



The Expert >>

9th Article - Repairs to Joints: Part 2 >>

In recent articles, we have been looking at the construction and maintenance of joints in floors. In the last edition, I considered the common sawn joint in some detail and here I am concentrating on the formed joints used at the boundaries of each pour. These are often known as day joints or construction joints for perhaps obvious reasons.

Traditionally, formed joints had simple round dowels fitted on one side with a sleeve for load transfer. The problem with this arrangement was that they provided very limited movement along the face of the joint. It was therefore quite common to see corners cracked off floor panels or cracks across panels. They were also notoriously difficult to keep in line while placing concrete. Misalignment caused the joints to bind up, often resulting in a mid panel crack parallel to the joint.

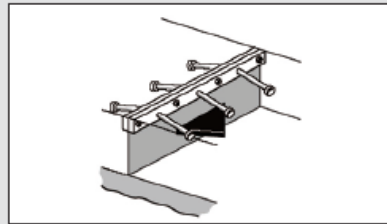
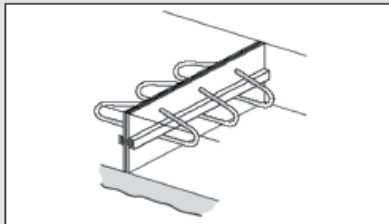
In recent years, engineers have developed systems to provide better alignment of dowels as well as dowels that provide more sideways (along the joint) movement. System later progressed to incorporate permanent steel formwork that provide protection to the arrises of the joints - joint armouring. These developments have had mixed results. Some systems use continuous prefabricated plates or profiles as shown in Fig 1. These provide the movement required along the face of the joint and joint armouring. However, many earlier forms were of too light a construction and break down under the traffic. A more fundamental weakness arises from the use of a tongue and groove to provide load transfer. The top side of the groove is inherently weak and is prone to

breaking away. Tell-tail cracks develop about 75 mm back from the joint and eventually this strip breaks away and has to be replaced. Restoration to the original form is doubtful as the basic structural weakness remains and it can be necessary to remove the complete joint.

A commonly used system combines continuous steel aris protection with discontinuous plate dowels as shown in Fig 2. These systems, which were first developed and tested in the USA, use diamond or trapezoidal shaped plates to transfer load. As the floor shrinks away from the joint, space is created along the edges of each plate to allow for side ways movement along the joint.

So dowel systems have improved and they can be robust and effective. However, when they go wrong they pose particularly tricky repair problems as steel and concrete do not mix well. On its own, concrete is relatively easy to repair. Damaged concrete can be cut out and replaced with cementitious or resin bound mortars. Both materials adhere well to surrounding or underlying concrete - they stick much less effectively to steel. Both repair materials are also easily ground down to create smooth running surfaces.

Armoured joints are therefore fine provided that the original construction is level and true. However, all floors are prone to curling at the edges of panels creating particular problems in defined movement areas of very narrow aisles. With no steel in the way, this is a straightforward matter of grinding and possibly the injection of grout beneath the slab. If there is an excessive gap at the joint, which is often the case with curled joints, then the gap can be closed by a



resin bound mortar inlay that is then cut to provide a new gap of just 4 mm to allow for on going movement. With steel in the way these repairs are virtually impossible and the joint system may need to be removed completely. The other thing to consider is that all joints open as shown in Fig 3. Provision needs to be made for closing these gaps and bear in mind that the joint took about 18 months to progressively open to this size 20 mm! So a number of intermediate fixes may be required before shrinkage is complete. Although modern construction joint systems have brought benefits for floor users, they are not a panacea and require careful attention at installation stage and in some cases, pose as-yet unanswered problems of maintenance when in operation. In the next edition, I will be looking at the design of floors for carrying loads near to and across joints and at ground support problems.

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