ADJUSTING AGRICULTURAL DRAINAGE TO BUILDINGS

ADAPTAREA DRENAJULUI AGRICOL LA CLĂDIRI

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Abstract. *In order to enhance stability and to ensure the normal operation of a building, both the land on which the building is erected and its foundation should meet particular requirements, i.e. the foundation should be strong and dry. Underground waters are responsible for up to 70 % of the problems and damages caused to non-industrial and industrial buildings, both during building erection and during building use and operation. The drainage of rain water and sidewalk water accumulating at the foot of the foundations is also a permanent problem. It is therefore necessary, especially when the buildings have basements, to provide a viable drainage system able to allow water and water vapor to drain and, hence, reduce the hydrostatic pressure exerted on the building walls.*

Key words: building drainage, drainage tube, filtering prism, geotextile

Rezumat. *Pentru a se asigura o stabilitate mărită şi o exploatare normală a unei clădiri, atât terenul pe care se construieşte, cât şi fundaţia trebuie să îndeplinească anumite condiţii, adică fundaţia să fie puternică şi uscată. Apele subterane sunt în proporţie de 70 % vinovate de problemele şi daunele cauzate construcţiilor civile şi industriale atât în faza de execuţie a construcţiei cât şi, în timpul utilizării şi exploatării lor. De asemenea, drenajul apelor pluviale şi a celor provenite de pe trotuare, care se acumulează la baza fundaţiilor, reprezintă o problemă permanentă. Din acest considerent este necesar, în special la construcţiile cu subsol, un sistem de drenaj viabil care să favorizeze eliminarea apei şi a vaporilor de apă şi, implicit, să reducă presiunea hidrostatică exercitată asupra pereţilor.*

Cuvinte cheie: drenaj la clădiri, tub de drenaj, prism filtrant, geotextil

INTRODUCTION

Drainage in building basements represents a permanent problem that must be solved by architects and designers. If water is not removed from the foundations' base, serious problems may appear in the rooms located under the ground, the infiltrate affecting the buildings' support walls (Rădulescu N. et al., 2010). Moreover, water accumulation near buildings loads the ground, in the detriment of the walls, which will have to bear sometimes even double pressures compared to the normal situations (Alexandrescu I., 2010). These problems may appear because of the absence of water elimination measures, of the inappropriate drainage or the incorrect methods of sealing walls against water.

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MATERIAL AND METHOD

In order to perform the marginal drainage of a building with basement, located on a land with an average slope of 15 %, a method was adapted, deriving from the removal of the excess water from the agricultural lands, made of absorbent drains and columns in filter material.

By removing the excess water from the agricultural lands by underground drainage associated with modeling the land in ridge bands, the specialty literature recommends the realization of columns in filter material for improving the intake of the absorbent drains located under ditches, from drains to ditches level. The introduction of filter columns, in the case of the drainage on the agricultural lands, allows the increase of ridges dimensions and the decrease of the collection-evacuation chain.

An economic solution of the modeling system of the land in ridge bands consists of performing water caption from ditches with collecting drains, located perpendicular on the bands, at long intervals (about 75 m) and the discharging process of each ditch in the collecting drain being made by means of a prism in granular filter material. The prism raised from drain level to the land surface realizes the ditch-drain hydraulic connection, this one being protected against plugging by a layer of geotextile (Barbu Fl., 1986).

RESULTS AND DISCUSSIONS

The drainage method consists of executing a channel at the foundation bloom, in marginal position of the building, at a distance of 1.20 m from the basement walls, so as that the drainage tube is laid on the vertical edge of the pavement (figure 1).

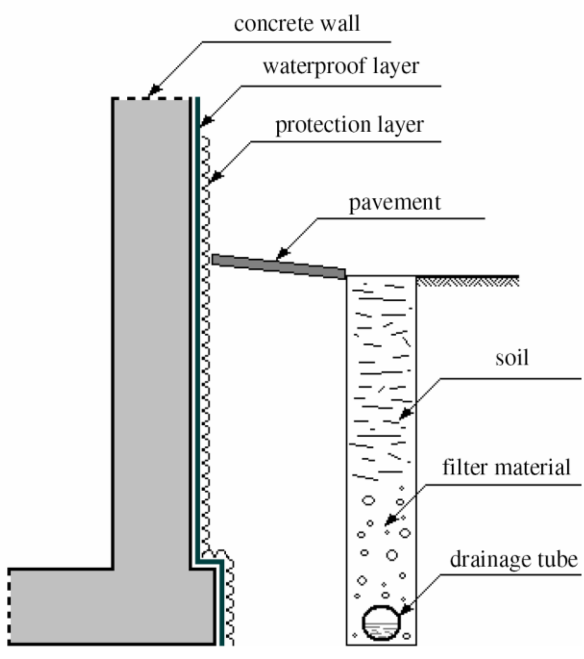

Fig. 1 – Drainage at the level of the building foundation bloom

Concrete wall, waterproof layer, protection layer, pavement, soil, filter material, drainage tube.

The channel with a latitude of 0.40 m (figure 2) was executed upstream at the level of the foundation bloom and downstream, at a depth greater than the foundation bloom, a longitudinal slope of about 2% has been ensured, for the flow of the water collected by the drainage tube.

Fig. 2 – Channel execution for laying the drain

The drainage tube of embossed PVC with the diameter of 110 mm, provided with sectional slots with latitude of 2 mm, slot area of 20 mm^2 and with a number of 40 slots per metric linear unit has been wrapped with geotextile for preventing its plugging (figure 3).

Fig. 3 – Laying the drainage tube wrapped with geotextile

The filter material made of gravel has been deposited on the drainage tube on a layer with a thickness of 0.50 m and latitude of 0.40 m (figure 4). In order to keep the latitude of the filter material layer, the gravel has been deposited concomitantly with the soil between the basement walls and the filter layer.

In order to facilitate the access of the rainwater and of the water from the pavements to the drainage tube, filter material columns were executed, having the diameter of 0.30 m and being located at a distance of 3 m, also made of gravel, from the level of the filter layer to the land area (figure 5).

Fig. 4 – Placing the filter material on the drainage tube

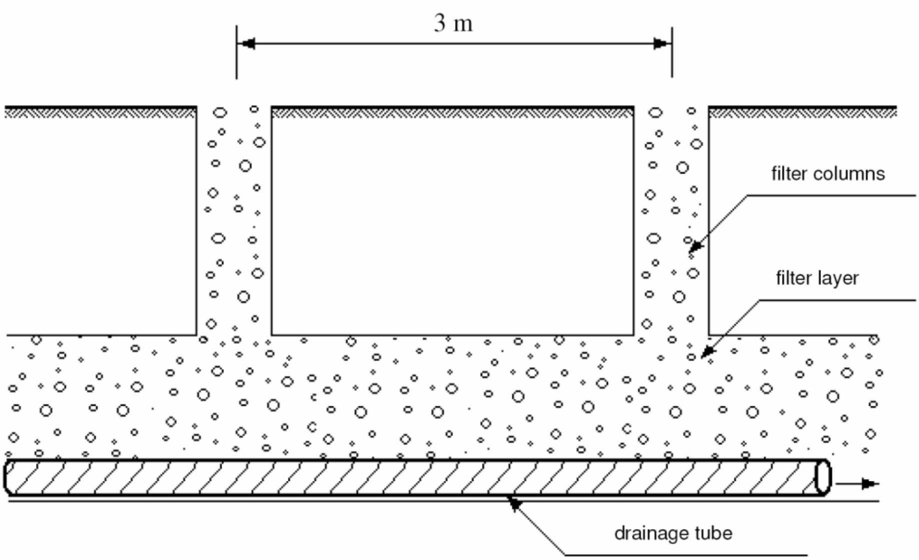

Fig. 5 – Building drainage with filter prism

The columns have been obtained by using tubes and bottomless barrels, which were filled with gravel and, after the spaces between them were filled with soil, the tubes and barrels were raised, forming this way filter columns (figure 6).

In order to reduce even more the hydrostatic pressure exercised by the soil on the wall upstream the building, an absorbent drain tube wrapped with geotextile was installed diagonally, laid at a depth of 1.00 m, using gravel as filter material, with a thickness of 0.30 m (figure 7). The water collected in this drain is taken over by the marginal drainage of the building by means of a bucket, which has been installed at the corner of the building downstream, which can be noticed in figure 3.

Fig. 6 – Obtaining filter columns

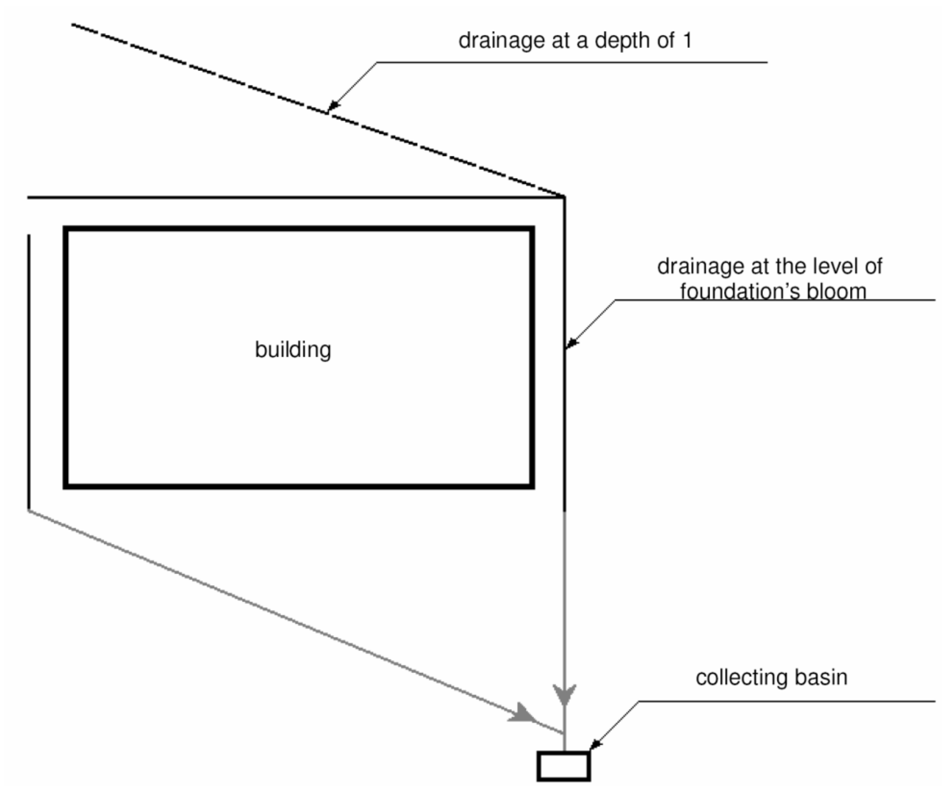

Fig. 7 – Building drainage outline

The water sources absorbed by the building drainage network are evacuated in a collecting basin, being used for irrigating the areas in the building neighborhood. The flows evacuated by the drainage network reaching the value of 21/s during the periods with heavy rainfall. The drainage system performed keeps the walls dry, avoiding dampness and mould in the rooms in the basement and their consequences.

CONCLUSIONS

1. The flows evacuated from the drainage network have different values according to rainfall intensity and duration, but also in the period of the year when rainfall is registered.

2. By executing an adequate marginal drainage for the buildings with basement, we avoid water infiltration in walls, dampness and mould formation, which allows an appropriate use of the areas in the basement.

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