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Comparison of equivalent earthquake load method for TEC-2007 and TBEC-2018: Adıyaman province example

DBYBHY-2007 ve TBDY-2018 için eşdeğer deprem yükü yöntemi çözümlerinin karşılaştırılması: Adıyaman ili örneği

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Research Article

Abstract
In this study, in terms of their approach to the equivalent earthquake load method, a comparison of the Turkish building earthquake codes published in 2007 and 2018 was made. For the study a reinforced concrete residential building, which is thought to be designed for the Adiyaman provincial center and its other districts was selected. It is assumed that the residential building has three spanning in the x and y directions (in plane) and the structural system consists of columns-beams. The floor height of the building was taken as 3 m for each floor and the number of floor was chosen as six, considering the construction style of Adıyaman province. The first natural vibration period of the residential building was determined with the help of the Rayleigh ratio formula and the empirical approach. Then, according to both earthquake codes, the base shear forces were determined separately for different soil classes using the structural characteristics of the residential building. Firstly, each code was evaluated within itself, and then a comparison of the codes with each other was made.

Keywords: TEC-2007, TBEC-2018, Base shear force, Equivalent earthquake load method

Özet
Bu çalışmada, 2007 ve 2018 yıllarında yayımlanan Türkiye bina deprem yönetmeliklerinin eşdeğer deprem yükü yöntemine yaklaşımı açısından bir karşılaştırması yapılmıştır. Çalışma için Adıyaman il merkezi ve diğer ilçeleri için tasarlandığı düşünülen betonarme bir konut binası dikkate alınmıştır. Konut binasının x ve y yönünde (planda) üç açıklığa sahip olduğu ve taşıyıcı sisteminin kolon-kirişlerden meydana geldiği kabul edilmiştir. Binaya ait kat yüksekliği her bir kat için 3 m olarak alınmış ve kat adedi ise Adıyaman ilinin yapılaşma biçimi göz önünde bulundurularak altı olarak seçilmiştir. Konut binasının Rayleigh oranı formülü ve ampirik formül yardımıyla birinci doğal titreşim periyodu belirlenmiştir. Daha sonra konut binasına ait yapısal özellikler kullanılarak her iki deprem yönetmeliğine göre taban kesme kuvvetleri farklı zemin sınıfları için ayrı ayrı belirlenmiştir. Elde edilen değerler öncelikle her bir yönetmelik için kendi içerisinde değerlendirilmiş ve daha sonra yönetmeliklerin birbirleriyle karşılaştırması yapılmıştır.

Anahtar kelimeler: DBYBHY-2007, TBDY-2018, Taban kesme kuvveti, Eşdeğer deprem yükü yöntemi

1. Introduction

Turkey is located in a region (Alp-Himalayan and Mediterranean surroundings earthquake belts) with high earthquake risk due to its earthquake zone [1]. Structures in these regions can be damaged as a result of earthquakes. Depending on the degree of damage, options such as retrofitting or reconstruction can be perform. The cost of both options can be high and this can affect the national economy, negatively. For this reason, the structures must construct the principles specified in the relevant codes. This minimizes the destructive effect of the earthquake [2].

For the first time, a code was needed due to the destructive effect of the 1939 Erzincan earthquake and an earthquake code was prepared in 1940. As a result of the development of construction technology and scientific studies, earthquake codes were updated in 1944, 1949, 1953, 1962, 1968, 1975, 1998, 2007 and finally 2018. In the old codes, the earthquake loads

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acting on the structure are defined by simpler formulas compared to TBEC-2018. However, in TBEC-2018, earthquake loads are defined by a series of formulas together with linear and nonlinear calculation methods [3-6].

Since most of the existing buildings in our country are built according to the old earthquake codes, studies on the comparison of old codes and current code make a significant contribution to the related literature. Başaran [7], created reinforced concrete frame reference models with two different number of stories according to 2007 and 2018 earthquake codes for the center of Afyonkarahisar, then applied the equivalent earthquake load (EEL) method for the frame models and used local soil classes as variable parameters. It was determined that the earthquake loads obtained using the 2018 code are lower than the earthquake loads obtained using the 2007 code. Aksoylu et al. [8] determined the period and base shear force values by applying the mode superposition and EEL methods to buildings containing 3, 4 and 5-story shear wall-frame elements for 2007 and 2018 codes. They stated that the base shear force values obtained according to the mode superposition method were 20% lower than the base shear force values obtained according to the EEL method. Bozer [9] compared the short period design spectral acceleration coefficient and 1 second period design spectral acceleration coefficient values for earthquakes with a 2% probability of exceeding in 50 years considering 81 provincial centers. It was stated that especially in weak soils the elastic design spectral acceleration values calculated according to the 2018 code show an increase when compared to the values calculated according to the 2007 code for many provincial centers. Döndüren et al. [10] performed earthquake analyses according to the 2018 and 2007 codes for the frame and shear wall-frame models. They considered the models with and without basements. They assumed that the models are constructed in Istanbul and Konya and have two different local soil classes, Z1 and Z3 for the 2018 code and ZA and ZD for the 2007 code. As a result of the analyses, they observed an increase in story displacements in TBEC-2018 when compared to TEC-2007, but a decrease was obtained in story shear forces. Özmen and Sayın [11] analyzed a 5-story reinforced concrete building using the EEL method according to TEC-2007 and TBEC-2018 codes. They obtained the mode shapes, periods, story displacements and base shear forces of the building by considering different soil classes and compared the results with each other. Ünsal et al. [12] analyzed a high-rise reinforced concrete building according to TEC-2007 and TBEC-2018 codes with EEL method. They investigated the change in peak displacement and base shear force by changing the building height. The base shear forces obtained from TEC-2007 were higher than the values obtained from TBEC-2018. They also found that the base shear force values decreased close to linearly when the height of the building increased. Nemutlu et al. [13] compared the acceleration spectra for Elazığ and Bingöl provinces according to TEC-2007 and TBEC-2018 codes. They analyzed the corner periods of both provinces, the change of coordinate-based spectrum coefficients according to different soil classes and acceleration spectra according to different earthquake levels. As a result, they concluded that TBEC-2018 is more safe and economical than TEC-2007. Öztürk et al. [14] conducted a study in which they compared the base shear forces calculated by the EEL method according to TEC-2007 and TBEC-2018 codes of a building assumed to be located in Osmaniye and Sakarya provincial centers. Karaca et al. [15] made a comparison between the soil fundamental periods and spectral acceleration values defined in TEC-2007 and TBEC-2018 for four different provinces.

In this study, a reinforced concrete frame structure, which is considered to be designed as a residential building in Adıyaman city center and its districts, was evaluated in terms of EEL according to TEC-2007 and TBEC-2018 code.

2. Material and Method

In this section, information about the buildings, to which the EEL method can be applied, is given and the application principles of the method are briefly mentioned.

2.1. EEL method according to TEC-2007

In order to apply the EEL method to the buildings, the limits in Table 1 given in TEC-2007, must be complied.

Table 1. The limits given in TEC-2007 for the application of the EEL method to buildings [4]

Seismic Zone	Building Type	Total Height Limit (m)
1-2	The torsional irregularity coefficient at each floor must satisfy the $\eta_{bi} \leq 2.0$ condition.	$H_N \leq 25$ m
1-2	The torsional irregularity coefficient at each floor must satisfy the $\eta_{bi} \leq 2.0$ condition and there must be no B2 type irregularity.	$H_N \leq 40$ m
3-4	All buildings	$H_N \leq 40$ m

The H_N value in Table 1 is the building height and η_{bi} is the torsional irregularity coefficient. In order to apply the EEL method, the total EEL or total base shear force (V_t) acting on the entire building in the x or y direction must be determined (Equation 1).

$$V_t=\frac{WA(T_1)}{R_a(T_1)} \geq 0.10\, A_0\, I\, W \tag{1}$$

In Equation 1, the total weight of the building, the spectral acceleration coefficient, the earthquake load reduction coefficient, the effective ground acceleration and the building importance coefficient is expressed as W, $A(T_1)$, $R_a(T_1)$, A_o,, and I, respectively. The story weight wi is calculated by summing the live loads (q) and dead loads (g). The building weight (W) is obtained by summing each of the story weights (Equation 2). Here n is the participation coefficient which takes the values of 0.3, 0.6 and 0.8 depending on the intended use of the building.

$$W = \sum_{i=1}^{n} wi \quad ; \quad wi = g_i + n.q_i \tag{2}$$

The spectral acceleration coefficient $A(T)$ is obtained by multiplying the earthquake zone coefficient A_O, spectrum coefficient $S(T)$ and building importance coefficient (I) (Equation 3).

$$A(T) = A_O\, I\, S(T) \tag{3}$$

The elastic earthquake loads are divided by the earthquake load reduction coefficient $R_a(T)$. This coefficient depends on the behavior coefficient of the structural system, the effect of the soil class and the natural vibration period of the first mode of the building (Equation 4).

$$\begin{aligned} R_a(T) &= 1.5 + (R - 1.5)\,\frac{T}{T_A} \quad &;\ 0 \leq T \leq T_A \\ R_a(T) &= R &;\ T_A \leq T \end{aligned} \tag{4}$$

For earthquake analysis, the natural vibration period of a building can be calculated by the Rayleigh ratio formula (Equation 5) unless a precise calculation is made. In this formula, the mass of each story, the fictitious displacement and the fictitious earthquake load are expressed as m_i, d_{fi} and F_{fi} respectively [4].

$$T = 2\pi \sum_{i=1}^{n} \frac{m_i\ d_{fi}^2}{F_{\mathrm{fi}}\ d_{\mathrm{fi}}} \tag{5}$$

2.2. EEL method according to TBEC-2018

Comprehensive changes were made in TBEC-2018 compared to TEC-2007. The definition of earthquake zones in TEC-2007 was replaced by the concept of earthquake design class (*DTS*) in TBEC-2018. The DTS concept is based on the building height class (*BYS*) and the spectral acceleration coefficient (S_{DS}) defined for the short period. In addition, the concept of building height class (*BYS*) was introduced differently from TEC-2007. BYS depends on the total height of the building (H_N) and earthquake design class (*DTS*). In order to apply the EEL method to the buildings, the limits in Table 2 given in TBEC-2018, must be complied.

Table 2. The limits given in TBEC-2018 for the application of the EEL method to buildings [5]

Building Type	Maximum Permissible Building Height Class	
	DTS = 1, 1a, 2, 2a	*DTS* = 3, 3a, 4, 4a
The torsional irregularity coefficient at each floor must satisfy the $\eta_{bi} \leq 2.0$ condition and there must be no B2 type irregularity.	*BYS* ≥ 4	BYS ≥ 5
All other buildings	*BYS* ≥ 5	*BYS* ≥ 6

One of the most important differences between TBEC-2018 and TEC-2007 is related to the calculation of effective section stiffness values in buildings designed according to strength. TBEC-2018 states that when designing slabs, beams, shear walls and columns, the bending stiffness (*EI*) values should be calculated as 0.25, 0.35, 0.50 and 0.70 times the initial stiffness, respectively. The total EEL in the earthquake direction is determined as in Equation 6.

$$V_{tE}^{(X)} = m_t\, S_{aR}\left(T_P^{(X)}\right) \geq 0.04\, m_t\, I\, S_{DS}\, g \tag{6}$$

Where m_t is the total mass of the building, S_{aR} is the reduced design spectral acceleration, $T_p^{(X)}$ is the fundamental natural vibration period of the building in the x direction and g is the gravitational acceleration. The calculation of $S_{aR}(T)$ is shown in Equation 7.

$$S_{aR}(T) = \frac{S_{ae}(T)}{R_a(T)} \tag{7}$$

TBEC-2018 stated that the Rayleigh ratio formula (Equation 5) can be used to calculate the fundamental natural vibration period value of the building. TBEC-2018 stated that if the period value found by Equation 5 is greater than 1.4 times the period value (T_{PA}) calculated by the empirical formula give in Equation 8, the empirical formula should be used.

$$T_{PA} = C_t\, H_N^{3/4} \tag{8}$$

S_{ae} (horizontal elastic design spectral acceleration) in Equation 7 is determined as in Equation 9 for DD-2 earthquake level.

$$\begin{aligned}
S_{ae}(T) &= \left(0.4 + 0.6\,\frac{T}{T_A}\right) S_{DS} &&; \quad 0 \leq T \leq T_A \\
S_{ae}(T) &= S_{DS} &&; \quad T_A \leq T \leq T_B \\
S_{ae}(T) &= \frac{S_{D1}}{T} &&; \quad T_B \leq T \leq T_L \\
S_{ae}(T) &= \frac{S_{D1} T_L}{T^2} &&; \quad T_L \leq T
\end{aligned} \tag{9}$$

The earthquake load reduction coefficient $R_a(T)$ is calculated as given in Equation 10. In this equation, the fundamental natural vibration period of the building is expressed as T, the corner periods of the horizontal design spectra are T_A and T_B and the transition period to the constant displacement region is T_L (6s).

$$\begin{aligned}
R_a(T) &= \frac{R}{I} &&; \quad T_B < T \\
R_a(T) &= D + \left(\frac{R}{I} - D\right)\frac{T}{T_B} &&; \quad T \leq T_B
\end{aligned} \tag{10}$$

In Equation 10, *D* and *R* denote the over strength coefficient and the load-bearing system behavior coefficient, respectively. The calculation of S_{DS} and S_{D1} is shown in Equation 11. In this equation, S_S is expressed as the map spectral acceleration coefficient for short period, S_1 is expressed as map spectral acceleration coefficient for 1.0 second period and F_S and F_1 are local soil effect coefficients and local soil coefficient for short period region, respectively [16].

$$S_{DS} = S_S F_S \qquad (11)$$
$$S_{D1} = S_1 F_1$$

T_A and T_B values are calculated according to Equation 12.

$$T_A = 0.2\frac{S_{D1}}{S_{DS}} \qquad (12)$$
$$T_B = 0.2\frac{S_{D1}}{S_{DS}}$$

3. Numerical Application

Within the scope of the study, a six-story reinforced concrete residential building with three openings in x and y directions and symmetrical in terms of geometric and load-bearing system for both directions was designed. The number of stories of the sample building were chosen by considering the construction style of Adıyaman province. It was assumed that there was no difference between the floors of the building in terms of the structural system and the structural system is composed of columns and beams of cast-in-place reinforced concrete. For this reason, a frame system with high ductility level was selected as the structural system. The concrete class of the building is C25/30, floor height is 3 m, column dimensions are 30/90, beam dimensions are 30/60 and slab thickness is 16 cm. The foundation system is assumed as raft foundation. The geometrical properties of the building are shown in Figure 1.

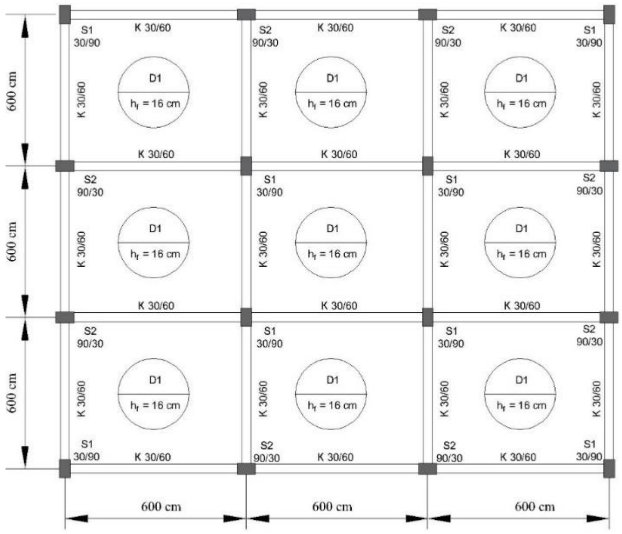

Figure 1. Floor plan of the sample building

It is assumed that the sample building was constructed in Adıyaman Center, Besni, Çelikhan, Gerger, Gölbaşı, Kâhta, Samsat, Sincik and Tut districts with different soil classes. The soil classes were considered as Z1, Z2, Z3 and Z4 in the analysis to be performed according to TEC-2007, and the soil classes were considered as ZA, ZB, ZC, ZD and ZE in the analysis to be performed according to TBEC-2018. The coordinates of the investigated building and the design spectral acceleration coefficients for these coordinates are given in Table 3.

Table 3. The coordinates of the sample building and the design spectral acceleration coefficients for these coordinates

Adıyaman Districts	Latitude	Longitude		ZA	ZB	ZC	ZD	ZE
Besni	37.697°	37.864°	S_{DS}	0.590	0.664	0.889	0.893	0.974
			S_{D1}	0.172	0.172	0.322	0.467	0.693
Çelikhan	38.035°	38.238°	S_{DS}	1.121	1.261	1.681	1.401	1.176
			S_{D1}	0.289	0.289	0.541	0.700	0.923
Gerger	38.029°	39.032°	S_{DS}	0.708	0.796	1.062	1.014	1.055
			S_{D1}	0.186	0.186	0.350	0.497	0.730
Gölbaşı	37.787°	37.654°	S_{DS}	0.974	1.096	1.462	1.234	1.127
			S_{D1}	0.261	0.261	0.489	0.644	0.879
Kâhta	37.788°	38.625°	S_{DS}	0.451	0.508	0.719	0.761	0.901
			S_{D1}	0.141	0.141	0.264	0.396	0.619
Merkez	37.749°	38.220°	S_{DS}	0.464	0.522	0.735	0.775	0.912
			S_{D1}	0.148	0.148	0.278	0.413	0.635
Samsat	37.579°	38.483°	S_{DS}	0.327	0.368	0.532	0.602	0.8
			S_{D1}	0.113	0.113	0.212	0.327	0.540
Sincik	38.032°	38.637°	S_{DS}	1.047	1.178	1.571	1.309	1.147
			S_{D1}	0.269	0.269	0.504	0.660	0.892
Tut	37.797°	37.9176°	S_{DS}	0.854	0.961	1.282	1.146	1.117
			S_{D1}	0.228	0.228	0.428	0.579	0.819

4. Results and Discussions

In the analysis of the building, concrete unit volume weight and elasticity modulus values were taken as 25 kN/m^3 and 30000 MPa, respectively. Dead loads acting on the slabs were assumed to be 6 kN/m^2 in a totally (slab weight and coating+screed loads). Also, live loads acting on the slabs were taken as 1.5 kN/m^2 at the top floor and 2 kN/m^2 at the normal floors (as recommended by TS 498) [17]. The fundamental natural vibration period values for the x-direction of the sample building were calculated by Rayleigh ratio formula (Equation 5) and empirical formula (Equation 8) as recommended in both TEC-2007 and TBEC-2018 (Table 4).

Table 4. Calculated period values of the sample building with Rayleigh ratio and empirical formulas

	Rayleigh Ratio	Empirical Formula
TEC-2007	0.709 s	-
TBEC-2018	1.132 s	0.874 s (1.223 s)*

* The value given in parentheses represents the maximum value to be considered in the earthquake calculation for the fundamental period values of TBEC-2018.

When the period values obtained according to TEC-2007 and TBEC-2018 were compared, it was seen that the values obtained according to TEC-2007 were lower than the values obtained according to TBEC-2018. This is due to the fact that effective section stiffness is taken into account in the period calculation according to TBEC-2018. Because in TBEC-2018, the effective section stiffness multiplier values for column and beam are taken as 0.7 and 0.35, respectively. However, in TEC-2007, section inertia is used directly (effective section stiffness multiplier 1).

TBEC-2018 has limited the use of the period value calculated with the Rayleigh Ratio formula of the building in the earthquake calculation. This limit is that the value calculated by the Rayleigh ratio formula should be less than 1.4 times the value calculated by the empirical formula. Therefore, 1.4 times of the period values calculated by the empirical formula and the period values obtained by the Rayleigh ratio formula were compared. According to Table

4, the values obtained by the Rayleigh ratio formula for the 6-story building are usable and these values will be used in the earthquake calculation.

The limits required for the application of the EEL method to the investigated buildings are given in Table 1-2. According to both TEC-2007 and TBEC-2018, the EEL method can be applied for the investigated building. In order to calculate the total base shear force values of the investigated building, in addition to the period values of the building, some parameters of the building should be determined for both codes.

4.1. Parameters used in determination of base shear force according to TEC-2007

Since the intended use of the building is residential, the live load participation coefficient (*n*) is 0.3 and the building importance coefficient (*I*) is 1.0. The effective earthquake zone coefficient (A_0) is 0.4 for Çelikhan, Gerger, Gölbaşı, Sincik and Tut districts (because it is a first degree earthquake zone), and 0.3 for Center (Adıyaman), Besni, Kahta and Samsat districts (because it is a second degree earthquake zone). The behavior coefficient of the structural system (*R*) is given as 8 for frame structure systems in TBEC-2018 [4].

4.2. parameters used in determination of base shear force according to TBEC-2018

Considering that the sample building will be designed at the coordinates given in Table 3, S_{DS} and S_{D1} values were determined at DD-2 earthquake level. The building importance coefficient (*I*) is taken as 1.0 and the building utilization class (*BKS*) of the sample building is 3. Using the S_{DS} and S_{D1} values, the earthquake design class (*DTS*) was obtained as 3a, 2a, 2a, 2a, 1a and 1a for ZA, ZB, ZC, ZD and ZE soil class, respectively. Using the obtained *DTS* values and the total height of the building (18 m), the building height class was determined as 6 for ZA soil class and 5 for all other soil classes. In addition, *R* coefficient was taken as 8 for TBEC-2018 and TEC-2007. Within the scope of the study, the base shear force values obtained according to TEC-2007 and TBEC-2018 were determined for the 6-storey sample building (Table 5).

Table 5. Base shear force values calculated according to TBEC-2018 and TEC-2007*

	Soil Class	Besni	Çelikhan	Gerger	Gölbaşı	Kâhta	Merkez	Samsat	Sincik	Tut
TBEC-2018	ZA	378.1	635.2	408.8	573.7	309.9	325.3	248.4	591.3	501.2
	ZB	378.1	635.2	408.8	573.7	309.9	325.3	248.4	591.3	501.2
	ZC	707.8	1189.2	769.3	1074.9	580.3	611.1	466.0	1107.8	940.8
	ZD	1026.5	1538.7	1092.5	1415.6	870.4	907.8	718.8	1450.7	1272.7
	ZE	1523.3	2028.8	1604.6	1932.1	1360.6	1395.8	1187.0	1960.7	1800.2
TEC-2007	Z1	937.5	1250.0	1250.0	1250.0	937.5	937.5	937.5	1250.0	1250.0
	Z2	1180.1	1573.5	1573.5	1573.5	1180.1	1180.1	1180.1	1573.5	1573.5
	Z3	1632.3	2176.4	2176.4	2176.4	1632.3	1632.3	1632.3	2176.4	2176.4
	Z4	1866.5	2488.7	2488.7	2488.7	1866.5	1866.5	1866.5	2488.7	2488.7

* Base shear force values are in kN.

The following results are obtained for Table 5:

- For all districts, the value of base shear force increased as the soil moved from strong to weak soil.
- The base shear force values obtained from TEC-2007 were higher than those obtained from TBEC-2018 for all soil classes.

- The same base shear force values were obtained for ZA and ZB soil classes in all districts (Therefore, ZA and ZB soil classes will be compared with Z1 soil class).

The proportional comparison of the base shear forces obtained with TEC-2007 and TBEC-2018 is given in Table 6. In this comparison, ZA and ZB soil classes are compared with Z1 soil class; ZC, ZD and ZE soil classes are compared with Z2, Z3 and Z4 soil classes, respectively [7,11,18-19]. For Table 6, it is seen that the ratio between the base shear force values calculated according to both codes decreases as one moves from strong to weak soil except for Sincik district. This ratio increases up to 3.8 for strong soils and decreases to 1.2 for weak soils.

Table 6. Proportional comparison of base shear forces obtained with both codes

Soil Class	Besni	Çelikhan	Gerger	Gölbaşı	Kâhta	Merkez	Samsat	Sincik	Tut
Z1/ZA	2.5	2.0	3.1	2.2	3.0	2.9	3.8	2.1	2.5
Z1/ZB	2.5	2.0	3.1	2.2	3.0	2.9	3.8	2.1	2.5
Z2/ZC	1.7	1.3	2.0	1.5	2.0	1.9	2.5	1.4	1.7
Z3/ZD	1.6	1.4	2.0	1.5	1.9	1.8	2.3	1.5	1.7
Z4/ZE	1.2	1.2	1.6	1.3	1.4	1.3	1.6	1.3	1.4

The numerical comparison of the base shear forces obtained according to TEC-2007 and TBEC-2018 are given in Figure 2-4. In these figures, the left axis represents the base shear force values, the right axis represents the ratio of the base shear force values obtained from both regulations (TEC-2007/TBEC-2018) and the horizontal axis represents the soil classes.

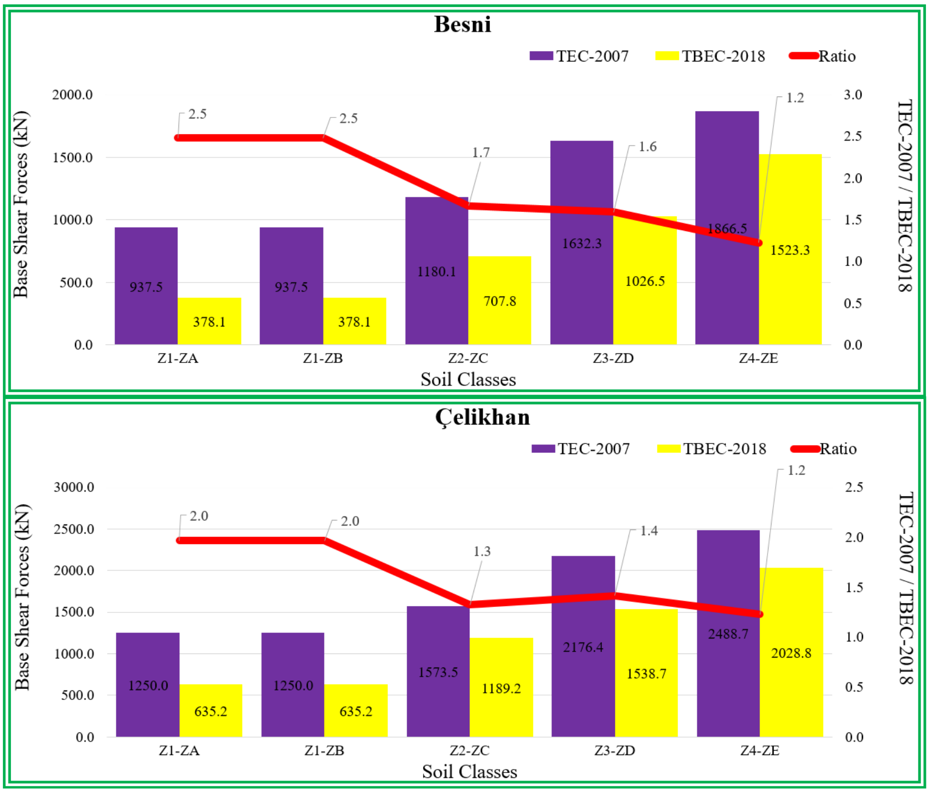

Figure 2. Comparison of base shear forces for Besni and Çelikhan districts

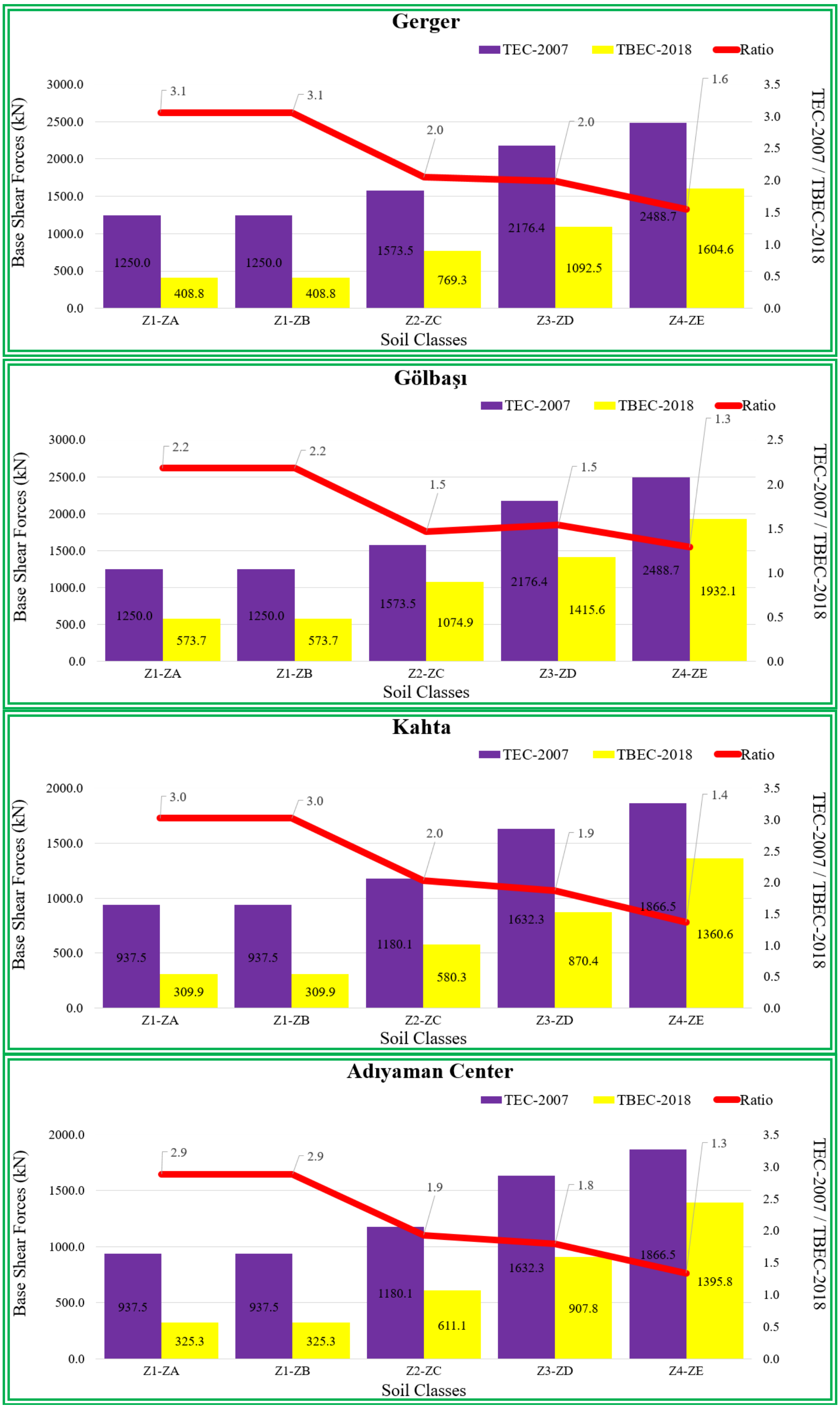

Figure 3. Comparison of base shear forces for Gerger, Gölbaşı, Kahta and Adıyaman Center districts

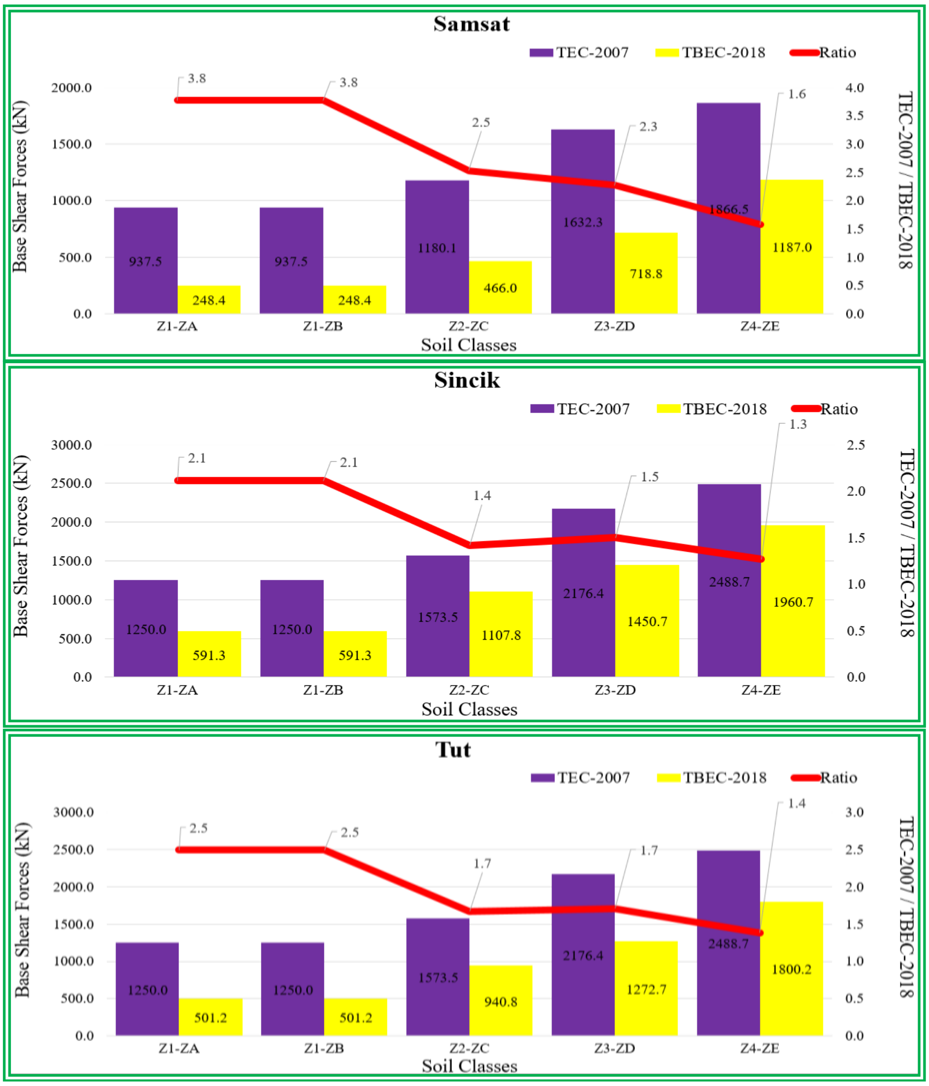

Figure 4. Comparison of base shear forces for Samsat, Sincik and Tut districts

5. Conclusions

In this study, the first fundamental natural vibration period values of a six-story sample frame structure with three spanning in the x and y directions (in plane) and a symmetrical geometry in terms of the load-bearing system were calculated by using the Rayleigh ratio and empirical formulas given in TEC-2007 and TBEC-2018. The base shear force values of the sample building were calculated. While determining these values, it was considered that the sample building was designed at coordinates with different soil classes in Adıyaman Center, Besni, Çelikhan, Gerger, Gölbaşı, Kâhta, Samsat, Sincik and Tut districts. The results obtained from the study are generally as follows:

- ❖ The period value calculated according to TEC-2007 was lower than the value calculated according to TBEC-2018. Because stiffnesses are taken into account in the period calculation according to TBEC-2018.
- ❖ It was found that the base shear forces varied depending on the soil class. Because, the base shear force values increased as the soil class increased from strong soil to weak soil.
- ❖ The same base shear force values were obtained for ZA and ZB classes in all districts.
- ❖ For all soil classes, the base shear force values obtained from TEC-2007 were higher than those obtained from TBEC-2018.
- ❖ The base shear force values obtained from TEC -2007 were determined as minimum 1.2 times and maximum 3.8 times higher than the values obtained from TBEC-2018.

- The ratio of the base shear force values obtained from TEC-2007 and TBEC-2018 (TEC-2007/TBEC-2018) decreased as the soil class moved from strong soil to weak soil (except Sincik district).

This study was carried out for the province of Adıyaman and a sample building reflecting the construction style of Adıyaman province. This study can be developed for buildings that will have different floor plans, different floor heights, different floor numbers and some structural irregularities. In this way, the data obtained from this study will be evaluated and interpreted from a wider perspective. In addition, carrying out this study for different provinces will provide a general evaluation opportunity.

6. Author Contribution Statement

The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

7. Ethics Committee Approval and Conflict of Interest

“There is no conflict of interest with any person/institution in the prepared article”

8. References

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