

INDUSTRY

Regupol[€]

Securing Loads

Anti-slip mats for trucks, trains,
airplanes and ships

Safety for operators,
freight and vehicles



BSW

www.berleburger.de

Regupol[®] anti-slip mats

Securing heavy goods

Whatever hazards occur through emergency braking, evasive action or bumpy surfaces, the load on board a truck or freight wagon must not move. But in most cases, it simply is not possible to

secure the load adequately just through the design of the vehicle superstructure. This is why anti-slip mats are meanwhile part of the standard equipment for any professional transport today. They

reduce the total pre-stressing tension needed to tie down the load, and together with the lashing straps, they ensure that the load and truck or wagon form a homogeneous unit.

Regupol[®] anti-slip mats have been tested and approved by:



Applications comply with DIN 75410 and BGI 649 (formerly ZH1/413). They fulfil the requirements as per VDI 2700, sheet 3.2, sheet 9 and sheet 15. Regupol[®] anti-slip mats

reduce damage to the load and to the vehicles. They reduce costs by minimizing the expenditure involved in wedging and tying down the load. Practical test reports are

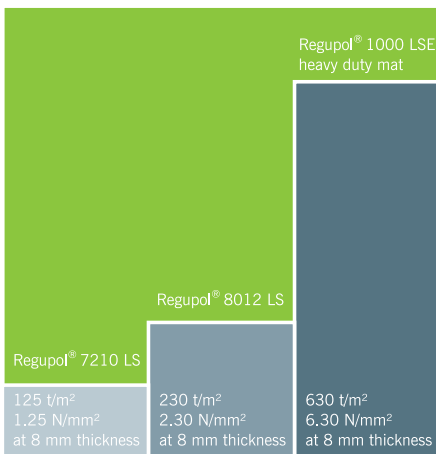
available for many different kinds of load. Regupol[®] anti-slip mats effectively increase safety on road and rail and also for air and sea transport.



In economic terms, Regupol® anti-slip mats made from PUR-bonded rubber granulate offer clear advantages. They can be fitted in next-

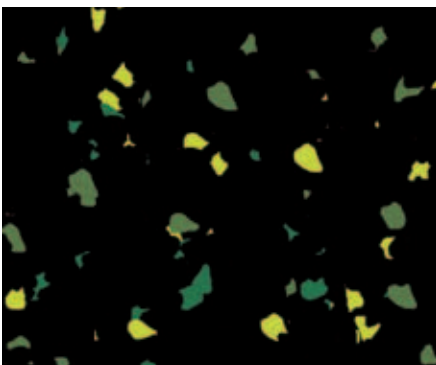
to-no time because they can be simply unrolled or placed under the load, saving valuable loading time.

Maximum loading



Types	Regupol® 7210 LS	Regupol® 8012 LS	Regupol® 1000 LSE heavy duty anti-slip mat
Maximum loading*	125 t/m ² = 1.25 N/mm ² at 8 mm thickness	230 t/m ² = 2.30 N/mm ² at 8 mm thickness	630 t/m ² = 6.30 N/mm ² at 8 mm thickness
Material	Anti-slip mat based on SBR/ NBR	Anti-slip mat based on SBR/ NBR	Anti-slip mat based on SBR/ NBR
Color	black with green, light green and yellow particles	black with green, light green and yellow particles	black with green, light green and yellow particles
Delivery form	rolls, sheets, cut to size upon request	rolls, sheets, cut to size upon request	rolls, sheets, cut to size upon request
Thickness	3 - 20 mm	3 - 20 mm	from 8 mm

* According to VDI 2700, sheet 15, the maximum loading of anti-slip mats should be chosen so that the material thickness is not deformed more than 30 %.



Regupol® anti-slip mats are colour coded. Original anti-slip mats are only authentic with this protected colour coding (yellow and green particles). Confusion with anti-slip mats of other manufacturers thus is impossible.

The friction coefficient of anti-slip mats depends on the material combination. In order to achieve optimum anti-slip properties, the contact surfaces i. e. load and floor must be swept clean and have to be grease-free. BSW also produces the anti-slip mat Regupol® 9510 RHS as well as further product solutions for specific applications.

Simply ask our customer consultants if you want to know

- which mat is best suited
- for which mode of transport
- for which goods and loads

Phone ++ 49(0)2751 803-122 / -125

INDUSTRY

Acceleration forces during transport



The dangers resulting from incorrectly secured loads are frequently underestimated. The acceleration forces under normal traffic conditions reach levels approaching the actual weight of the load. The friction force F_R of an anti-slip mat therefore counteracts any displacement of the load and is described in

physical terms as follows:

$$F_R = \mu \cdot G$$

F_G = weight force

μ = sliding friction value

g = acceleration due to gravity

$$F_G \cdot g = \text{mass force}$$

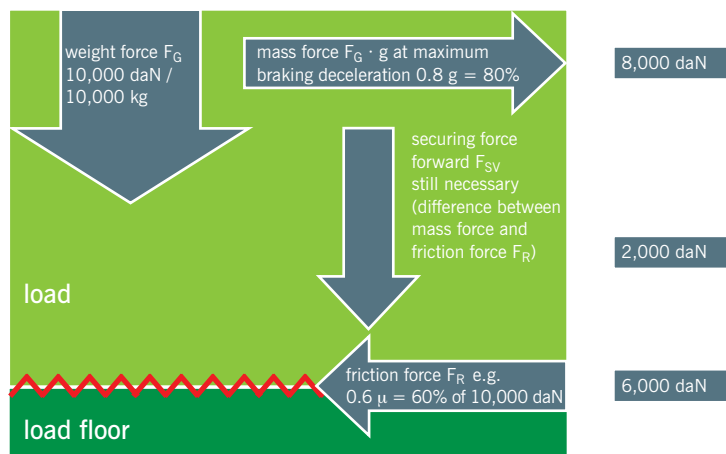
The difference between the mass force F and the friction force F_R is referred to as the securing force F_S :

$$F_S = F - F_R$$

The securing force F_{SV} is the force that the securing equipment has to absorb forward.

Load securing = friction force + securing force

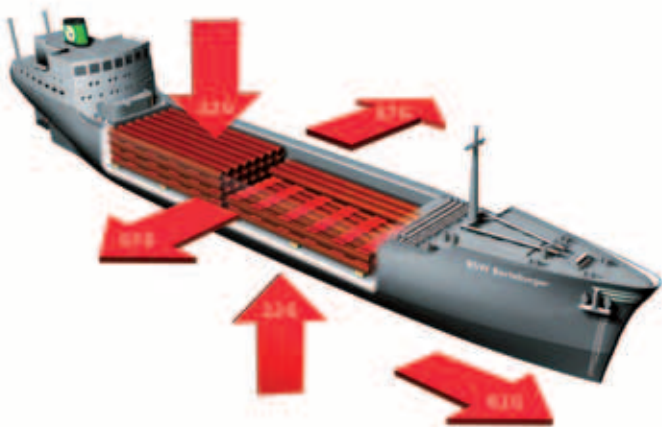
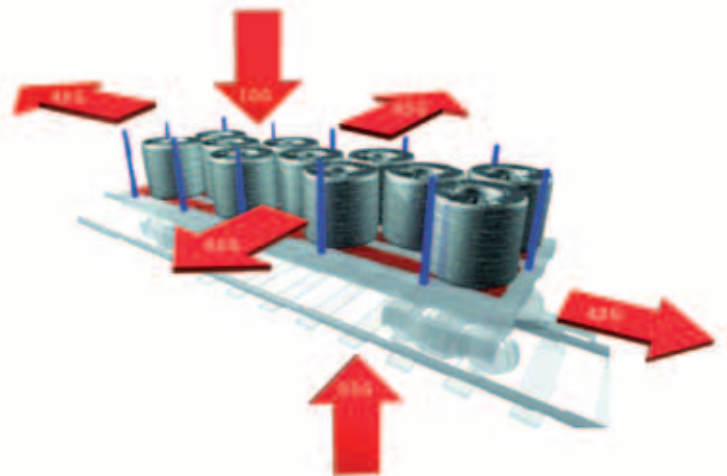
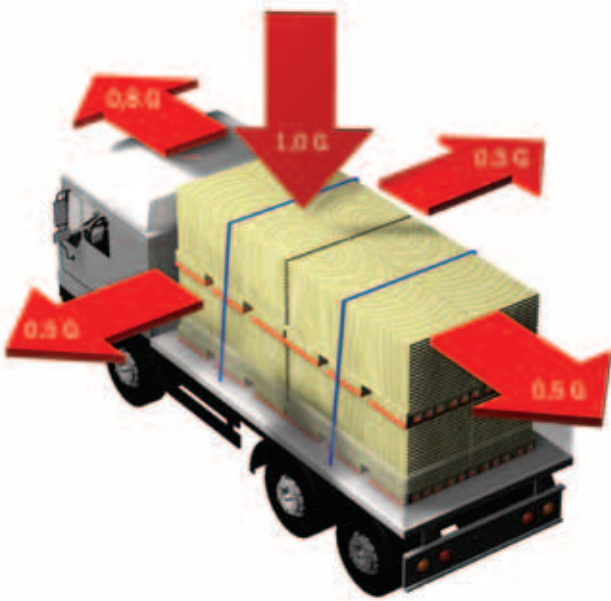
example



The example in the diagram shows a practical method of securing loads for a truck. The friction force of 0.6 g is about as high as when using an anti-slip mat. However, the load only has to be secured for normal driving and not for a traffic accident. But normal driving also includes:

- emergency braking 0.8 g = 80% of the load weight F_G
- extreme evasive action 0.5 g = 50% of the load weight F_G
- poor road surfaces 1.0 g = 100% of the load weight F_G

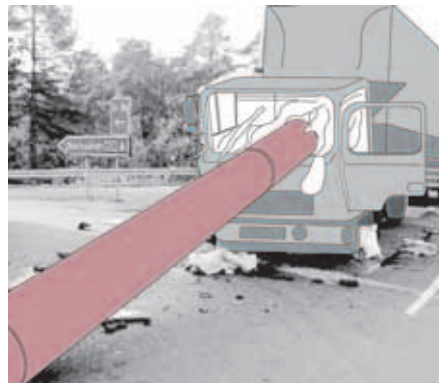
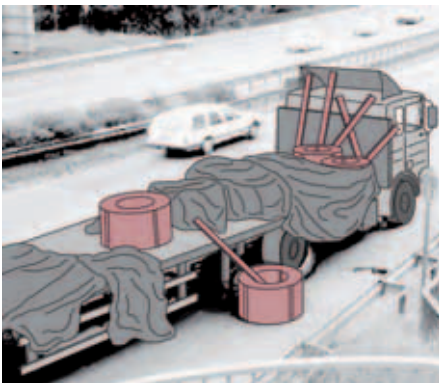
Loads are secured correctly by achieving a balance between the opposing forces occurring during transport. The loads are adequately secured when the sum of the friction force F_R and the securing force F_S is at least as large as the mass force F_G . The friction force is increased by anti-slip mats, the securing force by lashing straps and other equipment. As the mass force acting in a forwards direction when the truck brakes can reach up to 80% of the load weight (0.8 g), the load must be secured accordingly.



1.0 G refers to the weight force of the load. The forces that occur during the various movements of the load can reach up to 80% of this value (truck transport).

The friction force which together with the securing force prevents the load from slipping can be increased considerably by using anti-slip mats. A good anti-slip mat can warrant up to 60% and more of the load securing force. However, it is still not possible to dispense completely with lashing straps and other fixing equipment.

Consequences of not securing the load correctly



When goods are being transported, acceleration and braking together with lateral centrifugal force or vibration generate forces approaching the actual weight of the load. As a result, the load can slip and cause severe damage to property as well as accidents with casualties. For example, the load can break through the

front wall of a truck and cause severe injury to the driver. Dangers are also involved in unloading loads which have slipped. Frequently the load also falls from the vehicle and causes a hazard to other road users. Incorrectly secured loads are often also damaged themselves. In Germany alone, this results in load

damages amounting to several hundred million Euros a year. Incorrectly secured loads are estimated to cause approximately 20% of all accidents in heavy goods traffic.

Article 22 (1) German Road Traffic Regulations

The load including equipment for securing the load and loading devices are to be stowed and secured so that they cannot slide, fall over, roll backwards and forwards, fall down or cause avoidable noise even during emergency braking or sudden evasive action, in compliance with state-of-the-art technology.

Section 23 German Road Traffic Regulations

The vehicle driver is responsible for ensuring that his vision is not impaired ... by the ...

load, equipment or condition of the vehicle. He must ensure that the vehicle, train or towing combination and the load are in full compliance with the regulations and that the load does not jeopardize the vehicle's road worthiness.

Section 31 (2) German Road Traffic Licensing Regulations

The owner must not order or permit the vehicle to be used if he knows or must know that the load is not correct or that the roadworthiness of the vehicle is jeopardized by the load or

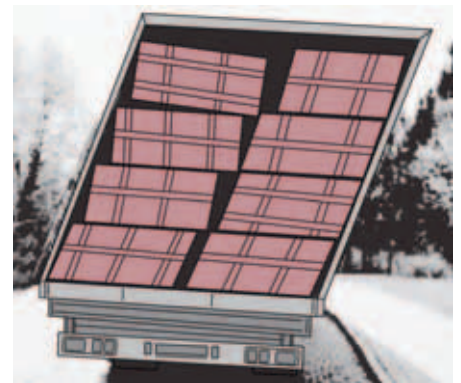
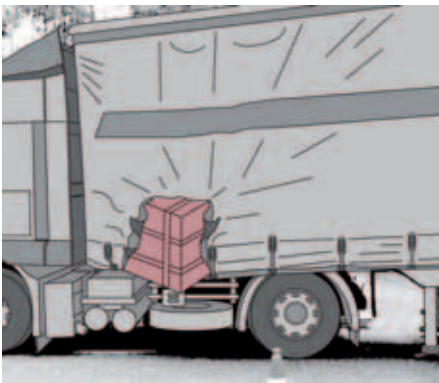
occupancy. An entrepreneur therefore already violates the German Road Traffic Licensing Regulations by omitting to use a vehicle with the necessary equipment for adequately securing the load.

Section 412 (1) German Civil Code

Unless indicated otherwise by the circumstances or traffic customs, the consignor shall load, stow, fasten and unload the goods in a manner safe for transport. The haulage contractor shall ensure that the load is safe for operations.



The diagrams have been produced on the basis of accident photos. People, indications of the location and vehicle registration numbers have been blocked out for legal reasons.



Overview of legal responsibilities

Civil law:
German Commercial Code

Consignor

According to Article § 412 German Commercial Code, the consignor is responsible for loading the goods in a manner safe for transport.

Haulage contractor

According to Article 412 German Commercial Code, the haulage contractor is responsible for loading the goods in a manner safe for operation.

Public law:
German Road Traffic Regulations,
Road Traffic Licensing Regulations

Loader, driver

According to Article 22 German Road Traffic Regulations, the loader and driver are obliged to secure the load.

Vehicle owner

According to Article 31 Road Traffic Licensing Regulations, the vehicle owner is obliged to equip the vehicle.



Regupol[€]



BSW manufactures a large variety of products for the transport business, the construction industry and for sports, fitness and leisure under the brand name Regupol[®]. Regupol[®] is a material compounded from rubber and polyurethane. BSW processes the product in its

own manufacturing sites to meet specific requirements using a number of different formulations. Regupol[®] products are versatile, durable and strong. Customised production, finishing and warehousing provide the customer with rapid solutions for every individual requirement.

**BSW GmbH
(Berleburger Schaumstoffwerk)**

has been manufacturing Regupol[®] materials for the transport and construction industries for over 30 years. These materials include anti-slip mats, membrane protection, impact sound insulation, vibration control and safety tiles, as well as floor surfaces. But BSW can do a lot more. Our product range for the sports industry is equally large. Here too, BSW is one of the international market leaders.

Regupol[®] is a registered trade mark of BSW. Regupol[®] is manufactured and distributed by BSW GmbH in Germany and Regupol Australia Pty.

www.berleburger.de

You can find more information on our products by visiting our website, where order product samples online, study our list of references and get in touch with your BSW contact directly.



Certified according to
DIN EN ISO 9001
DIN EN ISO 14001
OHSAS 18001

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