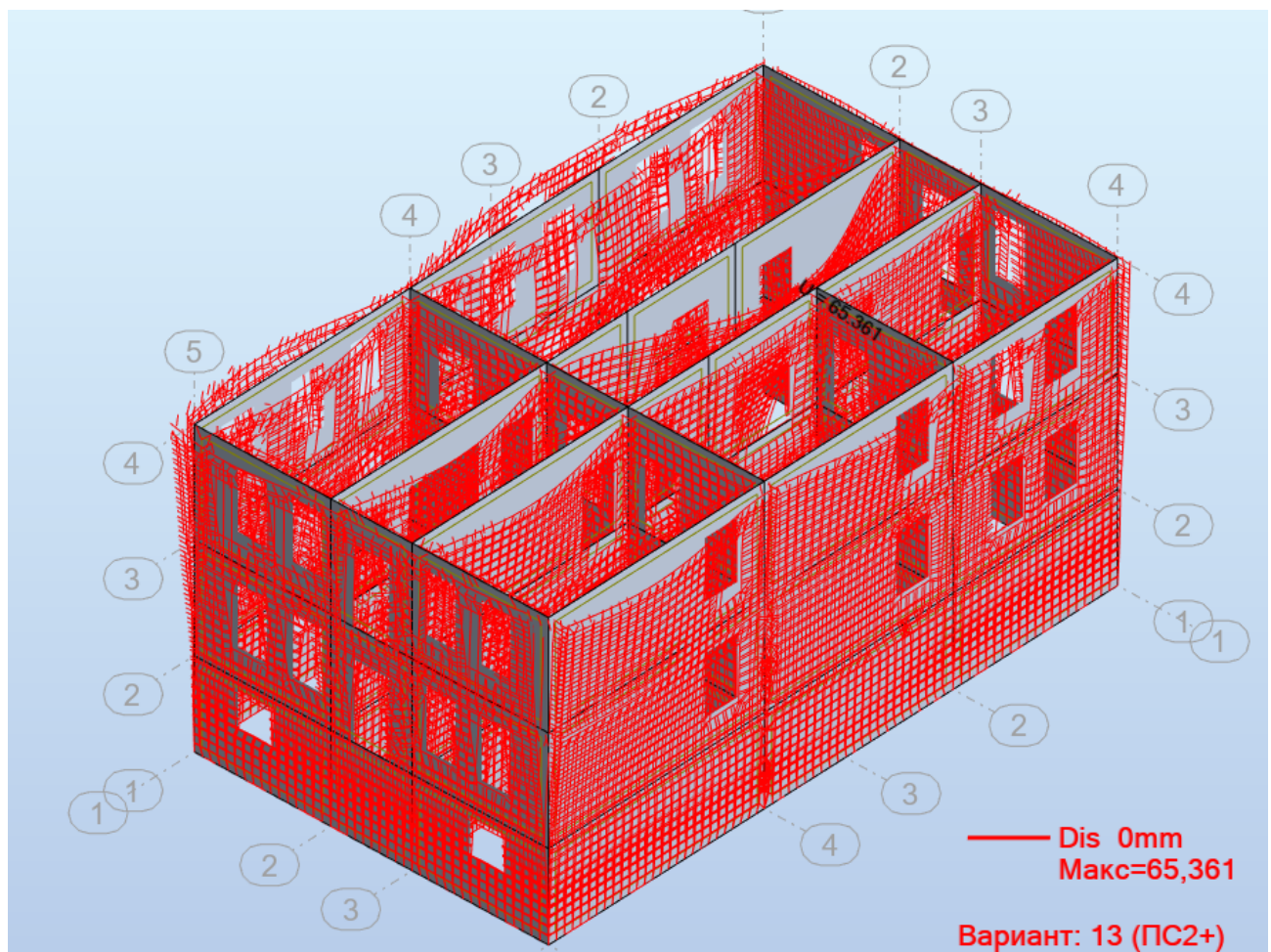
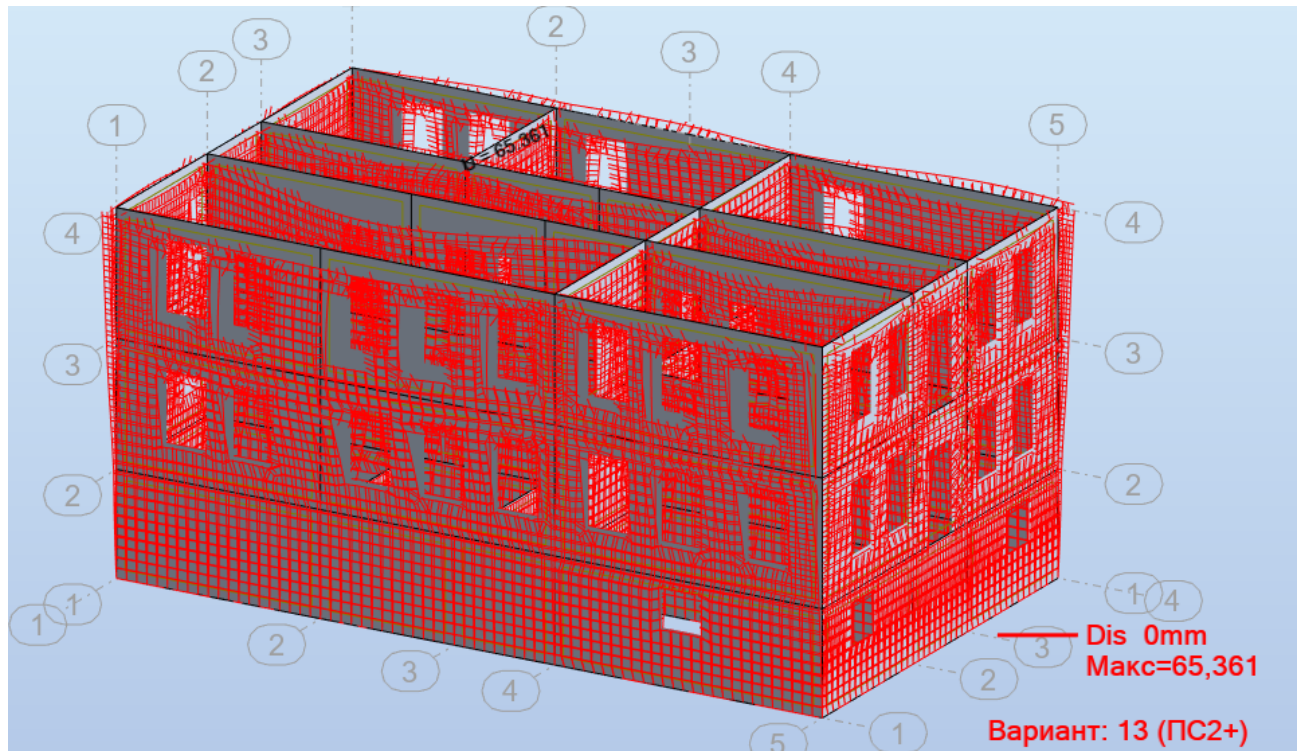
Design layout of unit 1 (isometric projection):



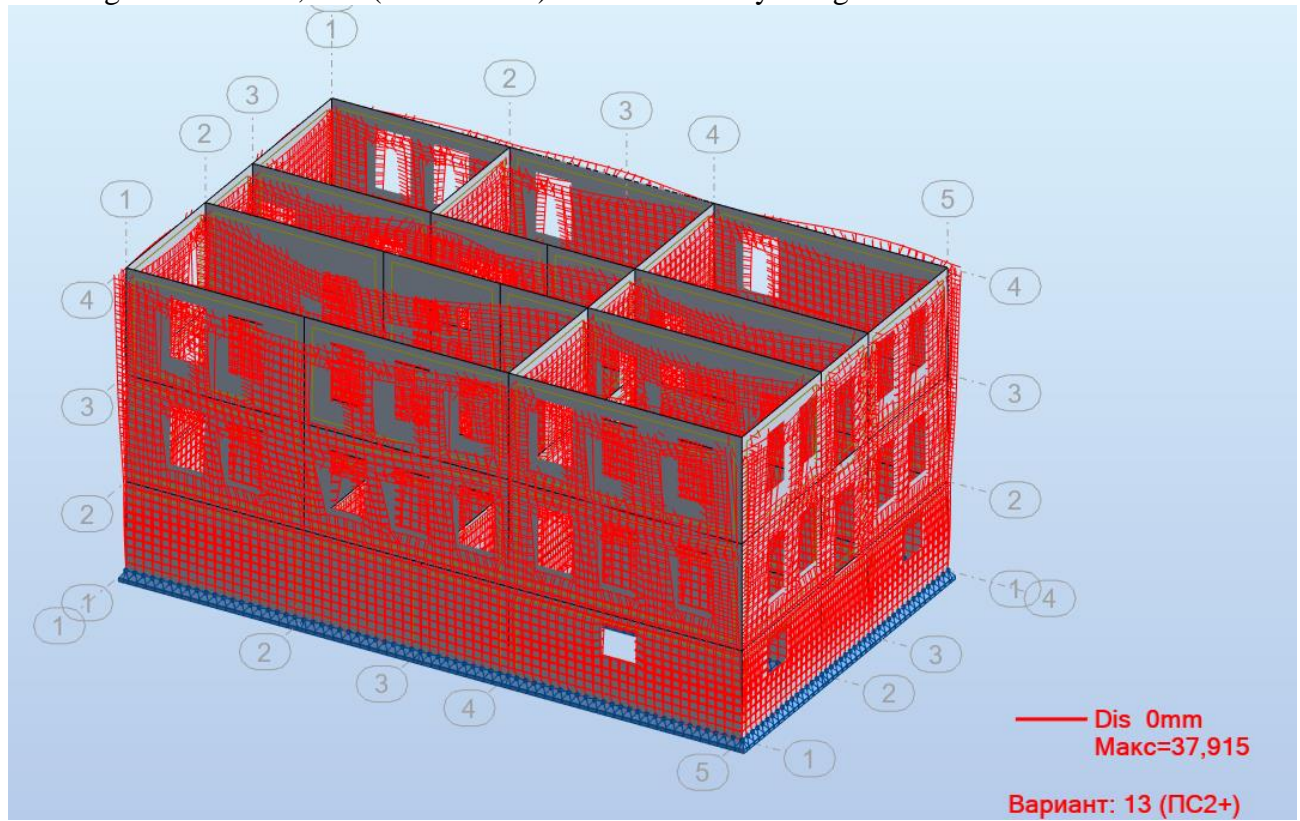
Stresses obtained in masonry SL –I kgf/cm² (limit state one):



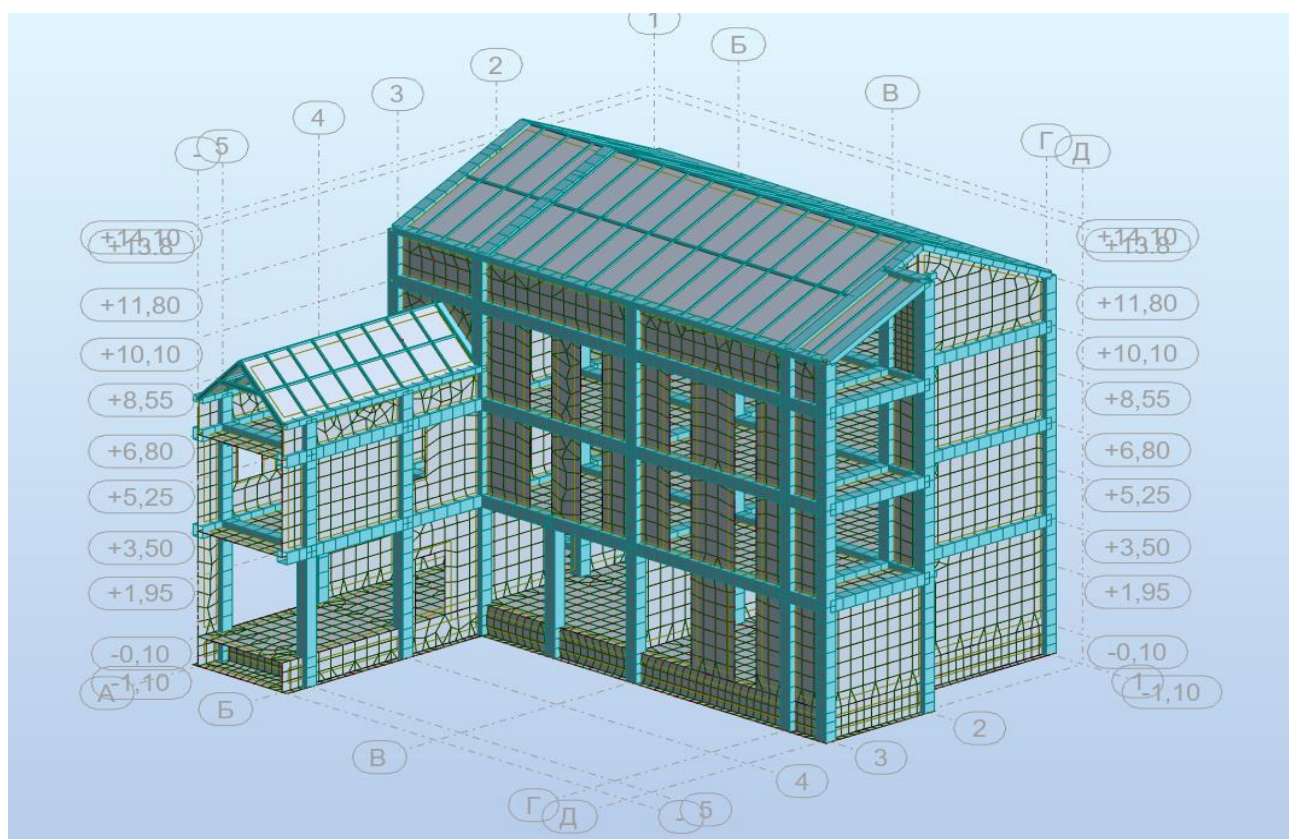
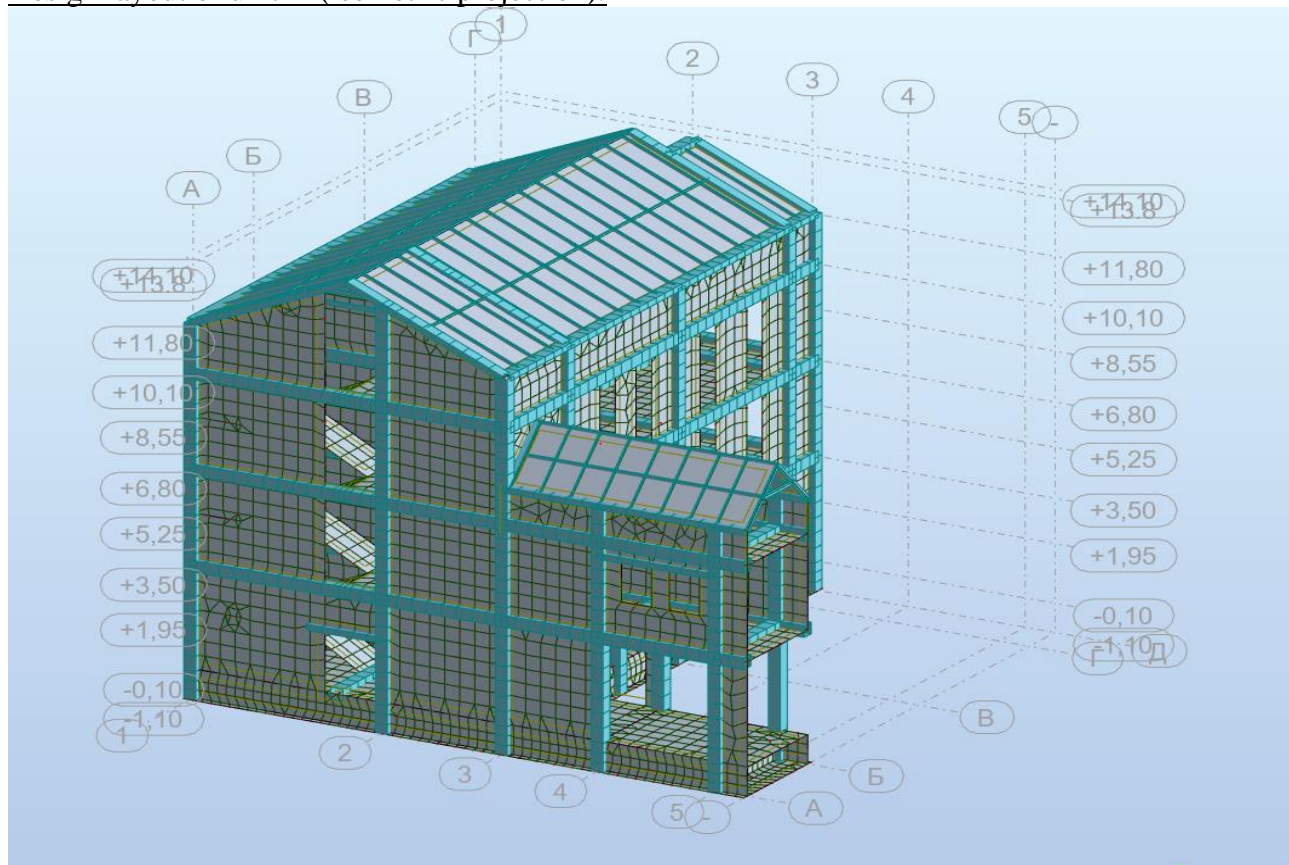
Building deformations, mm (limit state II) seismic intensity 8 degrees.



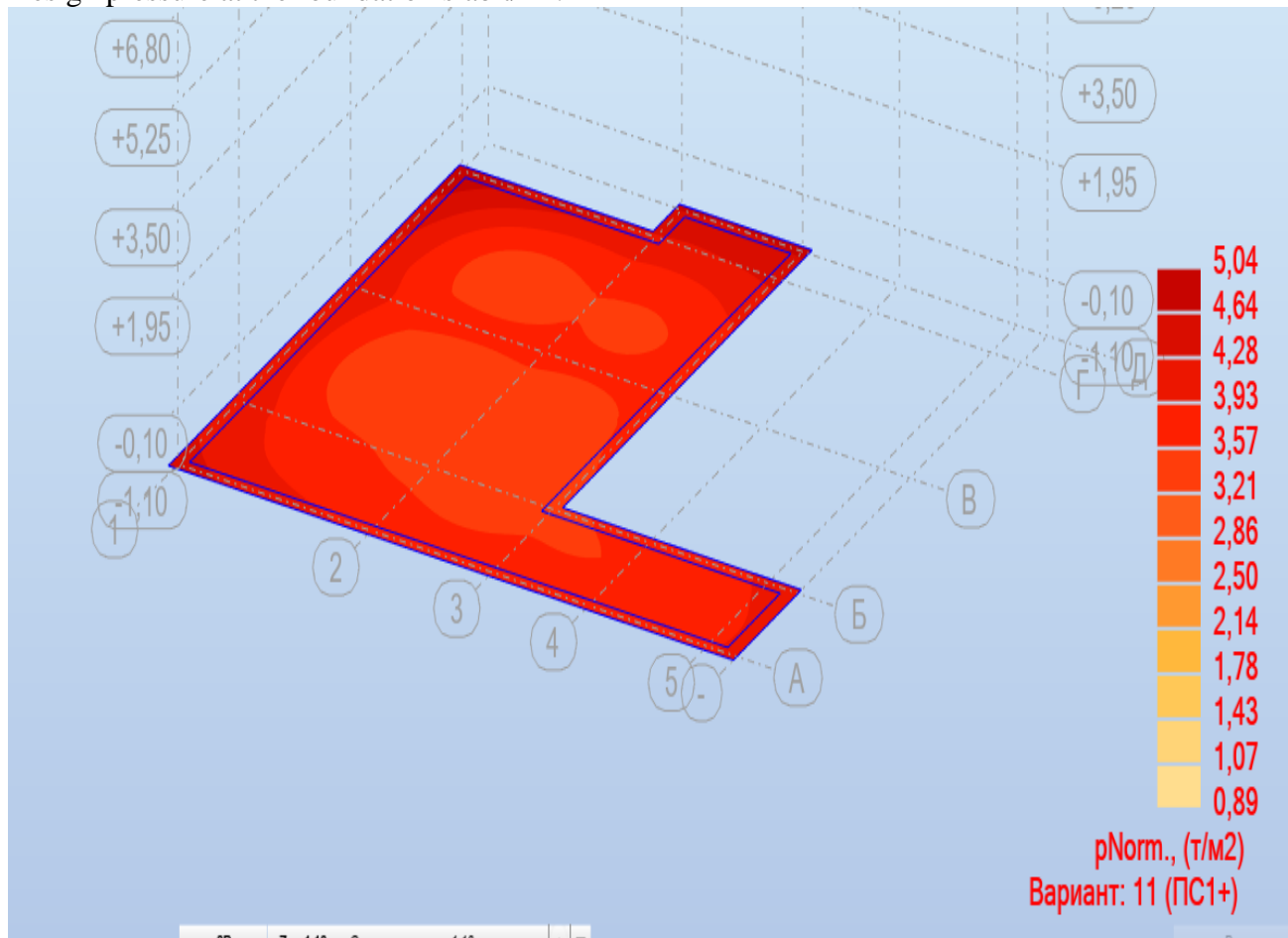
Building deformations, mm (limit state II) seismic intensity 7 degrees



Design layout of unit 2 (isometric projection):



Design pressure at the foundation slab t/m^2 :



Определение расчетного сопротивления грунта основания

Допущения и предпосылки. Методика расчета принята согласно СП 22.13330.2011 п.5.6.7.

Исходные данные. $\varphi = 18.00^\circ$; $c_{II} = 2.00 \text{ т/м}^2$; $\gamma_{C1} = 1.20$; $\gamma_{C2} = 1.00$; $k = 1.00$; $\gamma_{II} = 1.74 \text{ т/м}^3$; $\gamma'_{II} = 1.75 \text{ т/м}^3$; $d_1 = 1.10 \text{ м}$; $d_b = 0 \text{ м}$; $b = 1.00 \text{ м}$.

Расчет. По таблице 5.5 СП для текущего значения $\varphi = 18.00^\circ$ определены следующие величины:

$$M_\gamma = 0.43, \quad M_q = 2.73, \quad M_c = 5.31$$

Условие $d_b = 0 \text{ м} \leq 2 \text{ м}$ выполняется.

$b = 1.00 \text{ м} < 10 \text{ м}$, следовательно $k_z = 1.0$.

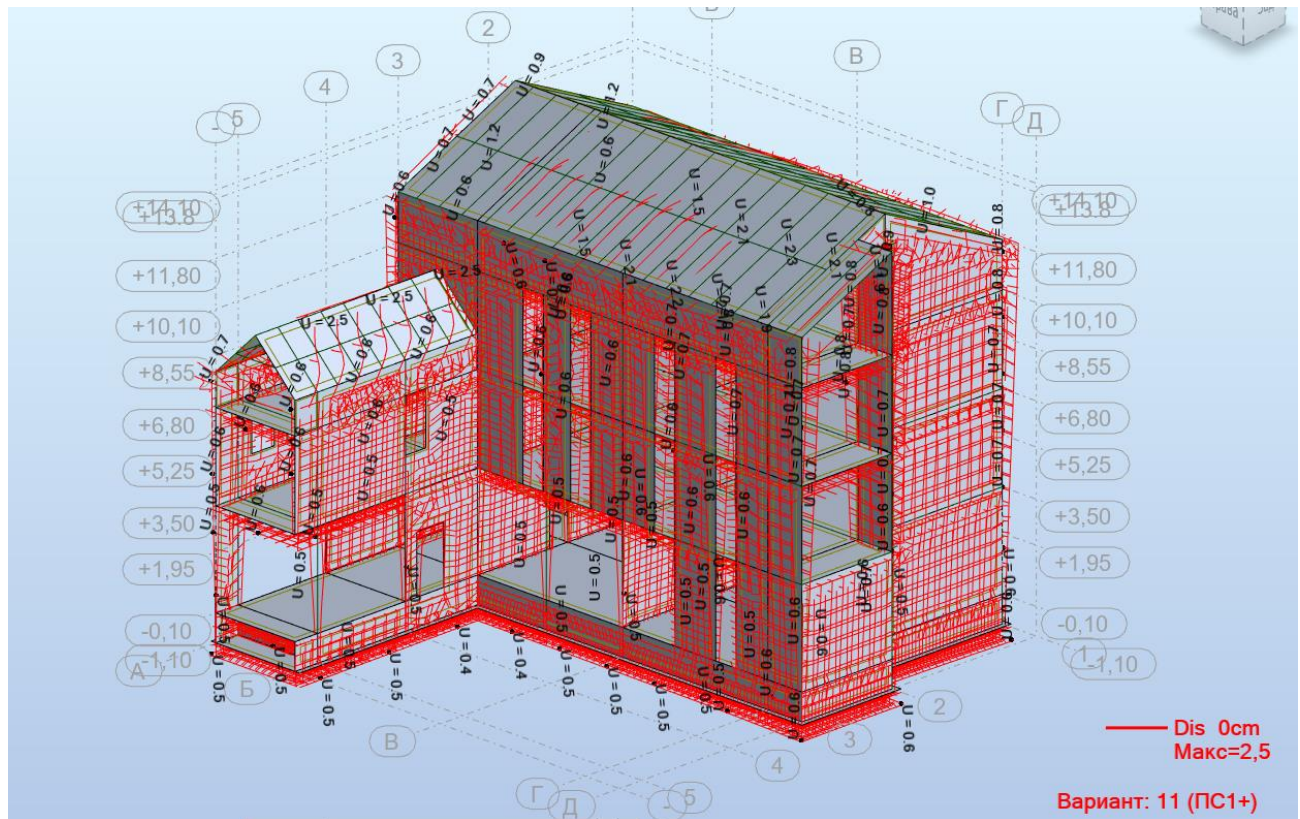
Расчетное сопротивление грунта основания определяется по формуле (5.7):

$$R = \frac{\gamma_{C1}\gamma_{C2}}{k} (M_\gamma k_z b \gamma_{II} + M_q d_1 \gamma'_{II} + (M_q - 1) d_b \gamma'_{II} + M_c c_{II}) =$$

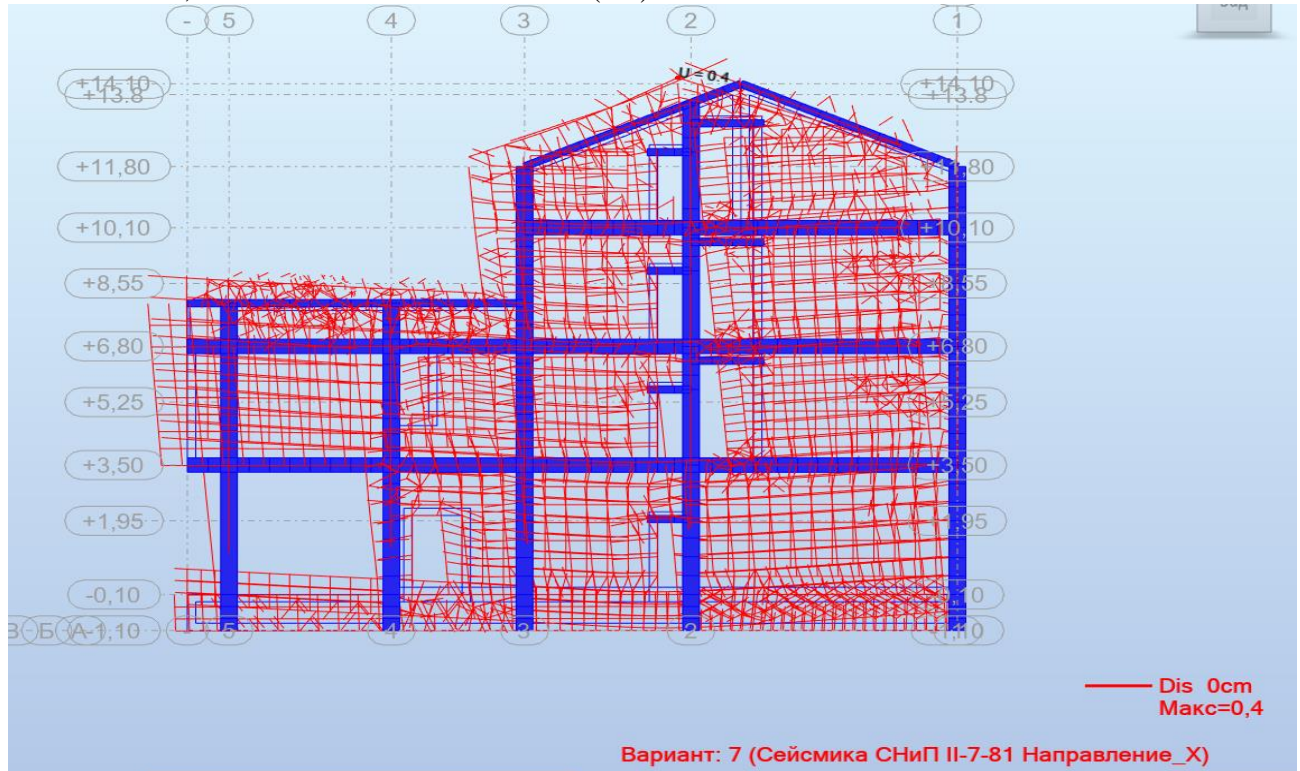
$$= \frac{1.20 \cdot 1.00}{1.00} (0.43 \cdot 1.0 \cdot 1.00 \cdot 1.74 + 2.73 \cdot 1.10 \cdot 1.75 + (2.73 - 1) 0 \cdot 1.75 + 5.31 \cdot 2.00) = 19.9 \text{ т/м}^2$$

Вывод. Расчетное сопротивление грунта составляет: $R = 19.9 \text{ т/м}^2$.

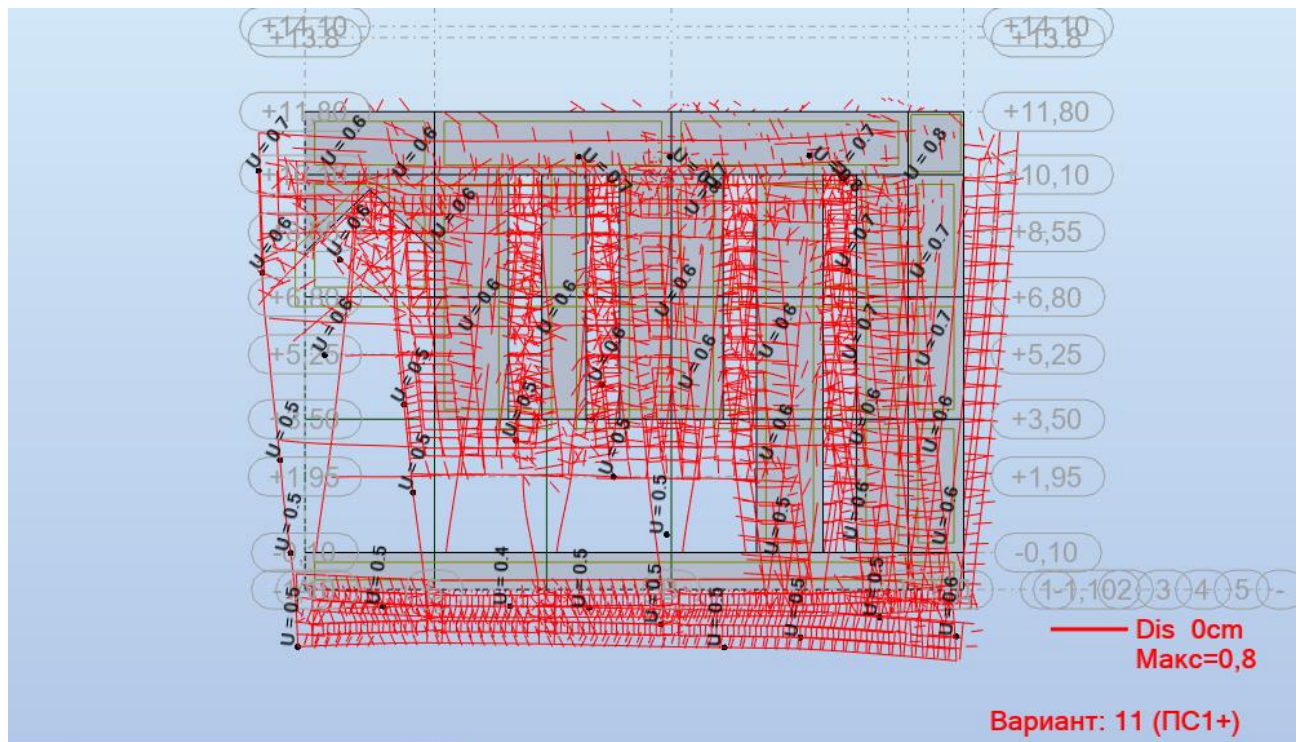
General layout, deformations (cm):



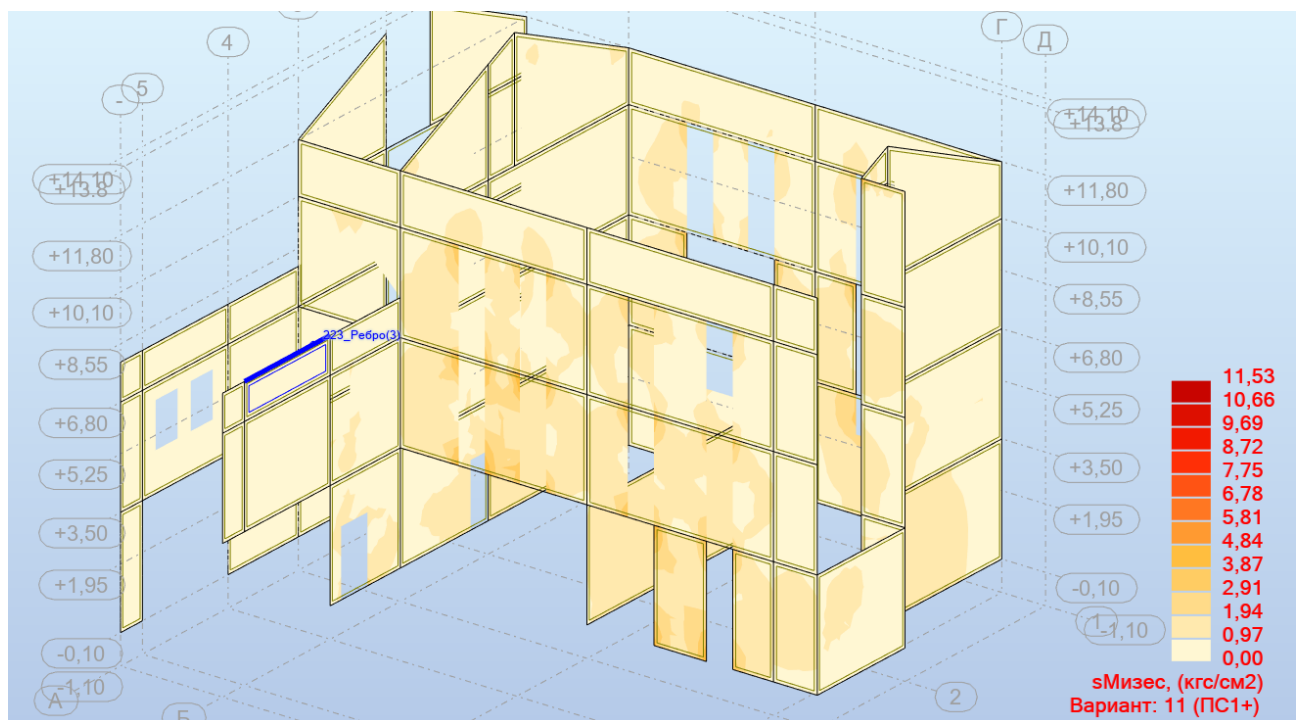
Deformations, direction of seismic actions X (cm):



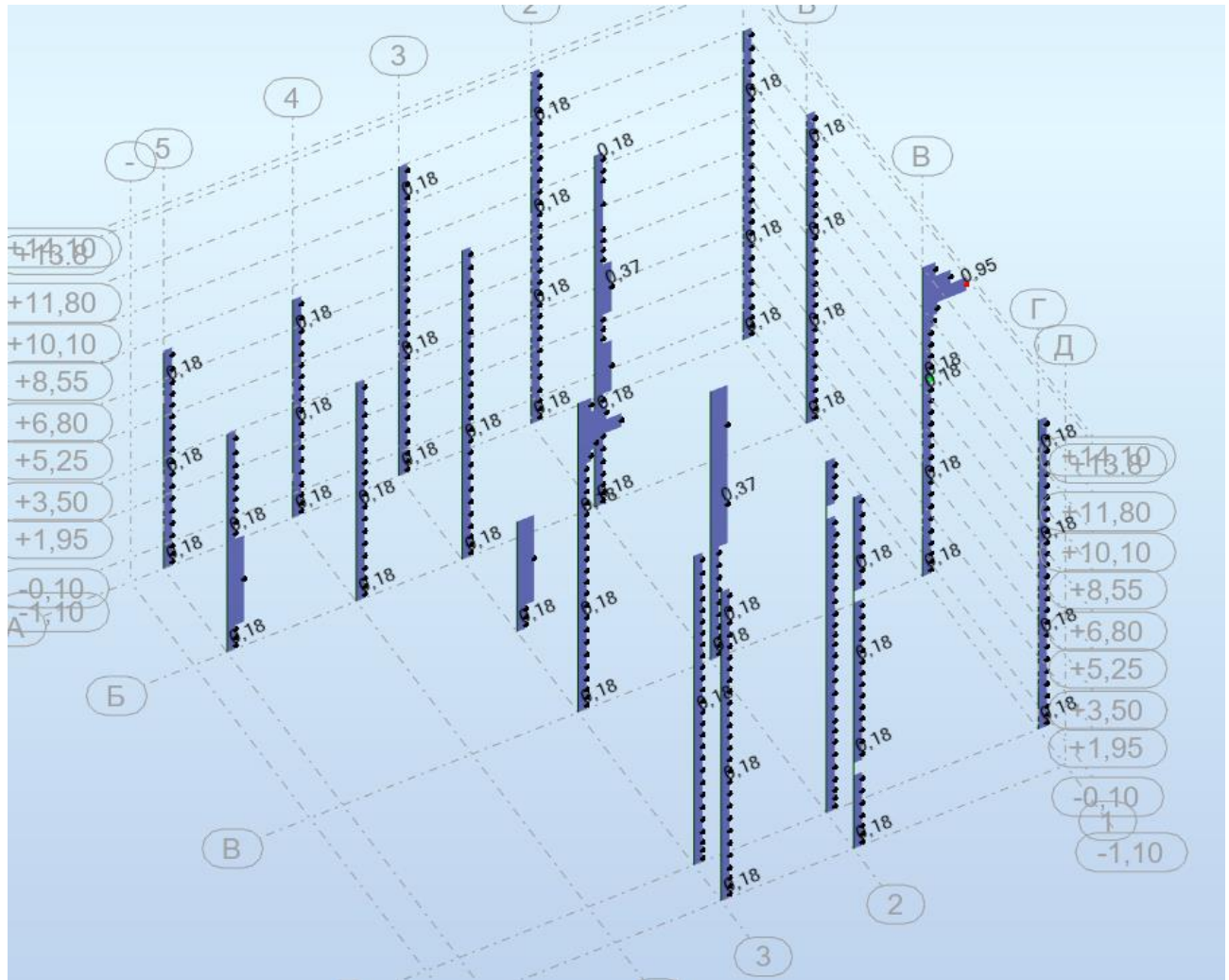
Deformations, direction of seismic actions Y (cm):



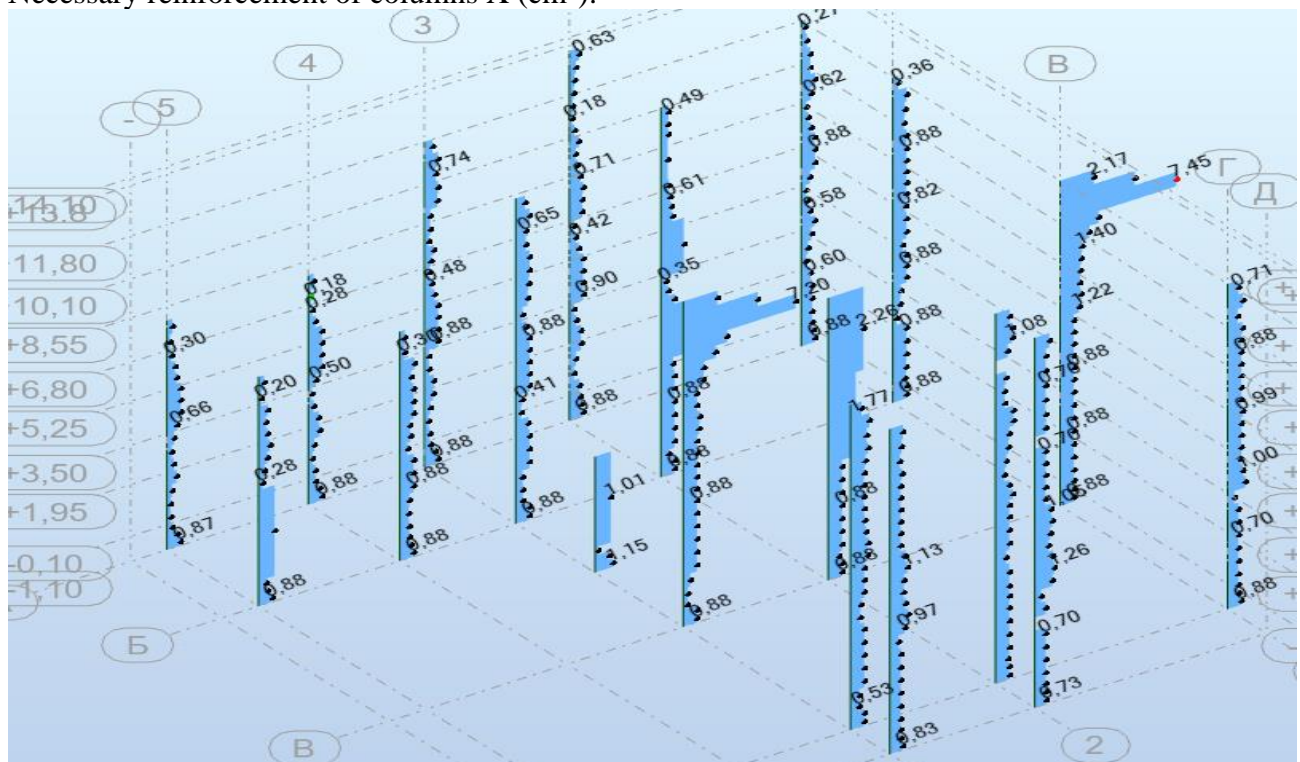
Stresses obtained in masonry, kg/cm²:



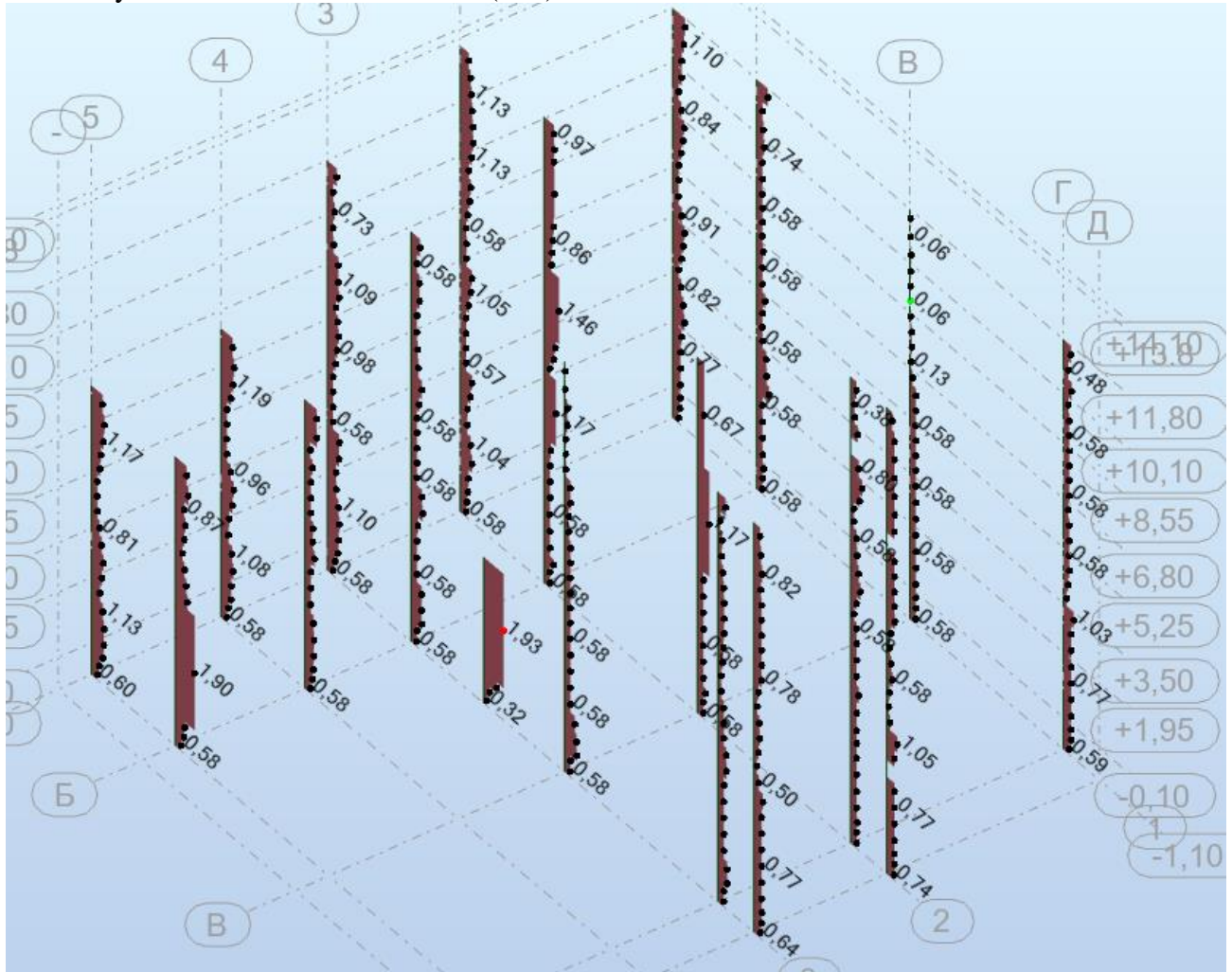
Column reinforcement coefficient:



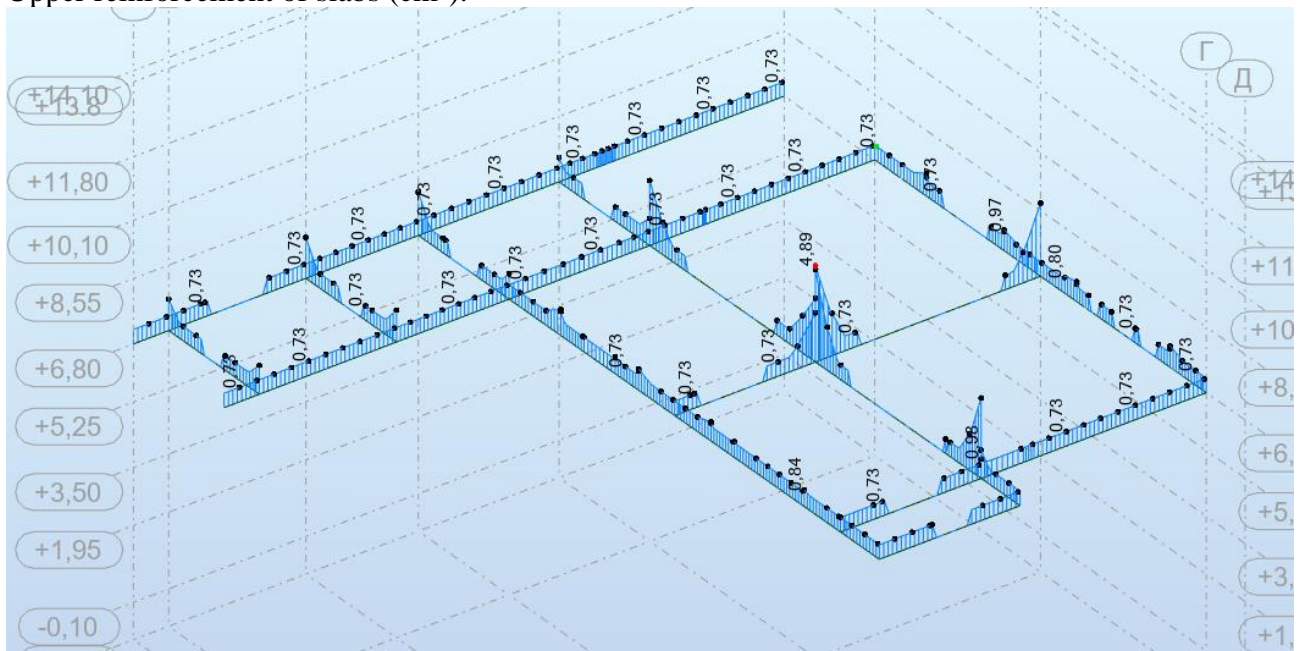
Necessary reinforcement of columns X (cm²):



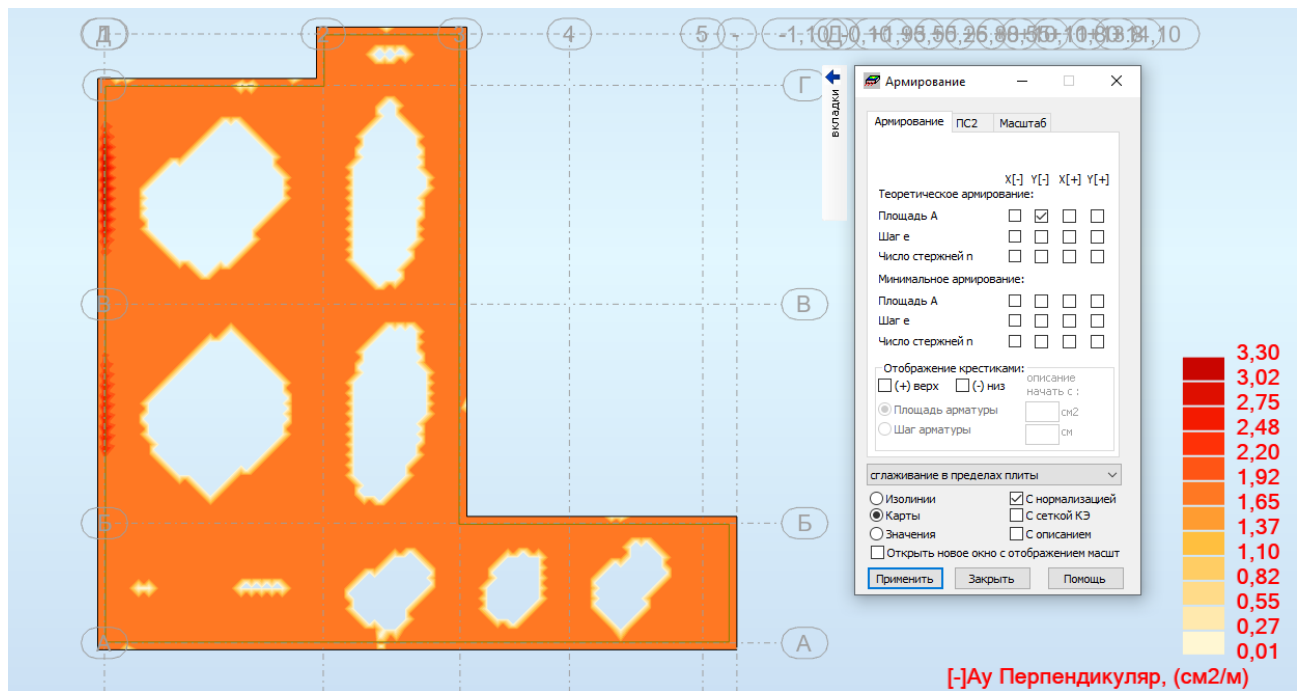
Necessary reinforcement of columns Y (cm²):



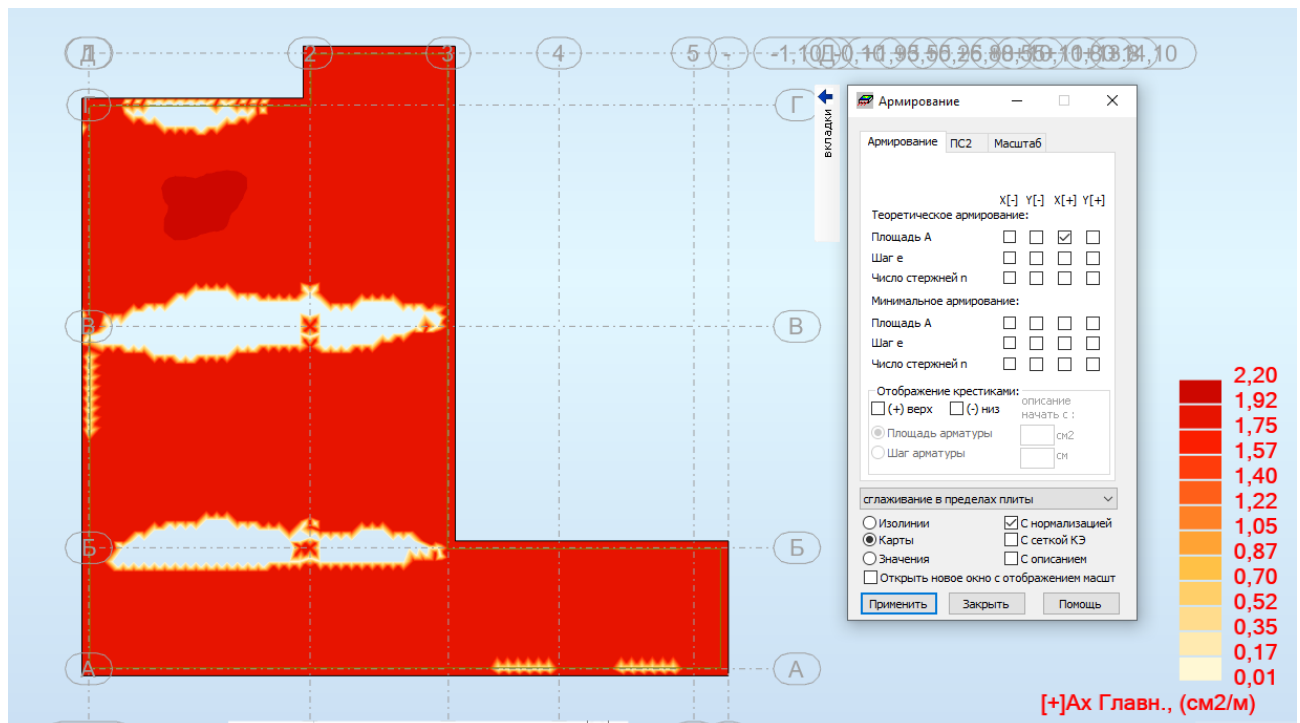
Upper reinforcement of slabs (cm²):



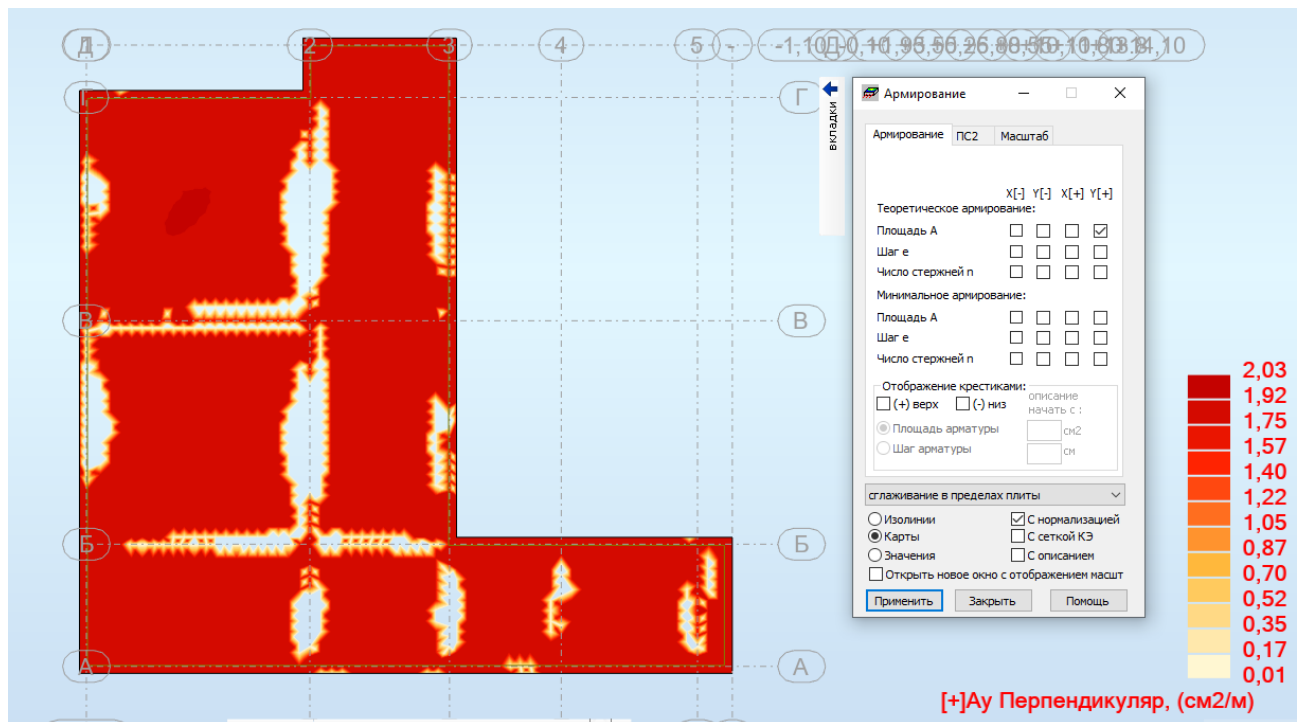
Bottom reinforcement of the foundation slab, direction Y (cm²):



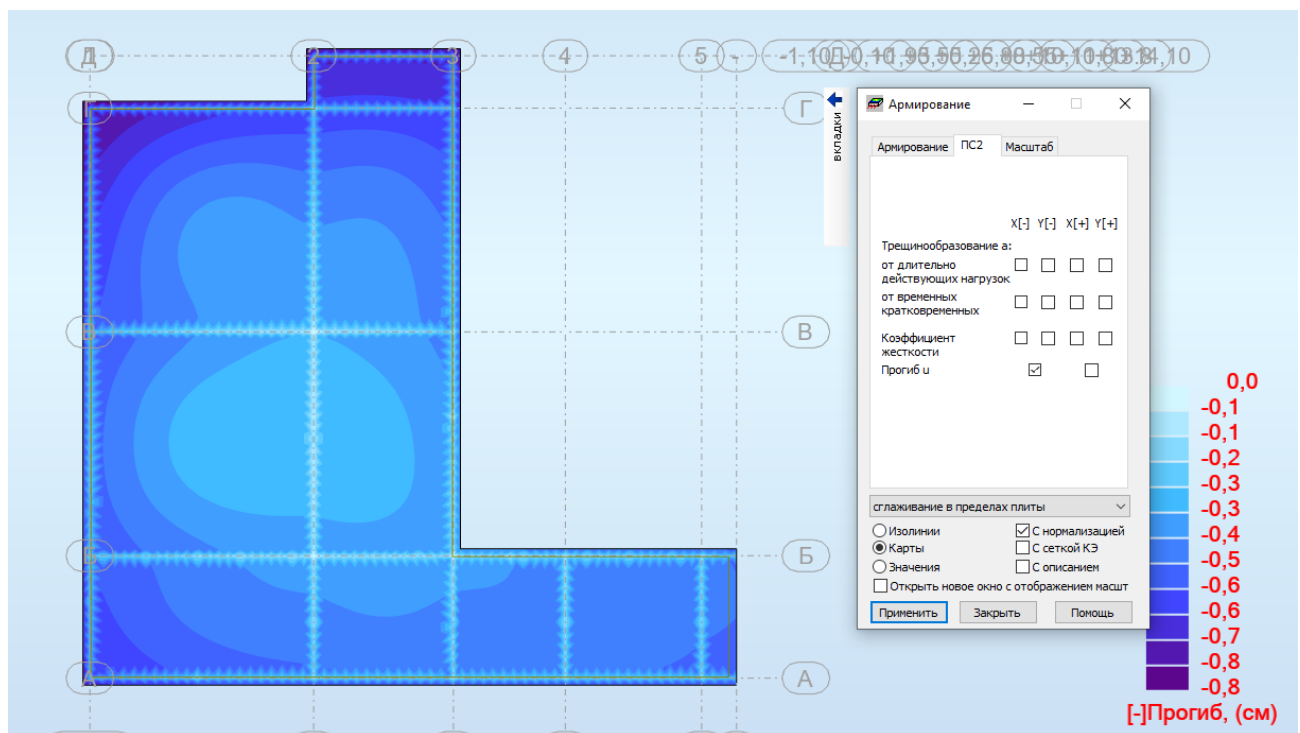
Upper reinforcement of the foundation slab, direction X (cm²):



Upper reinforcement of the foundation slab, direction Y (cm²):



Settlement of the foundation slab (cm):



6. Final conclusions and considerations

As a result of the calculations of the structural schemes of the buildings under examination, the following conclusions were reached:

Unit with cadastral no. 01005200.040.01 – unit no. 1

- Following the modelling and analysis of the stresses, efforts and deformations obtained, it was found out that the displacements at seismic actions with a design intensity of 8 degrees **exceed** the normative values.
- Taking into account the structural scheme of the building as well as the non-conformities described above in accordance with the normative requirements in force, we can find out that it **does not have** sufficient design seismic resistance of 8 degrees.
- In case of a seismic action with a design value, **deformations** and **degradations** in the form of oblique cracks and fissures, failures of masonry portions will occur, without collapse or total failure of the existing structural scheme, given the shortage of stiffness of the masonry structure obtained with a 14% value.
- The floors between the ground floor-floor and floor-attic levels, being made up of wooden elements, do not form a rigid disk between building levels and can ensure that horizontal (seismic) forces are taken over, as a result it cannot be included in the spatial structural calculation, while also being highly worn, their performance under seismic actions is unpredictable.
- As a result of the structural calculation, it was established that the design pressure on the foundation soil does not exceed the admissible pressures.
- The interventions carried out on the building (hole penetrations, internal reorganizations) during its operation, reduced its overall load-bearing capacity, and therefore the seismic resistance of the existing building is ensured at a design seismic intensity of 7 degrees with a reserve of 44%.
- These results are due to the initially selected successful scheme (rigid symmetrical masonry scheme in plane view with longitudinal and transverse load-bearing walls, monolithic slab above the basement) and the materials used to form the foundations and load-bearing walls (M 100 raw stone, protected with plaster on both sides).

Unit no.2 with cadastral no. 01005200.040.02.

As a result of the structural calculation analysis, the following conclusions were reached:

- The existing structural layout is of the monolithic skeleton type with load-bearing walls made of masonry of small limestone blocks and complies with the regulatory requirements in force for the location area with a seismic intensity of 8 (eight) degrees, except for its irregular shape in plane view, in the absence of a settlement-deformation joint between the building units.
- Following the structural calculation, it was established that the design pressure on the foundation soil does not exceed the permissible pressures.
- The sections of the load-bearing elements of the building (foundation slab, columns, beams, wall thickness) are sufficient to ensure earthquake resistance.
- After comparing the materials adopted in the detailed design, with the results of their laboratory tests, with the necessary ones, following the structural calculation it was found out that the design resistance to dynamic (seismic) actions of the building is ensured.
- The stress values in the load-bearing walls do not exceed the values of the standardized stresses.
- Displacements during seismic actions are within the limits of permitted values.
- Resistance and stability of the building with cadastral number 01005200.040.02 is ensured during seismic actions with an intensity of 8 degrees and can be operated subject to its functional purpose.

Unit no.2 (annex) with cadastral no. 01005200.040.02.

Following the analysis of the structural calculation of the annex, the following conclusions were reached:

- The structural scheme adopted for the existing height limit corresponds to the regulatory requirements in force.
- The sections of the load-bearing structural elements (foundations, columns, beams, floor) and their reinforcement are sufficient.
- The technical condition is satisfactory.
- The annex can be operated subject to its functional purpose, and the earthquake is ensured at an intensity of 8 degrees.

Schedules:

- Photos of material sampling on 4 sheets;
- Laboratory test reports on 5 sheets;
- Extracts from the cadastral file with the layouts of existing buildings on 13 sheets.

Civil engineer:

N. Barcari

(certificates series 2022-ET, no.0904 dated 12.10.2022, fields 4a,b,d)

Photos of material sampling:

Sampling of concrete elements (columns):



Sampling of masonry stone (walls):

