

論文 / 著書情報
Article / Book Information

題目(和文)	
Title(English)	Shear Behavior of Reinforced Concrete and Prestressed Concrete Beams with Variable Effective Depth
著者(和文)	侯 陳偉
Author(English)	Chenwei Hou
出典(和文)	学位:博士(工学), 学位授与機関:東京工業大学, 報告番号:甲第10325号, 授与年月日:2016年9月20日, 学位の種別:課程博士, 審査員:二羽 淳一郎,岩波 光保,廣瀬 壮一,高橋 章浩,千々和 伸浩
Citation(English)	Degree:, Conferring organization: Tokyo Institute of Technology, Report number:甲第10325号, Conferred date:2016/9/20, Degree Type:Course doctor, Examiner:,,,,
学位種別(和文)	博士論文
Category(English)	Doctoral Thesis
種別(和文)	論文要旨
Type(English)	Summary

論文要旨

THESIS SUMMARY

専攻：	土木工学	専攻
Department of		
学生氏名：	HOU Chenwei	
Student's Name	侯 陳偉	

申請学位 (専攻分野)：	博士	(工学)
Academic Degree Requested	Doctor of	
指導教員 (主)：	二羽 淳一郎	
Academic Advisor(main)		
指導教員 (副)：		
Academic Advisor(sub)		

要旨 (英文 800 語程度)
Thesis Summary (approx.800 English Words)

The reinforced concrete and prestressed concrete beams with variable effective depth are widely used in the recent construction field. Since there is no rational design method in current major specifications, it is necessary to clarify the shear resistance mechanism of such beams and propose a convenient evaluation method with high accuracy and compatibility. Therefore, the experiments of totally 10 reinforced concrete haunched beams and 7 tapered beams were carried out together with the nonlinear FEM analysis. Finally, some new evaluation methods for the shear capacities were proposed.

The thesis consists of 7 chapters. The contents of this thesis are organized as follows.

Chapter 1 introduces the background and the motivation of this study. The objectives of the study and the content of the dissertation are also included.

In **Chapter 2**, after the introduction of the basic theory on shear, the shear behavior and the existing design equations for reinforced concrete members and prestressed concrete members in the current JSCE design guidelines are introduced. Then the previous researches on shear behavior of reinforced concrete beams with variable effective depth are summarized, including the RC haunched beams (RCHBs) and RC tapered beams. Based on such previous results, the factors may affecting the shear behaviors of haunched beams and tapered beams are also discussed. These factors become the experimental parameters in the following experimental programs.

Chapter 3 introduces the experimental and analytical programs of RCHBs. The experiment of 10 specimens belonging to four series was conducted, to investigate the influence of the position of haunched portion, concrete cover, using of stirrups and the arrangement of tensile rebars. The concrete mix proportion, manufacture of test specimens, loading methods and dimensions of the 10 test beams are explained. The measuring items and measuring method are also introduced in this chapter with the nonlinear FEM analysis model.

The experimental results of each series in RCHBs are presented in **Chapter 4**. By comparing the crack patterns and the shear capacities of test beams in each group, the effects of each

parameter on shear resistance mechanism of RCHBs are investigated. The arch action occurs due to the debonding cracks in the RCHBs, while the position of the haunched portion is found to affect the shear behavior significantly. The concrete cover however has no big influence on the shear behavior. For the RCHBs with stirrups, the contribution of the stirrups are also different due to the different diagonal cracks' angles. In addition, compared with the crack patterns of RCHBs with bent tensile rebars, the shear behavior becomes totally different when the tensile rebar is changed into disconnected one in RCHBs without stirrups. Finally, the nonlinear FEM analyses are carried out to clarify the influence of arch action and bonding behavior on the shear behavior. By modifying the bond loss factor in the nonlinear FEM analyses, it is able to simulate the shear behavior of RCHBs.

Chapter 5 introduces the experimental and analytical programs of RC and PC tapered beams. There are totally 7 test beams belonging to three series: tapered RC short beam without stirrups, tapered RC slender beams without stirrups and tapered PC beams without stirrups. After the introduction of the experiments, the nonlinear FEM analysis model is also explained.

Chapter 6 presents the experimental and analytical results of tapered beams. The crack patterns, load-displacement curves and shear capacities are investigated to clarify the influence of each factors on the shear behavior of tapered beams. It is found that in tapered RC short beam without stirrups, there is no effect of the taper due to the arch action. For the slender tapered RC and PC beams without stirrups, there is the influence of the taper that the crack patterns and the shear capacities are different from the normal constant depth beams. Further, better understanding of the shear resistance mechanism in RC and PC tapered beams without stirrups is achieved with the nonlinear FEM analysis. The inclination of the shear stress flow increases as the slope of taper increases. The simple linear relationship between the slope of taper and the inclination of the stress flow for the tapered RC beams without stirrups is proposed. In PC tapered beams, the a/d ratio and the prestress levels are found to affect the inclination of the shear stress flow as well. Finally, by determining the location of the critical section with a general method from the analytical results, the new evaluation method for the evaluation of the shear capacity in tapered beams without stirrups is proposed. And the proposed method shows a good agreement with the experimental results as well as the high accuracy and compatibility.

Finally, the conclusions obtained in this study and the recommendations for further study are given in **Chapter 7**.

備考：論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note: Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1 copy of 800 Words (English).

注意：論文要旨は、東工大リサーチリポジトリ (T2R2) にてインターネット公表されますので、公表可能な範囲の内容で作成してください。

Attention: Thesis Summary will be published on Tokyo Tech Research Repository Website (T2R2).

(博士課程)

東京工業大学