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REPAIR AND STRENGTHENING OF REINFORCED CONCRETE STRUCTURES

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CHAPTER (7) Repair of cracked reinforced concrete beams with epoxy injection.

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STRENGTHENING OF R.C. BEAM BY ADDING NEW CONCRETE

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* *Repair of Cracked R.C. beams with epoxy injection*
BY: Hamdy H. Shaheen and Ahmed Mossa

7.1. REVIEW OF PREVIOUS WORK

7.1.1. Introduction for shear transfer in reinforced concrete

Situations exist where shear failure is constrained to occur along a plane, such as at the interface between a precast beam and a cast -in place deck slab, steel beam and concrete slabs, or at a certain locations in pre-cast concrete connections, also in case of strengthening of beams by adding new layer of concrete. The transfer of shear across the interface plane is called "Shear Transfer" to distinguish this type of shearing action from that which usually occurs in a reinforced concrete beam.

Through this chapter an attempt is made to review recent research works concerning the shear transfer between two concrete surfaces.

7.1.2. Composite beams and composite action

Precast R.C. beams and steel beams are used in building and bridge construction in conjunction with cast-in place concrete slabs. Economic considerations indicate the desirability of composite action between the precast and cast in place elements . Composite behavior with the slab serving as the flange of T-beams results in horizontal shearing stresses at construction joints. Various methods of joint treatment have been specified to obtain adequate joint strength. Doweling, use of shear keys, and roughening of the joint surface have been used in joint construction.

7.1.2.1 Behavior of precast beams with cast in place slabs

Physical properties of composite section. should be computed on the assumption of complete interaction between component elements (1). Tests on steel beams composite with concrete slabs have indicated that full ultimate moment may be developed despite the existence of appreciable amounts of shear slip at the interface. One should expect similar behavior with precast concrete beams designed to act compositely with concrete slabs. The behavior of these beams can be classified according to the strength of the shear connection between the different parts as follows.

7.1.2.1.1. Fully composite beam

It is defined as one in which the shear connection is adequate to develop the full ultimate moment capacity of the composite cross section. A fully composite beam would transmit the shearing forces at the joint with the same deformation as monolithic beam. Many researches describing the behavior of steel beams with concrete slabs have been made using adequate shear connection between the precast beam and the cast in place slab (2). An example of composite concrete beam is given by Robert F.Mast (3). He considered a simply supported beam with uniform load and a deck slab composite with the beam. At the ultimate load, the total compressive force is normally within the top