



PARDAK®110

INNOVATION AND EXPERIENCE WITH
FLEXIBLE ROOFTOP PARKING DECKS



ROOFTOP CAR PARKING FROM PLANNING

Due to urban densification and the continuous increase in traffic, it is becoming increasingly attractive to use the roofs of shops, offices, supermarkets, car dealerships or public buildings in urban areas and beyond as car parks.

With more than 50 years of experience in the supply and installation of parking roofs in Western Europe, we can call ourselves an international specialist in parking roofs. Always innovative and constantly developing.

In total, we have already converted more than 3.5 million square metres of roof

space into car parks. From large shopping centres and hospitals to car dealerships and supermarkets. At locations with heavy traffic and many daily parking movements.

The patented Pardak®110 system has been specially developed for this purpose and is suitable for intensive car traffic up to a total weight of 35 kN.

PARDAK®110 PAVING SYSTEM

The Pardak®110 paving system consists of the following components:

- › Pardak®110 precast concrete slabs
- › Pardak®110 tensioning elements
- › Pardak®110 pressure distributors
- › Pardak®110 cross pieces

PARDAK®110 PRECAST CONCRETE SLABS

The non-reinforced Pardak®110 slabs, with average dimensions of 109.6 cm x 109.6 cm x 9.3 cm, are manufactured under carefully controlled conditions in our factory. With a joint width of 3–5 mm this results in a modular grid size of 110 cm. The properties of the concrete slabs have been tested in accordance with DIN EN 1339 “Concrete paving flags” by the German Güteschutz NRW. The highest quality levels were reached on all requirements, such as dimensional stability, flexural strength, fracture load, resistance to abrasion and frost/road salt resistance (see data sheet). In addition, a special institution tested the skid resistance of the Pardak®110 slabs and gave it the highest possible value: R13.

The Pardak®110 slabs, each weighing 270 kg, are laid using readily available, highly manoeuvrable installation machines with vacuum lifting technology.

ADVANTAGES OF THE PARDAK®110 SYSTEM

- › **Fast and durable:**
The parking roof is quick to install and offers excellent value for money.
- › **Low maintenance:**
Thanks to the modular tile system, the roof is easy to open and close.
- › **Safe and dry:**
Good drainage prevents puddles and ensures a safe parking experience.
- › **Reliable planning:**
The method is virtually weather-independent, minimising the risk of delays.



The slab surface features drainage grooves in a diamond pattern. Apart from giving the surface its visual characteristics, these grooves drain the residual water towards the joints between the slabs from where it flows freely into the void for water drainage under the slabs and then into the roof outlets. And drainage slots in the sides of the slabs ensure even faster water drainage. Even during heavy rainfall, the surface remains dry. Even if the roof has no slope. This means: no puddles, improved safety and greater comfort for users.

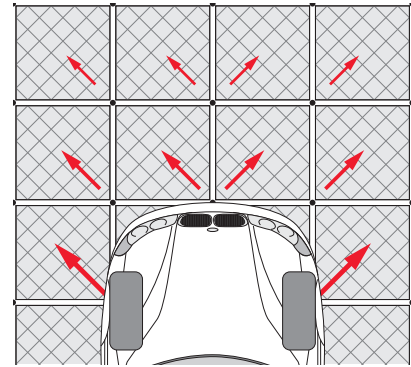
PARDAK®110 TENSIONING ELEMENT

The main component of the Pardak®110 system is the patented tensioning element. These elements are installed and tensioned at all points where the corners of adjoining slabs come together and are then adjusted to the right tension. The function of the Pardak®110 tensioning elements is to close the individual Pardak®110 slabs up against one another to create a unified deck. This ensures that the deck accommodates any manufacturing and laying tolerances as well as thermal expansion and other movements in the building, while keeping the slab surface stable at all times.

The tensioning element initially serves as a buffer to absorb the considerable horizontal forces that mainly occur as vehicles brake, accelerate and turn. The tensioning elements distribute some of these forces among the adjoining Pardak®110 slabs. The relative vertical movements between two adjoining slabs which occur as a vehicle passes over the joints are also reduced. The tensioning elements of the Pardak®110 system thus ensure that the pavement is stable at all times.

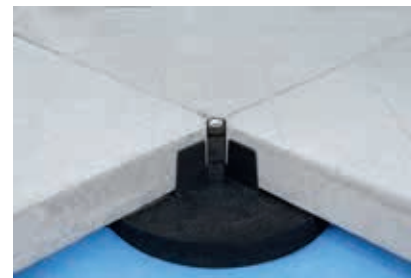
PARDAK®110 PRESSURE DISTRIBUTOR

The circular pressure distributors have a diameter of 400 mm and are on average 30 mm thick. They are placed under the corners of the Pardak®110 slabs. The function of the pressure distributors is to absorb and distribute the vertical forces that occur when cars pass over the parking surface. They also reduce the contact noise of the vehicle tires and create a cavity under the slabs through which water can drain away. The Pardak® 110 pressure distributor is the result of extensive and careful development. The pressure distributors are made of highquality rubber granulate which is pressed into the desired shape.



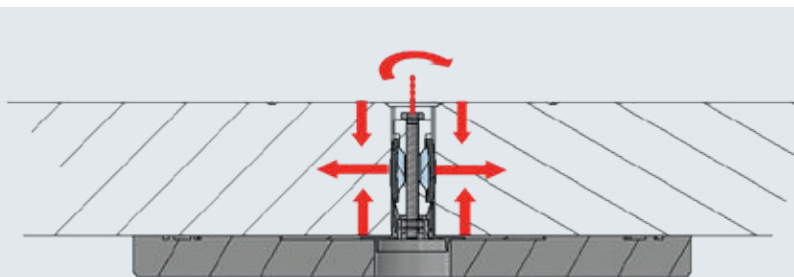
TRANSMISSION OF HORIZONTAL FORCES

Cross section of the Pardak®110 system with a tensioning element. The main function of the tensioning elements is to absorb and distribute horizontal forces.



COMPONENTS OF THE TENSIONING ELEMENT

The tensioning elements are installed in a square opening at all points where joints cross, and directly over the centre of the pressure distributors. The opening results from the geometry of the slabs which have diagonal 3-cm long side faces on their corners. The tensioning element contains plastic parts, surrounded by 4-mm thick rubber sleeves. These plastic parts can be adjusted by tightening the interior set screw.



Cross section of the Pardak®110 system with a tensioning element.

PARDAK®110 CROSS SPACER

The Pardak®110 system is installed with an integrated cross piece. This element contains a permanently built-in nut, into which the tensioning element is screwed directly and automatically secured. Thanks to its smart positioning, the cross spacer falls exactly into place and is anchored centrally. The result: a stable, secure connection and easy installation.

An additional advantage is its function as a precise spacer between the slabs. This creates an even joint pattern that is not only visually appealing, but also increases the stability of the entire surface.

THE ADVANTAGES OF THE CROSS SPACER

- › Improved securing of the tensioning element
- › Uniform and stable slab field
- › Easy installation thanks to integrated positioning
- › Extended service life of the system



SOUND INSULATION MEASUREMENTS

Peutz, the renowned Dutch sound insulation institute, performed sound level tests on the rooftop car park of the "The Wall" shopping centre on the A2 motorway near Utrecht in the Netherlands. This 34,000m² and 800 m long rooftop car park was produced by Zoontjens, using the Pardak®110 system, in 2008.

The Peutz test report confirmed that the dB values found there were considerably lower than those of the Pardak® 90 system. This is due to the more intensive horizontal and vertical tensioning of the Pardak®110 slabs.



The cross spacer features a built-in nut, into which the tensioning element is directly screwed and automatically secured.

ROOF STRUCTURE

Pardak®110 is generally installed on insulated roofs. The inverted roof structure is specifically suitable for this, as long-term experience has shown.

The components of the rooftop car park pavement structure on an inverted roof are:

- Waterproofing layer
- Thermal insulation
- Pardak®110 slabs

This layered construction of the rooftop car park matches the structure of an approved inverted roof where the waterproofing layer is located below the thermal insulation layer. Around the edge of the rooftop parking system, the perimeter restraint must be able to withstand a horizontal force of 3.5kn/lnm.

WATERPROOFING LAYER

To prevent underflow between the concrete deck and the waterproofing layer, bonded sealing in accordance with DIN 18195-5 is recommended. We are very satisfied with the use of liquid plastics at the edges of the deck and at other points where the waterproofing layer is connected to the building and to various structural elements.

THERMAL INSULATION

Inverted roofs have proven their worth both in theory and in practice. Several studies have shown their service life to exceed 30 years. The advantage of an inverted roof is the excellent protection provided for the waterproofing system against thermal and mechanical loads. This prevents the risk of the waterproofing layer being damaged by direct contact with the deck which is being subjected to dynamic loads.



If customers so require, coloured Pardak®110 slabs or Pardak®110 slabs with a top coat made of granulate materials in different colours can be installed, e.g. to demarcate parking bays. Pedestrian areas can be clearly demarcated using precast kerbs.

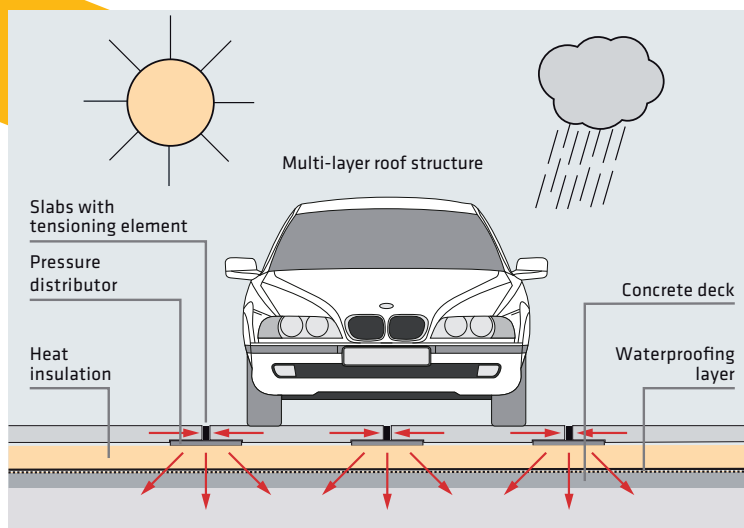
REFURBISHMENT

Old rooftop car parks that have sustained multiple damage often have to be refurbished. A first requirement for owners and operators is to know how the car park can be refurbished such that it can be put to optimum use again quickly, given the existing situation. The state of the existing building and the materials used then have to be assessed.

Another question that often crops up concerns the available fall and any corresponding height problems at connections and in the surface. Zoontjens has many years experience in this field.

After analysing the current situation (e.g., chloride damage due to de-icing salts) and a structural assessment, the **Pardak®110 system** is often chosen. Especially at high-traffic rooftop car parks, it offers:

- › **Faster installation:**
Slabs can be placed quickly, and the system is less weather-dependent. Even winter installation is possible.
- › **Rapid reopening of busy areas:**
Especially useful at ramps or tight manoeuvring areas; traffic can resume quickly.
- › **Strong project management:** Zoontjens' extensive renovation experience ensures smooth collaboration.



- › Independent movement of the Pardak®110 system relative to the building and the concrete deck
- › Weather-independent installation
- › No puddles
- › Easy removal and access to the thermal insulation and the waterproofing layer



ADVANTAGES OF USING THE PARDAK®110 SYSTEM TO REFURBISH AN EXISTING ROOFTOP CAR PARK

- › Installing a fall on inverted roofs is usually not necessary and, from a technical and economic perspective, this is often the best solution and one which is also permitted under construction law.
- › The construction depth of a pavement of Pardak®110 slabs is only 126 mm.
- › Three phases of the refurbishment process can take place on the building site at the same time without any significant problems.

Phase 1: The section of the old, damaged pavement that has not been refurbished yet is still available to traffic. The materials used for refurbishing are temporarily stored on this section as well.

Phase 2: Intensive refurbishment work (dismantling the existing roof structure, installing a new waterproofing layer and thermal insulation, laying the Pardak® 110 slabs).

Phase 3: Traffic is possible again on the part of the rooftop car park that has already been refurbished due to the major advantage that the Pardak®110 pavement can be driven on immediately after the Pardak® slabs have been tensioned – no curing is involved.

TECHNICAL AND ECONOMIC ADVANTAGES

- › Proven roof structure of the inverted roof with Pardak®110 slabs
- › High-quality concrete – Pardak®110 slabs are industrially precast
- › Permanent stability of the car park pavement
- › No fall layer is required
- › Intelligent detailed solutions
- › Rapid laying of the Pardak®110 slabs and the XPS sheets
- › The advantage of a rooftop car park which is free from water
- › Traffic noise is reduced by the pressure distributors and the intensively tensioned Pardak®110 slabs.



The specifications, construction, and details have been gathered in accordance with the latest technical regulations and with the greatest care. Zoontjens International B.V. does not accept any liability for any errors or any incompleteness nor for the consequences thereof. In the interest of innovations and improvements, we reserve the right to modify our products and systems.

WHAT IF THE WORLD WERE TWICE AS BIG

It can be, as far as we're concerned. Our world, twice as big. A world that we are helping to design and construct perfectly with our roof slab systems. Our many years of experience have made us the number one expert in rooftop paving. For sustainable roofs, livable roofs for socialising. We interact with architects and contractors every day. With roofers and project developers. Creators and constructors. We listen to them, work with them and advise them. That's why we're the number one party with the best rooftop vision. It's our higher ground.