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EXTRAS

**ASPECTS REGARDING THE DEGRADATION OF A
RETAINING WALL WITH THE DESTINATION TO
REINFORCE THE STABILITY OF THE SITE
ARRANGEMENT OF RESIDENTIAL BUILDINGS**

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Abstract. Performing the diggings nearby and/under the implantation quota of some existing buildings may trigger on the structural elements and/or over the arrangement site states of efforts or additional deformations, which may diminish the reinforcing capacity and/or loss of local/general stability given certain conditions of induced load.

The paper presents situation generated by the execution of a section of domestic sewage, near and under the implantation foundation of a retaining wall having the role of maintaining stability of the arrangement site of residential buildings.

Key Words: Retaining Wall; Stability; Degradation; Cracks; Linear Shifts; Angular Shifts.

1. General Aspects Concerning the Arrangement Site

The site which forms the object of the analysis is situated at the Eastern limit of Râșnov town, on the national road (DN1) between Râșnov and Poiana Brașov, next to the properties 14 and 16 on the Cetății St. [1].

The Northern side of the arrangement site is bordered by a retaining wall of natural stone masonry, with a role of maintaining the stability behind it, which is the support for the buildings-located at the numbers mentioned above.

The analysed area is part of Cretaceous age, characterized by polymictic conglomerates that form the petrographic structure of the Mountains Poiana Brașov. The Morphology of the land plot shows that real estates are located on a platform artificially arranged, dug in a cenomanian conglomerate towards the Southern slope, a gritty powder diluvium to the North and behind the retaining wall an inhomogeneous stuffing layer made of scratchy rocks, sand and dust (Fig. 1).

The DN1 national road is bordered on the South side by the retaining wall of the analysed site and is located on the axis of the Cetății Valley, the water course being directed by a system consisting of concrete ovoid pipes located under the road.



Fig. 1. – Appearance of earth filling behind the retaining wall.

2. Aspects Regarding the Degradation of the Retaining Wall

2.1. The Causes that Triggered the Degradation

During the execution of works of domestic sewage on the Cetății street in the town of Râșnov, near the buildings no. 14 and 16, located on the right side of the road Râșnov–Poiana Brașov, the reinforcing and stability of a part of the retaining wall that ensures the maintenance of stability of the site of the above mentioned buildings was affected.

The status of degradation was determined mainly by the digging works on the main domestic sewage collector, carried out near and under the implantation quota of the retaining wall and left open on relatively large length, for a certain period of time [1]. The state of degradation was favoured also by the action of other disturbing factors such as [2]

- a) the moisturizing of the earth under the retaining wall due to rupture during the digging works of a pipeline of the street water supply, located about 1.0 m from the basis of the wall;
- b) the reduced length of the implantation of the wall base on the land and lack of the borehole;
- c) the vibrations produced from road traffic;
- d) the technical status of the stone masonry.

capacității de rezistență și/sau la pierderea stabilității locale/generale în anumite condiții de solicitare induse. În lucrarea de față este prezentată o situație generată de execuția unui tronson de canalizare menajeră, lângă și sub talpa de fundare a unui zid de sprijin, cu rol de menținere a stabilității amplasamentului unor clădiri de locuit.



Fig. 8. – Blocking the movement of the retaining wall (using concrete works) and sustaining its wall parament.

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REFERENCES

1. Tamaș F.L., *Retaining Wall DN 1E, Râșnov, Valea Cetății St.* Techn. Report No. 21/2008, 2008.
2. Budescu M., Ciongradi I.P., Țăranu N., *Reabilitarea construcțiilor.* Edit. Vesper, Iași, 2001.
3. Tuns I., *Computation and Foundations.* Publishing House of the Transylvania University, Brașov, 2004.
4. Tuns I., Mîntulescu M., *Aspecte privind realizarea unei fundații tehnologice de dimensiuni mari în apropierea și sub cota fundațiilor structurale existente.* A XI-a Conf. Națion. de Geotehnică și Fundații, 384 – 391, Timișoara, 2008.

ASPECTE ALE DEGRADĂRII UNUI ZID DE SPRIJIN CU ROL DE MENȚINERE A STABILITĂȚII AMPLASAMENTULUI UNOR CLĂDIRI DE LOCUIT

(Rezumat)

Execuția săpăturilor în vecinătatea și sub cota de fundare a unor construcții existente poate determina asupra elementelor structurale componente și/sau asupra amplasamentului stări de eforturi sau deformații suplimentare, capabile să conducă la diminuarea

state of degradation, evidenced by cracks, exfoliations of material, by separation of the mortar from the joints and stones of the wall, enabling the development of vegetation (Fig. 7).



Fig. 7. – Portions of the wall with extended cracks, detachments of stone and abundant vegetation.

The form of manifestation of the presented degradation highlights the retaining and stability capacity of the retaining wall affected as a result of the sewerage works [4].

To restore the newly created situation, emergency measures are required aimed at restoring the strength and stability condition of the retaining wall affected following the sewerage works.

3. Conclusions

The major movements of the section affected by the sewerage works have determined the separation of parts of the retaining wall, entailing significant portions of land behind it, thereby endangering the safety of the two buildings located at the site bordered by the wall.

The degradation state resulted imposes urgent measures to stabilize the movement of the element of land retention in the site, followed by execution of a new section, at the same time with restoration of stability and the mechanical characteristics of the soil. The proposed rehabilitation measures consist in conducting two main stages of work

a) blocking the movements of the wall base by casting of a stuffing concrete (C5/7.5) in the trenches made at its basis, while ensuring a support for the wall paramant [2] (Fig. 8);

b) replacing the affected section with a new design, made of reinforced concrete and reinforcing the soil on the site by compaction and/or added injection material [4].

The linear and angular movements of the portion of the wall bounded by serious cracks have generated their separation from the wall and trigger of land portions expanding to the existing buildings (Figs. 5 and 6).



Fig. 5. – Portion of the wall detached from the wall.



Fig. 6. – Crashing of portions of land behind the retaining wall.

The long action of environmental factors have contributed fully to enhance the

by cracks whose opening reaches to 10 cm.

The opening of cracks formed in the area is accentuated in the area of the compression joint on the wall height, but cross also the support area of the protection bulwark achieved subsequently, (Figs. 3 and 4).

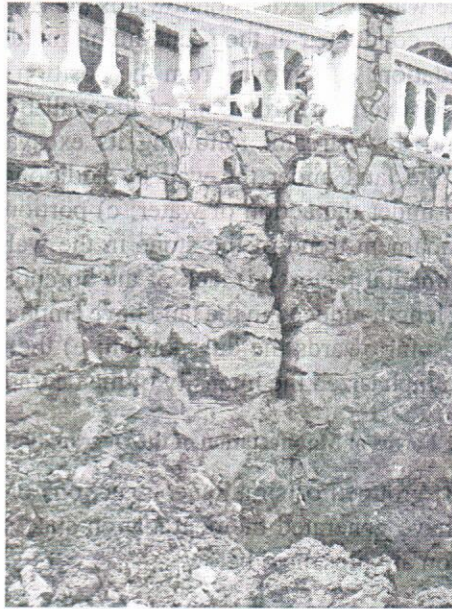


Fig. 3. – The large opening of the compression joint.



Fig. 4. – Cracks in the protection bulwark area.

2.2. The Analysis of the Degradation State

The causes of degradation specified in § 2.1 led to angular and linear movements (rotation) of the retaining wall, the appearance of vertical cracks with large opening, which led to the detachment of portions of masonry and training the ground behind the wall, with extension towards the two buildings [1].

The investigations conducted at the scene highlighted the following aspects of the state of degradation: a) removal from the position of balance and record of linear and angular movements (rotation) of the wall by annulling the passive resistance of the land downstream, following its excavation; b) reducing the reactive pressure of the land under the wall by additional compression due to the soak of the earth under the action of water; c) portions of wall with cracks, exfoliations and detachment trend of the stone in the wall, because of the long action of the environmental factors; d) lack of the borehole of the retaining wall and the implantation length reduced in the land have emphasized the feather effect and the tendency to spin towards the dug portion; e) the vibrations due to road traffic vehicles have emphasized the intensity of the degradation factors.

2.3. Forms of Manifestation of the Degradation State

The independent, grouped or simultaneous actions of the disturbing factors mentioned in § 2.1 have generated the degradation state shown in § 2.2, whose forms of manifestation are presented below.



Fig. 2. – The digging carried out on long sections near and under the foundation quota of the retaining wall.

The lack of passive resistance of the earth located downstream of the retaining wall [3], as a result of the digging carried out near and under the foundation quota, on long sections, (Fig. 2), led to linear and angular shifts of the wall, highlighted