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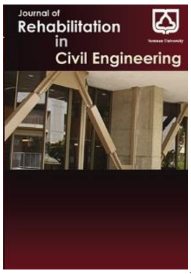

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Preparation of Same Acceleration Maps for Use in the Improvement of Structures in Sabzevar City

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ABSTRACT

Seismicity zoning was conducted for different areas of Iran due to general zoning in relative regulations. For increasing reliability in achieving desired safety margin and select a carefully basic acceleration of plan due to the sensitivity of the subject and usage of this parameter in the calculation of the basic shear and control on stability of the construction components, on the other hand, It is essential to zoning more accurate and partially. In this paper, in order to preparation of same acceleration maps of both the horizontal and the vertical component of the acceleration as a case study in the city of Sabzevar in Iran, the seismic springs identified and seismic parameters of the area extracted. According to attenuation relationships and the proper reasonable tree, probabilistic seismic hazard analysis was conducted. The effect of the vertical component was also applied. Two soil type has been selected for review. The first type of soil based on soil type I, II and second type of soil based on soil type III, IV of soil classification based on Iran's standard No. 2800. After doing the analysis of same acceleration maps according to different design levels with a return period of 475, 225, 72 and 2475 and based on seismic improvement buildings instruction in 50 years of useful life and two types of soil were calculated and plotted. Also, the results of the analysis of the potential risk of seismic with the results for the study zoning area Iran's standard No. 2800 were compared.

1. Introduction

An earthquake has caused some catastrophes in the world. More than 100 earthquakes with a magnitude of 6 or greater, and 10 earthquakes with a magnitude 7 or greater happen each year according to United States Geological Survey earthquake facts and statistics [1].

One of the main components of attenuation seismic vulnerability is analyzing of earthquake risk that is indicates the probability of the occurrence of certain levels of ground motions

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because of earthquake in a range of time . This method was first suggested by the Cornell [2].

Due to locating Iran on the Himalayan Alpine belt and the Arabian plate moving toward the Iran's plateau, we saw the earthquake with different magnitudes every year that they are sometimes devastating and destructive .Locating this city in the vicinity of Sabzevar [3] (Figure1) reverse faults with a length of 74 km with the ability to create an earthquake magnitude to 6.92 and devastating effects of the earthquake near field probable than other, and neglecting the terms and resistance Criteria and structural improvement resistance against stresses caused by earthquakes, exacerbate the risk of earthquakes in this city. In this paper has been tried to determine the acceleration of the design basis at different levels of risk for all parts of the city of Sabzevar using the centuries old historical seismic data collection and device data. The application Keyjko (2000) is used to estimate the seismic parameters. Contingency Evaluation of seismic potential risk for a 6 × 6 grid which includes the whole city and includes the main range of the city and the surrounding towns with using the software SEISRISKIII (1987) [4] and acceleration values at various levels based on two types of soil, that the first type matches type I and II and the second type matches the type III and IV, of Iran's standard No. 2800 [5], evaluated and at the end the same acceleration graph draw.

Fig 1. Map of study area of Sabzevar city [3].

2. Seism Tectonics of Sabzevar

Iran's seismic belt located over the Himalayas-Alp, is one of the most active seismic belts in the Middle East. Oil fields, geography, trade routes, and terrain, all contribute to the strategic importance of this region in the Middle East. Therefore, it is vital to investigate the activity of seismicity and tectonics of Iran [1].

In addition, Sabzevar city placed in northeastern Iran's central zone. This zone is triangular unit, which is located in the center of Iran, and it is limited by the Alborz Mountains from the north side and by loot block from the East and by a recessed area Sanandaj-Sirjan zone from the northwest to southeast. This zone is the oldest little continent in Iran that been influenced by a variety of geological events. Sabzevar city is located on three major base of Neogene, granite and ophiolite.

In this study, in order to preparation of same acceleration maps of both the horizontal and the vertical component of the acceleration as a case study in the city of Sabzevar in Iran, the seismic springs identified and seismic parameters of the area extracted. According to attenuation relationships and the proper reasonable tree, probabilistic seismic hazard analysis was conducted. The effect of the vertical component was also applied. two soil type has been selected for review. The first type of soil based on soil type I, II and second type of soil based on soil type III, IV of soil classification based on Iran’s standard No. 2800. After doing the analysis of same acceleration maps according to different design levels with a return period of 475, 225, 72 and 2475 and based on seismic improvement buildings instruction in 50 years of useful life and two types of soil were calculated and plotted. At the end, the results of the analysis of the potential risk of seismic with the results for the study zoning area Iran’s standard No. 2800 was compared.

3. Probabilistic Seismic Hazard Analysis (PSHA)

The essential tool for rational planning, design, and safety of infrastructures is seismic hazard analysis for seismically vulnerable regions [6]. In the Seismic Hazard Analysis with Probabilistic method, usually all of the earthquakes with certain magnitudes intended and combined above a minimum amount of M_0 on all sources of seismic and 200 kilometers from the site. In this method, on the basis of seismic studies of the selected range, seismic parameters (λ,β) evaluated and then on the basis of earthquake with what magnitude and what distance from the area happen and at what distance from the construction site happen and according to the degree of importance of the site, can be used with the attenuation model, maximum movement of land movement parameters of earthquake in the desired location by taking the risk levels and levels of appropriate design and all of the probabilities and non-certainties in the magnitude, evaluate the place and rate of occurring earthquakes. Earthquakes and related phenomena are non-deterministic processes, so that probabilistic method supply results that are more reliable but it is clear that the volume of data and time required for this method is more than determined method.

Evaluation levels with probabilistic method to draw same acceleration Maps is described.

4. Literature Review

Li et al [7] studied the influences of soil parameter variabilities and soil nonlinearity on UHS and associated seismic hazard curves.

Woessner et al [8] presented the 2013 European Seismic Hazard Model. It is a consistent seismic hazard model for Europe and Turkey which overcomes the limitation of national borders and includes a through quantification of the uncertainties.

The seismic hazard assessment for Romania has been conducted within the framework of the SHARE project and within the BIGSEES project [9].

Waseem et al [10] carried out probabilistic seismic hazard analysis to produce macro-seismic hazard maps of the northern Pakistan region that define new regional ground motion design parameters for 95, 475-, 975- and 2475-year return period earthquakes at important cities as local contour maps and horizontal uniform hazard.

Mousavi et al [11] showed the variability in USGS hazard curves due to epistemic uncertainty in its informed sub-model using a simple bootstrapping approach. They found that variability is highest in low-seismicity areas. On the other hand, regions of high seismic hazard, such as the New Madrid seismic zone or Oklahoma, exhibit relatively lower variability because of more available data and a better understanding of the seismicity.

Mouloud [12] presented a seismic hazard evaluation and develops an earthquake catalogue for the Constantine region over the period from 1357 to 2014. Their study contributed to the improvement of seismic risk management by evaluating the seismic hazards in Northeast Algeria. Hamlaoui et al [13] updated the evaluation of seismic hazard in Northeast Algeria by a probabilistic approach.

Dipova et al [14] evaluated seismic hazard for the Antalya area (SW Turkey) using a probabilistic method. They carried out for peak ground acceleration and rock ground with a 10% probability hazard level of exceeding in 50 years a seismic hazard map. They show that peak ground acceleration magnitudes on bedrock change between 0.215 and 0.23 g in the center of Antalya.

Nekrasova et al [15] evaluated the seismic hazard for earthquakes based on the unified scaling law. They applied the USLE method to evaluate seismic hazard and risks to the population of the three territories of different sizes representing a sub-continental and two different regional scales of analysis, such as the Himalayas and surroundings, Lake Baikal, and Central China regions.

Trianni et al [16] performed probabilistic seismic hazard analysis in the Bay of Bengal to acquire horizontal, unified hazard spectra for different return periods, at some selected regions along an offshore pipeline route.

5. Identify and Seismic Springs Modeling Faults

Relying on the role of the active faults in classification of seism genic and according to the fault are the most important linear sources, hence the coordinates of the active fault zone to the radius of 200 kilometers from the city of Sabzevar in the SEISRISKIII software (1987) [4] referred to as linear Springs was modeled. In the range of study, 26 active fault is visible in Figure2.

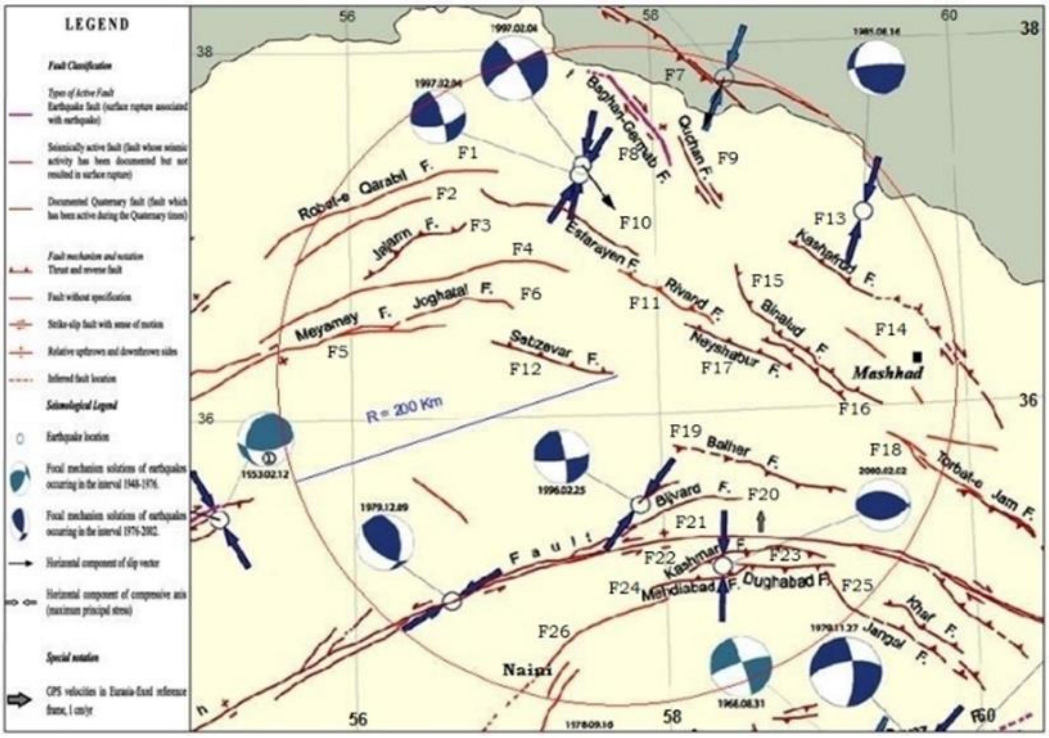

Fig. 2. Map of the active faults in the range of 200 km for Sabzevar city [17, 18].

6. Determine the Largest Possible Earthquake

In Probabilistic methods such as figurative nomination method earthquake risk analysis, it is necessary to have an estimate of the probable earthquake but in the Probabilistic methods this work is done by the software and the largest probable earthquake of the fault and the lowest distance between fault and the study Site in area is estimated. In order to calculate the maximum magnitude of the event the rapture parameters and experimental equations between rapture length and magnitude should be introduced to the software that in probabilistic method the Norouzi and Solmaz equation for reverse faults with equal weight coefficient is used. The percentage of ruptures for the fault with different lengths are different. This percentage is usually between 30% to 100% of the length of the fault. For the faults, smaller than 300 km is equal to 37% for the fault smaller than 100 km equal to 50% and for small faults, also 100% will be considered.

Norouzi equation [19].

$$M_S=1.259+1.244 \text{ LogL}; \text{ L(m)} \quad (1)$$

Solmaz fault inverse equation [20]:

$$M_S=2021+1.142 \text{ LogL}; \text{ L(m)} \quad (2)$$

7. Preparation and Optimization of Earthquake Catalogue Data

For the computation of seismic zone area is require the 200-kilometer radius of the earthquake catalog Sabzevar city be function of the Poisson distribution. So, has collected raw earthquakes catalog from sites such as IIEES [21], BHRC [22], NGDIR [23], USGS [24] and the historical catalog Ambrsyz-Melville [25], Berberian [26]. That was collected approximately 500 registered record. Then was attempted for making equal the magnitude by using the equation from the Iranian Committee on Large Dams IRCOLD [27] to change M_b to M_s and the table of the research of Mr.

Natel and Krynyzsky to change the magnitudes M_b, M_W, M_L to M_S (according to Table 1) and magnitude under 4 deleted, and remove the aftershock and before shock of the earthquake ,to comply with the catalogue of poison behavior by software Nupof with a method as the time window and presented first by Gardner and Nally, the main catalogue contains 213 record for estimation of the parameters of the regional seismicity.

$$M_S=1.21M_b-1.29 \quad (3)$$

Table 1. Convert magnitude units and the intensity of the earthquake.

Io	M_0	M_W	M_S	M_L	M_b
IV	1021	4.1	3.0	4.3	4.0
V	1022	4.5	3.6	4.8	4.5
VI	1023	5.2	4.6	5.3	5.0
VII	1024	5.8	5.6	5.8	5.5
VIII	1025	6.6	6.6	6.3	6.0
IX-X	1026	7.3	7.3	6.8	6.5
XI-XII	1027	8.2	8.2	7.3	7

8. Estimation of Seismicity Parameter

For understanding the seism tics properties of the area project, it is necessary to calculate Seism tectonics parameters λ, β. These parameters indicate the rhythm of occurring earthquakes on the base seism genic springs of that zone. The calculations related to the estimation of the parameters of Seism. Tectonic of the plan based on the region and the equation between earthquake event and frequency magnitude. So far, several methods are presented to estimate this equation and calculation of fixed coefficients to specify Seism tectonics parameters. In continue we are going to describe some of these methods.

8.1. Estimation of the Parameters of Seism Tectonics Richter- Gutenberg Method

Linear equation Gothenburg-Richter is [28] the most common and the most well-known of the equation that measure the Seism tectonics. This method is one of the oldest and one of the simplest method to estimate seismicity parameters. This method is use where any frequency-magnitude statistics are available. In General is well consistent with empirical data, but the General behavior of the equation in high and low range is non-linear (Figure 3).

The Gothenburg- Richter equation

$$LnN_c=a-bM \quad (4)$$

Which M is magnitude of earthquake, N_c, the expected number of earthquakes with greater magnitude than M on time period and 'a' and 'b' are constant numbers of Gothenburg- Richter equation.

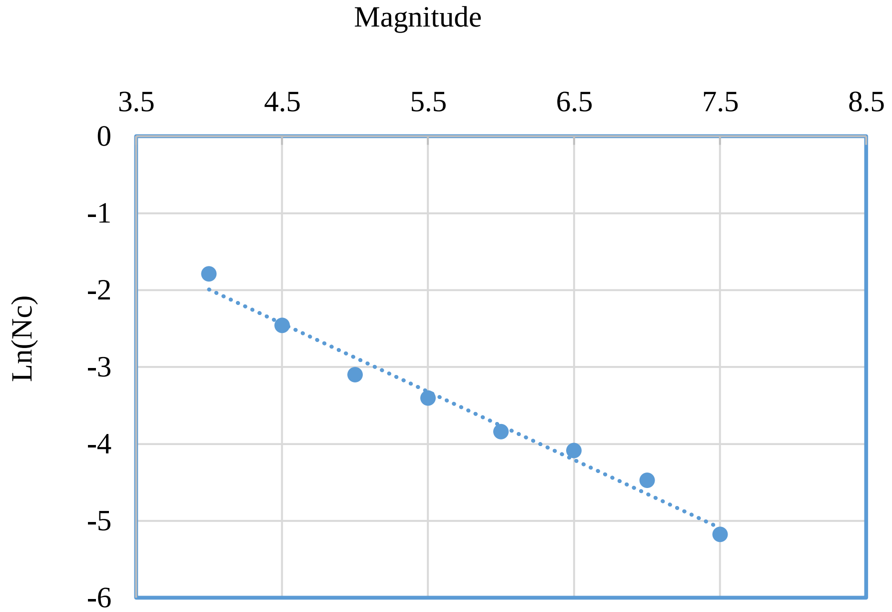

Fig. 3. Chart fitted to Gutenberg – Richter

- Seismic probability distribution function

$$P(M<m) = (1-e^{-\beta(m-M_0)}) / (1-e^{-\beta(M_{max}-M_0)}) = C\,(1-e^{-\beta(m-M_0)}) = Cte \quad (5)$$

Where the M is magnitude of the earthquake, M_0, minimum earthquake in the area, Max the largest earthquake in the region, β, coefficient Seism tectonics of the area Earthquake probability distribution function diagram is visible in Figure 4.

-Numerical calculation of the probability of the occurrence of an earthquake

$Ln(N_c)=-0.8977M+1.6292$; $a=1.6292$ & $b=0.8977$

To calculate the probability of the occurrence of an earthquake with the certain magnitude we use the following equation and diagram is visible in Figure 5.

$$P(M_{mid} - \Delta M/2 < M < M_{mid} + \Delta M/2) = f_M(M_{mid}).\,\Delta M \quad (6)$$

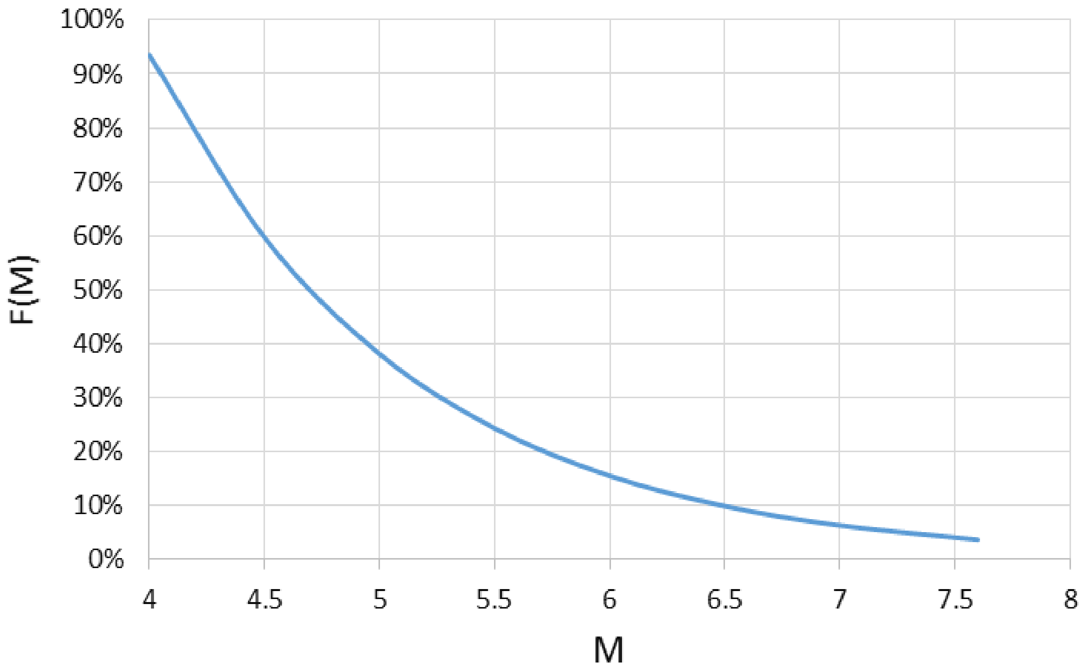

Fig. 4. Distribution probability of earthquakes function.

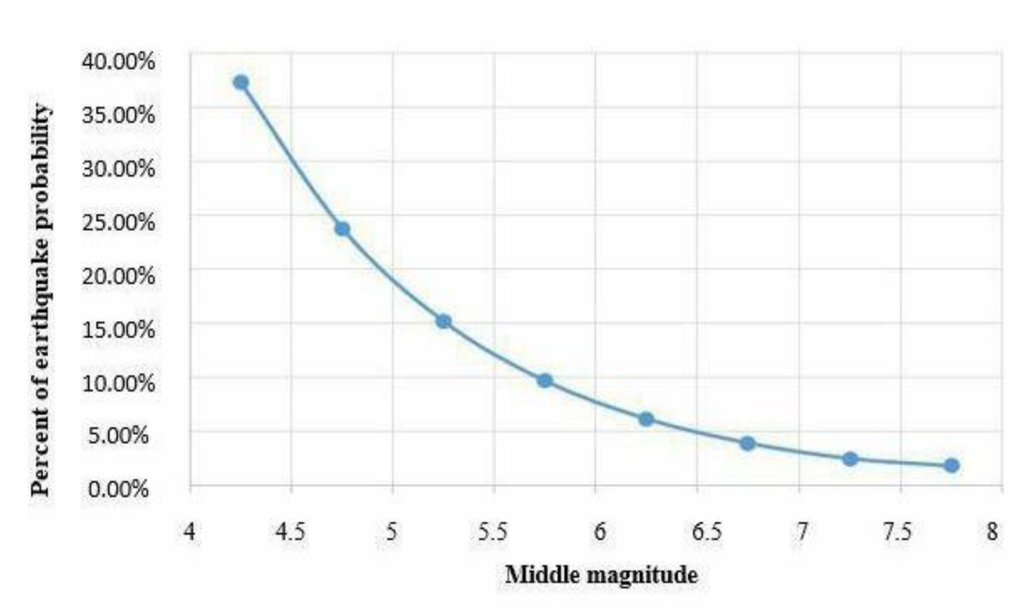

Fig. 5. The numerical probability of occurrence an earthquake.

8.2. Estimation of Seismic Parameters with Keyjko-Selool Method

Keyjko-selool method [29, 30] offers uncertainty of earthquake magnitude and incomplete data involve in the estimation of the earthquake parameters (according to Table 2).

In General, in comparison with Richter – Gutenberg and practice final results of this method are more valid and fitted more to the position of the springs of seism genic and their activities .The characteristics of this method can be mentioned as the following.

- It is possible to use diverse and inclusive event earthquakes that is similar to the seismic data of Iran.

- The probability of using a combination of historical and instrumental earthquakes with appropriate classification
- The probability of taking into account the uncertainty of the magnitude and assign different potential error for magnitude in each category
- Considering the magnitude of the threshold and maximum magnitude for different groups

-Determine the parameters of Seism tectonics (β, λ, M_{max}) with keyjko-selool method.

Seismicity parameters in each category in table2 is calculated and is visible.

Drawn graphs of keyjko-selool software data are visible in Figures 6, 7 and 8.

Table 2. Estimated seismicity parameters based on keyjko-selool method

Distribution ratio of seismic parameters			Seismic parameters	volume	Maximum magnitude	Content
1900<	1964~1900	<1964				
100	-	-	Beta	1.09± 0.16	0.5± 4.8	Historical earthquake
100	-	-	Lambda (Ms=5.3)	0.08		
-	39.7	46.3	Beta	0.11± 2.52	0.5±8.7	Artificial earthquake
-	.39	53.7	Lambda (Ms=4)	0.12± 1.66		
56.1	21.5	22.4	Beta	0.07± 1.88	0.5± 8.4	Historical and artificial earthquake
11.8	40.7	47.2	Lambda (Ms=4)	0.12± 1.66		

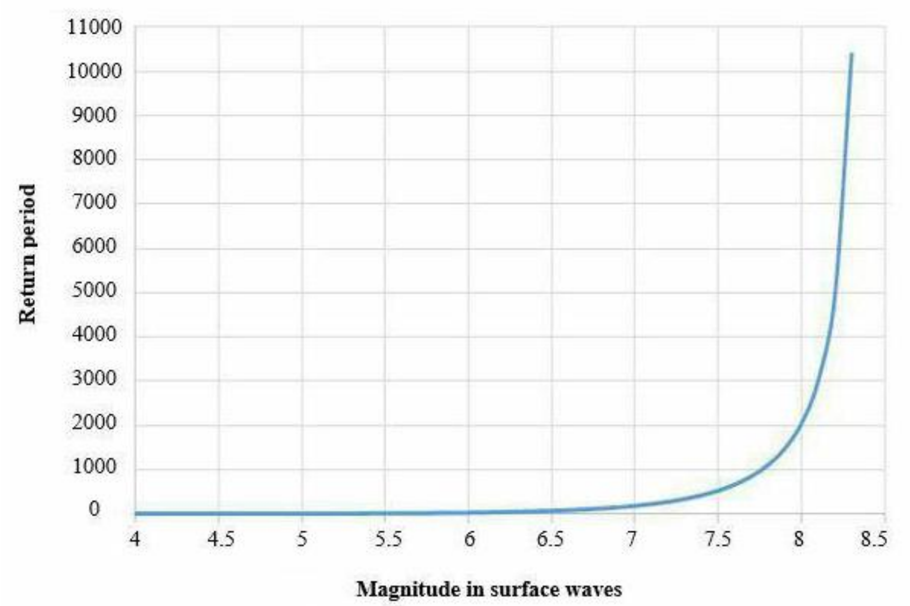

Fig. 6. The earthquake return period with different magnitude

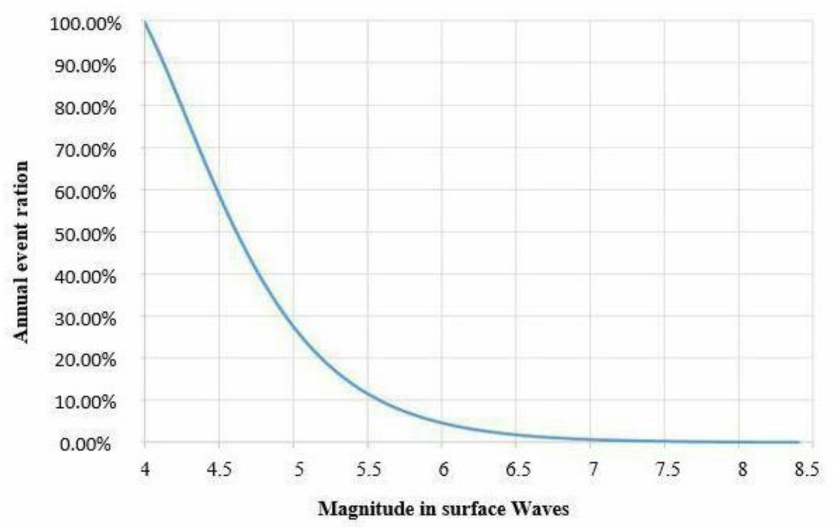

Fig. 7. Annual event ration for earthquakes larger than 4

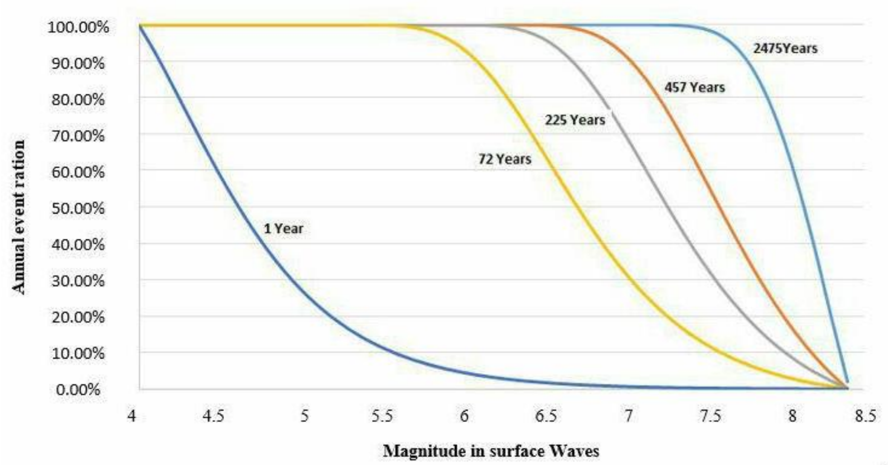

Fig. 8. The probability of an event based on surface magnitude for different design levels based on 360 magazines

9. Selection of Attenuation Relationship

Attenuation relationship are experimental equation that has presented by different researcher for different area based on earthquakes occur data and the relationship between ground motion parameters such as (acceleration, velocity, displacement, spectral response and etc.) and tell the magnitude and distance or other wanted parameters. Select a suitable attenuation relationship is very important for use in seismic hazard analysis. Because of the seismic hazard analysis that is significantly affected. The best relationship for use in a particular area is definitely, a relationship that has been prepared using information available in that area. It should be noted that geological conditions, tectonics, fault rupture mechanism and focal depth in one area, effect on the variation of ground motion at a distance in the areas. So the equation should be used that is produced using data from that area, to remove some shortcomings of each model. Although the option of using specific equation to a region, is an ideal option, but should not be forgotten that it is not always selective, and the reason is clear, The lack of information recorded in many regions, the probability of extracting an appropriate statistical equation for those areas ruled out. In such cases, the only logical and possible option is, using seismic and tectonic equation that have been determined in the same area.

Peak horizontal and vertical acceleration component used in all equations is calculate based on two types of soil. We continue to introduce these equations:

-Ramazi-Schenk attenuation relationship 1994 [31]

$$a=a_1(a_2+d+H)^{a_5} \exp(a_6 M_S) \; ; \qquad (7)$$

$$H=|d - a_3|^{a4} \; ; \; a=cm/s^2$$

Suggested factors for equation (7) are shown in Table 3.

-Campbell – Bozorgniya 2000 attenuation relationship 2000 [32].

The factors proposed and categories of soil type and categories of faulting mechanism for equation (8) are shown in Tables 4, 5 and 6, respectively.

Table 3. Suggested factors for Ramazi -Schenk attenuation relationship 1994 [31]

Accelerate factor		a_1	a_2	a_3	a_4	a_5	a_6
a_h	Soil	4000	20	16	0.63	-2.02	0.8
	Rock	4000	20	16	0.63	-2.11	0.79
a_v	Soil	4000	20	16	0.48	-1.75	0.53
	Rock	4000	20	16	0.48	-1.75	0.53

$$\text{Ln } Y = c_1 + c_2 M_w + c_3 (8.5 - M_w)^2 + c_4 \ln (\{R_s^2 + [(c_5 + c_6 \{S_{PS} + S_{SR}\} + c_7 S_{HR}) \exp (c_8 M_w + c_9 \{8.5 - M_w\}^2)]^{1/2}) + c_{10} F_{SS} + c_{11} F_{RV} + c_{12} F_{TH} + c_{13} S_{HS} + c_{14} S_{PS} + c_{15} S_{SR} + c_{16} S_{HR} \qquad (8)$$

Table 4. Suggested factors for Campbell – Bozorgniya 2000 attenuation model 2000 [32]

	C1= -2.816	C2=0.812	C3= 0	C4= -1.318	C5= 0.187	C6= -0.029
Uncorrected Horizontal Acceleration component	C7= - 0.064	C8= 0.616	C9= 0	C10= 0	C11= 0.179	C12=0.307
	C13= 0	C14= -0.062	C15= -0.195	C17= -0.320	σ = 0.509	
Corrected Horizontal Acceleration component	C1= - 2.807	C2= 0.756	C3= 0	C4= -1.391	C5= 0.191	C6= -0.044
	C7= - 0.014	C8= 0.544	C9= 0	C10= 0	C11= 0.091	C12= 0.223
	C13= 0	C14= -0.096	C15= -0.212	C17= -0.199	σ = 0.548	

Table 5. Categories of soil types in attenuation relationship

Holocene (HS)	Sediments	Vs30=290 m/s	SHS=1	SPS=0	SSR =0	SHR =0
Pleistocene (PS)	Older Sediments	Vs30=370 m/s	SHS =0	SPS=0	SSR =1	SHR=0
Soft Rock(SR)		Vs30=420 m/s	SHS =0	SPS=0	SSR =1	SHR=0
Hard Rock(HR)		Vs30=800 m/s	SHS =0	SPS=0	SSR =0	SHR=1

Table 6. Categories of faulting mechanism

Strike Slip	FHT =0	FSS =1	FRV =0
Reverse	FHT =0	FSS =0	FRV =1
Thrust	FHT =1	FSS =0	FRV =0

- Attenuation relationship of Khademi 2002 [33]

$$Y=C_1 \exp(C_2 M_w)((R + C_3 \exp(C_4 M_w))^{C5}) + C_6 S \; ; Y=g \quad (9)$$

Calculated factors of equation (9) are seen in Table 7.

Table 7. Suggested factors of attenuation relationship of Khademi 2002 [33]

Accelerate component		C1	C2	C3	C4	C5	C6	S
Horizontal component	Soil	0.0403011	0.41742	0.001	0.65	-0.035852	-0.035852	1
	Rock	0.040311	0.41742	0.001	0.65	-.035852	-0.035852	0
Vertical component	Soil	0.0015	0.8548	0.001	0.4	-0.4	-0.463	1
	Rock	0.0015	0.8548	0.001	0.4	-0.4	-0.463	0

- Attenuation relationship of Norouzi 2005 [34]

$$Ln(A) = c_1 + c_2 (M_w – 6) + c_3 \ln((EPD^2 + h^2)^{1/2}) + c_4 S \; ; \; A = cm/s^2 \quad (10)$$

Proposed factors for equation (10) are presented in Table 8.

Table 8. Suggested factors of attenuation relationship of Norouzi 2005 [34]

Accelerate component		C1	C2	C3	C4	H	□	S
Horizontal component	Gravel& sandy	7.969	1.220	-1.131	0.212	10	0.825	1
	Rock & Alluvial	7.969	1.220	-1.131	0.212	10	0.825	0
Vertical component	Gravel& sandy	7.262	1.214	-1.094	0.103	10	0.773	1
	Rock & Alluvial	7.262	1.214	-1.094	0.103	10	0.773	0

- Attenuation relationship of Mahdavian 2006 [35]

$$Log (y) = a + b M_S + c \log(R) + dR \quad ; \quad y = cm/s^2 \quad (11)$$

Considered factors for equation (11) are written in Table 9.

Table 9. Suggested factors for attenuation relationship of Mahdavian 2006 [35]

	bed	Earthquake parameter	a	B	c	d	σ
Alborz and central Iran	Rock	PGAH	2.085	0.243	1.02-	0.000875-	0.219
		PGAV	1.864	0.232	0.1049-	0.000372-	0.253
	soil	PGAH	1.912	0.201	0.79-	0.00253-	0.204
		PGAV	1.76	0.232	1.013-	0.000551-	0.229

- Attenuation relationship of Ghodrati 2007 [36]

$$Lny = C_1 + C_2M_S + C_3Ln(R + C_4 \exp[M_S]) + C_5R \quad , \quad y=cm/s^2 \quad (12)$$

Suggested factors for equation (12) are seen in Table 10.

Table 10. Suggested constant factors for the attenuation relationship of Ghodrati 2007 [36]

	bed	Earthquake parameter	C1	C2	C3	C4	C5	Σ
Alborz and central Iran	rock	PGAH	2.058	0.243	-1.02	-0.00875	0.219	0.478
		PGAV	1.864	0.232	-1.049	-0.000372	0.253	0.49
	soil	PGAH	1.912	0.201	-0.79	-0.00253	0.204	0.496
		PGAV	1.76	0.232	-1.031	-0.00551	0.229	0.53

10. Calculation and Plotting the Curve of the Points of the Desired Site Gravity

At this stage, the results of attenuation relationship with the logical tree can be seen in Figure 9 these are combine and defined in SEISRISKIII software (1987) [4] and for both equation of rapture-magnitude of Norouzi and Solmaz, horizontal and vertical acceleration component is calculated by the software.

Map of same acceleration with respect to design levels with return periods of 72, 225, 475 and 2475 and according to the instructions seismic rehabilitation of existing structures (Publication 360) [37] in 50 years of useful life based on two types of soil, the first type I and II and the second type based on the types III and IV type, of Iran’s standard No. 2800, were drawn.

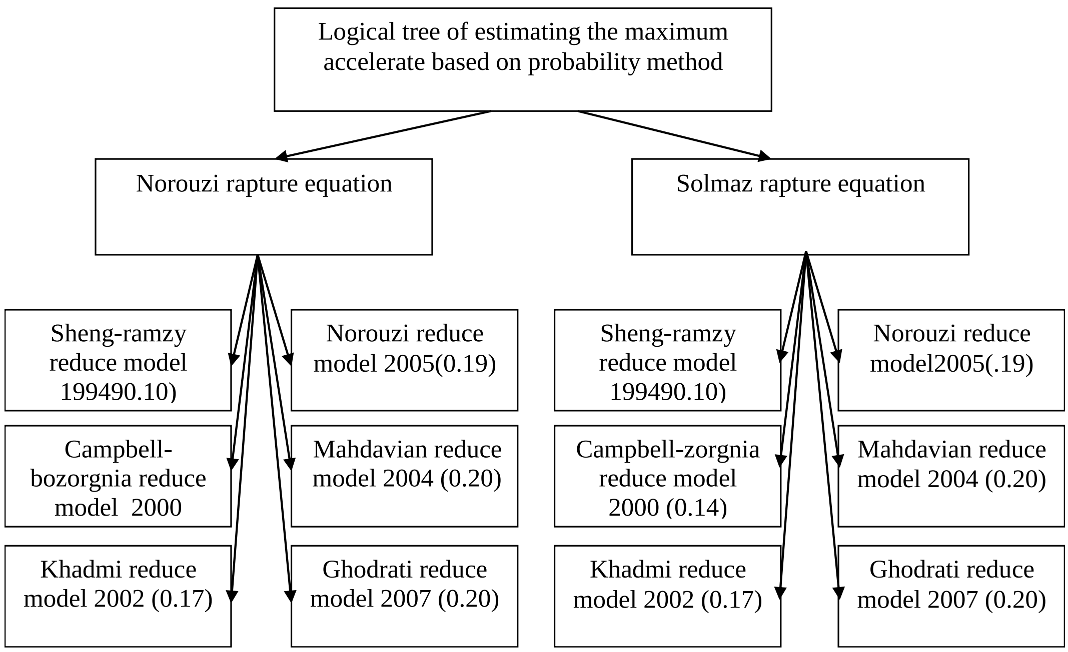

Fig. 9. Logical tree of attenuation method based on probability method

11. Results and Discussions

Finally, after introducing the parameters of rupture, seismicity and defining attenuation relationships, in the software SEISRISKIII (1987) [4] and acceleration values at various levels of risk based on two types of soil, that the first type matches type I and II and the second type matches the type III and IV, of Iran's standard No. 2800 with 475-year return periods in 50 years of useful life of the structure was calculated.

The results for the two different constructions, the first of which has hard soil and the second of soft soils, have been calculated, and at the end the same acceleration graph drawn and displayed on 6 ×6 grids (Figures 10 to 13).

Also because of Sabzevar is under the effect of earthquakes due to proximity to Sabzevar's fault that called "nearby basin", and these earthquakes are palsy and have more destructive effects than other earthquakes that caused by other sources with the same power, In this regard, essential considerations must consider in design and improvement of structures and cannot ignore the effect of the vertical component due to the pulsed nature of earthquakes and force applied to the structure in the low time range, so that maps were extracted in two categories of vertical and horizontal components.

It should be noted that according to Iran's standard No. 2800, in areas that do not study seismic calculations, the vertical acceleration component values are equal to 2.3 times the horizontal component values, and in this article, a good estimate of this ratio for the city of Sabzevar is calculated. Also, because Sabzevar city is located in a region with high relative risk level, the basis acceleration of the plan is considered equal to 0.3 acceleration of the earth's gravity; Because according to the quadruple classification table of seismic zones in Iran's standard No. 2800, Sabzevar city is located in a region with the high relative risk level.

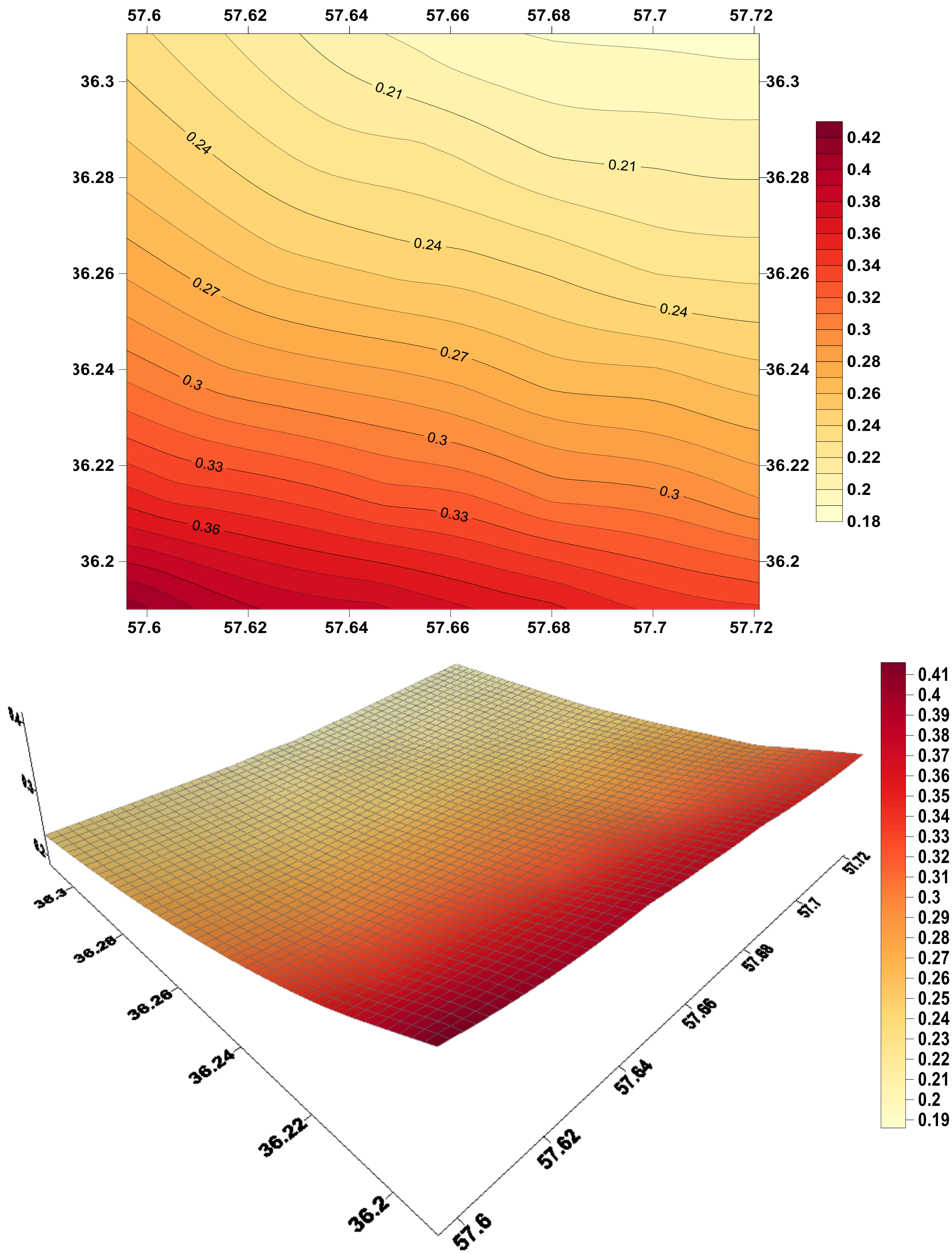

Fig. 10. Horizontal acceleration component of region, soil type I and II With 50% probability of occurrence in 50 years.

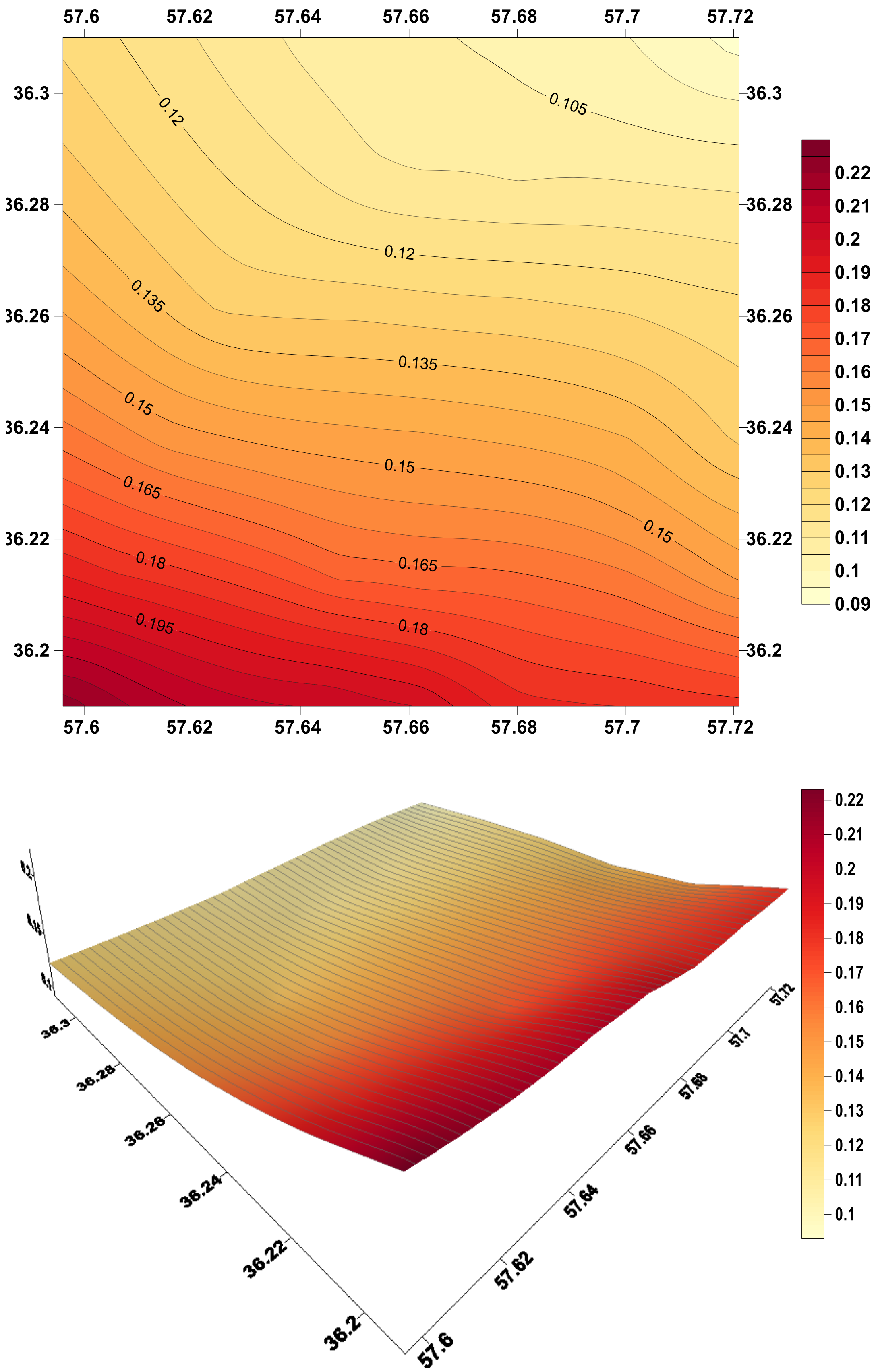

Fig. 11. Vertical acceleration component of region, soil type I and II With 50% probability of occurrence in 50 years.

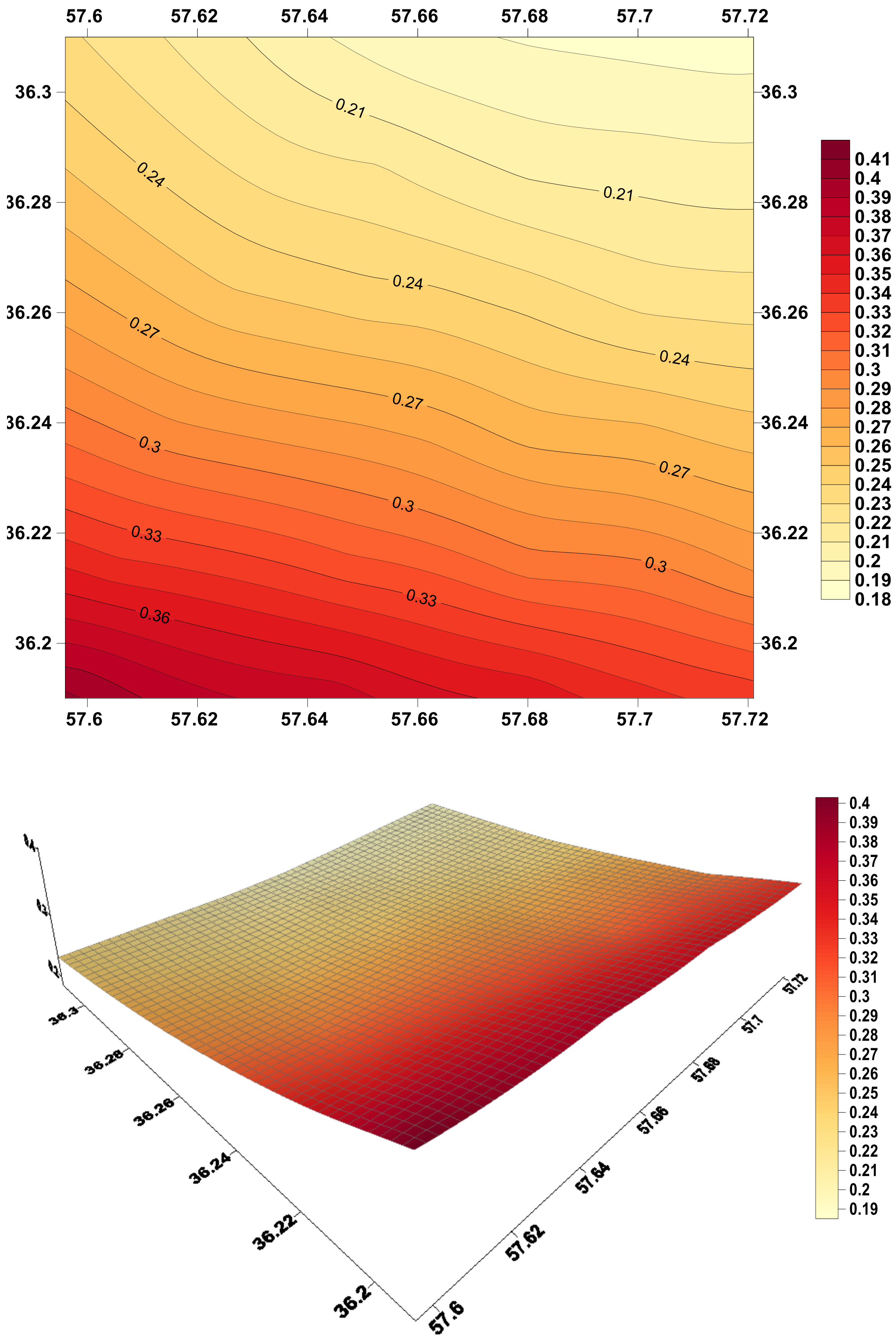

Fig. 12. Horizontal acceleration component of region, soil type III and IV With 50% probability of occurrence in 50 years.

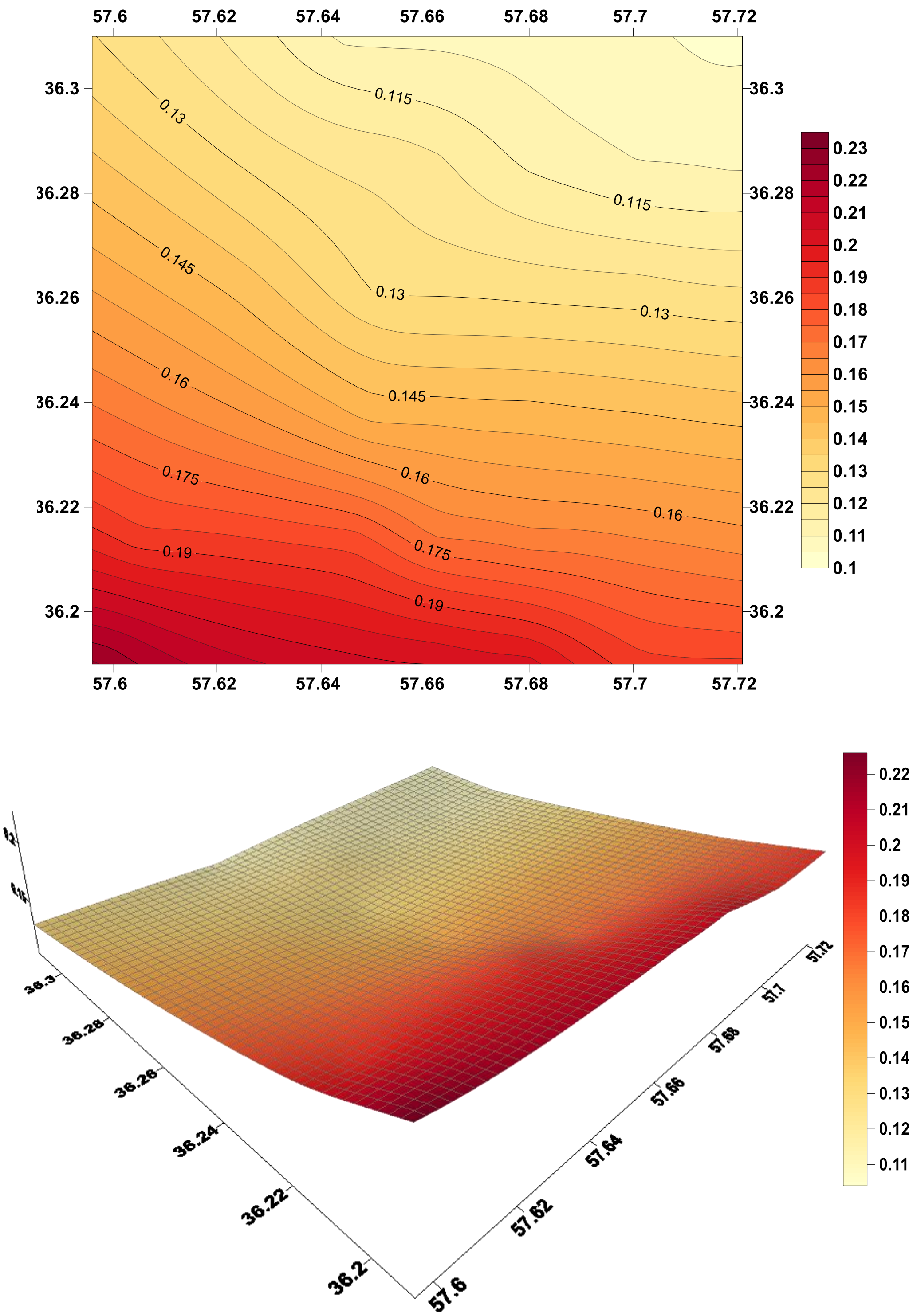

Fig. 13. Vertical acceleration component of region, soil type III and IV With 50% probability of occurrence in 50 years.

Conclusion

The following results was obtained by comparison of the same acceleration and the country's existing zoning map in Iran's standard No. 2800.

- According to the same acceleration, South and southwest of Sabzevar have peak acceleration more than another place of the city due to proximity to fault's Sabzevar. According to the analysis, to the southern and southwestern parts of the city to the level of risk of a return period of 475 years, in 50 years of useful life recommended structural risk level is too high, which this city in the appendix of Iran's standard No. 2800 is in a high relative risk zone. The results show that the peak acceleration value provided in Iran's standard No. 2800 is to ensure.

- It should be noted Iran's standard No. 2800 suggests vertical acceleration component value equal to 2/3 times the horizontal component in areas where the seismic calculations don't study. According to calculations done for the city of Sabzevar vertical acceleration component has been estimated between 0.5 to 0.6 times the horizontal component, That the acceleration components unit is based on the acceleration of gravity.
- The maps achieved by the result of Probable Potential Analysis based on two categories of soil series consist of soil tips available on Iran's standard No. 2800 and for vertical acceleration component and horizontal component and different levels of improvement and design that isn't comparable with the zoning of the country. This category causes the calculation design structures commensurate with the need and the importance of taking into consideration the security and economics, the needs of design, and the improvement of each area. Also according to the same acceleration, by changing the soil type from stiff state to softer state, peak horizontal acceleration is increased, which is compatible with Iran's standard No. 2800. Similarly, by changing the soil state, the peak vertical acceleration also increased.

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