리브라스를 이용한 콘크리트 수직시공이음면의 전단강도

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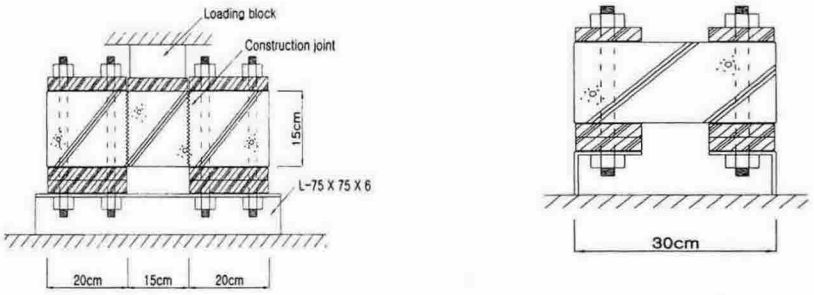
1. Introduction

Strength deterioration is possible at construction joint due to discontinuous concrete placement at the joint. To increase shear friction it is common practice to chip concrete surface causing constructional inefficiency and difficulty in quality control of structural capacity at the construction joint. Zhu[1] conducted three-point bend test on notched repaired beams with the interfaces to evaluate the bond strength between new and old concrete. Moriwaki et al[2] added polymer cement mortar to conventional materials and evaluated the flexural behavior of the vertical construction joint and the performance of the polymer-modified mortar. Chipping concrete surface is a traditional method to increase shear friction of concrete. However, this method is cumbersome and quality of joint is depends on craftman's ability. In this study, pushout tests were conducted to compare the interface shear strength of concrete in vertical construction joints made with three methods, (1) chipping, (2) rib-lath, (3) folded rib-lath. Referred to the shear strength in codes, shear capacity of these methods is compared.

2. Experimental Program

Table 1 Summary of Specimen

Specimen Series	Curing Age(day)	Treatment of Joint Surface
Ch-a	14	Chipping
Ri-a		Rib-lath
Fo-a		Folded rib-lath
Ch-b	28	Chipping
Ri-b		Rib-lath
Fo-b		Folded rib-lath



(a) Front View (b) Side View

Figure 1. Configuration of test setup

To conduct pushout test of specimens with vertical construction joint 18 specimens are made and the parameters of test specimen are curing period and method of joint surface treatment. As summarized in Table 1, two curing periods are selected and three types of surface treatment are employed. Each specimen series has three samples. The configuration of test sample is shown in Figure 1.

3. Nominal Shear Strength

In this section, ACI 318-95[3] was used to confirm the shear strength in construction joint interface. Shear strength provided by concrete members subject to flexure and shear only shall be computed as

$$v_c = 2\sqrt{f_{ck}} \qquad (1)$$

and when shear force is large compared to moment, the shear strength of concrete member is

$$v_c = 3.5\sqrt{f_{ck}} \qquad (2)$$

If the shear strength of unreinforced concrete member is over the values from eq. (1) and (2), code requirement for nominal shear strength is satisfied. In the section R11.7.3 of ACI 318-95, to include concrete in the shear friction the following equation is suggested.

$$V_n = 0.8\, A_{vf} f_y + A_c K_1$$

This equation can be used to evaluate the shear strength in unreinforced construction joint as follows:

$$v_c = K_1 \qquad (3)$$

where, K_1 is 28.1 kgf/cm^2 for normal weight concrete.

4 Result of Experiment

In Ch series, initial cracks occurred and propagated along the joint surface and then final failure is arrived. The surface of failed specimen was smooth. However, in Ri and Fo series, initial cracks occurred along the surface and then, crack propagated inside the specimen rather along the surface which is the sign of increase of shear resistance. For the b series specimens initial cracking load is measured and shown in Fig. 2.

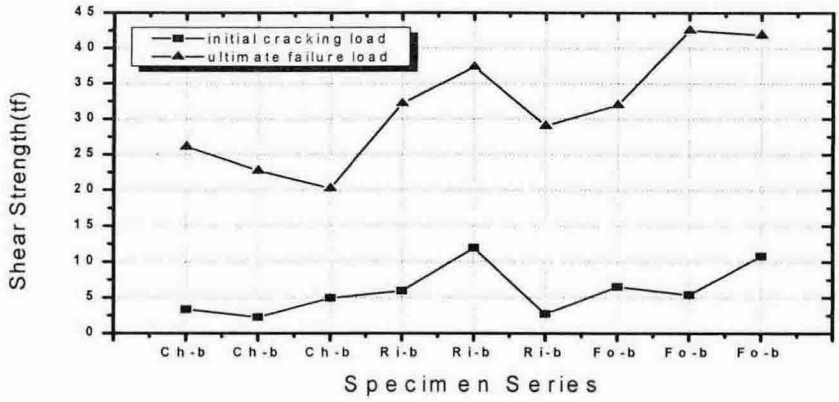


Figure 2. Experimental shear strength

The average ratios of the experimental shear strength to nominal shear strength from eqs(1), (2), (3) are illustrated in Figure 3 in which the ratio of Ch-b series is set as a benchmark. Fo-b series is over by 60% compared to Ch-b series. At the half of required curing time Fo-sereis does not show difference from Ri-sereis but atfter the required curing time Fo-sereis showed better performance by 14% over Ri-series.

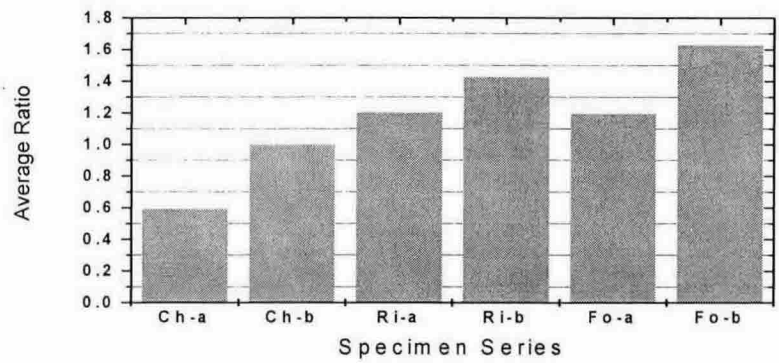


Figure 3. Comparison of joint shear capacity

5. Conclusion

This study carried the experimental evaluation of interface shear strength of concrete in vertical construction joint. To make construction joint in a massive concrete member without sacrificing structural safety three types of interface treatment are compared. Based on the result of experiment, the findings of this study are as follows: (1) Compared to the specimens made with conventional surface chipping, those with rib-lath showed excellent performance increasing shear resistance capacity by over 40%., (2) The role of shear key conceived by folding rib-lath played important role in enhancing shear resistance, leading to 14% increase of shear strength.

References

1. Y. Zhu, "Bond between new and old concrete", Analysis of concrete structures by fracture mechanics., Chapman and Hall, London, pp199-207, 1991.
2. T. Moriwaki, Y. Tsuji, C. Hashimoto, T. Nakajima, "Characteristics for strength of construction joint using polymer-modified mortar as joint materials," Proceedings of the Japan Society of Civil Engineers, V.31, No538, pp15-26, 1996.
3. ACI, Building Code Requirements for Structural Concrete(ACI318-95) and Commentary(ACI 318R-95), 1995.