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Examination of District Süleymanpaşa/Kumbag, province Tekirdag in terms of geotechnics

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Abstract

As in the whole world, the rapidly increasing construction in our country in recent years causes an increase in the demand for construction areas. With this demand, the construction areas may not respond to the structures we will make as ground strength. As a result, in such floors, the floor improvement process or the property of the structure to be built must be changed. Therefore, structures cannot be considered separately from the ground on which they will be built. It needs to be planned as a whole. Due to the fact that our country is a country located in the earthquake zone, ground surveys should be carried out before the structures are built. Although these ground surveys have been conducted more in the provinces, there are not many geotechnical studies that address the district-based structure-ground relationship and detail the ground infrastructure of the region by examining it. Therefore, in this study, we aim to eliminate this deficiency by considering the Kumbağ region of the Suleymanpaşa district of Tekirdağ from this point of view. For this purpose, ground survey reports prepared in the last few years in the region have been discussed, as well as the static and dynamic loads of the structures planned to be built, as well as the suitability of the structure to be built in terms of the strength of the ground, the seats that may occur on the ground have been calculated. Liquefaction conditions that will occur on the floors in the scenario of an earthquake with a magnitude of 7.0 in the region have been studied. It is discussed what kind of works will be carried out on the ground in case of adverse situations that may occur before and after construction in the region. As a result, a geotechnical infrastructure knowledge base of the region has been revealed.

Introduction

One of the natural disasters in the world and in our country is earthquake. It is known that many earthquakes have occurred in seismically active regions since the formation of the earth, resulting in the death of many people and the destruction of millions of buildings. Our country is located on one of the most active earthquake zones in the world.

According to the Earthquake Zones Map, it is known that 92% of our country is in earthquake zones, 95% of our population lives under earthquake risk, and 98% of large industrial centers and 93% of our dams are in earthquake zones.

In today's technology, it is not possible to prevent the occurrence of earthquakes or to predict when they will occur. However, it is possible to minimize the damage to life and property caused by earthquakes. The ground problem, on the other hand, is the excess of the building stock, which is almost everywhere in our country or built on problematic soils, further increasing the danger in an earthquake.

In Turkey, there are many studies to evaluate the lands from the geotechnical point of view in regions with soil problems [1-5].

Due to all these reasons, it was felt necessary to carry out such a study and a study was carried out on the Kumbağ region of Süleymanpaşa District of Tekirdağ province. Our region is located in a very risky region in terms of seismicity. Faults that may cause earthquakes within the borders of Tekirdağ Province; These are the fault fragments located on the edges of the Saroz - Gazi village fault and the depressions in the Marmara Sea.

The fault, which caused many earthquakes in the past, lastly caused an earthquake of 7.3 magnitude on 09.08.1902.

In this study, our aim is to examine the Soil Survey Reports (Geological and Geophysical Reports) made previously in Tekirdağ Province Süleymanpaşa District Kumbağ region, to evaluate these parcels separately from the geotechnical point of view and to reveal the ground condition of the region, to determine the soil bearing capacity of the examined parcels, the settlement under load acting on the structure. determine the amount and ground conditions. to analyze the liquefaction state.

Material and Method

Our study area is located in the Southern part of the Thrace Basin in Tekirdağ province Süleymanpaşa district Kumbağ region. It is surrounded by Malkara in the west, Muratlı and Çorlu in the north, and the Marmara Sea in the south. There is a 0-5% Topographical Slope. It is possible to study in any season. Study area Marmara region climate type provisions. Summers are hot and dry; winters are mild and rainy.

There is no mass movement (landslide, rockfall, collapse, crypt, soil flow) and potential, swelling, collapse potential, avalanche potential due to the structure of geological units (rock/ground), and it is a region with a very high earthquake risk when considered from an earthquake point of view.

By examining the previous Soil Survey Reports in this region; As a result of its location, field and laboratory experiments, and seismic studies, many data on the ground were obtained.

In the light of the data obtained from the Soil Survey Reports, the carrying capacity analysis, sudden and consolidated settlement analysis and liquefaction analysis of the region were carried out with the help of the Jeo Cad v3.9 analysis program. As a result of the calculations, it will be discussed whether a ground improvement process will be carried out by having information about the ground condition of these parcels.

Geotechnical analysis results

In order to define the soil and determine the soil parameters, fifteen boreholes were drilled in five different plots and measurements were made with the seismic refraction technique. Natural Unit Weight, Hydrometric Sieve Analysis, Triaxial Compression Test on Soil, and Direct Shear Tests on Soil were performed on the samples taken from the drilled wells in the soil laboratory. Groundwater was encountered at 2 - 3 meters in the study area. Information about the investigated area is given in Table 1. Analysis results are given in Table 2.

Table 1. Information about the study area

Parcel Information	Coordinates	Vs Vp Vs30	Ground water level (m)	Earthquake Data		Building Information BKS, I, DTS, BYS, Area
				Ss/S1/PGA/PGV/Fs/F1/Sds/Sd1	Ta-Tb-Tl	
Kumbağ 220/7	40.8695 27.4574	116 234 247.9	3	1.462/0.393/0.593/38.102/1.00/1.9 07/0.749/1.462	0.103/0.513/6.00	3/1/1/6/176
Kumbağ 220/3362	40.8744 27.4570	191 700 280	2.30	1.437/0.388/0.583/37.428/1.00/1.9 12/1.437/0.742	0.103/0.516/6.00	3/1/1/6/132
Kumbağ 399/12	40.8690 27.4586	198 1506 239.8	2	1.466/0.394/0.594/38.220/1.00/1.9 06/0.751	0.102/0.512/6.00	3/1/1/6/303
Kumbağ 390/17	40.8670 27.4574	385 782 479.6	2.15	1.474/0.396/0.598/38.448/1.20/1.5 0/1.769/0.594	0.060/0.336/6.00	3/1/1/6/195
Kumbağ 262/121	40.8734 27.4559	211 467 380.3	2.50	1.441/0.388/0.584/37.536/1.20/1.5 0/1.279/0.582	0.067/0.337/6.00	3/1/1/6/433

Tablo 2. Analysis results

Parcel Information	Floor Group	Bearing Power Analysis	Seating Analysis		Liquefaction Analysis
			Sudden Sitting	Consolidation Settlement	
Kumbağ 220/7	ZD	192<197 (X) İnsufficient	0.151>0.04(X) İnsufficient	0.217>0.04 (X) İnsufficient	0.208<1.1 (X) There is liquefaction
Kumbağ 220/3362	ZD	217.45<239 (X) İnsufficient	0.191>0.04 (X) İnsufficient	0.262>0.04 (X) İnsufficient	0.211<1.1 (X) There is liquefaction
Kumbağ 399/12	ZD	235.28<265 (X) İnsufficient	0.199>0.04 (X) İnsufficient	0.303>0.04 (X) İnsufficient	0.218<1.1(X) There is liquefaction
Kumbağ 390/17	ZC	181.75<183 (X) İnsufficient	0.011>0.04 (X) İnsufficient	0.221>0.04 (X) İnsufficient	0.02<1.1 (X) There is liquefaction
Kumbağ 262/121	ZC	180.10<264 (X) İnsufficient	0.621>0.04 (X) İnsufficient	0.297>0.04 (X) İnsufficient	0.267<1.1 (X) There is liquefaction

Conclusion and Suggestions

As a result of the examinations and researches made with the help of the JeoCad program, it has been seen that the soils in the region are insufficient in terms of bearing capacity. Soil group in our region. It has been determined that it is in the ZC, ZD class. Soil improvement is required on the ground where the structure will be built.

There is no definite limitation for settlement in the Turkish Building Earthquake Code. There are many scientists working in this field, and each seems to have different interpretations.

As a result of the analyzes we made in the JeoCad Program, it was seen that the settlement was above the acceptable limits.

When the liquefaction analyzes in the soils are examined, it has been observed that the ground water level of the structures in the range of 2.00 – 3.00 meters is below the groundwater level.

In the light of all these data, it is necessary to make improvements on the grounds on which the structures will be built.

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