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Creation in Armenia of the World Museum of Seismic Isolation — Its Idea, Concept, Structural Solution and Analysis

Mikayel G. Melkumyan[1]

[1] Professor, Doctor of Sciences (Engineering), Academician; CEO, "Melkumyan Seismic Technologies" LLC; President, Armenian Association for Earthquake Engineering, Armenia
Correspondence: Mikayel G. Melkumyan, Professor, Doctor of Sciences (Engineering), Academician; CEO, "Melkumyan Seismic Technologies" LLC; President, Armenian Association for Earthquake Engineering, Armenia.

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Abstract

Due to the research and design works carried out by the author of this paper starting from 1993, Armenia is currently one of the world leaders in development and extensive application of seismic (base and roof) isolation technologies, as well as this country is the world leader in large implementation of low-cost seismic isolation for construction of new and retrofitting of existing buildings. These facts brought to the idea on creation in Armenia of the World Museum of Seismic Isolation. Museum will serve as an international educational establishment to present the history of development and implementation of seismic isolation, to display expositions from countries around the world, where different seismic isolation systems have been successfully applied to various buildings and structures. It can serve as a common platform for acknowledgement of new solutions in earthquake engineering and will inspire young generations of scientists and engineers to embrace seismic isolation and to further its research and implementation. The author is planning to realize his idea and to create the Museum through his company "Melkumyan Seismic Technologies" LLC with the support of various institutions, companies and individuals across the world. Particularly, his company will invest in this project by providing the land and developing design drawings for the Museum building. It will be designed in the form of a giant seismic isolator of cylindrical type. There will be six stories in total, of which the first above ground floor will have the premises for an educational center, conference and cinema halls, and a cafeteria. Each of the rest four floors will serve as the space for exhibitions from different countries. An underground basement will be serving as a parking floor. The seismic isolation system of this building will be located at the upper part of the parking floor. The ground walking area and the roof's parapet will resemble the lower and upper flanges of the giant isolator. Museum will include a central core for elevator's shaft and a staircase. Outside view of the building will be architecturally solved in a way that belts provided around it will give an impression of steel shims between the layers presented by dark glass, imitating rubber layers. The bearing structure of the Museum building consists of the radial placed reinforced concrete frames. Four shear walls are envisaged in mutually perpendicular directions in the parking floor and in all floors along the height of superstructure. Other details on the structural system of base isolated Museum building are given in the paper and illustrated by the corresponding drawings. Analysis of the Museum building was carried out based on the provisions of the Seismic Code of Armenia, as well as seismic response analysis was carried out using acceleration time history of the 1988 Spitak Earthquakes. The period of oscillations of this base isolated building is equal to 2.14 sec. Displacement of the isolation system, deformed state of the building, the values of stories' maximum drifts and of seismic forces are also given and graphically illustrated in the paper.

Keywords: achievements in seismic isolation, illustration of newly constructed and retrofitted buildings, idea on creation in Armenia of the World Museum of Seismic Isolation, concept of the Museum, structural solution, design model, earthquake response analysis of the Museum's building, results of analysis

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1. Introduction

The research and experimental works on creation of the seismic isolation strategies were launched by the author of this paper in 1993 (Melkumyan M, 2022). Since that time and to date huge achievements were reached in application and implementation of seismic (base and roof) isolation technologies in construction of new and retrofitting of existing buildings in Armenia (Figures 1, 2, and 3). In this regard Martelli, Forni & Clemente have stated in their paper at the 15th World Conference on Earthquake Engineering: "*It is worthwhile stressing that Armenia remains second, at worldwide level, and has the largest number of building applications of seismic isolation per number of residents, in spite of the fact that it is a still developing country*" (Martelli A., Forni M. & Clemente P., 2012).

Single family house with stone load-bearing walls

Single family house with stone, load-bearing walls

4-story apartment building with R/C monolithic load-bearing walls

4-story apartment buildings with reinforced masonry load-bearing walls

3-story Clinic R/C frame building with shear walls

4-story Hospital R/C frame building with shear walls and asymmetric plan

7-story hotel and business center R/C frame building with shear walls and asymmetric plan

Figure 1. Some of the low-story base isolated newly constructed buildings in Armenia

Besides, as a principal structural engineer or member of the designers' groups the author have designed 107 earthquake resistant residential, civil, and industrial buildings for construction or retrofitting in different regions of Armenia and of Russia (Smirnov V., Eisenberg J., Zhou F., Chung Y. & Nikitin A., 2000), Romania (Melkumyan M. & Gevorgyan E., 2009), Peru (Melkumyan M., 2024), Nagorno Karabakh (Melkumyan M., 2020), Kazakhstan (Melkumyan M., 2024) and Turkey (Melkumyan M., 2024) including those with application of developed by him seismic isolation strategies (Figure 4).

16- and 10-story buildings "Our Yard"

20-story business center "Elite Plaza"

16- and 14-story buildings "Arami"

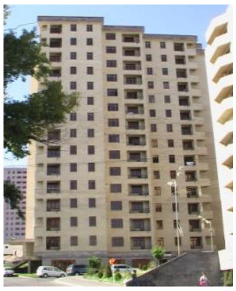
18-story buildings-twins "Northern Ray"

17-story building "Baghramian"

11-story building "Cascade"

16- and 13-story buildings "Dzorap"

17-story building "Sevak"



15-story building "Avan"

Figure 2. Some of the high-rise base isolated newly constructed residential complexes in Armenia with seismic isolation systems located at different levels and bearing structures of R/C frames with shear walls

The given information on wide implementation of the developed seismic isolation strategies for the large variety of newly constructed or retrofitted buildings testifies about the author's weighty contribution in this innovative and unique technology. International institutions, namely, the World Bank's Earthquake Zone Reconstruction Project and UNIDO, Malaysian companies Min Rubber Products Sdn. Bhd. and Sime Engineering Rubber Products Sdn. Bhd., as well as UK based Malaysian Rubber Producers' Research Association must be especially mentioned due to investing in construction and testing of one new base isolated building and in retrofitting by base isolation of one, as well as in protection by roof isolation of two existing buildings. Huntsman Corporation has invested in construction of two new base isolated buildings. Caritas Switzerland has invested in retrofitting by base isolation of one existing school building. "Hayastan" All-Armenian Fund has invested in construction of one new base isolated Clinic building. Together with that the Governmental program for providing apartments for young families has invested in construction of one new base isolated building, and the Healthcare Project Implementation Unit of the Ministry of Health has invested in retrofitting by base isolation of the Hematology Center existing building and in construction of new base isolated "Vanadzor" Hospital building. Huge investment was done by "Elite Group" CJSC through construction of 12 base isolated high-rise buildings and a business center. Then "Tufenkian Hospitality" LLC and "ITARKO Construction" CJSC each have constructed one base isolated building, and "Fredex Services" CJSC have invested in retrofitting by base isolation of an existing building to be converted into a hotel. Four base isolated single-family houses were constructed by private individuals.

5-story stone apartment building retrofitted by base isolation

9-story R/C frame apartment building protected by roof isolation

5-story R/C frame hotel building retrofitted by base isolation

3-story stone school building retrofitted by base isolation

9-story R/C frame apartment building protected by roof isolation

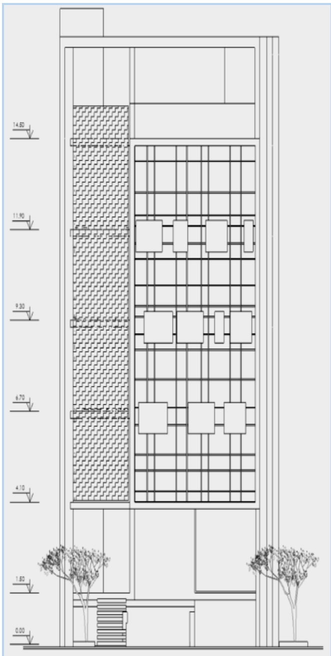
9-story R/C frame hematology center hospital building retrofitted by base isolation

Figure 3. Existing buildings retrofitted by base isolation or protected by roof isolation strategies in Armenia without moving people out and interruption of the buildings' use

Design for retrofitting by base isolation of the existing building in Romania was developed by the "Center of New Construction Technologies" (CNCT) headed by the author of this paper from 2011 to 2017. In 2018 he has founded the "Melkumyan Seismic Technologies" LLC (MST

LLC). This company has invested in development of the designs for construction of new base isolated buildings in Peru and Turkey, as well as for retrofitting by base isolation of existing buildings in Nagorno Karabakh and Kazakhstan. Due to the author's efforts Armenia started from 1994 manufacturing and testing of high-quality seismic isolators in accordance with the international standards. To date the number of already installed seismic isolators has reached about 5500. Testing of seismic isolators was carried out in the author's laboratories at the Earthquake Engineering Center of the National Survey for Seismic Protection, at the Engineering Research Center of the American University of Armenia, at the CNCT and the MST LLC (Melkumyan M. & Hakobyan A., 2005). It is worth noting that at the request of the Ministry of Urban Development the author has also developed the "*Guidelines for Design and Construction of Buildings Using Laminated Rubber Steel Bearings*", and the Standard of the Republic of Armenia 261-2007 "*Seismic Isolation Laminated Rubber Steel Bearing*". Both documents were adopted and approved by the Government of Armenia and published in 2007. Starting from 2006, due to author's efforts, for the first time in the history of the Republic of Armenia Building Codes the chapter on seismic isolation was included in the Code. Currently a new Chapter X "*Buildings and Structures with Seismic Isolation Systems*", which was developed by the author as well, is incorporated in the new edition of the Code in effect RABC 20.04-2020 (Melkumyan M., 2021). All the mentioned normative documents (Standards and Code) are shown in Figure 5 and the testing facilities are presented in Figure 6.

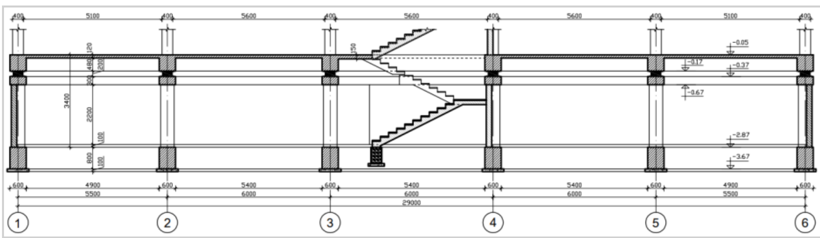
4-story existing stone bank building retrofitted by base isolation in the city of Irkutsk (Russia)



2-story existing stone Iasi City Hall building (Romania) to be retrofitted by base isolation

7-story residential building "Chullo" in the city of Arequipa (Peru) to be newly constructed using base isolation system

19-story (including two basement floors) existing apartment "Dostyk" building in the city of Almaty (Kazakhstan) to be retrofitted by base isolation

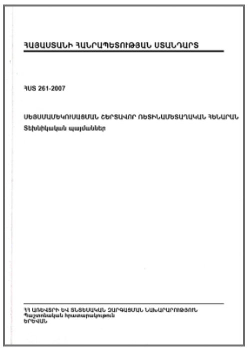


9-story existing large-panel apartment building retrofitted by base isolation in the city of Stepanakert (Nagorno Karabakh)

Vertical elevation of seismic isolation system of the 5-story apartment building designed for multiple implementations in the devastated zone of 2023 Turkey-Syria earthquake and submitted as the author's gift to Turkish people and people of other nationalities who are living in the affected area

Figure 4. Retrofitting of existing buildings and construction of new buildings in the regions out of Armenia designed by the author with application of the developed by him base isolation technologies

Guidelines for design and construction of buildings using laminated rubber steel bearings



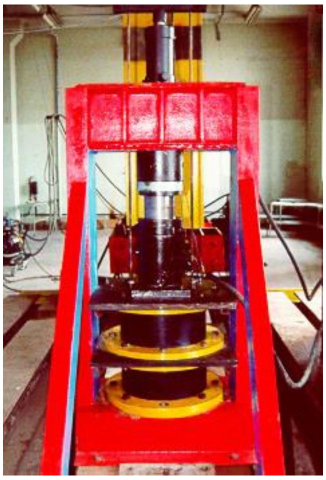
Standard of the Republic of Armenia 261-2007 — Seismic Isolation Laminated Rubber Steel Bearing

New edition of the Republic of Armenia Building Code RABC 20.04-2020

Figure 5. Normative documents (Standards and Code) related to manufacturing and testing of seismic isolators and to design of buildings with seismic isolation systems

General view of the test machine designed for testing two large size seismic isolation bearings

Deformation of seismic isolation rubber bearings in the combined shear and compression testing



General view of the test machine designed for testing two small size seismic isolation bearings

Figure 6. Facilities available in Armenia for testing of various large and small size seismic isolation bearings for buildings and bridges

2. Idea and Concept of the World Museum of Seismic Isolation

From the above given information, it follows that Armenia is currently one of the world leaders in development and extensive application of seismic (base and roof) isolation technologies, as well as this country is the world leader in large implementation of low-cost seismic isolation for construction of new and retrofitting of existing buildings. There are a lot of achievements also in other countries where seismic isolation is actively implemented and effectively used. These facts brought to the idea on creation of the special institution where all what was done in this field world-wide will be permanently exhibited. Therefore, the author suggested to create in Armenia a **World Museum of Seismic Isolation** and to make this idea as the main task of his Company. Thus, "Melkumyan Seismic Technologies" LLC will be constantly introducing and propagandize this new idea on creation of the World Museum and inviting the interested parties to join this project.

The Museum will serve as an international educational establishment to present the history of development and implementation of seismic isolation, to display expositions from countries around the world, where different seismic isolation systems have been successfully applied to various buildings and structures. It can serve as a common platform for acknowledgement of new solutions in earthquake engineering and will inspire young generations of scientists and engineers to embrace seismic isolation and to further its research and implementation.

It is suggested constructing the World Museum of Seismic Isolation in Yerevan, the capital of Armenia. "Melkumyan Seismic Technologies" LLC will invest in this project by providing the land and developing design drawings for the Museum building. It will be in the form of a giant seismic isolator (Figures 7 and 8). The ground walking area and the roof's parapet will resemble the lower and upper flanges of an isolator. Their diameter will be 38.5 m, while the diameter of other five floors will be equal to 30.6 m. The building will have six stories in total, of which each of the five above the ground will be of 3.2 m high. An underground basement of 4.0 m high will be serving as a parking floor. Outside view of the building will be architecturally solved in a way that belts provided around it will give an impression of steel shims between the layers presented by dark glass, imitating rubber layers.

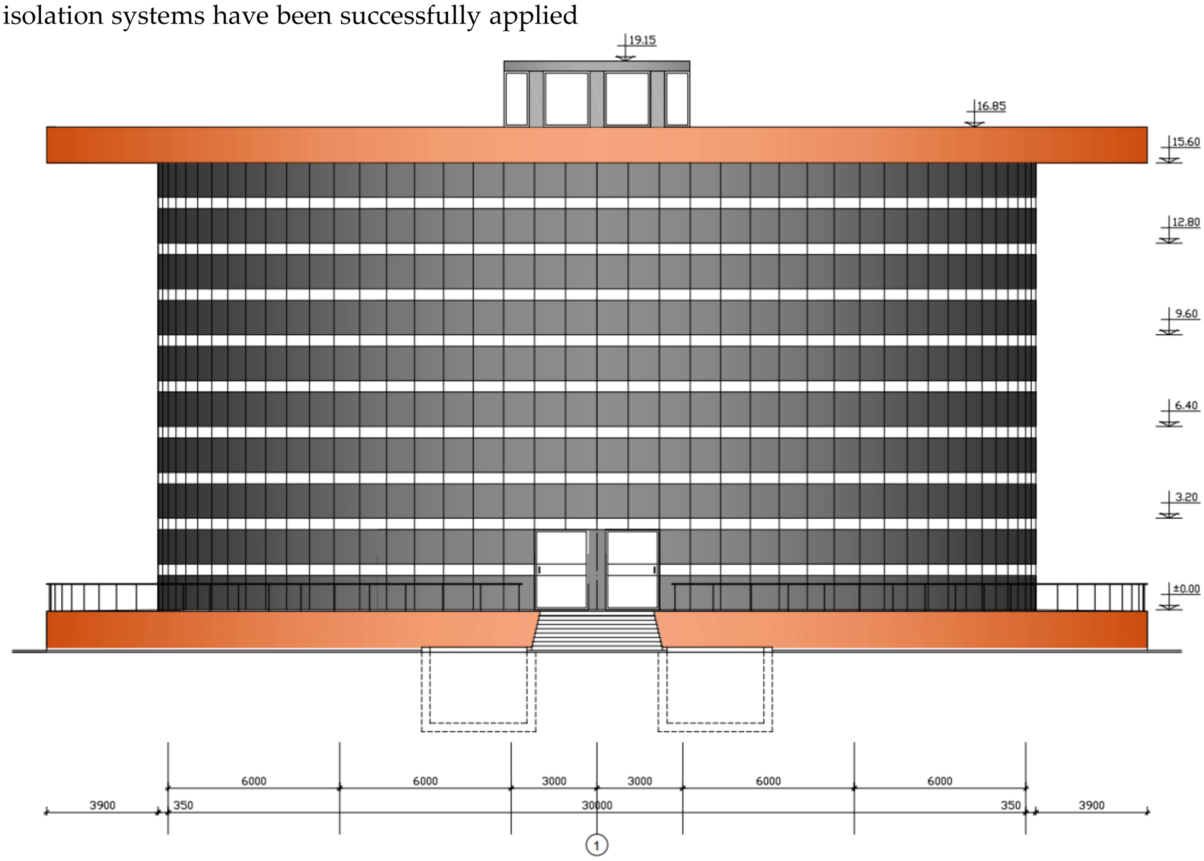


Figure 7. Design view of the World Museum of Seismic Isolation building (axis 1)

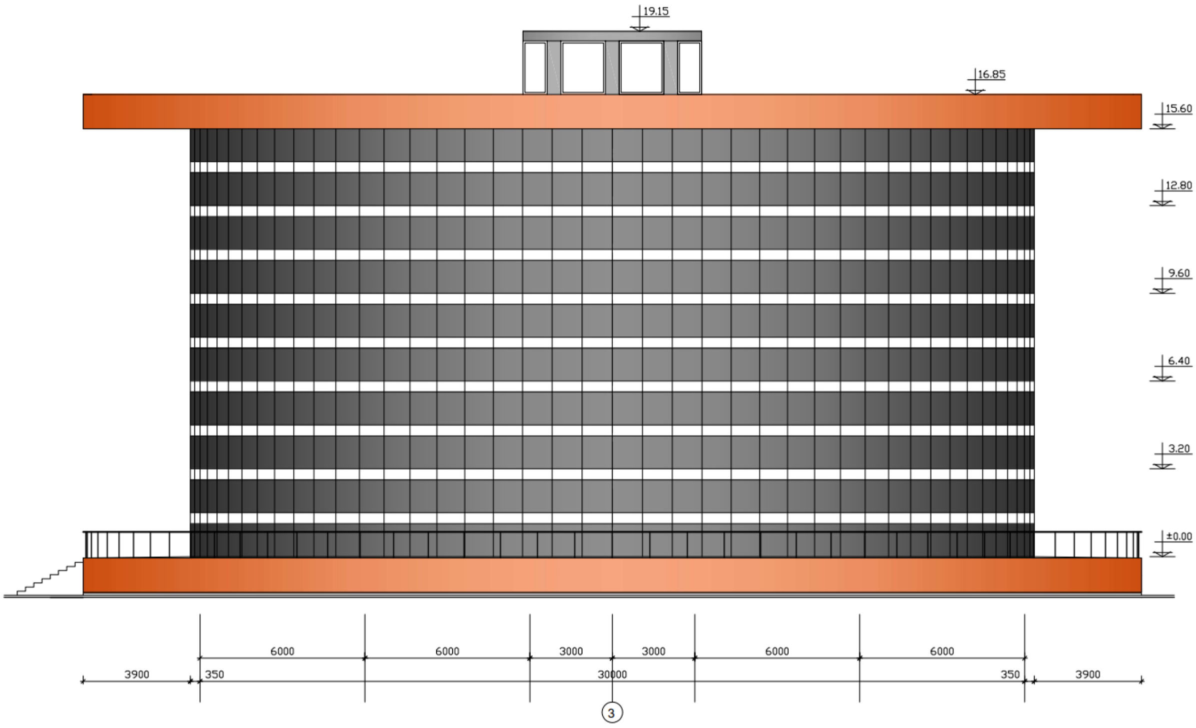


Figure 8. Design view of the World Museum of Seismic Isolation building (axis 3)

Museum will include a central core for elevator/lift's shaft and staircase, an educational center, conference and cinema halls, and a cafeteria (Figure 9). The cost of construction of the Museum, including high quality finishes, utilities, furniture, and equipment, and the surrounding infrastructure will be equal to about 9,000,000 USD. The maintenance cost of the building will be covered by the annual income received from the visitors, from organization of workshops, conferences, permanently acting exhibitions, etc.

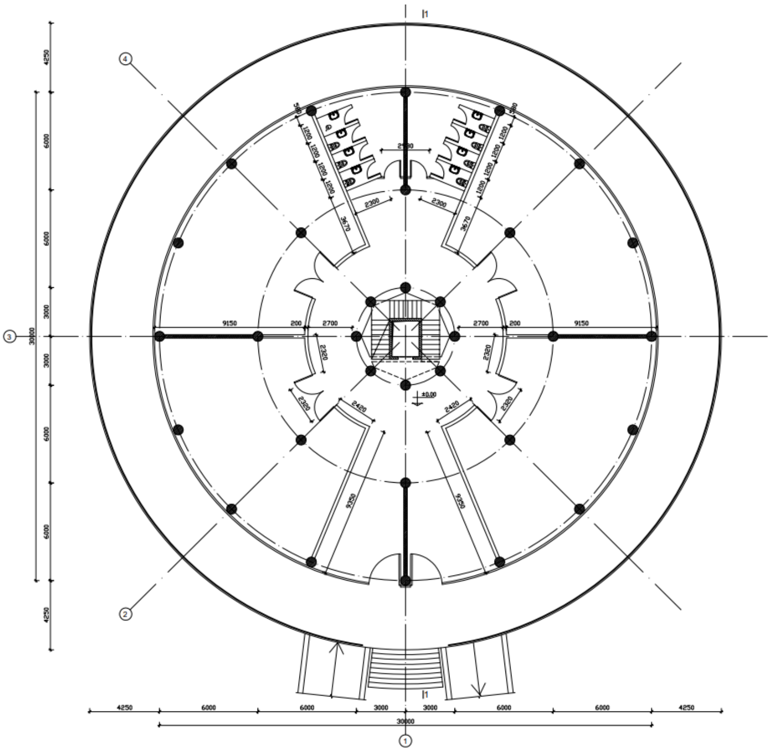


Figure 9. Plan of the first above ground floor of the World Museum of Seismic Isolation building showing the premises for educational center, conference and cinema halls, and a cafeteria

We invite all those who will read this paper and also various institutions, companies, associations, societies which are working in the field of seismic isolation, as well as scientists and engineers to participate in this project by making a financial contribution for the construction of the Museum and the final realization of this project. It goes without saying that all the legal, financial, and regulatory aspects, as well as contractual arrangements with all those who will be willing to invest into this project, will be managed appropriately.

As an example of the possible contribution, some part of the letter of the Company from USA KPFF Consulting Engineers is cited below showing the desire to take part in the Museum project. Technical Director of this Company Reid Zimmerman together with his colleague Jeff Diephuis visited Armenia where they were seismically evaluating buildings for the U.S. Department of State Overseas Building Office. They came across several of the seismic isolated buildings and got acquainted with our achievements in this field. In his letter to the author Reid Zimmerman wrote: *"…We find your proposal for a World Museum of Seismic Isolation to be constructed in Yerevan, Armenia to be intriguing and are interested in staying engaged. In total, KPFF has designed over 5 million square feet (465,000 square meters) of base-isolated building area distributed among 19 completed structures (with several more in construction) making up nearly 20% of all known base-isolated buildings in the United States. I believe this puts KPFF in a unique position to contribute to the World Museum representing the U.S. We would appreciate remaining engaged in this project as it develops further…".*

3. Structural Solution and Analysis of the Base Isolated Museum's Building

As it is mentioned in Paragraph 2 the Museum's building has five above ground floors. Besides the first floor the spaces of the rest four floors will be used to exhibit achievements in seismic isolation in various countries. As an example, Figure 10 shows the plan of the second floor.

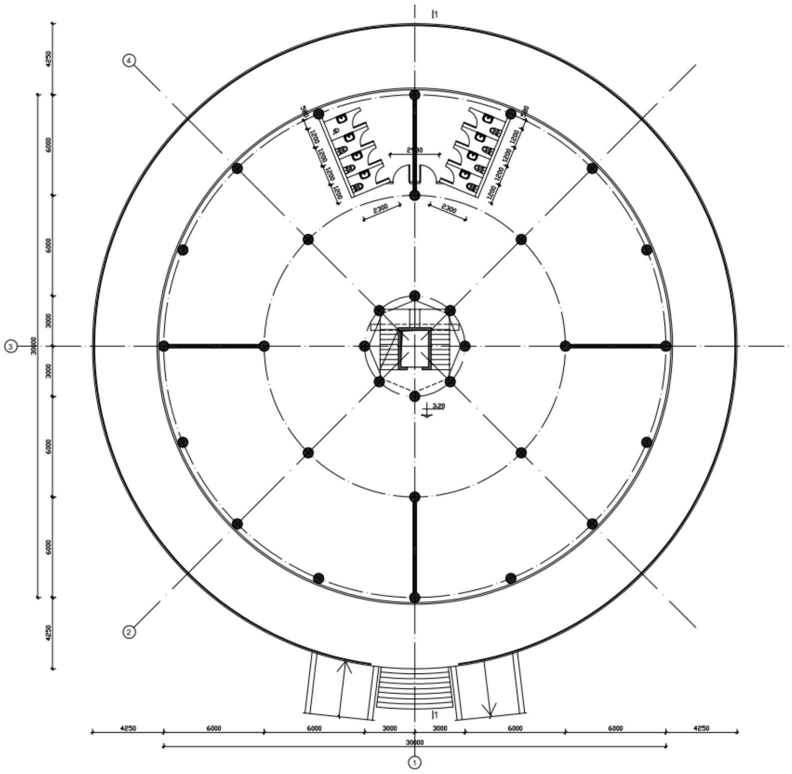


Figure 10. Plan of the second above ground floor of the World Museum of Seismic Isolation building where permanently acting exhibitions will be located

Structural solution of the building envisages location of the seismic isolation system at the upper level of the basement (parking) floor between the marks -0.05 and -1.30. Seismic isolation system consists of the lower beams 600×400(h) mm below the seismic isolation interface, the gap of 200 mm high where seismic isolators are located and of the upper beams

600×650(h) mm above the seismic isolation interface. Vertical section of the World Museum of Seismic Isolation building where location of the seismic isolation system is clearly seen is shown in Figure 11. Plan of location of 88 seismic isolators is shown in Figure 12.

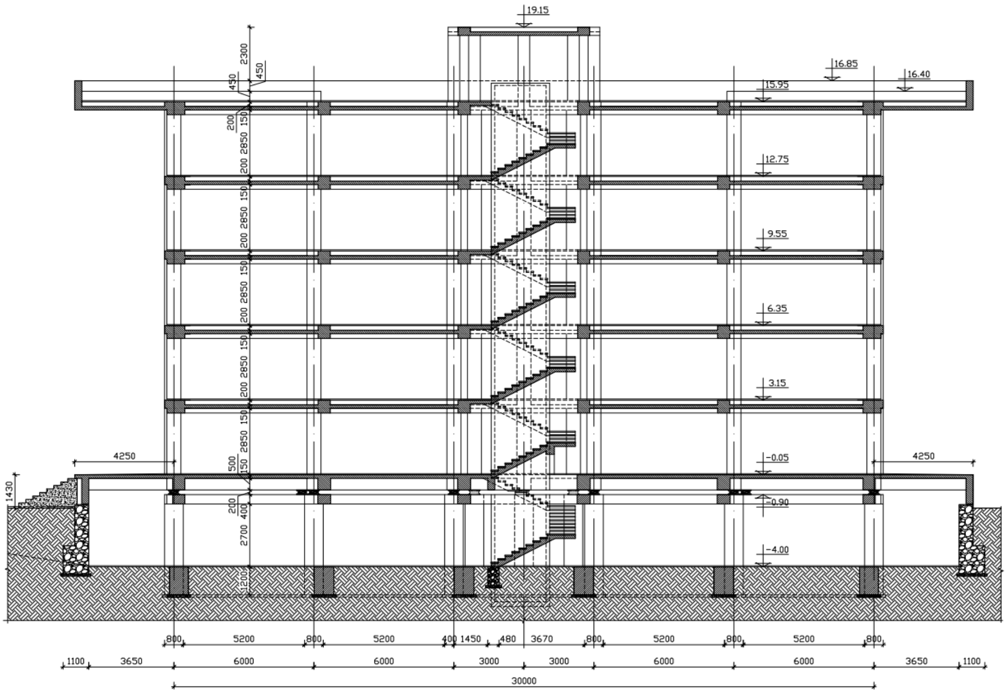


Figure 11. Vertical section of the World Museum of Seismic Isolation building

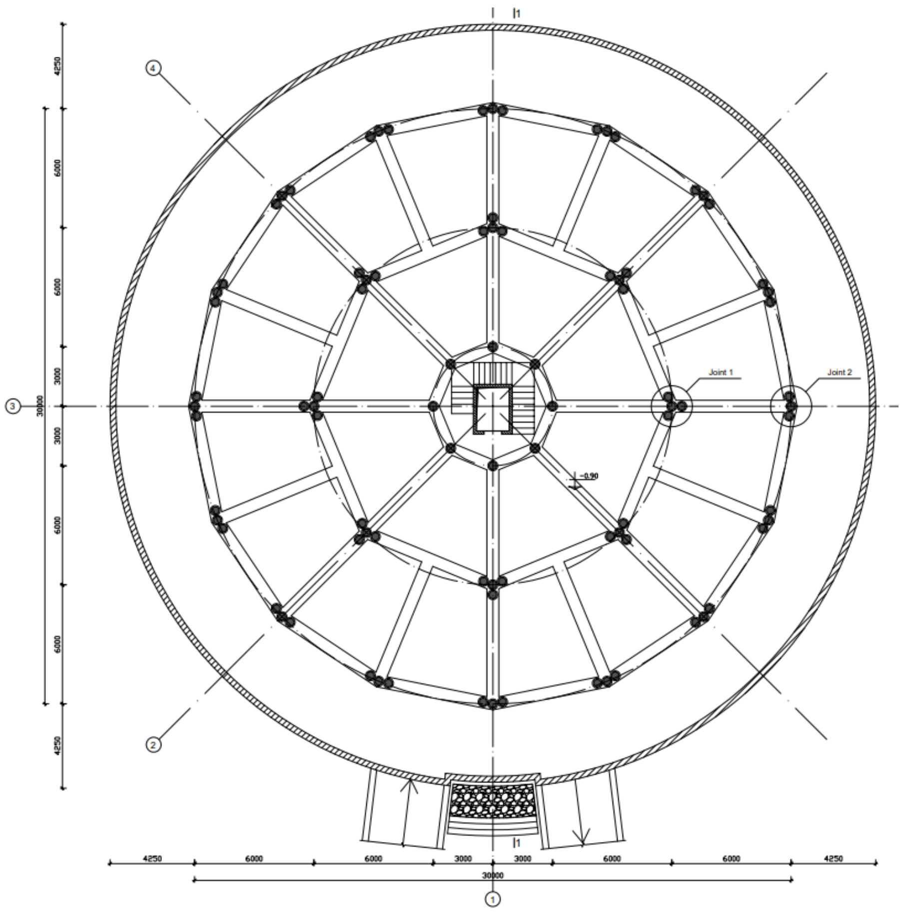


Figure 12. Plan of location of 88 seismic isolators at the mark -0.90 in the basement (parking) floor

The R/C lower beams do not have slab at their level, and they just connect all the columns of the basement (parking) floor which have the circle cross section of diameter 800 mm. These columns are supported by the strip foundation beams with the cross section of 800×1200(h) mm. Thus, all these structural elements together with the four shear walls of thickness 200 mm (Figure 13) are forming the rigid structural system below the seismic isolation interface. Immediately above this level the upper beams are located and support the whole superstructure (the part of the building above the seismic isolation plane). The upper beams are unified by the R/C slab with the thickness equal to 150 mm.

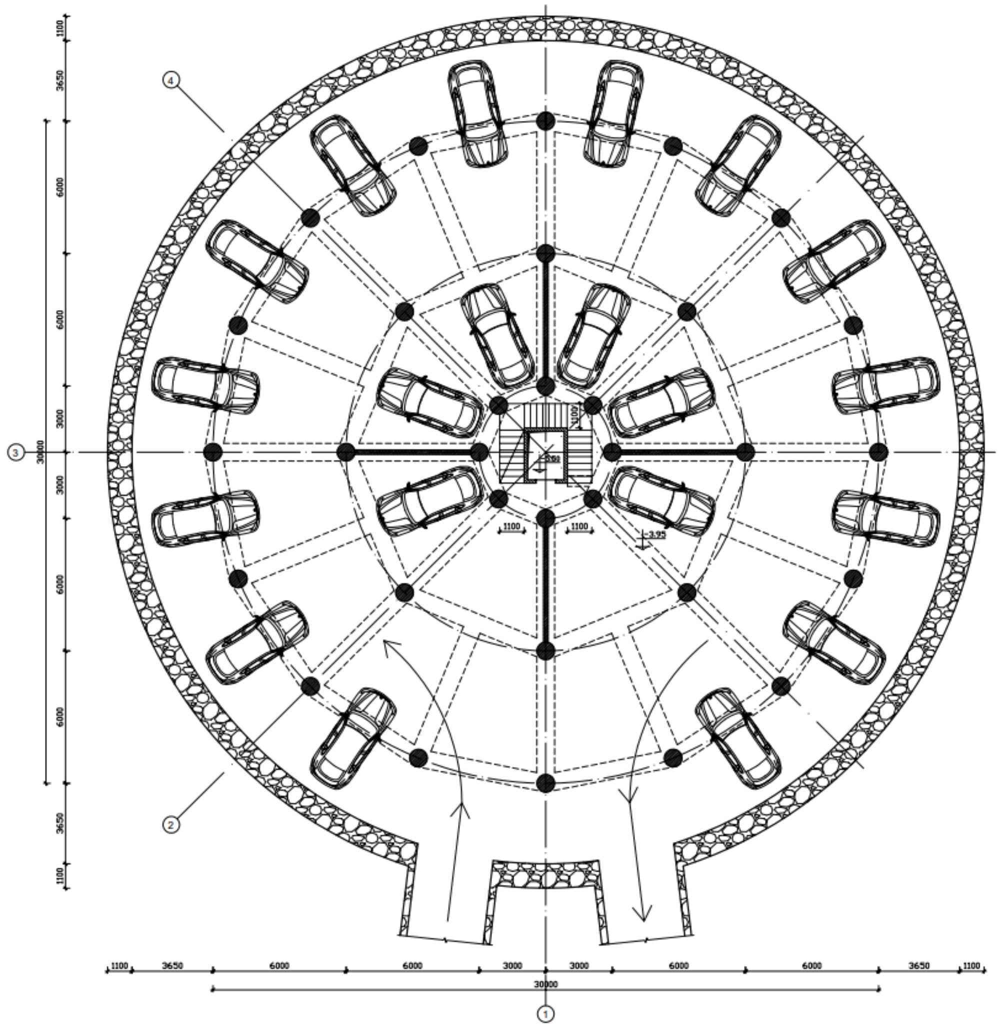


Figure 13. Plan of location of the strip foundation beams, columns and shear walls in the basement (parking) floor at the mark -3.95

From Figures 9, 10 and 11 it follows that superstructure of the Museum's building has R/C frames located in radial direction and four shear walls of thickness 200 mm in all floors. The columns of superstructure have the circle cross section of diameter 600 mm. They are connected by the beams which have cross section of 500×550(h) mm. The slabs of all floors in superstructure are designed with the thickness equal to 150 mm. The cantilever beams at the level of roof have the cross section of 500×750(h) mm supporting so-called upper flange and parapet of the Museum's building (see Figure 11).

Analysis of the Museum's building was carried out using LIRA-SAPR 2021 R2 program. The design model for the analysis of the building was compiled using different finite elements for columns, beams, shear walls and slabs. K55 finite element was used to describe in the model the seismic isolators. Different views of the design model of the Museum's building are shown in Figure 14.

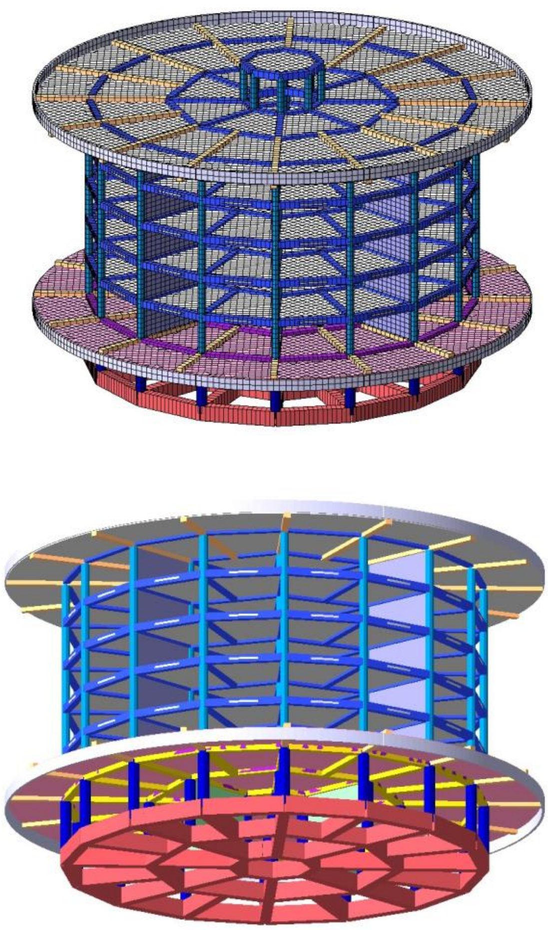


Figure 14. Views of the design model compiled for the analysis of the World Museum of Seismic Isolation building by the Armenian Seismic Code and the acceleration time history of the 1988 Spitak Earthquake

Analysis was carried out based on the provisions of the Seismic Code of Armenia, as well as seismic response analysis was carried out using acceleration time history of the 1988 Spitak Earthquake. The recorded accelerogram scaled to 0.4g is shown in Figure 15. The original accelerogram was recorded at Ashotsk station (EW direction) with the peak ground acceleration equal to 0.18g.

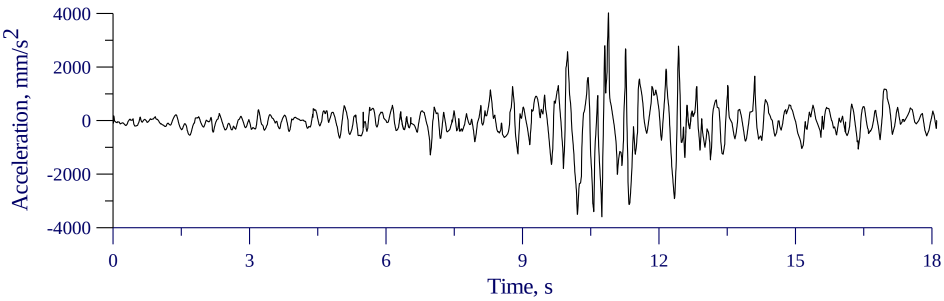


Figure 15. Accelerogram of the 1988 Spitak Earthquake recorded at Ashotsk station (EW direction)

Calculations were carried out considering the non-linear behavior of seismic isolation laminated rubber-steel bearings (SILRSBs) with the following input parameters: yield strength — 56 kN; yield displacement — 19 mm; effective horizontal stiffness — 0.81 kN/mm. SILRSBs of the same characteristics and sizes (Figure 16) were used to create the seismic isolation system of the Museum's building. They are made on the basis of neoprene and were designed and tested in the laboratory of "Melkumyan Seismic Technologies" LLC (Melkumyan M. & Hakobyan A., 2005; Melkumyan M., 2001). Total 88 neoprene SILRSBs have an aggregate effective horizontal stiffness equal to $k_{eff} = 0.81 \times 88 = 71.28$ kN/mm.

Number of rubber layers: 14;

Number of internal metal plates: 13;

External diameter of the bearing (D): (380 ± 2.0) mm;

Internal diameter of the bearing's central hole (d_1):

(19 ± 1.0) mm;

Height of the bearing (H): (202.5 ± 2.5) mm;

Thickness of the rubber layers (S): (9 ± 0.1) mm;

Diameter of the internal metal plates (d_2): (360 ± 0.5) mm;

Thickness of the internal metal plates (S_1): (2.5 ± 0.1) mm;

External diameter of the upper and lower flanges (d_3):

(376 ± 0.5) mm;

Thickness of the upper and lower flanges (S_2): (20 ± 0.2) mm;

Thickness of the upper and lower flanges' protective layer (S_3): (2 ± 0.1) mm;

Mass of the bearing: (77.5 ± 2.5) kg;

The bearing must withstand a maximum (design) permissible vertical loading of 1500 kN. Critical vertical load is equal to 4500 kN;

Shear modulus of the bearing's rubber must be:

(0.97 ± 0.15) MPa;

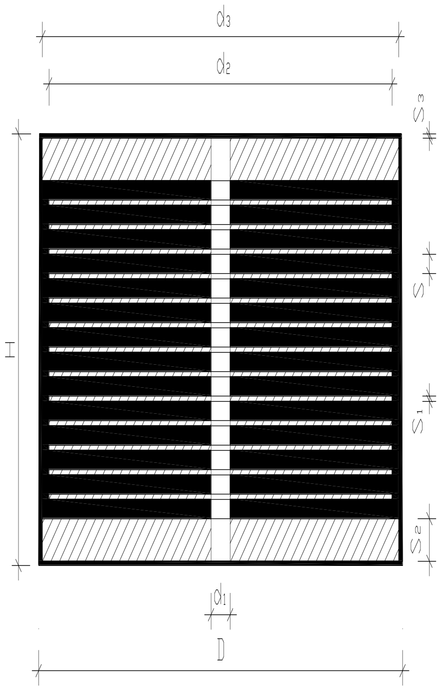
Vertical stiffness of the bearing: no less than 300 kN/mm;

Horizontal stiffness of the bearing: (0.81± 0.1) kN/mm;

The bearing must withstand a maximum (design) permissible horizontal displacement of 280 mm (about 220% of shear strain), without causing cracks greater than 3 mm deep and 6 cm long;

Shore A hardness of the bearing: 70 ± 5 points;

Damping coefficient of the bearing: 10-15%.



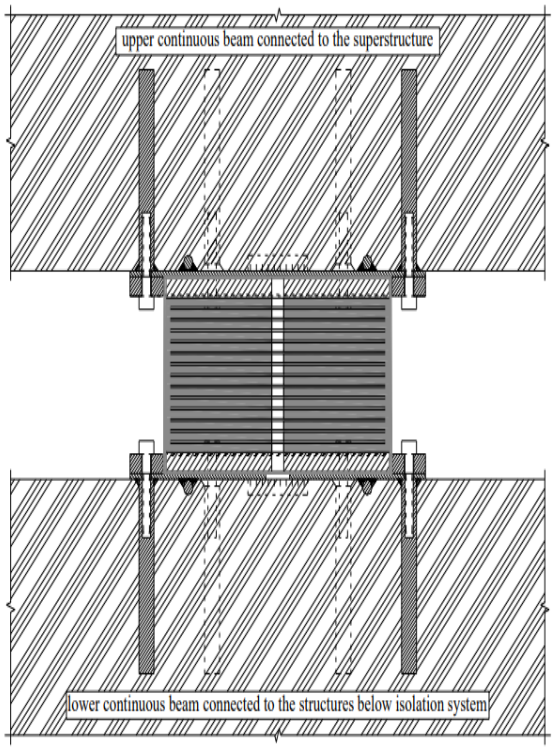


Figure 16. Dimensions and physical/mechanical parameters of SILRSBs to be applied in the seismic isolation system of the World Museum of Seismic Isolation building

It is necessary to state that in none of the SILRSBs the vertical force exceeds 1500 kN. Analysis has shown that thanks to the proposed approach of location of rubber bearings by clusters (Melkumyan M., 2013; Foti D. & Mongelli M., 2011) in the seismic isolation system (see Figure 12), a more or less uniform distribution of the vertical loads was achieved. The differences in vertical loads for different isolators do not exceed the factor of 1.5. This fully corresponds to the requirements of the Seismic Code of Armenia.

The soil conditions for the considered building are correspond to category II, for which the soil conditions coefficient is k_0=1. The site is located in a zone, where the expected maximum acceleration is equal to a=400 cm/sec^2. The allowable damage coefficient (reduction factor) stipulated in the Code for this particular case of R/C building with shear walls is equal to k_1=0.4. From the obtained results it follows that the period of oscillations of base isolated Museum's building is equal to 2.14 sec.

The total weight of the building is equal to Q_{total}=54390 kN. The sum of the seismic horizontal forces at the level of the foundation beams is equal to S_{total}=28480 kN based on the calculations in accordance with the Armenian Seismic Code. At the same time, the sum of the seismic horizontal forces at the level immediately above the seismic isolation system will be equal to S_{sis}= k_{eff} ×D, where D is the horizontal displacement of the isolation system which is equal to 229 mm (Figure 17). Consequently, the S_{sis}=71.28×229=16323 kN.

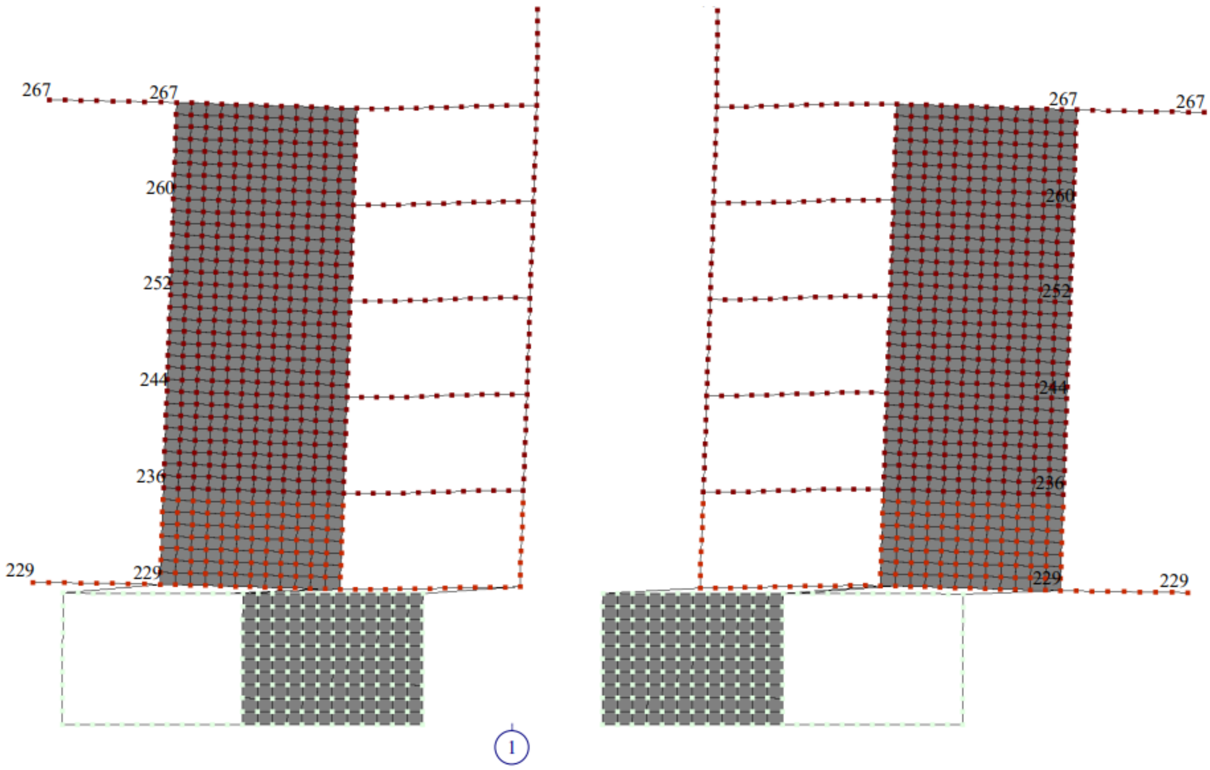


Figure 17. Calculated values of horizontal displacements immediately above the seismic isolation system and at each floor of the superstructure of Museum's building

If to take into account that the weight of the superstructure above the seismic isolation system is equal to Qss=44800 kN, then the weight of the basement floor will be equal to Q_{total}-Q_{ss}=54390-44800=9590 kN. The weight of the structures of the first above ground floor immediately above the seismic isolation system including the walking area is equal to Q_0=9600 kN. The same will be the weight of the fifth floor, but the weight of the floors from the first to the fourth will be equal to Q_1=…=Q_4=6400 kN. Using these values, it is easy to calculate the magnitudes of the seismic forces at the level of slabs of each floor by the formula given in the Armenian Seismic Code:

$$S_k = \frac{k_1 S \cdot Q_k h_k}{\sum_{i=1}^{n} Q_i h_i},$$

where $k_1 = 0.4$, $S = S_{sis} = 16323$ kN and h_k is the distance from the slab above the seismic isolation system to the slab of the floor at the level "k".

By doing the simple calculations, seismic forces at the level of slabs of each floor (including the slab at zero level immediately above the seismic isolation system) were found and equal to: S_0=112.32 kN, S_1=368.64 kN, S_2=737.28 kN, S_3=1105.92 kN, S_4=1474.56 kN, S_5=2764.80 kN. From the received results, having the values of the seismic forces and the masses of the building, acceleration above the seismic isolation system can be calculated and will be equal to c_0=1.17 m/sec^2. This means that due to application of seismic isolation the input acceleration of 4.0 m/sec^2 decreases in superstructure of the Museum's building on more than 3 times, which is typical for base isolated buildings (Melkumyan M. & Gevorgyan E., 2010; Melkumyan M., 2014). This is one of the main features of seismic isolation (Melkumyan M., 2011).

From Figure 17 one can see that the inter-story drifts in superstructure are varying from 7 to 8 mm. However, according to the Armenian Seismic Code allowable drifts for the frame buildings with shear walls must be no bigger than 1/270 of the floor height equal to 3200 mm in case when the building locates in zone where expected input acceleration is 4.0 m/sec^2. Consequently, due to application of seismic isolation the inter-story drifts in superstructure are smaller than allowable drifts in 1.58 times in average, which is also an important advantage of seismic isolation systems.

4. Conclusions

Achievements in Armenia in the field of seismic isolation have made this country as one of the world leaders in development and extensive application of seismic (base and roof) isolation technologies, and as the world leader in large implementation of low-cost seismic isolation for construction of new and retrofitting of existing buildings.

The research and experimental works on creation of the seismic isolation strategies were launched by the author of this paper in 1993. Since that time and to date huge achievements were reached in application and implementation of seismic isolation technologies in construction of new and retrofitting of existing buildings in Armenia.

International and local institutions, as well as local companies which invested in the projects on application of seismic isolation in the country are mentioned. Some of the low-story and also high-rise base isolated newly constructed together with the retrofitted existing buildings designed by the author for implementation in Armenia and in other countries are well illustrated.

The carried out large-scale works brought the author to the idea on creation in Armenia of the World Museum of Seismic Isolation. The Museum will serve as an international educational establishment to present the history of development and implementation of seismic isolation, to display expositions from countries around the world, where different seismic isolation systems have been successfully applied to various buildings and structures.

Structural concept of the Museum's building is briefly described. It will be designed in the form of a giant seismic isolator of cylindrical type. The ground walking area and the roof's parapet will resemble the lower and upper flanges of an isolator. The building will have six stories in total, including five above ground floors and an underground basement serving as a parking floor. Seismic isolation system will be located at the upper level of the basement floor. Outside view of the building will be architecturally solved in a way that belts provided around it will give an impression of steel shims between the layers presented by dark glass, imitating rubber layers.

Analysis of the Museum's building was carried out based on the design model compiled using different finite elements for columns, beams, shear walls and slabs. K55 finite element was used to describe in the model the seismic isolators applied in the seismic isolation system of the Museum's building. Dimensions and physical/mechanical parameters of the used seismic isolators are given in detail. The period of oscillations of this base isolated building is equal to 2.14 sec. Displacement of the isolation system reaches 229 mm which is in agreement with the Code requirements. Deformed state of the building is graphically illustrated, and the values of stories' maximum drifts are not more than 8 mm which is much smaller than allowable drifts. The seismic forces are also given in the paper and acceleration immediately above the seismic isolation system is equal to c_0=1.17 m/sec^2. This means that due to application of seismic isolation the input acceleration of 4.0 m/sec^2 decreases in superstructure of the Museum's building on more than 3 times.

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