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Effective relative storey drift limits in flexible jointed infill wall applications

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ABSTRACT

Relative storey drifts is limited by earthquake codes for earthquake safety of structures. In 2016 Turkish Earthquake Code (TEC 2016), which has yet in draft, the criteria for delimitation of relative story drifts have been specified. Compared to the previous ones, this earthquake code included the use of flexible jointed infill wall - frame joints which affect the relative storey drift limit. In this study, the limitation rules of the effective relative storey drifts are explained in detail in the case of the use of flexible jointed infill wall-frame joints specified in the section "Calculation and Limitation of Effective Relative Storey Drifts" of the TEC 2016. In addition, the maximum allowable effective storey drifts are calculated separately for each province center.

1. Introduction

Due to the fact that Turkey is located in the earthquake-prone area, the earthquake resistant structural design concept has a great importance in our country. Earthquake resistant structural design rules are determined by earthquake regulations. The earthquake regulations updated in the light of experiences obtained from earthquakes and scientific studies are in continuous development. TEC 2016, which is still in draft form, contains important changes according to previous earthquake codes. The limitations of the relative storey drifts and the application of the flexible jointed infill wall are the changes of this regulation [1].

In the design stage of a building, infill walls are one of the most complicated components to predict the effect on the building although there are several techniques to insert them to the building model [2,3]. The experiences obtained from the last earthquakes show that infill walls changes the dynamic behavior and damage mechanism of the buildings [4-8]. To overcome the problems caused by infill walls, flexible connections between infill wall and surrounding frame were proposed by researchers [9-11]. Flexible infill – frame connection method was also included to the 2016 TEC draft. Application of the flexible or conventional joints changes the relative storey drift limits [1].

Relative storey drifts is limited by earthquake codes in many countries [12]. These limitations are determined according to different rules in each code [13-15]. The effects on the lateral drifts of the structure and the damages taken during the earthquake of the infill walls were ignored in many earthquake codes including TEC 2007 [16] (2007 Turkish Earthquake Code) which is in force in our country. However, from the 1960s, in some countries' earthquake codes, it is taken into account in limitation of relative storey drifts. One of the important innovations in the draft TEC 2016 is the arrangement of the infill walls to avoid damage by determining the relative storey drift limits separately according to infill wall – frame joint types such as flexible jointed and adjoined [1,12].

In TEC 2016 draft, a relative storey drift limit interval involving all buildings can be defined by changing the parameters such as storey height, natural period, local site class and parameters depends on location of building. In this study, it was aimed to reveal the allowed maximum relative storey for buildings to be designed with flexible jointed infill wall – frame connection according to TEC 2016. For the parameters determining the relative storey drift limits, the storey height is fixed to 3 meters and the other parameters are arranged to obtain the maximum relative storey drift limit. Thus, the relative storey drift limit for each provincial center with latitudes and

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longitudes is determined for a height of 3 meters.

2. Limitation of Effective Relative Storey Drifts in TEC 2016 Draft

In TEC 2016 draft, rule of the limitation of effective relative storey drifts depends on some parameters such as storey height, type of infill wall – frame joint (adjoint or flexible jointed), natural period of building, distance to active fault plane, local site class, design spectral acceleration coefficient [1].

Limitation of effective relative storey drifts is calculated according to Equation (1) when the infill walls are manufactured adjoined to the frame and according to Equation (2) when flexible joints are used between the infill wall and frame.

$$\lambda \frac{\delta_{i,max}^{(X)}}{h_i} \leq 0.008 \tag{1}$$

$$\lambda \frac{\delta_{i,max}^{(X)}}{h_i} \leq 0.016 \tag{2}$$

In these equations, h_i is the storey height, $\delta_{i,max}^{(X)}$ is the maximum value of the effective relative story drift of the i^{th} floor of the building in X direction, λ represents the ratio of elastic design spectral acceleration calculated according to earthquake DD3 (earthquake return period of 72 years) to elastic design spectral acceleration calculated according to earthquake DD2 (earthquake return period of 475 years) (Equation 3).

$$\lambda = \frac{S_{ae}(T)_{DD3}}{S_{ae}(T)_{DD2}} \tag{3}$$

One of the important changes in the calculation of effective relative storey drifts in the TEC 2016 is the inclusion of elastic design spectral accelerations. There is also a significant difference in the calculation method of the elastic design spectral accelerations at TEC 2016. The calculation of the elastic design spectral acceleration is also included in this study since the λ coefficient is obtained using the elastic design spectral accelerations in the calculation of the allowed maximum effective relative storey drifts.

In the calculation of the elastic design spectral acceleration, first of all, from the earthquake hazard map, the hazard map spectral acceleration coefficients S_S for the short period and S_1 for the period of 1 second are taken from the location at which the considered structure is to be constructed. Using the hazard map spectral acceleration coefficients, the design spectral acceleration coefficients S_{DS} and S_{D1} are obtained using Equation (4) and Equation (5).

$$S_{DS} = S_S \times F_S \tag{4}$$

$$S_{D1} = S_1 \times \gamma_F \times F_1 \tag{5}$$

In these equations, F_S and F_1 are the local site effect coefficients, and γ_F is the coefficient of distance of the faultline. The local site effect coefficients F_S and F_1 are obtained from Table 1 for the short period zone and from Table 2 for the 1 second period zone using the local site class and hazard map spectral acceleration coefficients. The coefficient of distance of the faultline is calculated according to the cases given in Equation (6). In this equation, L_F is the distance to the fault plane. γ_F is taken as "1" for DD-3 earthquake ground motions in this study [1].

Table 1. Local site effect coefficients for short period zone (TEC 2016, Table 2.1)

Local Site Class	Local Site Effect Coefficient for Short Period Zone F_S					
	S_S≤0.25	S_S=0.5	S_S=0.75	S_S=1.0	S_S=1.25	S_S≥1.5
ZA	0.8	0.8	0.8	0.8	0.8	0.8
ZB	0.9	0.9	0.9	0.9	0.9	0.9
ZC	1.3	1.3	1.2	1.2	1.2	1.2
ZD	1.6	1.4	1.2	1.1	1.0	1.0
ZE	2.4	1.7	1.3	1.1	0.9	0.8
ZF	Site-specific soil behavior analysis will be performed.					

Table 2. Local site effect coefficients for 1.0 sec. Period (TEC 2016, Table 2.2)

Local Site Class	Local Site Effect Coefficient for 1.0 sec. Period. F_1					
	S_1≤0.1	S_1=0.2	S_1=0.3	S_1=0.4	S_1=0.5	S_1≥0.6
ZA	0.8	0.8	0.8	0.8	0.8	0.8
ZB	0.8	0.8	0.8	0.8	0.8	0.8
ZC	1.5	1.5	1.5	1.5	1.5	1.4
ZD	2.4	2.2	2.0	1.9	1.8	1.7
ZE	4.2	3.3	2.8	2.4	2.2	2.0
ZF	Site-specific soil behavior analysis will be performed					

$$\begin{aligned} &\gamma_F = 1.2 && L_F \leq 15km \\ &\gamma_F = 1.2 - 0.02(L_F - 15) && 15\,km \leq L_F \leq 25km \end{aligned} \tag{6}$$

Spectrum characteristic periods are calculated according to Equation (7). The natural period is denoted by T , and the transition period to the constant displacement region T_L is 6 seconds. Using this obtained data, the horizontal elastic design spectral accelerations are calculated according to the cases given in Equation (8).

$$T_A = 0.2 \times \frac{S_{D1}}{S_{DS}} \tag{7}$$

$$T_B = \frac{S_{D1}}{S_{DS}}$$

$$\begin{aligned} S_{ae}(T) &= \left(0.4 + 0.6\frac{T}{T_A}\right) \times S_{DS} && (0 \leq T \leq T_A) \\ S_{ae}(T) &= S_{DS} && (T_A \leq T \leq T_B) \\ S_{ae}(T) &= \frac{S_{D1}}{T} && (T_B \leq T \leq T_L) \\ S_{ae}(T) &= \frac{S_{D1} \times T_L}{T^2} && (T_L \leq T) \end{aligned} \quad (8)$$

3. Limitation of Effective Relative Storey Drifts in TEC 2016 Draft

In this study, the maximum effective relative storey drifts allowed for all provincial centers were calculated according to the rule in the section "*Limitation of effective relative storey drifts*" in the TEC 2016 draft. The storey heights in the calculations were determined to be 3 m, using statistical study by Azak et al. [17]. The variable parameters are the natural period and the hazard map spectral acceleration coefficients which vary depending on the location of the structure.

ZA and ZE local site classes have been used as strong and weak grounds defined in the TEC 2016 draft for the understanding of the effect of the site class on limiting the effective relative storey drifts. The initial value of the natural period, which is another effective parameter for limiting the effective relative storey drift, is selected as 0.2, which is increased by 0.1 intervals to calculate the maximum effective relative storey drifts for each province. The abbreviations for each case that is calculated are shown in Table 3. The maximum effective relative storey drifts calculated for cases where the infill wall-to-frame joint is flexible jointed are shown in Table 5 for each provincial center according to natural period and local site class. The latitudes and longitudes of the provincial centers where the effective relative storey drift limit is calculated are also presented in Table 4.

Table 3. Parameters and abbreviations

Abbreviation	Local Site Class	Natural Period
D2A	ZA	T=0.2
D3A	ZA	T=0.3
D4A	ZA	T=0.4
D5A	ZA	T ≥0.5
D4E	ZE	0.2≥ T ≥0.4
D5E	ZE	T=0.5
D6E	ZE	T=0.6
D7E	ZE	T=0.7
D8E	ZE	T=0.8
D9E	ZE	T=0.9
D10E	ZE	T≥1.0
Dmax	Maximum effective relative storey drift	

Table 4. Latitude and longitude of provincial centers where calculations are made

Province	Latitude	Longitude	Province	Latitude	Longitude	Province	Latitude	Longitude
Adana	37.1075	35.3825	**Giresun**	40.9177	38.3844	**Samsun**	41.2908	36.3361
Adıyaman	37.7628	38.2756	**Gümüşhane**	40.4594	39.4803	**Siirt**	37.9274	41.9422
Afyon	38.7573	30.5382	**Hakkâri**	37.5774	43.7366	**Sinop**	42.0266	35.1512
Ağrı	39.7193	43.0509	**Hatay**	36.2026	36.1602	**Sivas**	39.7505	37.015
Amasya	40.6562	35.8373	**Isparta**	37.767	30.5535	**Tekirdağ**	40.9786	27.5152
Ankara	39.9208	32.854	**İçel**	36.781	34.5877	**Tokat**	40.314	36.5513
Antalya	36.8869	30.7062	**İstanbul**	40.9878	29.0368	**Trabzon**	41.0064	39.7109
Artvin	41.1812	41.8205	**İzmir**	38.419	27.1277	**Tunceli**	39.0758	39.5337
Aydın	37.8471	27.8437	**Kars**	40.601	43.0944	**Şanlıurfa**	37.1601	38.7989
Balıkesir	39.6474	27.8864	**Kastamonu**	41.3777	33.7763	**Uşak**	38.6742	29.4057
Bilecik	40.1426	29.9793	**Kayseri**	38.7227	35.4869	**Van**	38.5038	43.3955
Bingöl	38.8832	40.4929	**Kırklareli**	41.7341	27.2191	**Yozgat**	39.8221	34.8081
Bitlis	38.4053	42.1079	**Kırşehir**	39.1462	34.1606	**Zonguldak**	41.4549	31.7886
Bolu	40.7327	31.6087	**Kocaeli**	40.7651	29.9445	**Aksaray**	38.3703	34.0272
Burdur	37.7183	30.2822	**Konya**	37.8718	32.5005	**Bayburt**	40.2593	40.2268
Bursa	40.1972	29.0615	**Kütahya**	39.4192	29.9853	**Karaman**	37.1701	33.223
Çanakkale	40.15	26.4027	**Malatya**	38.3487	38.3189	**Kırıkkale**	39.8437	33.5056
Çankırı	40.6002	33.6164	**Manisa**	38.6139	27.4337	**Batman**	37.8999	41.1311
Çorum	40.55	34.9539	**K. Maraş**	37.5775	36.9266	**Şırnak**	37.5212	42.4556
Denizli	37.7829	29.0963	**Mardin**	37.321	40.725	**Bartın**	41.6265	32.3299
Diyarbakır	37.9367	40.2075	**Muğla**	37.2152	28.3639	**Ardahan**	41.113	42.7022

Province	Latitude	Longitude	Province	Latitude	Longitude	Province	Latitude	Longitude
Edirne	41.6769	26.5529	**Muş**	38.7449	41.4998	**Iğdır**	39.9233	44.0457
Elazığ	38.6749	39.2208	**Nevşehir**	38.627	34.7207	**Yalova**	40.6585	29.2743
Erzincan	39.7468	39.491	**Niğde**	37.9703	34.6769	**Karabük**	41.1956	32.6231
Erzurum	39.9056	41.2684	**Ordu**	40.9845	37.8758	**Kilis**	36.7155	37.1141
Eskişehir	39.7658	30.5238	**Rize**	41.0271	40.5177	**Osmaniye**	37.0747	36.2465
Gaziantep	37.063	37.3792	**Sakarya**	40.8511	30.3164	**Düzce**	40.8403	31.1546

When the drift values obtained according to the natural periods are examined, a linear relationship cannot be established between the period and the maximum effective relative storey drifts. In some regions, higher drift values are obtained in buildings with higher natural periods, while in some regions, higher drift values are obtained in buildings with lower natural periods. The hazard map spectral acceleration coefficients vary according to the geological conditions and the fact that the horizontal elastic design acceleration spectrum is not linear cause a lack of a proportion or tendency in the change of the displacement to the period.

It has been observed that the effective relative storey drift limit differs between 0.2 - 0.5 period intervals for ZA local site class, and does not change with larger period values greater than 0.5. In the calculations made according to the ZE local site class, it is seen that the effective relative storey drift limit changes between 0.2 - 0.4 period interval and no change in period values larger than 1.0, and the drift limit changes in 0.4 - 1.0 period interval.

Table 5. Effective relative storey drift limits for flexible jointed wall-to-frame connection (mm)

Province	D2A	D3A	D4A	D5A	D4E	D5E	D6E	D7E	D8E	D9E	D10E	Dmax
Adana	135.1	127.6	127.6	127.6	92.6	98.2	117.9	119.8	119.8	119.8	119.8	135.1
Adıyaman	123.6	123.6	155.4	155.4	81.0	81.0	90.8	105.9	121.0	126.3	126.3	155.4
Afyon	135.1	155.5	155.5	155.5	73.8	84.5	101.4	118.3	126.9	126.9	126.9	155.5
Ağrı	125.4	125.4	134.8	134.8	84.8	84.8	93.9	109.5	119.8	119.8	119.8	134.8
Amasya	122.3	126.9	154.5	154.5	66.6	66.6	66.6	77.8	88.8	99.9	104.4	154.5
Ankara	126.2	126.2	129.3	131.1	112.5	112.5	112.5	115.5	126.3	126.3	126.3	131.1
Antalya	120.0	117.5	117.5	117.5	80.0	84.4	101.3	105.6	105.6	105.6	105.6	120.0
Artvin	134.2	122.0	117.4	117.4	106.2	106.2	111.7	111.7	111.7	111.7	111.7	134.2
Aydın	140.2	180.1	180.2	180.2	67.3	67.3	72.9	85.0	97.2	109.4	113.4	180.2
Balıkesir	130.6	144.0	144.0	144.0	71.1	71.1	81.8	95.4	109.0	109.2	109.2	144.0
Bilecik	116.9	116.9	131.6	131.6	77.8	77.8	79.2	92.4	105.6	109.0	109.0	131.6
Bingöl	120.6	150.0	157.3	157.3	65.2	65.2	65.2	75.3	86.0	96.7	99.8	157.3
Bitlis	121.5	117.1	111.8	111.8	76.7	76.7	84.2	95.1	95.1	95.1	95.1	121.5
Bolu	131.6	158.2	177.8	177.8	65.4	65.4	65.7	76.6	87.6	98.5	108.0	177.8
Burdur	136.3	167.2	167.2	167.2	71.4	79.8	95.8	111.8	125.4	125.4	125.4	167.2
Bursa	128.0	135.4	144.0	144.0	70.5	70.5	77.1	90.0	102.8	107.0	107.0	144.0
Çanakkale	114.3	114.3	112.4	112.4	68.1	68.1	70.2	81.8	85.2	85.2	85.2	114.3
Çankırı	129.4	129.4	153.3	153.3	75.3	75.3	78.7	91.8	105.0	115.8	115.8	153.3
Çorum	121.3	121.3	142.6	142.6	74.6	74.6	76.5	89.2	102.0	110.1	110.1	142.6
Denizli	124.7	151.1	151.1	151.1	65.8	65.8	76.7	89.5	102.3	107.6	107.6	151.1
Diyarbakır	110.8	110.8	110.8	110.6	102.6	102.6	102.6	102.6	103.6	103.6	103.6	110.8
Edirne	149.2	149.2	118.3	118.3	118.6	118.6	118.6	109.1	109.1	109.1	109.1	149.2
Elazığ	127.9	128.0	128.0	128.0	69.8	69.8	75.0	87.4	90.9	90.9	90.9	128.0
Erzincan	139.0	156.5	179.8	179.8	67.1	67.1	67.1	77.3	88.3	99.4	109.6	179.8
Erzurum	151.7	153.9	161.2	161.2	73.3	73.3	76.2	88.9	101.6	111.2	111.2	161.2
Eskişehir	148.6	148.6	150.0	150.0	87.3	87.3	94.1	109.7	123.4	123.4	123.4	150.0
Gaziantep	122.6	122.6	119.4	119.4	102.0	102.0	102.0	109.9	109.9	109.9	109.9	122.6
Giresun	131.4	131.4	118.4	118.4	110.2	110.2	110.2	109.3	109.3	109.3	109.3	131.4

Province	D2A	D3A	D4A	D5A	D4E	D5E	D6E	D7E	D8E	D9E	D10E	Dmax
Gümüşhane	129.0	129.0	116.2	116.2	101.8	101.8	101.8	104.3	104.3	104.3	104.3	129.0
Hakkari	134.3	156.6	156.6	156.6	74.3	84.5	101.4	118.2	130.3	130.3	130.3	156.6
Hatay	152.3	178.7	186.3	186.3	74.1	74.9	89.8	104.9	119.8	129.8	129.8	186.3
Isparta	123.9	145.8	145.8	145.8	71.3	84.3	101.2	118.0	125.3	125.3	125.3	145.8
İçel	135.0	129.8	116.8	116.8	124.0	124.0	118.3	118.3	118.3	118.3	118.3	135.0
İstanbul	119.6	132.2	141.8	141.8	66.9	66.9	71.6	83.6	95.5	101.6	101.6	141.8
İzmir	129.5	152.6	152.6	152.6	67.0	67.0	74.8	87.3	99.8	107.0	107.0	152.6
Kars	125.4	120.3	109.8	109.8	96.8	96.8	101.4	103.8	103.8	103.8	103.8	125.4
Kastamonu	122.5	122.5	153.3	153.3	73.4	73.4	78.4	91.4	104.6	115.8	115.8	153.3
Kayseri	176.7	176.7	175.4	175.4	139.5	139.5	155.8	172.6	172.6	172.6	172.6	176.7
Kırklareli	139.5	139.5	116.6	116.6	116.6	116.6	116.6	108.7	108.7	108.7	108.7	139.5
Kırşehir	136.3	136.3	138.8	141.8	136.6	136.6	136.6	142.2	145.7	145.7	145.7	145.7
Kocaeli	126.2	155.8	169.4	169.4	67.9	67.9	67.9	78.2	89.4	100.6	104.5	169.4
Konya	146.4	150.6	150.6	150.6	137.0	145.5	154.2	154.2	154.2	154.2	154.2	154.2
Kütahya	170.8	170.8	167.6	167.6	85.4	85.4	94.8	110.6	126.4	127.9	127.9	170.8
Malatya	127.1	131.3	131.3	131.3	70.6	70.6	82.6	96.4	98.8	98.8	98.8	131.3
Manisa	132.4	156.0	156.0	156.0	67.0	67.0	74.5	86.9	99.3	108.1	108.1	156.0
K. Maraş	134.2	157.3	168.0	168.0	72.0	74.1	88.9	103.8	118.6	124.9	124.9	168.0
Mardin	120.0	120.0	120.0	108.8	119.8	119.8	119.8	119.8	119.0	110.6	110.6	120.0
Muğla	119.9	136.5	137.4	137.4	68.1	68.1	78.8	91.9	105.0	105.5	105.5	137.4
Muş	117.9	117.9	136.6	136.6	68.1	68.1	70.2	81.8	93.6	101.6	101.6	136.6
Nevşehir	139.8	139.8	148.6	148.6	140.9	140.9	140.9	151.0	151.0	151.0	151.0	151.0
Niğde	152.7	152.7	164.0	164.0	143.2	143.2	156.8	163.0	163.0	163.0	163.0	164.0
Ordu	119.8	119.8	119.8	119.5	105.9	105.9	105.9	105.9	107.0	107.0	107.0	119.8
Rize	162.1	128.6	117.6	117.6	112.9	112.9	112.2	112.2	112.2	112.2	112.2	162.1
Sakarya	132.0	150.4	167.5	167.5	65.5	65.5	68.2	79.5	90.9	102.3	108.9	167.5
Samsun	122.6	122.6	132.0	132.0	85.3	85.3	85.3	92.2	105.4	108.8	108.8	132.0
Siirt	128.2	130.7	137.3	137.3	84.9	84.9	100.2	116.8	124.1	124.1	124.1	137.3
Sinop	148.3	148.3	148.3	128.8	132.6	132.6	132.6	132.6	120.6	120.0	120.0	148.3
Sivas	121.9	121.9	120.0	118.6	100.3	100.3	100.3	100.3	104.6	104.6	104.6	121.9
Tekirdağ	124.0	135.0	149.0	149.0	67.5	67.5	71.7	83.6	95.5	105.2	105.2	149.0
Tokat	120.1	120.1	144.7	149.4	69.1	69.1	69.1	78.2	89.4	100.6	106.7	149.4
Trabzon	163.2	139.6	121.3	121.3	122.1	122.1	117.4	117.4	117.4	117.4	117.4	163.2
Tunceli	131.4	131.4	147.3	147.3	72.5	72.5	74.4	86.8	99.2	108.6	108.6	147.3
Şanlıurfa	129.5	129.5	129.5	141.0	129.9	129.9	129.9	129.9	134.9	141.1	141.1	141.1
Uşak	113.8	126.6	126.6	126.6	71.3	75.3	90.3	105.4	111.3	111.3	111.3	126.6
Van	135.6	139.7	142.2	142.2	83.0	83.0	98.3	114.7	123.5	123.5	123.5	142.2
Yozgat	122.8	122.8	122.8	113.1	116.6	116.6	116.6	116.6	106.6	106.3	106.3	122.8
Zonguldak	145.8	143.9	122.5	122.5	100.4	100.4	100.4	108.2	108.2	108.2	108.2	145.8
Aksaray	215.6	209.8	202.1	202.1	193.3	193.3	198.6	198.6	198.6	198.6	198.6	215.6
Bayburt	134.5	132.3	110.6	110.6	91.0	91.0	91.0	96.0	96.0	96.0	96.0	134.5
Karaman	153.0	127.4	125.4	125.4	152.1	133.8	129.4	129.4	129.4	129.4	129.4	153.0
Kırıkkale	135.2	135.2	139.4	139.4	104.9	104.9	106.4	124.2	129.8	129.8	129.8	139.4
Batman	119.5	119.5	116.5	108.0	109.6	109.6	109.6	109.6	102.6	102.6	102.6	119.5
Şırnak	149.5	168.0	168.0	168.0	79.6	94.5	113.4	132.2	141.0	141.0	141.0	168.0
Bartın	148.6	141.2	122.6	122.6	102.6	102.6	102.6	109.0	109.0	109.0	109.0	148.6
Ardahan	134.8	135.0	135.0	135.0	84.6	89.0	106.9	119.4	119.4	119.4	119.4	135.0
Iğdır	135.9	141.0	144.0	144.0	88.2	88.2	104.8	122.2	128.6	128.6	128.6	144.0
Yalova	122.2	145.4	154.2	154.2	62.9	62.9	62.9	72.6	83.0	93.4	99.3	154.2

Province	D2A	D3A	D4A	D5A	D4E	D5E	D6E	D7E	D8E	D9E	D10E	Dmax
Karabük	132.3	132.3	158.6	158.6	74.6	74.6	77.6	90.6	103.5	116.4	118.1	158.6
Kilis	131.3	131.3	149.1	149.1	94.4	94.4	98.2	114.6	131.0	131.8	131.8	149.1
Osmaniye	133.4	146.0	158.3	158.3	75.5	78.2	93.8	109.5	125.1	126.5	126.5	158.3
Düzce	140.7	156.3	169.9	169.9	66.7	66.7	68.1	79.4	90.8	102.2	108.9	169.9

4. Conclusions

In this study, according to TEC 2016 draft, maximum effective storey drift values have been calculated in varying natural periods for local site class of ZA and ZE of selected points in each city center. The following results are obtained from the drift values obtained from the calculations:

• In the vast majority of provinces, it is seen that the limits of effective relative storey drifts are higher for the ZA local site class than for the ZE local site class. However, it is unable to make generalizations because of the existence of opposite conditions.

• Where the infill wall-frame connection is flexible jointed, it is allowed to drift twice as much as the adjoined connection.

• Drift limit should be calculated for the point at which the structure will be constructed, because effective relative storey drifts depend on parameters that are not linear and have no particular tendency.

• The obtained drift limits will help to determine the gap or flexible joint sizes for the wall-frame joints to be developed.

Finally, for the flexible jointed infill wall applications, this study reveals the reduced relative storey drift limits of each city center for a wide natural period range which could be often encountered in application. It is expected that the obtained drift values would be the helpful to determine the flexible joint size.

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