

# New volumetric stability additive has successful commercial debut

**A new shrinkage-compensating concrete additive has been successfully used on its first commercial project – a warehouse floor in Portugal.**

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Permaban Signature in-situ.

Concrete floors are typically poured in bays, with the inclusion of construction joints at regular intervals to control the shrinkage forces at work in the concrete as it cures.

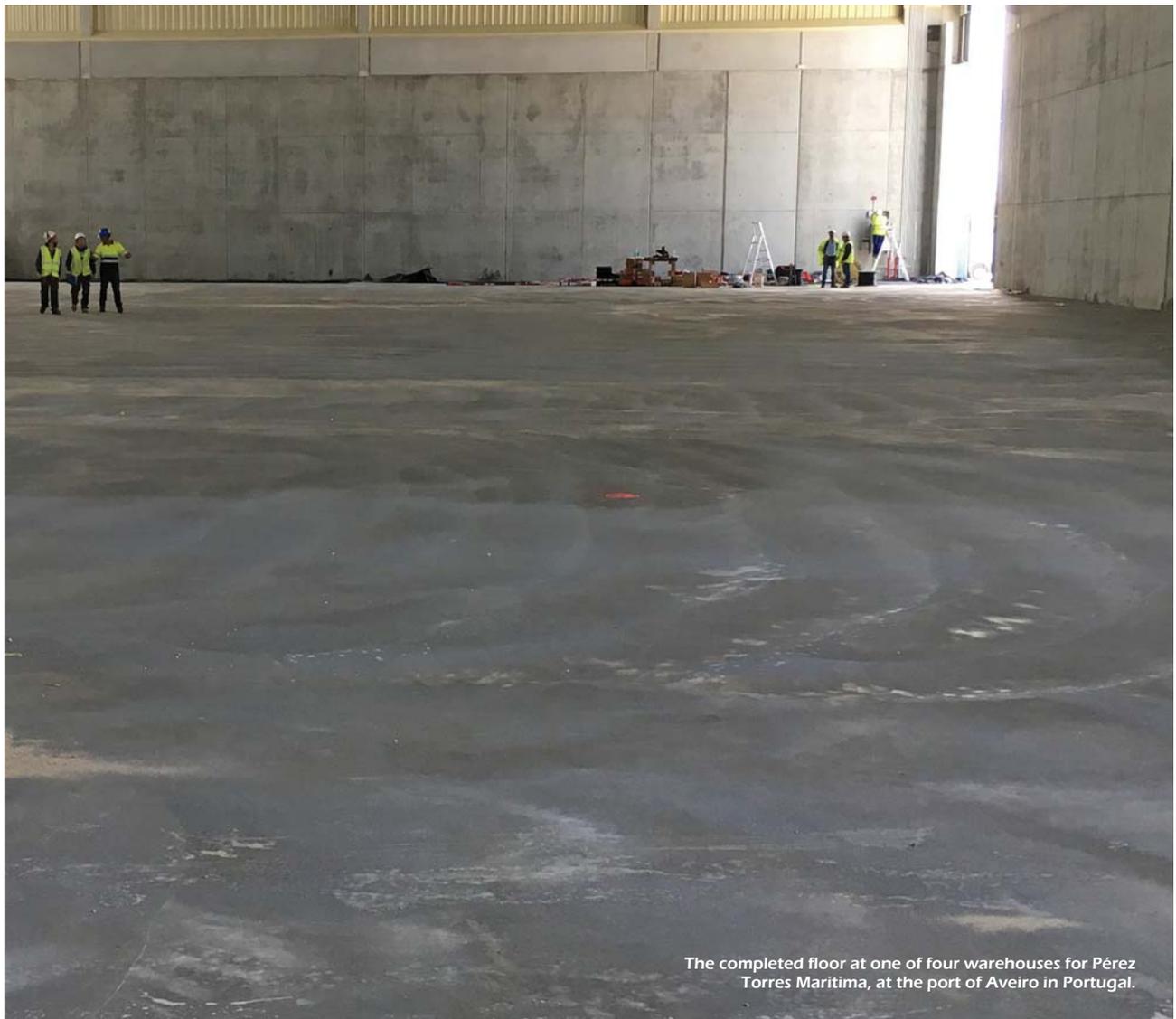
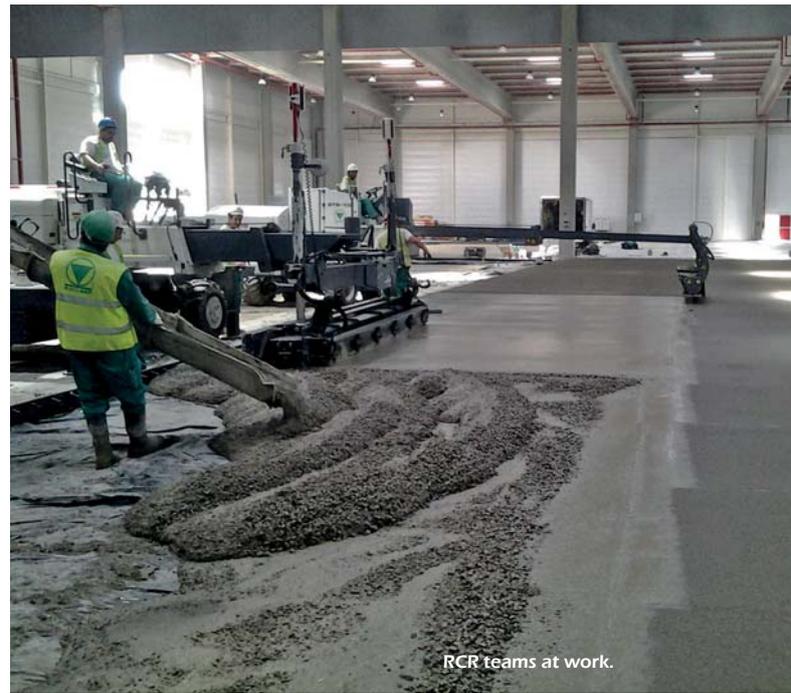
However, joints present operational challenges for warehouse owners. Not only can joints limit how the building is used (eg, where racking may be placed) but also they can readily become damaged when trafficked by hard vehicle wheels, creating an ongoing maintenance problem.

Reducing the presence of joints in a floor is now seen as highly desirable and 'jointless' floors (which eliminate the need for saw-cut control joints) are increasingly popular.

### Controlling shrinkage

However, the problem remains of how to control shrinkage in the larger jointless bays. The inclusion of steel fibres in the concrete is a well-recognised approach, which also provides the benefit of building flexural strength and shear strength so that the floor can bear heavier loads.

Alternatively – and sometimes additionally – steel fabric can be used for shrinkage control, although this can prove costly.





Another completed floor at one of four warehouses for Pérez Torres Marítima, at the port of Aveiro in Portugal.

### Introducing LINK EVR

LINK EVR is a concrete additive with an ingredient exclusive to RCR Industrial Flooring. Several chemical elements are modified and designed to achieve a measured expansion inside the concrete. The expansive additive includes a calcium compound that is reactive with the cement. This 'volumetric stability' agent inhibits shrinkage, so that fewer construction joints are needed. It also allows more freedom over the shape of the bay being poured, so that irregular shapes can be accommodated.

The additive also reduces surface permeability, so is beneficial for use in areas where there is a risk of liquid spillages or repeated water ingress, which would otherwise seep into the concrete floor and compromise the strength and durability of the slab.

### Pérez Torres

The Pérez Torres Group is a major international handling, storage and shipping organisation, with operations in ports around the coasts of Spain and Portugal.

Pérez Torres Marítima (PTM) has had a presence at the port of Aveiro in Portugal since 2014, when it began to act as port operator, shipping agent, forwarder, customs agent and storage provider.

As PTM's operations at the port expanded, so did its need for storage space and hence in 2016 contractor Acciona Construction was commissioned to construct four new warehouses, totalling 11,000m<sup>2</sup> of floor space.

The hard-working bulk storage area demanded strength and durability to handle the constant movement of goods, ranging from grain to steel coils. Being in a port, the floor would also benefit from reduced permeability. The client was keen to avoid differential settling of the floor, to minimise the use of joints and to ensure any joints were protected from damage that might be caused by the wheeled loaders operating in the warehouses.

Furthermore, the floor was a rectangular shape, which is more challenging for jointless construction.

Del Truébano Ingeniería (dT*i*) was appointed to the design, and realised that the particular challenges of the floor called for specialist advice to enhance its own expertise. It therefore sought to create the design in partnership with specialist concrete flooring application company ASIC Pavimentos, part of RCR Industrial Flooring. ASIC added Monofloor – an industrial flooring design specialist and a fellow RCR company – to the design team. Working together, a bespoke flooring specification was proposed to meet the particular challenges of the project.

### The design solution

Two concrete specifications were created. For the grain store, the RCR design team recommended a 180mm-thick concrete slab. For the steel-coil store, a thicker slab was proposed, at 250mm. In both cases, the concrete would incorporate steel fibres for strength; Bekaert Dramix 3D 65/60 was selected at a dosage of 20kg/m<sup>3</sup>.

For joint armoured, 105 linear metres of Permaban Signature would be used. The half-hexagonal shape of the joint's profile would allow vehicles smooth transit in any direction, without causing impact damage.

To reduce permeability and accommodate the unusual shape, the LINK EVR additive would be used, at a rate of 25kg/m<sup>3</sup> – 50 tonnes in total.

The engineer, client and contractor were pleased with the solution and so ASIC and Monofloor continued to work together during the pour, which took place in September and October 2016. Monofloor supervised the site preparation and the pour, which was undertaken by ASIC.

Since the completion of the project, ASIC and Monofloor have visited the completed building several times to check that the surface and the shrinkage are as expected, and the result is hailed a great success. ■