(Photos: Peikko.)

Figure 1: External view of major project in the UK.

A solution for trouble-free dock area isolation in distribution centre floors

The provision of dock levellers, so essential in industrial and distribution buildings, presents designers and contractors with a significant challenge when constructing the building floor.

Trent Davis, Peikko Group, Newton Aycliffe, UK

In any large-area concrete floor, particularly in distribution centres, the careful treatment of intrusions and transitions within the structure is extremely important to avoid problems such as cracks and to give a trouble-free floor.

Intrusions into floor slabs, such as columns or other fixed features, must be effectively isolated to prevent 'locking' of the concrete slab allowing the natural shrinkage to take place unrestrained. If such locking does occur then it will often result in early shrinkage cracking of the slab, which will usually require constant ongoing and expensive rectification repairs for the life of the building.

The consequent impact and delays to operations can be disastrous, especially for very high utilisation buildings such as distribution centres.

The dock areas are of particular concern because they are usually large features and they must not only be effectively isolated from the main floor slabs but also, of course, they are one of the most heavily trafficked areas. This not only imposes substantial cyclical loads on the area but also the consequences of failures such as cracks are even more disruptive than in other parts of the building.

For these reasons it is common practice to isolate the dock areas with a proprietary contraction joint system, which provides not only edge protection to the concrete but also effective load transfer across the joint. It is essential that any such joints are designed to allow unrestrained contraction movement of the adjacent concrete in the two planar directions to avoid cracking, while supporting any vertical loads across the joint.

Unfortunately in many cases this approach has only been partially successful and in some buildings despite the provision of 'anti-crack' reinforcement across the corners of the dock areas, substantial diagonal cracking into the main floor slab has resulted. The reason for this is typically because of the sharp 90° corner at the intersection of the slabs, which introduces a severe stress-concentration point at the internal corner within the main floor slab.

Better solution

A much better solution is to avoid such sharp internal corners, which is now possible with the introduction of curved joint sections as part of the Peikko TERA Joint range. The curved joints have the same cross-sectional design as the normal linear joints so edge protection and load transfer is maintained and installation and connection to standard joints are very straightforward. Figure 3 shows the joints installed using the common pin-fixing method along with the straight sections prior to pouring the concrete.

The radius of the curved sections is 900mm, which is easy to incorporate into most conventional floor slab layouts and yet eliminates the stress concentration caused by conventional 90° corner joint sections.

Figures 1–8 show the application of the curved TERA Joint in two major international distribution centres – the first near Bratislava, Slovakia and the second, more recently, near London in the UK. Since the completion of these projects and others, the response from engineers and contractors to the curved joint has been tremendous and following discussions in early 2010, the range has been further extended to include a 45° curved section. This now allows even more flexibility in the layout and positioning of joint details within the floor structure.

The curved TERA joint now offers the design engineer a solution to the difficult problem of isolating large intrusions into floor slabs without introducing undesirable stress concentration points such as sharp internal corners. ■

Figure 2: Basic curved joint section.

Figures 3 and 4: The straight and curved elements installed prior to pouring concrete.

Figures 5 and 6 above: The dock area with concrete pour completed.

Figure 7 right: Finished floor detail.

Figure 8 below: Finished floor, UK project.