

Lockable dowels on Aberdeen's new Emergency Care Centre

Concrete frame specialist PJ Carey has installed 500 Ancon lockable dowels on a new ten-storey hospital building in Aberdeen. The dowels have replaced the need for 'pour strips' to be left in the post-tensioned concrete to accommodate concrete shrinkage. Annabelle Wilson of Ancon Building Products reports.

The dowels transfer load across a joint and accommodate movement, so they eliminate the long site delays associated with propping the concrete slabs while the pour strips are open, typically four to eight weeks per floor level. Early removal of slab props improves site access and allows follow-on trades such as building services to move into an area earlier in the build schedule.

Accommodating movement

A key design consideration in a post-tensioned concrete structure of this magnitude, where long column-free spans are required, is the accommodation of normal concrete shrinkage. In the UK, this movement is often accommodated by leaving 'pour strips' – 1m-wide openings in the slabs – which are filled once the concrete has stabilised to provide the desired continuity in the frame.

Dowel bars transfer load across joints in concrete and are used with a sleeve component where movement is required. Unlike traditional debonded dowels, a lockable dowel accommodates an initial phase of movement and can then be locked in position with a mechanical plate and epoxy resin. The locked dowel continues to transfer vertical load but prevents further movement taking place.

This Ancon product is relatively new in Europe, but has been used by the Australian post-tensioning industry for several years to replace the use of pour strips. The product range includes solutions for slab-to-slab and slab-to-wall joints.

Project details

Matthew Consultants, a specialist in post-tensioned concrete design, specified the Ancon dowels. Its director, Ben Ume, explains how and why the products were used, "Before the introduction of lockable dowels, the construction details on a building of this type would have been quite different. On each floor level, a pour strip would have been located midway between two cores. These strips divide the area into two smaller slabs, reducing the amount of movement to be accommodated without shortening the overall span of the floor. Although a common approach to take, it leaves reinforcement bar exposed on-site, which can cause a trip hazard and requires the floor to be supported from below for several weeks.

"Ancon's dowel system allows this centrally positioned pour strip to be replaced by a temporary movement joint between the slab and a core wall. The sleeve component



Left and below: Emergency Care Centre, Aberdeen.



"It is a proven engineered solution that reduces on-site man hours and improves site access."



will accommodate movement well in excess of what we anticipate here so the slab can be cast in a single pour, and, as shear load is transferred by the dowel bar, propping times are significantly reduced.

"It is a proven engineered solution that reduces on-site man hours and improves site access."

The lockable dowels were supplied by distributor SIG Construction Accessories, located in Perth, and the post-tensioning contractor on the project was CCL Systems.

Wall-to-slab dowel system

The wall-to-slab system used on the project comprises a



Above: Example of site access issues with an open pour strip.

Top right: Lockable dowel void formers visible in the slab and movement accommodated at the joint.

Above far right: Locking plate located on the dowel prior to the resin being poured.

Below: Wall-to-slab lockable dowel application.

Below right: Reinforcement bar and post-tensioning strands being located around the lockable dowel sleeves.

Bottom: Lockable dowel components.

stainless steel threaded anchor, dowel bar, box-section sleeve and locking plate; a plastic L-shaped void former; and 1.5 litres of a two-part epoxy resin. One end of the dowel bar is threaded to fit the anchor component and the other end features a series of grooves to accept the locking plate.

To install the system, the anchor is first cast into the face of the wall with a nailing plate. When the slab is ready to be constructed, the dowel is screwed into the anchor and then the sleeve is pushed over the dowel. The system is tied to the local reinforcement and the concrete is cast.

The dowel locates in a guide tube within the sleeve component and is free to move as concrete shrinkage takes place; the box-section design allows lateral, longitudinal and some rotational movement to occur.

When movement has stabilised and the joint between the slabs has been filled, the dowel is locked. The void former allows inspection of the dowel at this time. The fan-shaped locking plate is located over a groove on the bar.



(Photos: PJ Carey (Contractors) Ltd.)

The two-part epoxy resin is mixed and poured into the void former, ensuring it flows along the stainless steel box section towards the joint.

After 24 hours, the void can be filled with cementitious material, level with the top of the slab, to complete the installation.

When locked, the dowel continues to transfer vertical load but further movement is prevented from taking place.

Emergency Care Centre

Main contractor Robertson Construction Group is delivering a thoroughly modern healthcare environment to its client NHS Grampian. The new centre is due to open in 2012 and will bring together unscheduled care services from across the Grampian Region at one strategic location.

Above the Accident and Emergency department, the building will provide eight floors of advanced clinical accommodation to include cancer care facilities. Internal corridors will link the emergency care centre with the main infirmary building and the children's hospital, to facilitate patient and staff transfers.

Externally, contemporary claddings in white, grey and silver will combine with dark glazing to complement the high-tech interior.

Improve and accelerate

Project manager Eamonn O'Donnell says, "PJ Carey chose the lockable dowel system because it offered time and cost savings, which accelerated an already fast-build programme."

Use of the dowels at the temporary movement joints between slabs and core walls has replaced the need for mid-slab pour strips, eliminating a long period of slab propping at each floor level.

Matthew Consultants first specified the Ancon dowels on the six-storey University Campus Suffolk Phase 2, which was highly commended in the 2010 CONSTRUCT Award for Innovation and Best Practice. ●



(Images: Ancon Ltd.)



(Photos: CCL Systems Ltd.)

