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Experience with New Prestressing Materials

Expérience avec de nouveaux matériaux pour la précontrainte

Erfahrung mit neuen Spannbeton-Baustoffen

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Recently the use of external prestressing technique became a subject of increasing interest in bridge construction. However, the long-term behaviour of external prestressing steel tendons are not yet well-known. Important corrosion problems had been already detected in cable-stayed bridges in last years. High strength fibres as an steel substitute show a satistactory short- term behaviour when tested in laboratory. However not so much is known about long-term behaviour in real construction environments. The poster deals with a full-scale application of aramide fibre as prestressing element in the agressive environment of a big city in order to continuously monitor the evolution of durability and structural properties along time.

The experimental design is a stretch (80 m. long) of a cantilever structure spanning 4 m. which has to support the upper traffic of the North Ring- Road now under construction in the city of Barcelona (Spain). This construction is a very important key in order to achieve a global solution on traffic communications involved in the celebration of the Summer Olympic Games in 1992. The prestressing element is an aromatic polyamid with a high degree of cristallinity (aramid) in a matrix of epoxy resin. Characteristic axial tensile strength is 2800 N/mm^2 and the elasticity modulus is 130 KN/mm^2. An important aspect concerning the long-term behaviour of this material is the aging phenomena under permanent prolonged load. The 80 m. experimental part is designed fully prestressed.The prestressing tendon layout is assumed straight with variable depth according to the linear variable depth of the cross section (Figure 1). Strain, displacement and pressure measurement devices are located on several elements in order to continuously monitor the long- term behaviour of prestressing fibre. In addition, five empty ducts of 10 cm in diameter are placed per element to fill-in with conventional prestressing steel tendons if the prestressing fibre does not work correctly in the future (Figure 2). Due to space problems to properly locate the ducts and long-term anchorages for the composite tendons in the cast in place solution, the prestressed cantilevers are precast elements of 1.8 m.(Total 40 elements) . The fibre is anchored by bond in concrete. According to the brittle rupture of the composite material the amount and location of reinforcing steel should be properly designed to achieve ductility requirements if the prestressing is not effective. The junction of precast elements with cast in place lateral walls is made by means of conventional prestressing bars avoiding the tensile stress in the joint (Figure 1). The cast in place reinforced concrete (20 cm) between precast elements assures the continuity of superestructure.

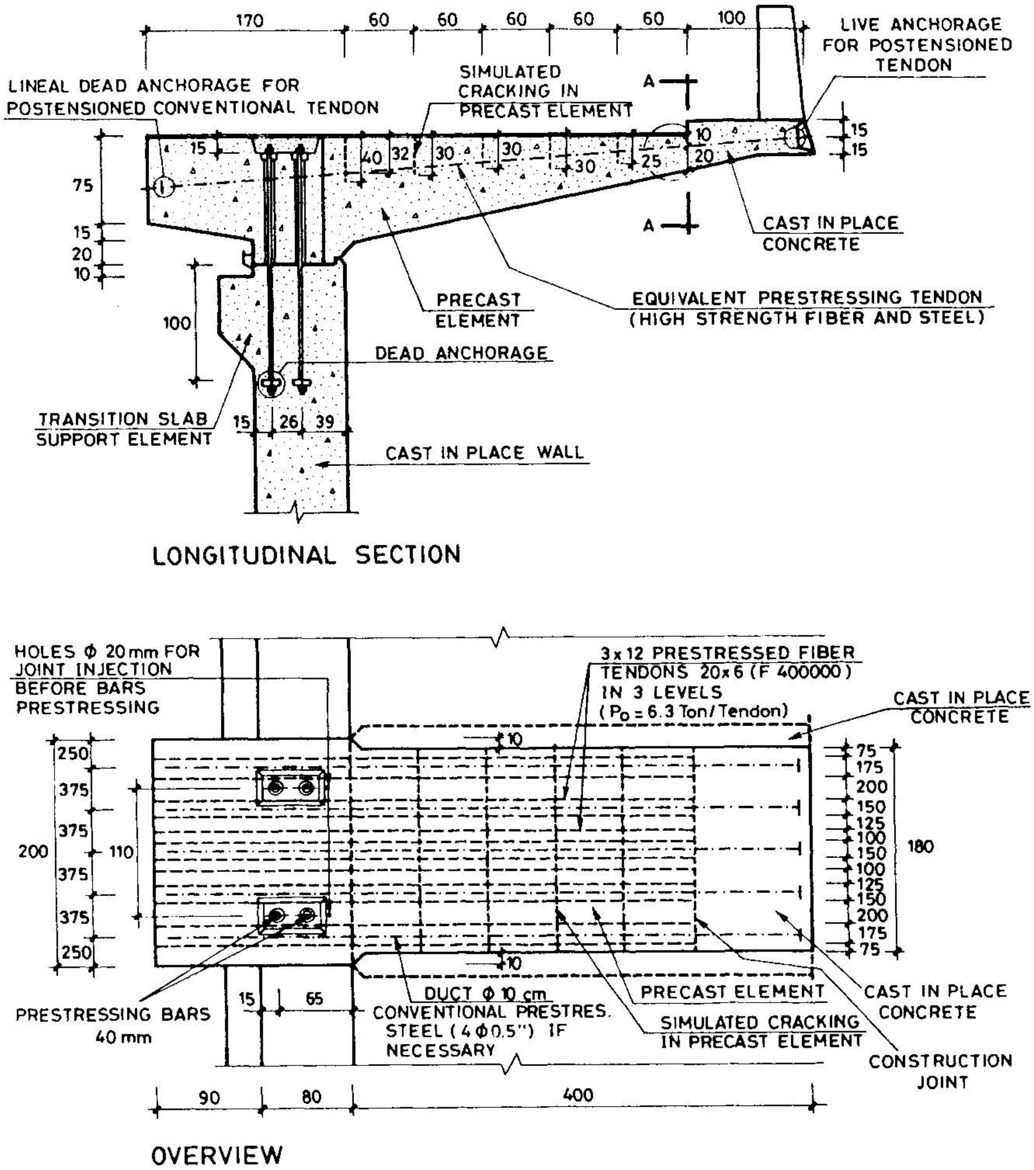

Figure 1

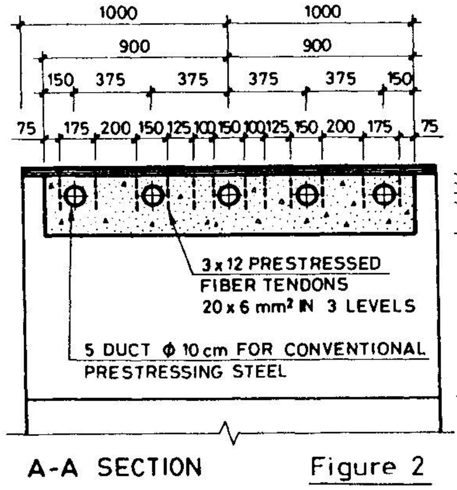

Figure 2