

확률기법에 기초한 FRP rebar로 보강된 콘크리트 슬래브의 펀칭전단강도 모델에 대한 고찰

A Study on Probability-based Punching Shear Model of Concrete Slabs Reinforced with FRP rebars

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ABSTRACT

The objective of this study is to propose the new punching shear model for two-way concrete slabs of building structures and bridge decks structures reinforced with FRP or steel rebars. To do this, two evaluating methods are applied here. One is the ratio of test to model and the other is probability analysis with probabilistic uncertainties. In conclusion, it shows that the proposed punching shear model evaluates the tested punching shear strength as conservative with stability and it exhibits better probabilistic characteristics than existing punching shear models.

1. Introduction

To solve the degradation of structural capacity of RC structures, FRP rebars have been remarkably interested as substituting material to conventional steel rebars for concrete structures. Even though many researches for FRP rebars have been investigated, they have usually been focused on the one-way concrete structures such as beams. Thus, for more effective application of FRP rebars, it needs to extend to the two-way concrete structures reinforced with FRP rebars. The objective of this study is to propose the new punching shear model for two-way concrete slabs of building structures and bridge decks structures reinforced with FRP or steel rebars. To do this, probability-based method is applied in this study. It is to investigate reliability of the proposed punching shear model with probabilistic uncertainties such material, geometry and modeling error. The reliability of the proposed punching shear model is evaluated by investigating the compatibility between the nominal punching shear load and punching shear load according to the targeted confidence level of 95%.

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2. Existing punching shear models for comparative study

In this study, 61 test results that had been conducted is adopted. For the comparative study, 11 punching shear models which has been used and researched are considered as follows: Modified ACI 318-95, Modified ACI440-98, ACI440H, BS8110, EC2, El-Gamal et al (2005), Gardner (CEB Bulletin 168, 1990), JSCE, MC90, Ospina et al (2003), UW (Jacobson et al, 2005).

3. The suggestion of probability-based punching shear model

To develop more reasonable punching shear model, compatibility and reliability is considered in this study. The uncertainties of the proposed punching shear models may be exist and it brings the result of decrease of the possibility to predict the punching shear strength even though it shows the desirable compatibility from the ratio of test to model. That is why compatibility and reliability must be simultaneously considered (Figure 1). The compatibility can be acquired by investigating the ratio of test to model. Especially, it is important for concrete slabs reinforced with FRP rebars because of the brittle failure of punching shear.

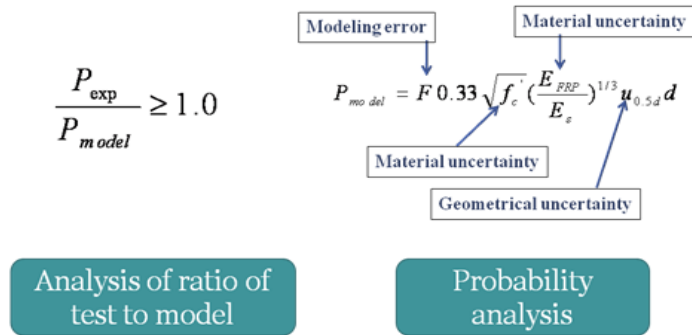


Figure 1 The fundamental needs to propose punching shear model

4. Conclusion

The new punching shear model proposed in this study shows that it can evaluate the tested punching shear strength as conservative with stability and exhibits better probabilistic characteristics as existing punching shear models. Further studies to find effective parameters for more reasonable punching shear model are needed using additional experimental data and FEM.

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