NEW RAINWATER COLLECTION AND EVACUATION SYSTEMS FOR ROAD REHABILITATION WORKS

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Rezumat. *Rigolele pentru drenaj sunt elemente importante pentru construcţia infrastructurii, ele deşi sunt expuse celor mai mari încărcări îşi îndeplinesc rolul fără a le fi observată prezenţa. Drenarea este necesară peste tot acolo unde apele reziduale trebuie controlate şi deversate în siguranţă. Sistemele standard cât şi cele care implică dezvoltarea de soluţii special create în funcţie de cerinţele particulare, conduc la rezultate optime pentru situaţiile cele mai diferite, în ce priveşte drenarea. Rigolele reprezintă soluția pentru drenajul apelor pluviale în lucrările de drumuri, acestea fiind prezente ca o consecință a dezvoltării centrelor urbane și a zonelor rezidențiale, precum și a infrastructurii acestora. În ultimii ani, problemele și dificultățile legate de managementul apelor pluviale au crescut ingrijorător.*

Abstract. *Drainage gutters are important elements for the construction of infrastructure, although they are exposed to the highest loads, they fulfill their role without their presence being noticed. Drainage is required wherever wastewater must be controlled and discharged safely. Standard systems as well as the development of special solutions created according to particular requirements, lead to optimal results for the most different situations in terms of drainage. Gutters are a solution for stormwater drainage in road works as well as a consequence of the development of urban centers and residential areas, including their infrastructure. In recent years, the problems and difficulties related to stormwater management have increased alarmingly.*

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1. Introduction.

Invisible but indispensable

Drainage gutters are important elements for the construction of infrastructure, although they are exposed to the highest loads, they fulfill their role without their

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presence being noticed. Drainage is required wherever wastewater must be controlled and discharged safely [1].

Decades of experience in the production of precast concrete have established BG-Graspointner as the only Austrian manufacturer to have developed an innovative, well-sized, internationally competitive concrete drainage system.

Standard systems as well as the development of special solutions created according to the particular and individual requirements of the clients lead to optimal results for the most different situations regarding drainage [1].

Punctual or linear drainage

In principle, there are two variants in terms of drainage: punctual drainage and linear drainage.

Punctual drainage. In the case of punctual drainage, the surface water drains in one place of the drainage surface and will be discharged there. Therefore, the surface must have a slope in the direction of runoff.

Linear drainage. Linear drainage has the advantage that it allows the road surface to be flat and therefore easy for vehicles to travel. A flat surface is executed simpler and faster and implicitly with lower costs.

In addition, linear drainage is very useful in separating various surfaces such as e.g. paved or concrete paved surfaces. For this, the range of grill models can be used as a design element.

2. Rinwater drainage using gutters

The advantage of gutters as a solution for stormwater drainage as a consequence of the development of urban centers and residential areas, as well as their infrastructure, the problems of stormwater management, have increased worryingly [2].

Today, stormwater management is crucial, its lack causing three major problems:

- Environmental - Because meteoric waters that enter the soil, in urban and industrial areas, are loaded with pollutants (lead, hydrocarbons, etc.), the distance they travel from when they fall to the ground until they are taken and directed to be should be kept to a minimum in order to limit the risk of pollution [3].

- Traffic safety - In traffic areas (roads, highways), the presence of water is a major danger. This causes the vehicles to flatten, limiting their adhesion to the ground, or turn into ice and ice in winter, also affecting traffic safety.

- Comfort - As it accumulates, rainwater turns into puddles, becoming obstacles for pedestrians or cyclists. Collecting and evacuating rainwater will contribute to well-being and comfort.

There are two classic ways to drain water from a surface: Punctual drainage and linear drainage. Special situations exist in the case of airport runway drainage, where the techniques applied for surface water drainage are slightly different and they will be treated separately.

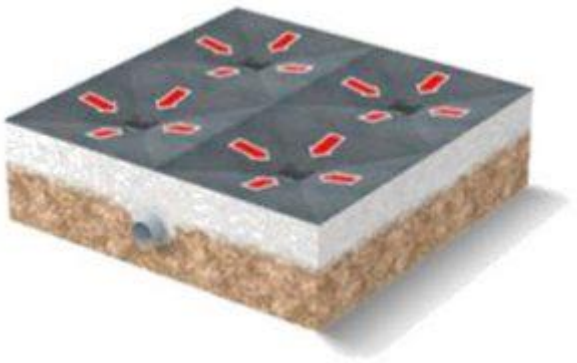

Fig. 1. Punctual drainage of rainwater

a) Punctual drainage of rainwater

In the case of punctual drainage (Fig. 1), following a hydraulic calculation, the surface is divided into sections, and a drain will be installed for each section, and an underground pipe will take the water from all these points.

Benefits: standard solution, widely known and accepted.

Disadvantages:

• Requires a large amount of work to prepare the land, especially if it is intended for road traffic. In this case, a minimum height of 0.6 m from the exhaust pipe is required

• These surfaces with slopes on several sides are difficult to achieve and do not look very good.

• The resulting surface is uncomfortable for drivers.

b) Linear drainage of rainwater using gutters

Fig. 2. Linear drainage of rainwater using gutters

In the case of linear drainage (Fig. 2), the water is taken and directed through a gutter.

Benefits: • A much simpler field preparation, there are no more system components that require protection against traffic on large load classes.

• Easy applicability - the area should be divided into only two sections with different slopes that will direct the water to the gutter.

• No risk of puddles

• Quick and easy to maintain because it is a single system, not a lot of drains or other underground systems

• An aesthetic solution thanks to the lack of irregularities due to multiple slopes. No more puddles, on the surface, a line appears, which integrates perfectly with the urban environment. It can be seen that the most effective solution is the drain with the help of gutters.

Special situations:

Generally, on roads and highways, rainwater is taken up and discharged transversely on one side of the road. As a principle, the drainage of rainwater will be done punctually, or linearly, depending on the system implemented. In urban areas, rainwater is collected from one side of the street, flowing along its curbs, where drains are placed from place to place, which take it and direct it to the general storm sewer system.

Benefits:

• Cheap solution
• Standard solution, well known
Disadvantages:

• The same inconveniences characteristic of punctual drainage.
• Dangerous to traffic: In case of heavy rain, a large volume of water will collect on one side of the road
• The different sizes and shapes of the curbs do not allow them to direct the same amount of water, favoring the appearance of puddles

Solution:

Grilled gutters would be the best alternative to this system. However, they are mainly used for highways (2 × 2 lanes) or for areas in urban centers where, for aesthetic reasons, concrete curbs are not required.

Gutters are also used to drain large infrastructures, such as highways, airport runways, etc. where rainwater can be collected in concrete pours poured on site.

Advantages of gutters and gutter systems cast on site:

Cheap system, used especially in countries with cheap labor.

Disadvantages of gutters and drainage systems with gutters cast on site:

• Steel or cast iron grills cannot be fixed very well on the edge of these cast channels, which affects their stability when passing over them.
• Large amounts of materials and labor are required.
• There is no guarantee that they will cope with large load classes, as long as the gutters are poured on site
• Gutters cannot be sealed
• Low system durability due to random implementation conditions.

Therefore, prefabricated gutters with grills are the best alternative to conventional systems, both technically and economically.

Drains

Cast iron drains for collecting rainwater from terraces, platforms, roads, streets, bridges and parking lots (Fig. 3). Punctual collection of rainwater, rainwater or rainwater.

Fig. 3. Cast iron street drain

• Cast iron street drain with modular, adjustable lower body, made of polypropylene

• Grills with load class C250 and D400, provided for vandalism

• The design of the grill allows crossing with bicycles or strollers for people with disabilities

• The lower body can be adapted by combining five types of elements

Fig. 4. Drain with concrete body

• Drain with concrete body with polymers and cast iron grill (Fig. 4)

• DN100 discharge with seal

• Alluvial basket included

• Integrated hydraulic guard

• Load class A15-B125

Fig. 5. Special drains for bridges

• Special drains for bridges (Fig. 5)

• Adjusting the position of the grille frame in all directions

• Connection to the bridge waterproofing with mechanical flange with screw connection

• Vertical or horizontal discharge

• D400 load class according to SR EN 124

• Stock availability

Fig. 6. Cast iron drains for installation in multi-storey car parks

• Cast iron drains for installation in multi-storey car parks (Fig. 6)

• Dimensions 200x200 mm or Ø200

• Vertical or horizontal discharge

• Load class L15-M125

• Stock availability

Fig. 7. Drain system with dimensioning elements.

• Drainage system with dimensioning elements for roofs, terraces, green roofs (Fig. 7)

• Cast iron lower bodies, with mechanical flange for fixing the waterproofing

• Polymer concrete upper bodies, to compensate for the height of the ground layer

• Cast iron and stainless steel grills

BGU Universal rules

Universally applicable for both DIY and professional applications, these universal gutters have load class A15 - B125. The grilles cover the body of the gutter and thus allow the connection with various finishing materials, such as concrete paving.

BGU-Z Universal gutters with recessed frame

Due to the high strength, with load class A15 - E600 these concrete gutters are suitable to be mounted both on private areas such as houses and courtyards, and on areas with heavy traffic as we find on the public domain, such as be e.g. pedestrian areas or parking lots and industrial platforms.

BGZ-S Heavy traffic ditches

Solid concrete body that is further reinforced with a Z-profile cast iron frame. This gutter is installed mainly on heavily trafficked surfaces such as national roads, highways and transport company's platforms.

BG Heavy traffic gutters with safety catch

Maximum safety for the highest requirements, guaranteed by the safety catch gutter, a unique product in Europe.

BG Crossing gutters

The BG crossing gutter has been specially adapted to the needs of agriculture and forestry and is used to drain rural, forestry and agricultural roads. Available with cast iron grill, grid or wooden grill.

BG Sealing system

The BG sealing system helps you to seal our drainage systems both in common applications and in areas with dangerous goods. Instructions for correct installation are available.

Rainwater drainage – Gutters with M profile

Slit gutters are indispensable for the construction of public roads (Fig. 8). The slot system is a progressive method of draining water on large paved / asphalted surfaces, such as public roads, highways, airports, ensuring the rapid and efficient drainage of rainwater from areas where the classic drainage it is not enough. The demand for this product is constantly growing due to the development of large logistics centers, where they are used to drain water from large asphalt / concrete / paved surfaces, etc.

Fig. 8. Gutters using M profile

Micro slot gutters

• intended for the drainage of water from gas stations, parking lots, respectively other small asphalt surfaces (Fig. 9)

• complete system consisting of prefabricated concrete elements and accessories (connecting and cleaning elements) with a length of one meter

• drain cross section: 108 cm²

• Versions: with continuous slot, with slope included 0.5% or without slope

• slot width 18 mm

• the installation does not require lifting equipment

• load class: D400

Concrete characteristics:

The gutters are made of high-strength vibrated concrete, class C45 / 55 XF4. The superior composition of the concrete gives the product the following characteristics: - high pressure resistance, - high degree of impermeability and

superior resistance to chemicals, - low degree of liquid absorption, - complies with the characteristics imposed by the norms EN 201-6, EN 1433, TKP18 / 2005, TP 137, TP 152

AQUAFEST joining system

The gutters are equipped with the patented system - AQUAFEST with two rings, which confers the following advantages:

- perfect sealing,

- joint in one position,

-simple and reliable installation,

- resistance against hydrocarbon infiltration,

- fixed dimension of the expansion joint.

Fig. 9. Implementation of gutters with M profile

3. Conclusions

Drainage gutters are important elements for infrastructure construction. This solution is required wherever wastewater needs to be controlled and discharged safely. *Linear drainage* has many advantages in comparison with Point Drainage of rainwater, including:

-a much simpler field preparation, there are no more system components that require protection against traffic on high load classes
- without the risk of puddles forming,
- an aesthetic solution due to the lack of irregularities due to multiple slopes

Slit gutters are indispensable and are strongly recommended for public roads construction.

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