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Urban Renewal: Examination of a building in Beykoz, Istanbul

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Abstract

The meaning of Urban Transformation is to identify the problematic areas of the city and to remedy these problems (Duncan, 2012). To briefly emphasize its importance, it means 'life' (Mitra and Mehta, 2011). So urban regeneration can save many lives. Predetermining the buildings that will be destroyed as a result of natural disasters or identifying the damaged buildings after natural disasters and eliminating these problems means saving lives (Shi and Liu, 2018). If these problems are not dealt with, it means that we may experience the Izmir disaster that we faced in 2020 again and again [URL:1]. As engineers, we must identify these structures and fulfill them. We obtain the need for urban transformation of a building with risk assessment reports. As a result of risk assessment reports, risky structures should be overhauled and strengthened or reconstructed within the scope of urban transformation (McCornick ve diğ.).

Kentsel Dönüşüm: İstanbul Beykoz'da bir binanın incelenmesi

Anahtar Kelimeler:
Kentsel Dönüşüm, Beton, Beton Teknolojisi

Özet

Kentsel Dönüşümün anlamı, kentin sorunlu alanlarını belirlemek ve bu sorunlara çare olmaktır (Duncan, 2012). Önemini kısaca vurgulamak gerekirse ‘hayat’ demektir (Mitra ve Mehta, 2011). Yani kentsel dönüşüm birçok hayatı kurtarabilir. Doğal afetler sonucu yıkılacak binaların önceden belirlenmesi veya doğal afet sonrasında zarar gören binaların tespit edilmesi ve bu sorunların giderilmesi hayat kurtarmak demektir (Shi ve Liu, 2018). Eğer bu sorunlarla başa çıkılmazsa, 2020 senesinde karşılaşmış olduğumuz İzmir felaketini tekrar tekrar yaşayabileceğimiz anlamına gelir [URL-1]. Biz mühendisler olarak, bu yapıları tespit etmeli ve gereğini yerine getirmeliyiz. Bir binanın kentsel dönüşüme ihtiyacını, risk değerlendirme raporlarıyla elde ederiz. Risk değerlendirme raporları neticesinde, riskli yapıların elden geçirilip güçlendirilmesi veyahut kentsel dönüşüm kapsamında, yeniden inşa edilmesi gerekir. (McCornick and et al.)

1 Introduction

The purpose of urban transformation projects is healthy living, solid structures and structural changes that include actions such as renovation to improve structures. Urban transformation started with the modernization of cities that were destroyed after the Second World War and the improvement of damaged structures.
The projects created to identify the problematic buildings in the cities and make them healthy and livable, and the projects aimed at eliminating the problems in the buildings in order to preserve the texture of the city, are called urban transformation projects. Rebuilding buildings

that have completed their lifetime, and protecting people from the negative effects of natural disasters are among the main goals of urban transformation.
The urban transformation processes of the building located in Yaşar Alboran Çıkmazı No:4 Kanlıca / Beykoz / Istanbul will be discussed and examined.

Fig 1.1

2 Material and Methods

Projects aiming to solve the problems in cities, to make such areas healthy and livable or to modernize them by rebuilding, express the meaning of urban transformation. To put it briefly, urban transformation; It is the work done to solve the problems of the structures that disrupt the texture of the city or complete their life.
Buildings that have completed their lifetime may not be earthquake resistant. Many of our buildings built in the past do not have a license. The types of concrete and reinforcement used in unlicensed buildings are also unknown. For example, on 06.05.2021, a 26-year-old unlicensed building in Istanbul Zeytinburnu was demolished by itself [URL:2]. The short life span depends on the type of concrete and reinforcement. Before unlicensed buildings are damaged, a risky structure determination report must be made.
Risky structure detection report; These are the reports that contain general information about the building, carrier system information, collected information, analysis results, and detection results. The risky structure determination report of our building in Beykoz, which I researched, is also given in the appendices.

Buildings that are not earthquake-proof and have completed their lifetimes need to be rebuilt in order to minimize the damage they may cause when faced with natural disasters. In accordance with Law No. 6306, such structures are determined and necessary action is taken.
The purpose of the Law No. 6306 is stated in Article 1 as follows: “The purpose of this Law; It is to determine the procedures and principles regarding the improvement, liquidation and renewal in order to create healthy and safe living environments in accordance with the norms and standards of science and art in the areas under disaster risk and the lands and lands where there are risky structures outside these areas.

Risky Structure Detection Process Stages:

The floors that are less than 25% of the area in the basement floors are not considered in the calculation of the number of floors. Floors of such structures are not evaluated, the top floor is considered as vertical load and mass.
Reinforced concrete buildings whose height does not exceed 30 meters including basements or 10 floors including basements are low-rise reinforced concrete buildings.
Buildings with a total height of between 30 and 50 meters or between 10 and 17 floors, including basements, are mid-rise reinforced concrete buildings.
Buildings with a total height of more than 50 meters or more than 17 floors, including basements, are high-rise reinforced concrete buildings.

Based on this information, the building located in Beykoz, for which our risk assessment report will be prepared, is classified as low-rise reinforced concrete buildings with a total of 5 floors, including the basement floors.

The structural system features of the building will be determined by the surveys to be taken from the examination floor and all basement floors. The examination floor is taken as the lowest floor. A survey will also be taken from floors where columns or walls have discontinuity in the carrier system.

The floor with all its facades exposed throughout the floor height is the ground floor. Therefore, the investigation floor was chosen as the ground floor. The surveys of the floors up to the ground floor were removed.

In the floors taken, the dimensions of all columns, walls, beams and floors will be determined by the placement of these elements in the floors and their axial spacing. The total number of floors of the building and the heights of all floors will be measured and indicated on the survey. All columns and overhangs on the floors where the survey is taken must be processed on the survey.

When the building was examined, the survey drawing was made by measuring the column dimensions, beam dimensions, floor height, without skipping any bearing detail, and the measurements were completed. Afterwards, the drawings were drawn and detailed in AutoCad, and then drawn in Sta4Cad.

The carrier system knowledge level will be minimal or comprehensive. If the project of the building is not available, the minimum level of knowledge is considered. For a comprehensive level of knowledge, the building's static project must be available and the checked structural system properties, element dimensions and reinforcement details must be compatible with the project. If even one of the features differs, the minimum knowledge level is accepted.

Since the researched building has no projects, including the static project, the knowledge level is the minimum level of knowledge.

The bearing capacities of columns, walls and beams are calculated using the material strength and are used by multiplying the information level coefficient given in Table 2.1.

Table 2.1 Knowledge level coefficients

Knowledge Level	Knowledge Level Coefficients
Minimum	0.90
Comprehensive	1.00

In order to determine the number of existing reinforcements from the floors surveyed, at least 20% of the total number of columns and at least 20% of the total number of walls are determined from each floor, at least 6 pieces for columns and at least 2 pieces for walls. If the total number of columns is less than 6, it will be determined from the number of existing columns, and if there is 1 wall, it will be determined from that wall. This process will be done by stripping the shell concrete of the walls and columns that are fixed. Diameter, placement, transverse reinforcement type, longitudinal reinforcement type, spacing and details will be determined on the curtains. In the columns, the type of transverse reinforcement, diameter, hook condition, longitudinal reinforcement placement, transverse reinforcement spacing and details will be determined. The average values of the reinforcement ratio obtained from the columns and walls examined will be calculated separately for the floors taken in the survey. Reinforcement ratios for columns and walls without reinforcement determination will be taken as the average values for the columns and walls studied.

Column stripping was performed in the study floors, and the reinforcement diameters were determined.

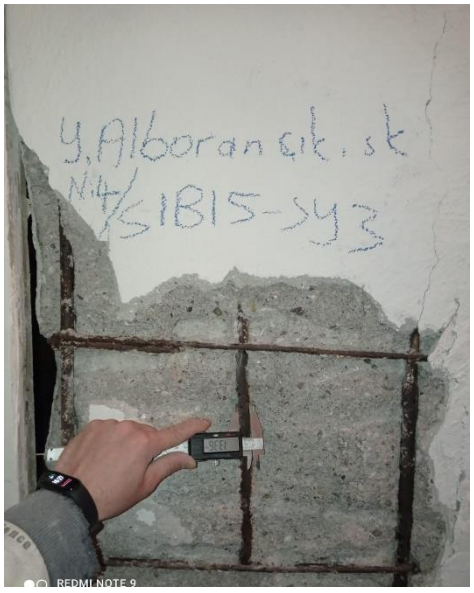

Fig 2.1

The yield strength of the existing reinforcement will be determined depending on the type of reinforcement. As a result of the stripping process, the carriers with corrosion in the reinforcement and the decrease in the diameter of the reinforcement due to corrosion will be determined. The average diameter reduction amount of the reinforcement found by stripping is calculated separately for the floors whose survey is taken.

Tables were created with the data obtained from the laboratory results of the building located in Beykoz, Yaşar Alboran Çıkmazı street. For example, 8ø14 longitudinal reinforcements and 24ø8 stirrup reinforcements of our column named S1B15 are written in the tables. The amount of corrosion was calculated as 5%. As a result of corrosion, the diameter of our longitudinal reinforcement was 13.36, and the diameter of our stirrup reinforcement was 7.67. The stripping table of the 1st basement floor is given in Table 2.2.

1. Basement	Column				Longital Reinforcement			Reinforcement Ratio (p)	Fyk (Mpa)	Stirrup Reinforcement
	No	B	H	Area (cm^2)	Number	Diameter (mm)	Area (cm^2)			
	S1B-18	25	50	1250	8	14	12.31	0.00985	220	Q8/24
Stripping	S1B-14	25	50	1250	8	14	12.31	0.00985	220	Q8/26
	S1B-15	25	50	1250	8	14	12.31	0.00985	220	Q8/24

Table 2.2 Basement Stripping Chart

Table 2.3 Basement Corrosion Ratio

1. Basement	Column No	Project Reinforcement	Present Reinforcement	Corrosion (%)	Fyk (Mpa)	Stirrup Reinforcement
Stripping	S1B-18	14	13.19	6	220	Q8/24
	S1B-14	14	13.58	3	220	Q8/26
	S1B-15	14	13.36	5	220	Q8/24
			Average Corrosion	4		

In the beams of the building, the reinforcements in the span will be considered as the bottom reinforcement and the reinforcements in the supports will be considered as the upper reinforcement. Beam support lower reinforcement is taken as 1/3 of the upper support reinforcement.

Not less than 6 core samples will be taken to determine the existing concrete strength on the inspection floor.

6 core samples were taken from the ground floor of the examined building. The core sample was taken as shown in Figure 2.2. Figure 2.3 is the core sampling process of another project in Ümraniye.

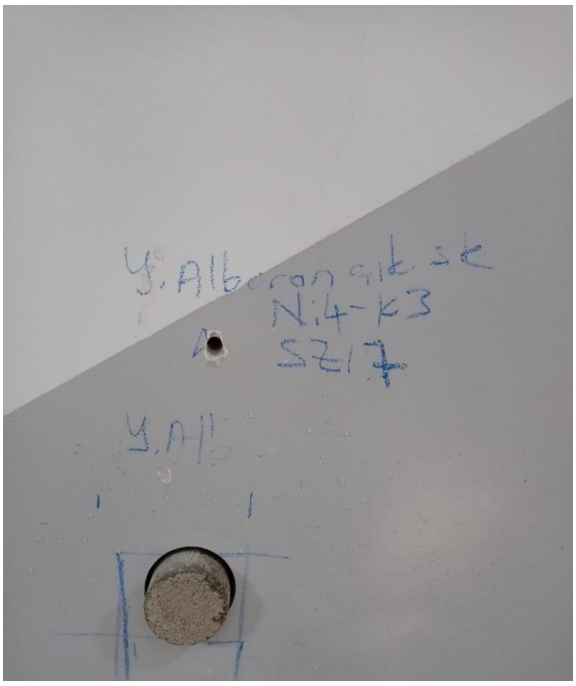

Fig 2.2

Fig 2.3

In researches, new ground research can be made of the land where the building is located, or the results of previous soil surveys can be used in its immediate vicinity. If a ground survey is not carried out, the project engineer decides to use the locally available data. If no inspection is made, the local soil class is taken as Z4.

The local ground class of the building located in the Kanlıca neighborhood of Beykoz district is shown as 'ZC' on the AFAD 2018 Turkey Earthquake Map. The earthquake ground motion level is also shown as DD-2.

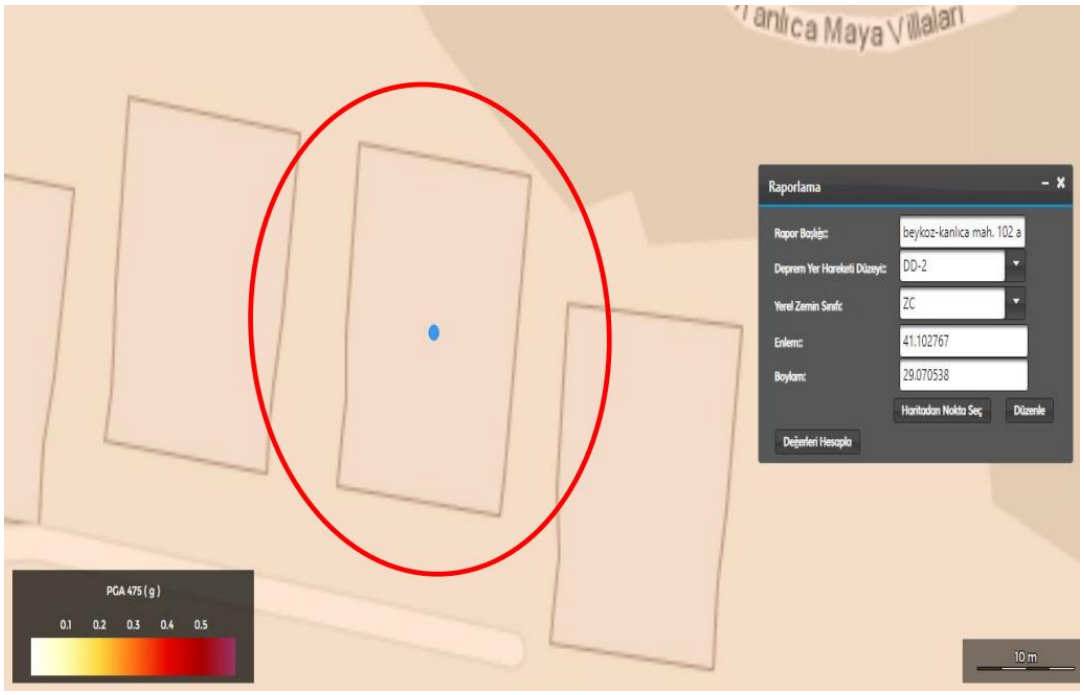

Fig 2.4

It is located at 41.1° latitude and 29.07° longitude coordinates of the building. Soil class is determined as ZC. ZC floor class; It states that it consists of very tight sand, gravel and hard clay layers or weathered very cracked weak rocks. Earthquake ground motion level 'DD-2' characterizes the infrequent earthquake ground motion in which the probability of exceeding the spectral magnitudes in 50 years is 10% and the recurrence period is 475 years. This earthquake ground motion is also known as standard design earthquake ground motion.

For the non-destructive compressive strength measurement of concrete, the test hammer process is applied to at least 20% of the number of columns in the examination floor. The way the test hammer is applied is by hitting the concrete. According to the hardness of the concrete, the body recovers more or less.

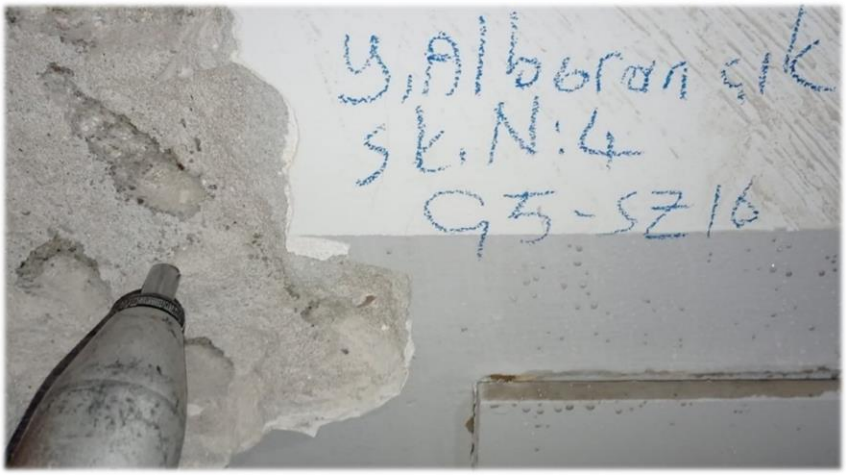

Fig 2.5

12 test hammer samples were taken from the investigated building. The application method is as shown in Figure 2.5.
With the reinforcement detection device, the reinforcements inside the columns and walls are detected and displayed in the reinforcement detection form. Reinforcement conditions are examined by scanning with the X-ray method.
Scanning of column reinforcements in the project is shown in Figure 2.6. Figure 2.7 shows the 3D drawing of the building via Sta4Cad.

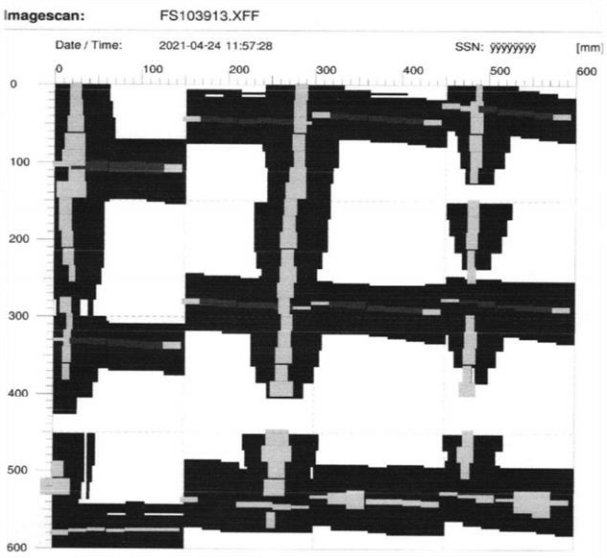

Fig 2.6

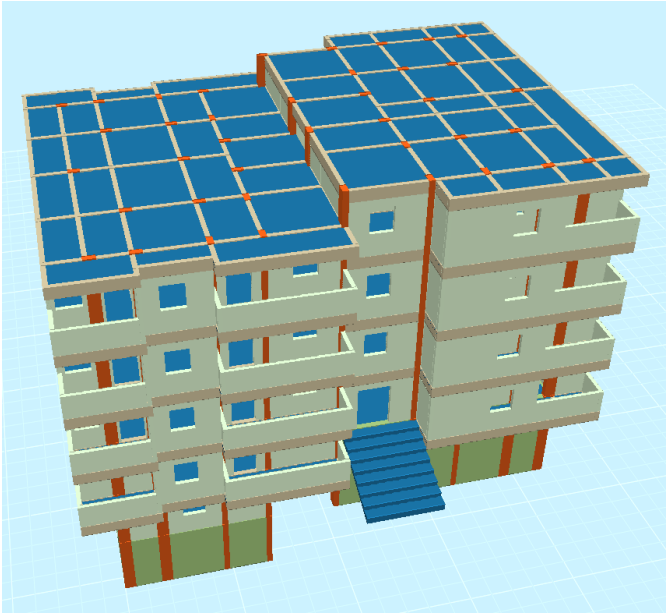

Fig 2.7

3 Results and Discussion

İstanbul / Beykoz / Kanlıca Yaşar Alboran Çıkmazı No:4 address building is located on Block 102, Plot 16.
The year of construction is unknown.
The building consists of 2 basements + 1 ground + 2 normal floors.
The sitting area is approximately 150m². The total usage area is approximately 1595m².
The floor system of the building is slab floors and its thickness is 12 cm.
Table 3.1 contains other information about the structure.

Table 3.1 Building Information

Building Purpose of Use	House
Structure Significance Factor	1
Number of Free Floors	5
Average Floor Height	2.93 m
Total Floor Height	17.6 m
Review Floor Seating Area	375 m²
Building Total Usage Area	1595 m²
Carrier System Behavior Coefficient	8
Live Load Participation Coefficient	0.3
Knowledge Level	Minimum
Knowledge Level Coefficient	0.9
Targeted Performance Level	Life safety

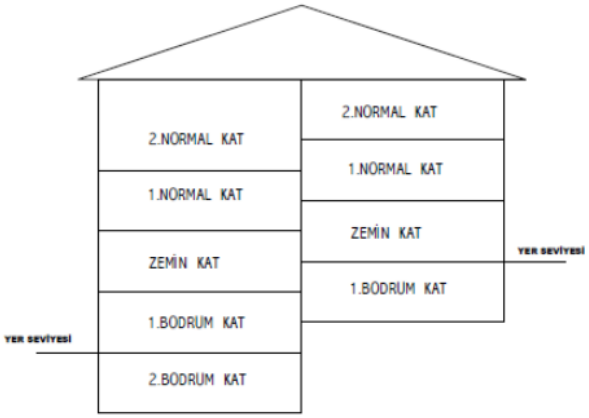

Fig 2.8

Fig 2.9

Figure 2.9 is the satellite view of the building.
Figure 2.8 is the schematic view of the structure in the X-Y plane.
The existing concrete strength of the building was measured as 9.6 Mpa. Concrete elasticity module is 15491.9 kg/cm².
The reinforcement class was found to be S220, and the elastic modulus of the reinforcement is 2200 kg/cm².
The modeling of the building was made with the help of Sta4Cad-V14.1 computer program after drawing the structural system survey in situ. During the modeling, the relevant articles were considered within the framework of RBTEIE2019 regulations and it is within the scope of the 3rd floor risky building.
In Table 3.2, the analysis results of the building's inspection floor are given via Sta4Cad.

Table 3.2 Analysis Results

3. kat Md/Mr moment kapasite sınırın aşan kolon sayısı : 27
3. kat (δ/h) relatif kat öteleme sınırın aşan kolon sayısı : 40

KOLON ve PERDE EKSENEL GERİLMELER (t)

Kolon	Ng	Nq	Ng+n.Nq	Ac	fck	σ =(Ng+n.Nq)/Ac
SZ01	59.60	8.19	61.06	1250	96	48.85
SZ02	39.65	6.33	41.55	1250	96	33.00
SZ03	40.56	5.65	42.22	1250	96	33.78
SZ04	36.66	5.89	38.63	1250	96	30.90
SZ05	56.68	7.91	58.57	1250	96	47.18
SZ06	44.80	5.59	46.48	1250	96	37.18
SZ07	43.19	5.53	44.85	1250	96	35.88
SZ08	33.92	4.90	35.40	1250	96	28.32
SZ09	71.36	8.65	73.96	1250	96	59.17
SZ10	47.88	8.19	50.27	1250	96	40.22
SZ11	32.70	5.45	34.34	1250	96	27.47
SZ12	36.51	5.01	37.26	1250	96	29.80
SZ13	37.68	6.56	39.62	1250	96	31.70
SZ14	30.08	5.33	31.63	1250	96	25.30
SZ15	46.48	7.36	48.66	1250	96	38.93
SZ16	35.48	5.75	37.20	1250	96	29.76
SZ17	48.19	7.16	50.34	1250	96	40.27
SZ18	40.68	6.46	42.57	1250	96	34.05
SZ19	101.64	15.66	106.34	1250	96	85.07
SZ20	45.04	7.48	47.28	1250	96	37.82
SZ21	51.61	7.71	53.92	1250	96	43.13
SZ22	121.68	15.64	126.52	1250	96	101.21
SZ23	39.90	6.46	41.84	1250	96	33.47
SZ24	50.88	7.57	53.15	1250	96	42.52
SZ25	43.11	6.48	45.07	1250	96	36.06
SZ26	50.83	8.56	53.40	1250	96	42.72
SZ27	30.69	5.15	32.22	1250	96	25.78
SZ28	38.47	6.32	40.37	1250	96	32.29
SZ29	38.30	6.30	40.19	1250	96	32.15
SZ30	33.47	5.18	35.03	1250	96	28.02
SZ31	50.89	7.76	53.22	1250	96	42.58
SZ32	59.22	8.34	61.72	1250	96	49.38
SZ33	94.96	8.25	96.83	1250	96	77.46
SZ34	33.97	5.32	35.57	1250	96	28.45
SZ35	35.76	6.08	37.58	1250	96	30.07
SZ36	56.01	8.03	58.42	1250	96	46.74
SZ37	45.83	8.52	47.17	1250	96	37.74
SZ38	39.62	5.42	41.14	1250	96	32.91
SZ39	35.76	5.07	37.28	1250	96	29.83
SZ40	72.11	8.78	74.75	1250	96	59.80

σ = 1578.56 / 40 = 39.464 (kg/cm²)

YAPI 3. KAT SINIR DEĞERLERİ AŞAN KESME KUVVETLERİ TOPLAMI (t)
Kritik Kat ortalama eksenel gerilme σ = 39.464 (kg/cm²) 0.1×fcm<σ<0.65×fcm ==> Ct=0.35×(0.65-C)/0.55=0.182
Kritik Kat sınır değeri = 0.182 = %15,2

Deprem kombinasyonu	Toplam kesme kuvveti	m ve (δ/h) sınır değerini aşan kesme kuvveti
-X yönü deprem	184.20	179.73 %98 > 15,2
+X yönü deprem	177.93	173.45 %97 > 15,2
-Y yönü deprem	202.12	202.12 %100 > 15,2
+Y yönü deprem	201.22	201.22 %100 > 15,2

3. kat, Riskli yapı kapsamına girmektedir. >

As a result of the performance analysis made according to RBTEIE 2019, the building is "RISKY".

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