

ROAD AND BRIDGE RESEARCH INSTITUTE

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TECHNICAL APPROVAL IBDiM No. AT/2008-03-0507

Name of the product: Polyethylene road grate EKOFIX

The Applicant: **GAMAPLAST**
Gamalczyk i Wspólnicy
Spółka Jawna
66-400 Gorzów Wielkopolski
ul. Miedzichodzka 12 f

Expiry date: **2013 -11 -20 (replaces AT/2003-04-0507)**

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A. GENERAL AND TECHNICAL PROVISIONS

1 SUBJECT OF THE TECHNICAL APPROVAL 1.1 Technical identification of the construction product

The subject of the Technical Approval is the polyethylene road grate EKOFIX, produced by "Gamaplast" from Gorzów Wielkopolski, intended for use in transport engineering, hereinafter referred to as the road grate EKOFIX.

The road grate EKOFIX is executed by method of injection of polyethylene having symbol HDPE and large density, obtained from the process of recycling plastic waste. It can be re-recycled in the same system.

The material properties of HDPE are as follows:

- density at the temperature (23 + 0.1) °C from 956 kg/m³ to 964 kg/m³
- content of volatile materials no more than 0.15%
- temperature of softening from 70 °C to 135 °C
- tensile strength from 20 MPa to 30 MPa

Road grate EKOFIX with dimensions: 603 mm x 384 mm x 51 mm is manufactured in green and black color, in two types, presented in Figure 1 and Figure 2.

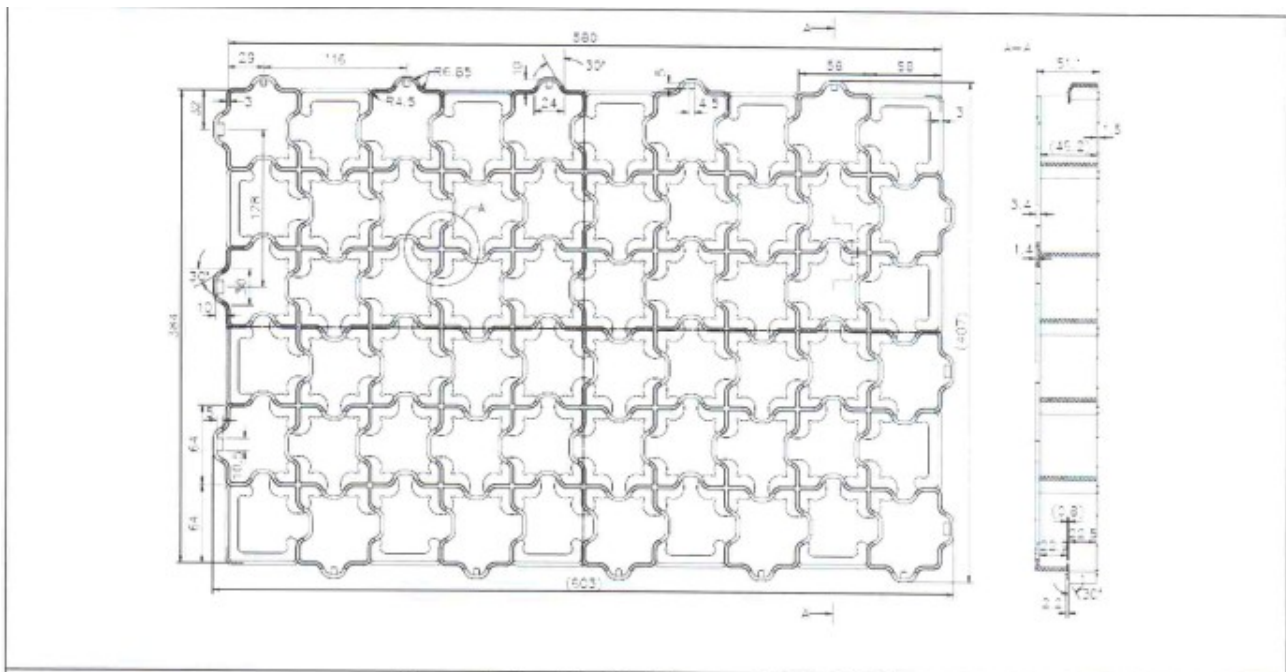


Figure 1- road grate EKOFIX1

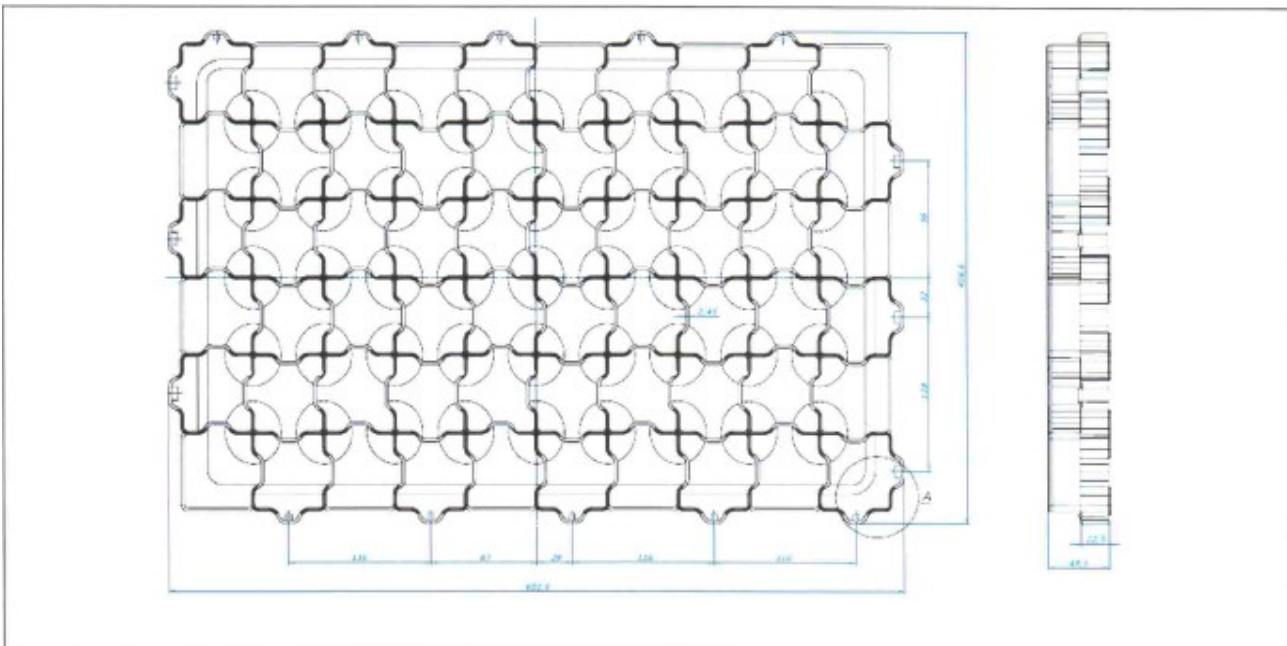


Figure 2- road grate EKO FIX 2

EKO FIX road grate is a system of chambers, forming in the outline a set of rectangular structures in the honeycomb like form.

EKO FIX road grate has connection fasteners, used for installation in a system creating a uniform surface, horizontally and vertically stable.

1.2 Classification of the product

PKWiU: 25.23.15-50.99

PCN: 3925 90 10 0

2 INTENDED USE, SCOPE AND CONDITIONS OF APPLICATION

2.1 Purpose

The road grate EKO FIX is meant for construction of the hardened pavement with a possibility of sowing the upper surface with grass or filling with aggregate. The application of the road grate EKO FIX enables increase in the biologically active area. The road grate EKO FIX transfers surface unit pressures to ca. 2.05 MPa. During precipitation the grate stabilizes ground and protects vehicles against sinking. At the same time, it enables natural circulation of water. The road grate EKO FIX can be one used also with sowing with grass of pavement to ensure aesthetical appearance and simultaneous protection of growing grass against destruction by the car wheels.

2.2 Scope of the application

The scope of application of the road grate EKO FIX in transport engineering by category of application:

category A: sidewalks and car parks with permitted vehicles < 2500 KG:

- path and pedestrian routes in the parks (only with sowing with grass),
- drives to garages,
- positions for camping trailers,
- car parks,

- category B: pavements for parking positions of truck,
- category C: pavements meant for traffic and manoeuvre roadways:
 - road shoulders,
 - estate access roads to residential buildings, accesses to office buildings and manufacturing facilities,
 - access roads and vehicle manoeuvre areas along residential blocks of flats and industrial facilities,
- category D: protections and strengthening
 - protection of space around trees growing along sidewalks,
 - strengthening of drainage ditch borders,
 - protection of slopes against erosion.

2.3 Conditions of application

Pavement structure with the road grate EKOFIX consists of:

- upper surface built of the road grate along with the lawn base or sand-grit sub-crust,
- base course layers.

The surface layer determines the specific nature of pavements with road grate and is subject to the requirements specified by the Applicant.

The base course layers for the scope of application from item 2.2, subitems A and B, generally should conform to the provisions included in the Regulation of the Council of Ministers of 2 March 1999 on Technical Requirements For Public Roads And Their Location (Journal of Laws No. 43, item 430 of 14 May 1999).

In detail, in terms of layers and built surface of pavements with the road grate, attention should be paid to draining conditions, namely to protection of working conditions of the base course not bound in the adopted operation period. By the time of creating the Catalogue or Manual of designing and construction of pavements with the road grate, the selection of materials and pavement structures should be adjusted to certain conditions of application, as well as method of execution of pavements with the road grate should be included in the technical design considering the requirements:

- included in the Regulation of the Council of Ministers of 2 March 1999 on Technical Requirements For Public Roads And Their Location (Journal of Laws No. 43, item 430 of 14 May 1999),
- set out in this technical approval,
- technology of design and execution of pavement with road grate in agreement with the owner of the Technical Approval.

Pavement with road grate may be limited with border, strips, row of paving blocks, etc.

3 TECHNICAL-UTILITY PROPERTIES, REQUIREMENTS

3.1 Materials

Requirements concerning material properties for manufacturing of the road grate EKOFIX are included in table 1.

Table 1

No.	Properties	Unit	Requirements	Testing methods according to
i	2	3	4	5
1	Mass flow ratio	g/10min	declared value*)	PN-EN ISO 1133:2006
2	Test of injection, as well as flexibility of grate	-	declared value*)	Procedure of IBDiM No. IBDiM-TWk-85/07
*) value tested on the basis of test results of delivery of raw material for manufacturing road grate EKOFIX				

3.2 Road grate EKOFIX

Requirements concerning properties of the road grate EKOFIX are included in the table 2.

Table 2

beyond the listed requirements no more than

No.	Properties	Unit	Requirements	Testing methods according to
1	2	3	4	5
1	Compressive strength of grate, no less than	MPa	2.0	Procedure of IBDiM No. IBDiM-TW-01/01
2	Decrease in compressive strength of the grate after storage in gasoline	%	20	
3	Decrease in compressive strength of the grate at temperature of 30 °C with respect to strength 2.0 MPa	%	30	
	Appearance			Procedure of IBDiM No. IBDiM-TW-02/01
	- color	color	uniform	
	- surface	-	smooth, without cavities and damages	
	- edge nicks	-	unacceptable	
5	Dimensions -deviations from length, width of and thickness	mm	+ 3/-2 mm	

3.3 Base of the road grate EKOFIX

The scope of thickness of each of the layers of pavements with the road grate EKOFIX for lighth traffic is presented in Figure 3. The carrying layer thickness (item C. 4.3) should be determined in the technical design depending on application and expected type of automotive vehicles. The carrying layer depending on the planned destination can be executed e.g. as base course of rubble stone or broken aggregates in technology of mechanical stabilization.

Properties, requirements and methods of examination for an executed pavement with the road grate EKOFDC with stabilized mechanically (non-improved) base course according to PN-S-06102:1997 or with base course of stone rubble according to PN-S-96023:1984 are included in table 3.

Table 3

			Requirements for category			Testing methods according to
			A	B	c	
1			3			4
1	Secondary deformation module of base course *) at least	MPa	60	100	***)	PN-S-09102:1997, A**)
2	Total deflection of pavement, no more than	mm	3.5			
3	Secondary deformation module of pavement at least	MPa	80			
<p>*) Control test of execution of the base course before laying lawn base or road grate. **) Test with taking into consideration pavements with road grate conducted as control tests of pavement after appropriate period of its stabilization. ***) according to conditions included in item 2 of this Technical Approval</p>						

4 GUIDELINES ON TECHNOLOGY OF MANUFACTURING, TRANSPORT AND STORAGE, AS WELL AS LABELLING CONSTRUCTION PRODUCT

4.1 Transport and storage

Road grate EKOFDC can be stored in natural conditions.

Loading, transport and unloading of road grate EKOFIX should be conducted so as to ensure that its damage and dirt would not take place.

Packaging, storage and transport of the road grate EKOFIX according to the manufacturer's recommendations.

During transport packages of the road grates EKOFIX should be protected against moving.

4.2 Manner of construction product labelling

The product should be labelled with construction product label, according to the regulation of the Minister of Infrastructure of 11 August 2004 on Methods Of Declaring Compliance Of Construction Products And Method Of Their Labelling With A Construction Product Label (Journal of Laws No. 198, item 2041).

On each packaging with the road grates one should place a label containing at least the following information:

- product name,
- name and address of the manufacturer,
- type of grate,
- color of grate,
- scope of application,
- date of manufacturing,
- Control entry no.,
- No. of Technical Approval IBDiM,
- number and date of issuance of the national statement of compliance.

5 CONSTRUCTION PRODUCT COMPLIANCE ASSESSMENT

5.1 Valid compliance assessment system

According to Article 4, Article 5, passage 1, item 3 and Article 8, passage 1 of the Act of 16 April 2004 on Construction Materials (Journal of Laws No.92, item 881), the product to which the Technical Approval applies may be launched to the market and used in performing construction works with the scope corresponding to utility properties and intended use, if the Manufacturer has conducted assessment of compliance, issued the national declaration of compliance with Technical Approval IBDiM No. AT/2008-03-0507 and labelled the product with construction product label, in accordance with valid regulations.

According to the regulation of the Minister of Infrastructure of 11 August 2004 on Methods Of Declaring Compliance Of Construction Products And Method Of Their Labelling With A Construction Product Label (Journal of Laws No. 198, item 2041), assessment of compliance of the product with Technical Approval IBDiM No. AT/2008-03-0507 is conducted by the Manufacturer using system 4.

In case of system 4 of the compliance assessment, the Manufacturer may issue national declaration of compliance with Technical Approval IBDiM No. AT/2008-03-0507 on the basis of:

- initial test of type conducted by the Producer,
- company production control.

5.2 Initial type test

The initial test of type is a test confirming required technical and utility properties, conducted before introducing the product to the market and use. The initial test of type includes the scope of tests stated in item 3.1 and item 3.2.

Type tests should be made again when a product, company production control and/or reference document change, i.e. in the situations when the results of the previously conducted tests may be called into question. The need for repeating

tests of type may result from changes in raw materials, significant changes in the manufacturing technology or conditions, for instance in the case of replacement of technological line or transfer of production plant.

The tests that in the approval procedure have been the basis for determining technical and utility properties may constitute the initial test of type in the compliance assessment.

5.3 Requirements for company production control

Company production control should include:

- specification and control of materials by controlling documents presented by the manufacturer and comparing f their properties with the requirements of item 3,
- control and tests in the manufacturing process, conducted by the manufacturer according to the principles and procedures specified in the documentation of company production control of those products and comparison of test results with the requirements item 3.

5.4 Finished products tests

5.4.1 Tests program

Program of tests includes:

- current tests, supplementary tests.

5.4.2 Current tests

Current tests of the road grate include control of: appearance, dimensions, compressive strength.

5.4.3 Supplementary tests

Supplementary tests of the road grate include control of:

decrease in compressive strength of the grate after storage in gasoline,
decrease in compressive strength of the grate at temperature of 30 °C with respect to strength 2.0 MPa
mass flow ratio, -tests of injection and flexibility of the grate.

Supplementary tests, in justified cases, at the stage of preparing production of the road grate, may include technical properties and the requirements included in table 1 and table 2.

5.5 Frequency of tests

The current tests should be conducted in accordance with agreed plan of tests, but not less frequently than for each batch of the product. Size of the batch should be determined in the documentation of company production control.

Frequency of the current and supplementary tests is specified in Table 4.

Table 4

No.	Properties	Frequency of tests
i	2	3
A Current tests		
1	Appearance	once a week or according to the Company Production Control
	Dimensions	once a week or according to the Company Production Control
3	Compressive strength of the grate	once a month or according to the Company Production Control
B Supplementary tests		
1	Decrease in compressive strength of the grate after storage in gasoline	once a year
2	Decrease in compressive strength of the grate at temperature of 30 °C with respect to strength 2.0 MPa	once a year
3	Mass flow ratio	for delivery of raw material
4	Test of injection, as well as flexibility of grate	for delivery of raw material

5.6 Testing methods

The tests should be conducted according to the methods specified in table 1 and table 2.

5.7 Sample taking for tests

Samples for tests should be taken randomly, in accordance with the provisions contained in the documentation of the Company Production Control.

5.8 Assessment of test results

The manufactured product should be considered as consistent with the requirements of Technical Approval IBDiM No. AT/2008-03-0507, if the results of all tests have rendered positive results.

6 FORMAL AND LEGAL DETERMINATIONS

6.1 Technical Approval IBDiM No. AT/2008-03-0507 shall not affect the rights resulting from the provision of the Act on Industrial Property Right of 30 June 2000 (Journal of Laws of 2003 No. 119, item 1117 with later amendments). Ensuring of these rights is one of obligations of the manufacturers submitting the application for issuing Technical Approval IBDiM.

6.2 Technical Approval IBDiM No. AT/2008-03-0507 is a document proving usefulness of the road polyethylene grate EKOFDC in the scope resulting from the provisions of the Technical Approval.

6.3 Technical Approval IBDiM No. AT/2008-03-0507 is not a document approving product to the market and use in road construction industry.

According to Article 10 of the Act of 7 July 1994 Building Law (Journal of Laws No. 89, item 414 with later amendments) the product to which Technical Approval IBDiM No. AT/2008-03-0507 applies, can be used when performing construction works only if this product has been approved to the market under separate regulations.

6.4 Technical Approval IBDiM No. AT/2008-03-0507 is not a document authorizing to label the product with the construction product label before introducing to the market.

According to Article 5.1, item 3 and Article 8, passage 1 of the Act of 16 April 2004 on Construction Materials (Journal of Laws No. 92, item 881), the product is suitable for use in performing construction works, if is labelled with the construction product label.

Labelling of the construction product with construction product label is allowed, if the manufacturer has conducted assessment of compliance and issued, at its sole responsibility, national declaration of compliance with the Technical Approval.

-The Road and Bridge Research Institute in Warsaw, when issuing the Technical Approval, does not take responsibility for any possible breach of exclusive and vested rights.

-Any deviations from the provisions of the Technical Approval IBDiM shall require a written consent of the Road and Bridge Research Institute in Warsaw.

-The Technical Approval IBDiM shall not exempt the manufacturer from responsibility for relevant quality of the polyethylene road grate EKOFDC, as well as the contractors of construction works from responsibility for its proper application.

-The Road and Bridge Research Institute in Warsaw may reverse the Technical Approval for legitimate reasons.

-The Technical Approval IBDiM does not replace permits of the construction authorities necessary for conducting works within transport engineering.

6.10 The Applicant of the Technical Approval IBDiM shall be obliged to transfer to recipients of the road polyethylene grate EKOFIX company manual in the Polish language, defining conditions of application, storage and transport.

7 EXPIRY DATE

Technical Approval IBDiM No. AT/2008-03-0507 is valid until 20 November 2013

The validity of Technical Approval IBDiM No. AT/2008-03-0507 may be prolonged for subsequent periods, if its Applicant or formal successor submits in this case an appropriate application to the Road and Bridge Research Institute in Warsaw, not later than 3 months before the deadline for validity of this document.

B. APPROVAL

On the basis of the Regulation of the Minister of Infrastructure of 8 November 2004 on Technical Approvals, As Well As Organizational Units Authorized To Their Issuing (Journal of Laws No.249, item 2497), as a result of the approval procedure conducted at the request of company:

**GAMAPLAST Gamalczyk and Wspólnicy
Spółka Jawna 66-400 Gorzów Wielkopolski
ul. Międzychodzka 12 f**

The Road and Bridge Research Institute in Warsaw has a positive assessment in terms of technique and acknowledges usefulness of the construction product:

Polyethylene road grate EKOFIX

for use in transport engineering within the scope specified in item 2 of this Technical Approval.



DYREKTOR

prof. dr hab. inż. Leszek Rafalski

Warsaw, 28 November 2008

E n d

C. ADDITIONAL INFORMATION

KEYWORDS: PROTECTIVE GRATE, HARDENED PAVEMENT

1 INFORMATION ON THE TECHNICAL APPROVAL

Technical Approval IBDiM No. AT/2008-03-0507 revokes and replaces IBDiM Technical Approval No. AT/2003-04-0507.

To Technical Approval IBDiM No. AT/2008-03-0507 the following changes have been introduced:

-changes have been introduced in table 1 and table 2,

-item 5 Construction product compliance assessment has been added.

2 REFERRED TO STANDARDS AND DOCUMENTS

For references of norms dated only quoted edition is applied. For undated references the last edition (as amended) of the referred to publication is applied.

PN-EN 13043:2004 Aggregates for bituminous mixes and surface consolidations, used on roads, airports and other areas intended for traffic

PN-EN ISO 1133:2006 Plastics - Determination of mass flow ratio (MFR) and mass to volume ratio (MVR) of thermoplastic plastics

PN-B-04481:1988 Building grounds - Tests of ground samples

PN-S-06102:1997 Car roads - Base courses of mechanically stabilized aggregates

PN-S-96023:1984 Road structures - Base course and pavement of rubble stone

Test procedure of IBDiM No. IBDiM TW--01/01 Protective grate to grass pavements - Test of carrying capacity.

Test procedure No. IBDiM IBDiM TW--02/01 Protective grate to grass pavements - Test of appearance.

Test procedure No. IBDiM IBDiM-TWk-85/07 Protective grate to grass pavements - Test of injection and flexibility of the grate.

Catalogue of typical structures of vulnerable pavements and semi-rigid pavements, IBDiM, Warsaw 1997.

Regulation of the Council of Ministers of 2 March 1999 on Technical Conditions For Public Roads And Their Location (Journal of Laws No. 43 , item 430)

Act of 7 July 1994 Building Law (Journal of Laws No. 89, item 414 with later amendments)

Act of 30 June 2000, Industrial Property Rights (Journal of Laws of 2003 No. 119, item 1117 with later amendments)

Act of 16 April 2004 on Construction Materials (Journal of Laws No. 92, item 881)

Regulation of the Minister of Infrastructure of 8 November 2004 on Technical Approvals, As Well As Organizational Units Authorized To Issue Technical Approvals (Journal of Laws No. 249, item 2497)

Regulation of the Minister of Infrastructure of 11 August 2004 on Methods Of Declaring Compliance Of Construction Products And Method Of Their Labelling With A Construction Label (Journal of Laws No.198, item 2041)

3 DOCUMENTS USED IN THE APPROVAL PROCEDURE

-Hygienic certificate for road grate PANEL EKOFIX No. HK/B/0330/01/2008, National Institute of Hygiene, Warsaw 2008

-Report on test of dimensions and strength of grate EKOFIX no. 301002 of 12.02.2003, drawn up in the Research-Experimental Laboratory ASPHALTA based in Berlin, on the basis of the requirements of standard DIN EN ISO 7500-1, Berlin 2003.

4 DESCRIPTION OF EXECUTION OF PAVEMENT WITH THE ROAD GRATE

4.1 General rules

Elements of pavements with the road grate EKOFIX, which contain natural subsoil, carrying layer, the lawn base and curb or border, are executed on the basis of the technical design. General sketch of the layer system of pavements with the road grate is presented in Figure 3.

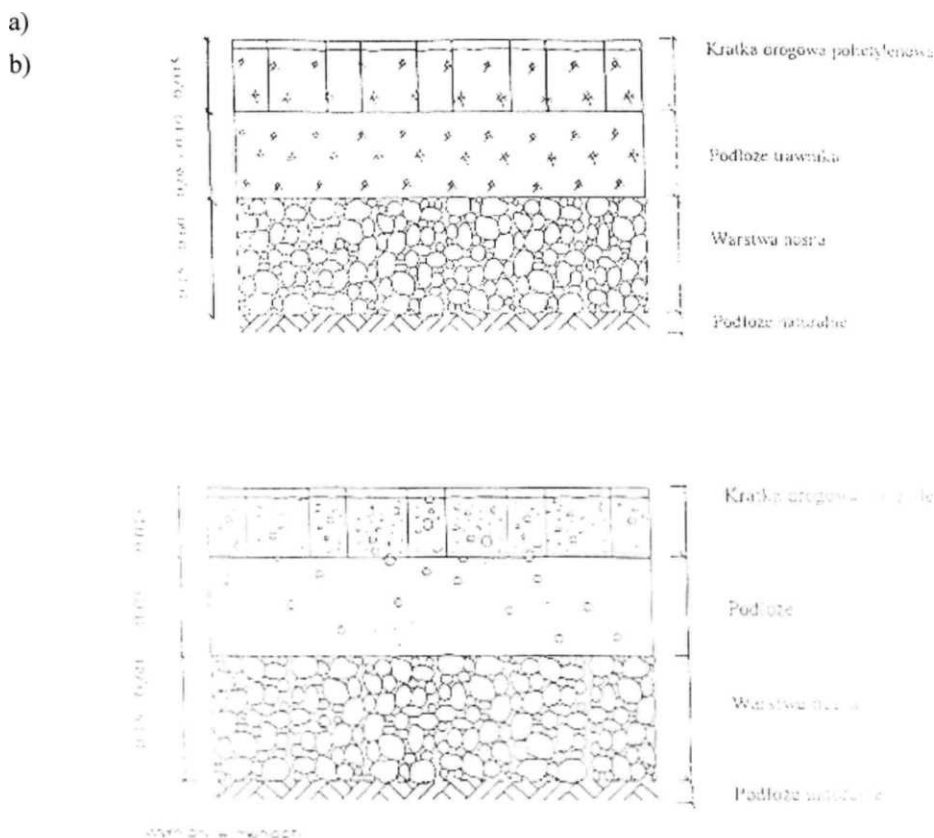


Figure 3 -
The sketch of the layer system of pavements with the road grate EKOFIX

- a) filling with grass
 b) filling with aggregate

4.2 Preparation of the base of the road grate EKOFIX

Before covering the base with the road grate EKOFIX, one should check, according to the technical specification included in the technical design:

- preparation and compacting of the native ground,
- execution of carrying layer in accordance with the adopted technology
- execution of the lawn base,
- embedding of a curb or border.

Suitability of natural base ground and its density should be specified according to PN-B-04481:1988. Quality control of aggregates and execution of load-carrying layer is conducted depending on the adopted technology for the planned designation of pavements with the road grate EKOFIX. In the case of executing the load-carrying layer as a base course of broken stone, one should follow the requirements of PN-S-96023:1984 or, in the case of broken aggregates embedded in technology of mechanical stabilization - the requirements of PN-S-06102:1997.

When using a curb or border, one should check its support on the carrying layer.

4.3 Preparation of the lawn base

The layer of the lawn base with thickness from 0.08 m to 0.10 m is executed in the case of sowing with grass with mixture consisting of:

- sand (from 0.5 mm to 0.6 mm) in the quantity from 60% (v/v) to 80 % (v/v).
- vegetable soil or native soil in the quantity from 15% (v/v) to 35% (v/v),
- garden peat in the quantity from 4% (v/v) to 5 % (v/v).

4.4 Installation of the road grate

Elements of the laid grate may be:

- buried with garden soil and sown with grass,
- filled with rolled grass from roll.

On the surface of the layer defined as the lawn base one installs the grate EKOFIX designed with encasing of surfaces as specified in the technical design.

4.5 Filling of the road grate

Filling of the road grate chambers can be executed in two ways, namely by:

- filling with grass,
- filling with aggregate.

4.5.1 Filling with grass

The chambers of laid grate are backfilled with garden soil to such a height so that, after time when the garden soil is subject to self consolidation supported with uniform sprinkling, the surface of garden soil would be 5 mm below the upper edge of the grate. Grass sowing should be conducted in the quantities compliant with the instruction of the seeds' manufacturer. In the case of light soil filling the grate, the seeds can be mixed earlier with the soil. In the period of intensive grass growth, the soil should be kept in the condition of large humidity and one should also avoid prolonged parking of vehicles.

The rolled grass should have time from 3 to 4 weeks for enrooting.

After complete overgrowing of the grates with grass the created surface should be treated like an ordinary lawn. All the nurturing works, fertilization and watering should be the same as at intensively used lawns.

4.5.1 Filling with aggregate

Chambers of the grate EKOFIX laid on the lawn base (item 4.3) can be filled with grit with fraction from 4 mm to 6.3 mm, according to PN-EN 13043:2004 or other filling, according to the technical design. The amount of filling should be such that, after time when the grit is subject to self consolidation, the grit surface would be 5 mm below the upper edge of the grate.

5 APPLICANT / MANUFACTURER

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6 SET OF TECHNICAL APPROVALS of the Road and Bridge Research Institute

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Dear Sir or Madam,

In accordance to the changes made in grid Ekofix 2, we would like to inform that the pressure capacity have changed from 2,05 MPa to 1,4 MPa. In the same time we would like to inform you that we will undertake activities aiming to include this change in Technical approval.

Gamaplast Gamalczyk i Wspólnicy Sp. J.