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GEOLOGICAL REPORT
NATIONAL HISTORICAL MUSEUM

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1. INTRODUCTION

This report provides an overall assessment of the Tirana area. The object under study is located in Ded Gjo Luli Street, Tirana.

2. PURPOSE OF THE STUDY

The purpose of the geotechnical study is to determine the physical-mechanical characteristics of the soils and rocks that meet in the area where the object is built (National Museum). For this, investigative works have been performed with dynamic penetrometer, and their geotechnical interpretation has been performed. The data from the field works of other authors, old studies, etc. were also used.

3. RELIEF AND POSITION

The place where the facility was built is in the central part of the city of Tirana. In this area we have two large geomorphological units; the first unit is the terrace of alluvial origin where the city of Tirana was built and the hills east of the city of Tirana.

The area where the city of Tirana was built represents the plain city of Tirana. This medium-sized terrace on which the city of Tirana was built is of alluvial origin created by the erosion and deposition of the Lana and Tirana rivers. In some parts of this terrace are very developed negative physio-geological phenomena such as collapses and landslides of cover formations but also the narrowed part of the root formation.

The hills of the eastern area of the city of Tirana, are small hills on which the villages of the area are built. These hills are built of sedimentary rocks that are fragmentary deposits (clay, siltstone and sandstone). Terrigenous or fragmentary formations are weak rock formations and form slopes with a gentle slope. At the base of the slope are agricultural lands planted with fruit trees and some cases with wheat corn and vegetables.

Figure 1. Satellite Image of the National Historical Museum of Tirana (taken from Google Earth).

4. GEOLOGICAL CONSTRUCTION

The lands of the city of Tirana are divided from the geomorphological point of view into three categories, in the lands of sub horizontal plain terrains, in the lands of hilly terrains and in the lands of mountainous terrains. The construction site belongs to the category of plain terrain lands. These terrains fully represent the alluvial terracotta plains of the Tirana, Lana and Tërkuzëz rivers. From the geomorphological point of view, the present features of the land of Tirana and its surroundings have been gradually taken during the plio-Quaternary geological development of a wider region, the Tirana-Ishëm depression (syncline), which is included in the easternmost part of the Pre-Adriatic Lowland.

These features express the ratio of the interaction of internal and external forces, which have conditioned the formation of today's relief. Internal forces have led to escalating tectonic differentiations of various parts of the region as ups and downs. These in turn have been subjected to the action of external factors (corrosion, leaching, accumulation, etc.) which have further shaped and developed them. At the end of the Miocene (hand-to-hand, going north of this structure, sedimentation continued until the Pliocene) the syncline bend of Tirana had risen above sea level and was subject to erosion and rinsing. The Plio-Quaternary era (N_2 - Q_1) left no trace of accumulation. Conditions for the accumulation of solid river inflows were created there by the end of the Middle Pleistocene (Q_2) when the region was in decline. At this time the region is further differentiated into hilly area (unit) and plain area (unit).

Hilly unit - This unit includes the suburbs of the city of Tirana, which are characterized by a raised hilly relief, which have been subject to erosion and rinsing starting from the Pliocene until today.

Here we distinguish the hills on the south and south-west side, which are those of Yzberisht, Selita e Vogël and Sauk. They represent ridge-shaped hills with steeper slopes (about 20 - 35 °) than the western ones. Coming towards the city, the slopes soften until they take the form of low hills and ridges that reach a height of 150 - 200 m.

The hills on the north side lie mainly in the Babrru area, building (representing) the northern slope of the Tirana River. The slopes of these hills have a gentle slope of about 10° - 15°. These are mostly built of sandstone. The hills on the east side stretch from Sauku to Shish - Tufina. The relief from this side gradually rises until it passes into hilly-mountainous relief with an immediate breaking of the slope to form the western slope of Dajti mountain. This hilly relief, in general, is divided by a not very dense network of streams and streams, which end in the main arteries of our region, in the river of Tirana and in that of Tërkuzë.

Field unit - includes the lowest part of the region, the plain area, which from place to place is scaled, in the form of terraced levels (stairs). Inside the city of Tirana these terrace levels are well decipherable, not only because of the numerous systems and constructions, but also because here the terraces (2-3 levels) are supported, even buried due to the tendency to dive continuous area during the Quaternary.

In the sector Shtish - Tufina - Kinostudio there are two terrace levels (terraces of the erosion-cumulative type). Gradually this level comes lower in the direction of Kinostudios where it goes down to 145m. Then in the direction of the center of Tirana and the former Textile Factory "Stalin" lower further.

The thickness of alluvial deposits of terrace II ranges from several meters (in the sector Shtish - Tufina - Kinostudio) up to 30 - 40m (Technological College - Bread Factory, former Wood Factory "Misto Mame"). This large thickness of alluvium of this terrace in the city area and further west, indicates a continuous decrease of this area during the formation of the terrace (during the middle and upper quaternary) (Q2-3) and its sinking. in the direction of the Stalin Textile Factory. During this time the river of Tirana had to have the direction from Kombinati and joined the river Erzen nearby, where today is the Beshir Bridge.

Over time (during the new quaternary and today) (Q_3 - Q_4) the riverbed of Tirana has shifted more and more from north - west (towards Kamza) to the current state. This conclusion is supported by the relatively small thickness (from several meters to 10 - 15m) that alluvium has on this side, which build the first terrace of the Tirana River. This terrace, in the sector of Brari Bridge - Antibiotic, is of the erosional-accumulative type, while below it is of the accumulative type. It has greater development from the left bank of the river, thus forming a wide plain, which receives its greatest expansion starting from the Allias. From the right bank of the river this terrace has limited development, mostly in fragmentary form. Just starting from below Babrru this terrace expands quite a lot especially below the Higher Agricultural Institute. The terrace of the river of Tirana (its surface) has an absolute height of about 150m at the Shoe Factory 90m etc. The height from the river bed ranges from 6-8m (at the dog school) to 3-4 m at the Meat Factory.

The alluvium of this terrace is sometimes deposited directly on the bedrocks (siltstone and shale) and other times on the alluvium of the second terrace. Their greatest thickness reaches up to 15-20m, represented at the top by plastic clays and sometimes by mud (Allias-Party School) with a thickness of 2-3m. The lower part is built of gravel, mainly of limestone composition and filled with sand material.

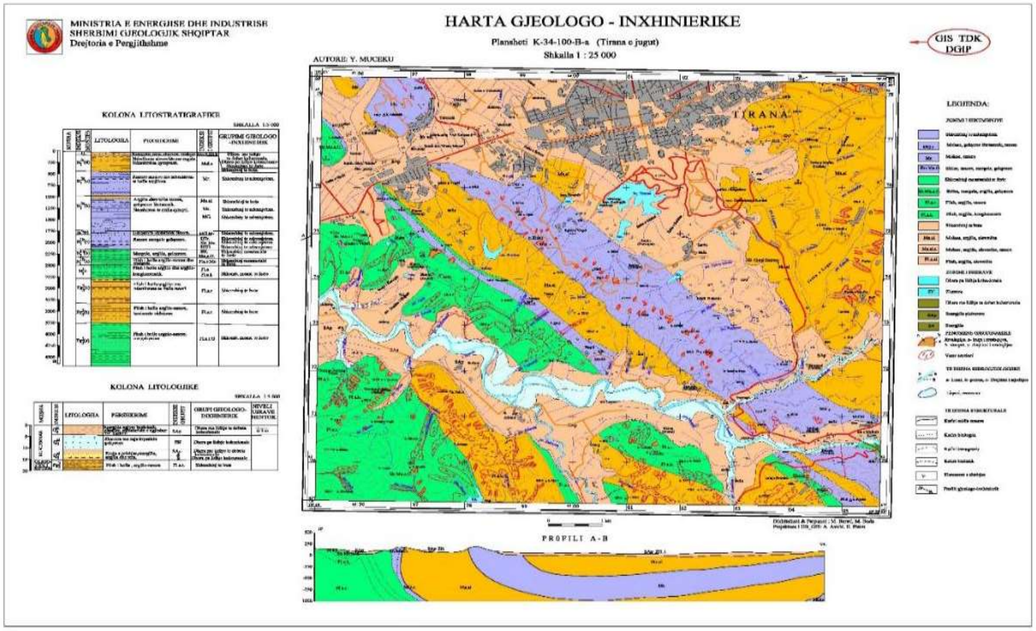

Figure 2. Geological Map of Tirana

4.1 STRATIGRAPHY

Holocene (Qh)

Holocene deposits are widespread in Albania. Almost all genetic types such as continental, intermediate and marine are found in this section. The most widespread are alluvial deposits, which have almost completely filled the Adriatic Lowland from Shkodra to the vicinity of Vlora. Other genetic types, such as proluvial, eluvial and deluvial, marshy and lake, lagoon and marine, have significant prevalence, which we will describe in more detail below.

The Holocene section is becoming more and more detailed and divided into two floors, the Early Holocene and the Late Holocene, often referred to as the Historic Holocene. It got this name because on this floor the traces of human civilization have begun to be distinguished.

In our country, from the recent works, Early Holocene formations have been singled out through the study of Sporopolins and the determination of the absolute age and fossils to be treated in the relevant chapter, as well as the late Holocene, (historical) mainly based on archaeological data. Regardless of the data obtained, the Holocene will be treated undivided and the areas where the data were obtained will be treated more extensively.

Alluvial deposits

They are widespread in the lowlands, in the middle reaches of the rivers, and often in the upper reaches. In the middle and upper flows, they form the bed terrace deposits as well as the present

bed deposits, which belong to the late Holocene. These deposits have been and are the object of exploitation of aggregates, as they are mainly represented by gravel, gravel and sand. We find these deposits in all our rivers, Droje, in Zeza and Tërkuze, the river of Tirana and Erzeni.
In the area of Tirana- Ishm we have alluvial deposits formed by the tributaries of the river Ishm. Early Holocene alluvium is distinguished in this area, which belong to the deposits of the first terrace level found in the area of Mëzez Ishëm and those of the late Holocene that we meet in the Ishm estuary and belong to the level of the bed terrace. They are mainly represented by alevrite, fine sands and clays.

5. REGIONAL TECTONIC AND NEOTECTONIC

The Tirana region is part of the Lowland with the same name, part of the Pre-Adriatic Lowlands, which has its origins in the Tortonian, during the late geosynclinal era. The deposits formed within it belong to the molasses formation. Structurally, these deposits build today a relatively wide and long syncline structure, with asymmetric construction, the wings of which are confined by the transgressive extension of the molasses deposits on the old Cretaceous-Lower Miocene (Burdigalian) basin or by the eastern and western regional faults. of western. The axis of this syncline generally extends from the southeast to the northwest, starting from the region of Elbasan and continuing in the plain of Tirana - towards Fushë Krujë, until its sinking in the Adriatic Sea, in the confluence of the rivers Ishëm and Mat. During the overall performance, this axis undergoes partial changes of direction that is clearly noticed by the exploration works. The Tirana syncline is very asymmetric: its asymmetry is caused by the development of a regional fracture that extends at the eastern foot of the Preza hills to the southeast to Kashar, Gropaj, and between Sharra and Vaqarr, passing slightly west of Petrela, continues straight southeast, always between Lower Miocene and older deposits of the basement of the structure. This fracture has led to the placement with a large drop angle from 30 - 50 ° up to a vertical placement of molasses deposits from Krraba Crest to Petrela, and further northwest in Mëzez, etc. The other regional fault that has affected this structure, the eastern one, is the great over thrust of the Dajti mountain- range that is fixed inside the syncline only in its southeastern and northwestern part (Krujë-Thumanë) with paving elements Az. = 50-60° and drop angle 60-80°. Both of these regional faults are usually accompanied by smaller secondary faults.

The Tirana syncline during the Pliocuaternary neotectonic stage in the south towards Qafe Krraba has experienced the largest increase, while to the north the increase is fading, which is reflected in the filling of this syncline with Quaternary deposits and the lack of terraces in the Ishem River.
The eastern edge of the Tirana syncline is placed inconsistently on the carbonate and flysch structures of Makaresht and the lack of new detachments is the reason why the contrast in relief is small. The western edge of the syncline bordering the new backward tectonics with the Preza monocline has a clear contrast in relief and is more active from the point of view of earthquake

generation.

6. HYDROGEOLOGICAL CONDITIONS

Depending on the lithological types of rocks that make up the city of Tirana and its surroundings, there are two aquifers such as; Quaternary deposit aquifer complex and Aquifer complex of molasses root formation

I. Within the Quaternary aquifer complex, two aquifers are distinguished:

a. The phreatic water horizon is mainly associated with poorly cemented conglomerates of overgrown terraces.

From the multi-year measurements of the depth of the water level extension, it results that we are dealing with a regime with the highest-level in the months of February-March and the lowest in the months of September-October. The amplitude of the level fluctuation ranges from 3m in the central area of the city, up to 5m in its eastern area. The direction of the movement of the phreatic waters, as it results from the map of the hydro- isochrones, is made from the east to the west, ie parallel to the current flow of the Tirana river. The waters of this aquifer are mineralized waters less than 1 gr / l of the hydro chemical type Ca (HCO3) 2 with pH = 7-7.4 hardness, 16 ° -18 ° and non-aggressive.

b. The horizon of water with sub artesian pressure

Alluvial gravels with mainly limestone composition of the Tirana plain form the second aquifer with subartesian character. This aquifer is fed mainly by the Tirana River and partly by the Lana River in the sectors where gravel comes to the surface, in which this horizon takes on a character without pressure. This horizon is quite aquatic and valuable. Alluvial gravel waters have a mineralization of 0.5 - 0.7 gr / l hardness 16 ° - 18 °, with predominant ions of calcium, magnesium and hydrocarbons. These waters are not aggressive to concrete and metal structures.

II. The aquifer complex of root formations is associated with the sandstones and conglomerates of Tortonian. From these formations emerge the rare springs with small inflows. They are permanent springs with very variable regime and are used as drinking water of the surrounding areas.

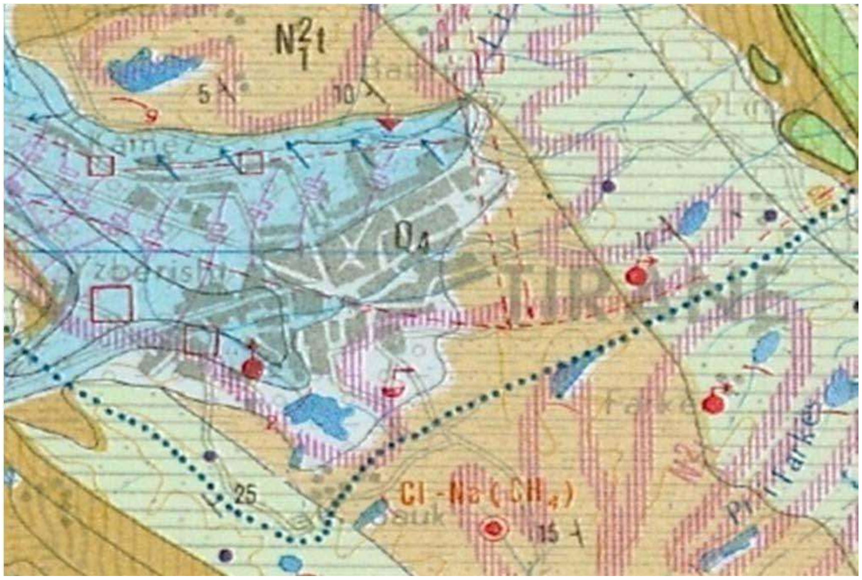

Figure 3. Hydrogeological map of Albania, Tirana area. Sh: 1: 200 000

7. GEODYNAMIC PHENOMENA

In the study of geological phenomena of this area we are based on existing studies and new information we have received from the current study. Based on these data we are describing the geological phenomena that are present in the geological formations that meet in this area. The most obvious geological and geodynamic phenomena observed in this area are:
1. The phenomenon of weathering and alteration
2. The phenomenon of consolidation of marine deposits

These phenomena can be explained briefly below:
1. The phenomenon of weathering is evident in the root formations consisting of clays and siltstones. These rocks are new deposits and with poor clayey cementation, those under the action of atmospheric agents are transformed from soft rocks into soils. This phenomenon is more common in the hilly part of the area.

2. The phenomenon of consolidation of marine deposits these deposits consist of layers of sand and clay with content of organic matter. The sand layers are slightly to moderately consolidated and under the action of the load these layers consolidate for a short time. Clay layers consolidate under the action of loads for a relatively long time. The presence of organic matter complicates and prolongs the consolidation time because organic matter decomposes over time, during decomposition it changes its volume and brings immediate reductions which negatively affect the stability of objects placed on these layers.

8. SEISMICITY

Definition Of Dynamic Site Response (Rdt)

Numerical probability methods were used to determine the dynamic response of the RDT plot. The main points with this procedure are

- Macro-seismic framing of the area
- Seismogenetic area of the referent
- Introductory accelerometers
- Determining the calculation code
- Determining the calculation model
- Calculation of the maximum horizontal acceleration (known in the specialized literature as the PGA field) expected on the ground.

The final result is the elastic response spectrum or spectra presented to the structural designer.

Macro-seismic framing of the area

In the seismic relation of RDT (dynamic ground regime), it is of special importance to make an analysis of the historical seismicity of the area. According to the seismic zoning map, the city of Tirana is included in an area with intensity I = 7 points MSK 64 for average land conditions (Sulstarova et al., 1980). According to the study of seismic microzoning of the city of Tirana, in special areas the seismic intensity can go up to 8 points MSK-64 (Kociu et al., 1988). The city of Tirana from the geological point of view takes place in the molasses syncline of Tirana, between the active counter-attack that limits the syncline of Tirana from the west and the active over-pressure that complicates the inverted arm of the Dajti anticline (Aliaj, 1988). Many earthquakes have been generated from the area of active detachments of Tirana, where we mention:

Earthquake of 1617 with Io = 8 points (MSK-64) in Kruje,

Earthquake of 5 September 1843 with Io = VIII-IX front MSK-64,

Earthquake of October 20, 1851 with Io = VIII-IX front MSK-64 that caused serious damage,

Earthquake of 26/08/1852 with Io = 8 points (MSK-64) in Cape Rodon,

Earthquake of 16/05/1860 with Io = 8 points (MSK-64) in Beshir Bridge,

Earthquake of 16 August 1907 with Io = VIII front MSK-64;

Earthquake of 04/02/1934 with Ms = 5.6 in Ndroq,

Earthquake of 19/08/1970 with Ms = 5.5 and Io = 7 points (MSK-64) in the area of Vrap,

Earthquake i16 / 09/1975 with Ms = 5.3 in Cape Rodoni,

Earthquake of 09/01/1988 with Ms = 5.4 in Tirana.

Seismogenetic of the referent area

Earthquake epicenters are mainly concentrated during disconnections or areas of active disconnections (Aliaj, 1988). Determining seismogenic areas or seismic source areas, as they are otherwise called, is the first fundamental step in probabilistic earthquake risk analysis. Seismic source areas represent terrains with common seismological and neotectonic features; this means that seismicity in an area of seismic resources is uniformly distributed throughout the area and future earthquakes can occur anywhere in the area. Thus, seismic resource areas are defined by two fundamental instruments as; by seismicity profile and from the current tectonic regime of the region under consideration.

Seismic source areas 2004 (Aliaj et al., 2004), which are:

1. Area of Lezhë-Ulqin (LU) me Mmax=7.2
2. Area of Ultësirës Pranadriatike (PL) me Mmax=7.0
3. Area of Bregdetit Jonian (IC) me Mmax=7.0
4. Area Korçë-Ohër (KO) me Mmax=6.9
5. Area of Elbasan-Dibër-Tetovë (EDT) me Mmax=6.9
6. Area of Kukës-Peshkopi (KP) me Mmax=6.5
7. Zona Shkodër-Tropojë (ST) me Mmax=6.5
8. Area of Pejë-Prizren (PP) me Mmax=6.8
9. Area of Shkupit (SK) me Mmax=6.5

Parameters for seismic source areas

Highest magnitude estimates were made for each earthquake source area taking into account the largest earthquake observed in the area under consideration, the magnitude of the earthquakes occurring in the respective seismic bands, and the tectonic logic of the occurrence of major earthquakes. The best Mmax estimates have been made taking into account the largest known earthquakes in similar tectonic environments. Albania's epicenters are mainly concentrated
along the active disconnections, which are 3 longitudinal and 2 transverse active disconnection zones as follows:

Detachment with Ionian-Adriatic overpass, extending in the direction VP-VVP;
Separation area grabs Shkodër-Mat-Librazhd (direction VP)
Separation zone grabs Peshkopi-Korça (direction VJ)
Normal detachment area Shkodër- Tropojë (direction VL)
Normal detachment area Elbasan-Dibër (direction VL)
The transverse zones Shkodër-Pejë and Vlorë-Tepelena divide the detachment zone with Ionian-Adriatic overhang into 3 segments (North, central and south). The overcurrent detachment area is represented by 3 normal detachments, controlled graben and semi-graben (Shkodra Pliocene-Quaternary graben, Mati Miocene graben, Librazhd Miocene graben.
Our study area is part of the Pre-Adriatic Lowland (PL) area which is a coastal area that includes post-Pliocene overhangs in oblique thrust with V to V-VP extension, which are cut transversely from rare thrust-type detachments with LVL extension. This disconnection zone is still active and seismogenic, during which the strongest earthquakes were recorded, such as: March 1273 Ms = 6.6; 17 October 1851 Ms = 6.6; 17 December 1926 Ms = 6.2; September 1, 1959 Ms = 6.2; 18 March 1962

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Ms = 6.0 (Sulstarova et al., 2005, Papazachos & Papazachos, 1989). Focal mechanism resolution and microtectonic studies show that this area is in oblique propulsion regime (Sulstarova, 1986; Muço, 1994). Based on the largest earthquakes recorded in the past in this area, in the future, earthquakes with Mmax = 7.0 may occur

Geotechnical model of the construction site

Based on the performed studies, a one-dimensional 1D sizmostratigraphic model was constructed consisting of pianoparallel layers with reciprocal rigidity. From the geological-engineering point of view, we distinguish 4 layers with different physico-mechanical properties.

Layer No. 1: 0 -2 m filling material with Vs= 190 m/s

Layer No. 2: 1 -4 m a combination high and low plasticity clays with Vs= 290 m/s

Layer No. 3: 4 - 8 m high plasticity clays and medium gravel mixture with Vs= 430 m/s

Layer No. 4: 8 - 21 m gravel with Vs= 500 m/s

The geotechnical model of the construction site was compiled based on the geological-engineering data and the seismic wave velocity values determined for the construction site formations. The geotechnical model of this construction site was defined as a 4-layer model in accordance with the geological-engineering data and our estimates for transverse seismic wave velocities. Seismic basement depth is accepted at depths above 30 m, based on measured transverse wave velocity values. The amplifying environment of seismic oscillations are surface layers with a total thickness of 21 m.

Site classification according to the Albanian Design Code KTP-N2-89

The classification of lands used in the Albanian Design Code KTP-N2-89 (see appendix N ° 1) for seismic risk assessment is based on the study for seismic zoning of the country, where the concept of average land conditions is given for the first time. (Sulstarova et al., 1980). Quaternary lands with large thickness, compaction and great depth of groundwater have been evaluated as lands with medium conditions, for which no increase in macrosmic intensity has been observed.

-According to this Code, this construction site is classified of the Second Category with letter c.

c. Loamy formations

1. 1. Low plasticity sandy silt, sandy clay with or without the content of granular material, in a strong plastic and elastic state with moisture.

Site classification according to EC 8

In accordance with the definitions of EC 8, the impact of local soil conditions on seismic action can be considered by considering five soil classes A, B, C, D, and E. In accordance with these requirements for site classification according to EC 8 and based on the calculated parameters can estimate that the parameter VS_{30} By the method MASW -> VS30 = 392 m/s.

-According to EC 8, the geological environment in this construction site is classified as Class B.

Highly compacted sand, very hard gravel or clay deposits, characterized by a gradual increase in mechanical properties, with increasing depth and equivalent velocity values between 360m/s and 800m/s

From the seismic noise recordings, the HVSR graph was calculated and analyzed, with the following parameters; distance of time frame 30 s, smoothing with triangular frame as large as 5% of the central frequency. We are dealing with a recording in which the peak (H / V> 2) at the frequency f0 = 0.947 Hz is clearly visible and with an amplitude A0 = 3.385 which is confirmed by meeting the SESAME validity criteria. The vibration period of the ground is: T0 = 1 / f0 = 1.055 sec.

As a conclusion we can say that the most preferred and recommended variant for the design of the building in this construction site is the use of the spectral curve normalized according to EC8 with these parameters: The period of ground vibration is: T0 = 1 / f0 = 1.055 sec. amax = 0.466 * g, Se (T) max = 1.206 * g, TB (s) = 0.090s; TC (s) = 0.276 s; TD (s) = 2,592 s.

9. FIELD WORKS

To determine the detailed geological and geotechnical conditions of the area where the facility will be built, a detailed work program has been drafted which will be rigorously implemented by the study group. The field works aim to determine in the field the characteristics of geological formations as well as the identification of geodynamic phenomena.

Purpose of fieldwork

The purpose of the fieldwork is to determine the geotechnical and geological characteristics of the formations of the area in question. In the field work phase, disturbed and undisturbed samples were recovered for laboratory analysis.

Processing of the Dynamic Penetrometric Test

A test was performed with a Pagani TG 30-20 Dynamic Penetrometer manufactured by Pagani Geotechnical Equipment, Piacenza.

Device Features

Dynamic Penetrometer DPM, Tipi Pagani TG 30-20
Weight of the rocking mass: 30 kg
Free falling height: 20 cm
Type Diameters: 35.7 mm
Aste length: 100 cm
Weight of Aste per meter: 2.4 Kg
Distance between readings: 10 cm

Operating opening angle: 60 °

The correlation factor between N10 (number of strokes per 10 cm of its sinking) of Nspt is: Nspt = 0.9xN10.

1 dynamic penetrometer test was performed at this depth of P1: 11.0 m. The execution of the test was performed regularly, without any problem, ensuring maximum verticality. During the extraction of the test layers, wet material was observed, which indicates that the test passed in mostly weak and moist formations.

Investigation Notes:
The data processing is based on known empirical correlations providing a non-specific lithostratigraphic construction, but derived from the operator's interpretation, and from the information obtained on site during the penetrometric test. Data processing was done with ProgramGeo (Italy) SCPT software. In this software for the calculations of various geotechnical parameters the empirical correlations of the authors in literature

10. GEOTECHNICAL CONDITIONS OF THE STUDIED AREA

Based on the data collected from the penetrometer test performed and similar works previously performed in the area of our facility and in the vicinity of the area, determination of their properties and characteristics, estimating the mass of natural moisture, the measure of consolidation by Assessing the state of their ecosystem and other parameters, it was concluded that the site studied for the construction of this facility is in relatively good geological-engineering conditions.

Layer No.1

It is represented by a mixture of various thrown materials, consisting of construction wastes such as pieces of bricks, tiles, concrete, stones, etc., which have been used to fill and arrange the square. This layer is met in the entire site surface with a thickness of about 1.3m and since it is not very uniform and is not used in any case for supporting the foundations.

Layer No.2
Consists of light to medium beige to brown beige silt and clay deposits. They are moist in plastic condition. They are moderately consolidated. They are found at depths from 1.3-9.0m.
Physical -mechanical properties:

Specific gravity	Gs= 2.60
Bulk unit weight	γ = 1.84 gr/cm^3
Dry unit weight	γ_d = 1.51 gr/cm^3
Deformation modulus	E=165 kg/cm^2
Angle of internal friction	φ = 25°
Cohesion	c_u = 0.47 kg /cm^2
Allowable bearing capacity	σ = 1.50 kg / cm^2

Layer No.3

It is represented by beige to gray silts and clays, which are moist, these soils are sandy and include carbonate. They are medium hard plastic, moderately consolidated. They are found at depths of 9.0–10.6 m.

The physical-mechanical properties of this layer are:

Specific gravity	Gs= 2.65
Bulk unit weight	γ = 2.09 gr/cm^3
Angle of internal friction	φ = 28°
Cohesion	c_u = 1.30 kg /cm^2
Allowable bearing capacity	σ = 2.0 kg / cm^2

11. CONCLUSIONS AND RECOMMENDATIONS

1. From the point of view of geological construction, the area where the facility was built is located in the alluvial deposits of the second terrace of the river Tirana. These deposits are based on terrigenous (clay sand) of the Tortonian age.

2. The conditions of the square where the facility is built are relatively good.

3. From the field observations it is estimated that the dynamic level of groundwater is in the range -4.5 - 5.0m

4. During the geological survey and field geological works that have been carried out for the geological study, no phenomena of massive soil movements have been ascertained.

5. Seismically according to the Albanian Design Code KTP-N2-89, the construction site is classified of the second (II) category letter C. Formations such as; Silts and clays with or without the content of granular material, in stiff plastic and elastic state with moisture.

6. According to EC 8, the geological environment in this construction site is classified as Class B. Very dense sand, gravel or very hard clay deposits, characterized by a gradual increase in mechanical properties, with increasing depth and equivalent velocity values between 360m/s and 800m/s

7. No cracks or sagging in the foundations are noticed.