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**Shear Behavior of Self Compacting Concrete Deep Beams Reinforced with GFRP and Steel Rebars**

Submitted in partial fulfillment of the requirements for the Master of Science degree in the Department of Civil Engineering at the College of Engineering, King Saud University.

by

Saleh ……..

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**Shear Behavior of Self Compacting Concrete Deep Beams Reinforced with GFRP and Steel Rebars**

**سلوك القص في الكمرات الخرسانية العميقة ذاتية الدمك المسلحة بالحديد وقضبان الألياف الزجاجية**

 **Prepared by:**

**Saleh ……..**

This thesis was discussed on, ……………………

 corresponding to ……………..and was approved by the following:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Prof.xxxxx Dr. xxxxxxx**

Advisor Co-advisor

Members of the Examination Committee

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **Prof. xx Dr. xx**

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# ABSTRACT

Reinforced Concrete (RC) deep beams are often required in structures for the transfer of heavy loads to columns/shear walls at relatively close spacing. The span to depth ratio of these beams being small, their behavior is different from normal beams. The requirement of heavy flexural and shear reinforcement in RC deep beams causes rebar congestion, which makes the concreting difficult. The use of steel fibers in concrete further enhances the difficulties in concreting due to considerable reduction in the workability of fiber reinforced concrete (FRC). These difficulties can

# الملخص

غالبا ما يتم اللجوء إلى استخدام الكمرات الخرسانية العميقة المسلحة في المنشآت لنقل الأحمال الثقيلة إلى الأعمدة /جدران القص في التباعد القريب نسبيا، حيث تكون نسبة المجاز (الطول) إلى العمق لهذه الكمرات صغيرة، وسلوكها مختلفا عن سلوك الكمرات العادية.

# CHAPTER 1

# INTRODUCTION

## GENERAL

Reinforced concrete (RC) deep beams are members loaded on one face and supported on the opposite face so that compression struts can develop between the loads and the supports, and have either a clear spans equal to or less than four times the overall member depth or have regions with concentrated loads within twice the member depth from the face of the support (ACI 318-14 sec 9.9 and SBC 304 sec 10.7). Based on the literature, reinforced concrete beams could be classified based on the span-to-depth ratio. Deep beams typically have a shear span-to-depth ratio of less

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