AV08.

A Shear Transfer Model for RC Interface

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The shear transfer mechanisms at construction joints for members with normal to high strength concrete and dowel reinforcement were experimentally studied. The primary objective was to assess each contribution of the shear transfer through dowel action of the reinforcement and that through concrete of interface with or without shear keys. Based on these experimental data, a shear transfer model for the high strength concrete interface with rectangular shear keys and dowel reinforcement was proposed in this study. The model well predicted the shear capacity of such joint. For a practical design purpose, also proposed were simplified half empirical equations to estimate the shear capacity of joints with various interface conditions.

A sliding shear failure model for specimens with rectangular shear keys and dowel reinforcement

It is noted that in the case of C100CG specimen (rectangular shear keys, f'c=95MPa, fy=867MPa for shear friction bars), the peak shear stress reached at the slip of about 1mm as shown in Fig.1 although shear sliding failure of the shear key was visually confirmed after the test. Such a large slip at the peak shear stress cannot be expected if a shear sliding failure occurred without lateral confinement. The reasons are as follows: (1) The elastic shear deformation of the shear key is too small to induce such a large slip, (2) The elastic shear deformation of the concrete block between the slip measuring points is also negligibly small, (3) The cohesion between flat interfaces of concrete is lost with a minor slip, (4) The ascending slope angle of the shear stress-slip curve is too large to be explained by the increase of the contribution of dowel action of D100CG specimen where no shear key was provided, represented by the dashed line in Fig.1

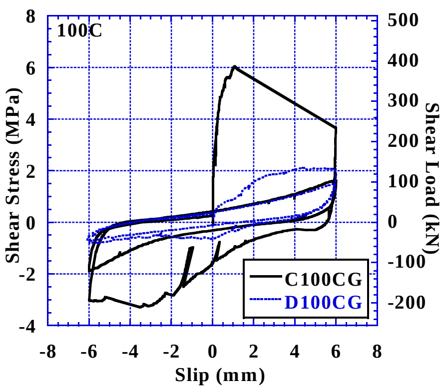
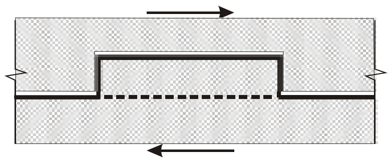
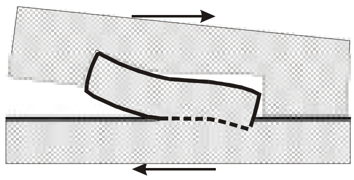


Fig.1 Shear stress-slip relation for a specimen with rectangular shear keys

Based on the above considerations, the failure mechanisms of the rectangular shear keys with dowel reinforcement can be assumed as shown in Fig.2. First, the cohesion around the shear key face is lost with a minor slip as shown in Fig.2 (a). Then, the tensile part of the shear key base is peeled off and the compressive part induces additional rotation of the shear key. This kind of deformation mechanism of the shear key will be able to induce a large slip at the ultimate shear strength. Additional slip might be given by the local crushing of the concrete edge of the shear key. Finally, the compression zone of the shear key base fails in the manner of the sliding shear as observed in a squat wall test.



(a) Minor slip due to loss of cohesion



(b) When the maximum shear stress is reached

Figure 2: Deformation of a shear key

Conclusions

1. The shear failure mechanisms of the construction joint interface with rectangular shear keys are considered based on the experimental observations. A model representing those failure mechanisms was proposed in this study and predicted well the shear strength of such construction joint.
2. Equations to predict the shear strength of the roughened or smoothed surface joint with dowel reinforcement were also proposed. The shear strengths predicted by those equations agreed reasonably well with the experimental results.

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