

The tilte of the proposal

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

Aref Abadel

4/1441 H

12/2019 G



**استمارة الموافقة على خطة البحث لرسالة الماجستير**

**وترشيح المشرفين عليها**

**اسم الطالب:** عارف عبادل  **رقم الطالب:** xx

**الكلية:** الهندسة **القسم:** هندسة مدنية - انشاءات

**عنوان الرسالة باللغة العربية:**

"العنوان بالعربي"

**عنوان الرسالة باللغة الإنجليزية:**

“Title in English ”

**المشرف** الرئيسي:

**المرتبة** العلمية: أستاذ

**التخصص:** هندسة إنشاءات

**المشرف المساعد**

**المرتبة العلمية:** أستاذ

**التخصص:** هندسة إنشاءات

# Abstract

One of the applications example of post-installed adhesive anchors in concrete is beam-column connection, wherein a RC or steel beam is connected to an existing RC column using adhesive anchors. In this application, besides the pullout force, the anchors are also subjected to sustained shear force. As the characteristics of polymers used as adhesive are time dependent, the polymer molecules may begin to rearrange and slide past one another under sustained shear force. This kind of deformation of adhesive may affect the performance of adhesive anchors. This effect may aggravate at high weather temperatures. ..........................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................

**الملخص**

فهنالك العديد من حالات التحميل المختلفة التي لم يوضع لها أحكام من قبل الكود السعودي أو الأمريكي للبناء. مما يجعل المهندسين والممارسين في هذا المجال يلجؤون لاستخدام هذه التقنية اعتماداً على ما تروج له الشركات المصنعة لمثل هذه المواد. ........................................................................

.......................................................................................................................................

# Contents

[Abstract 1](#_Toc38403587)

[Contents 3](#_Toc38403588)

[LIST OF FIGURES 4](#_Toc38403589)

[LIST OF TABLES 4](#_Toc38403590)

[1. INTRODUCTION 5](#_Toc38403591)

[2. LITERATURE REVIEW 5](#_Toc38403592)

[2.1. Concrete structure 5](#_Toc38403593)

[3. GAPS IN RESEARCH 6](#_Toc38403594)

[4. RESEARCH OBJECTIVES 6](#_Toc38403595)

[5. RESEARCH METHODOLOGY 6](#_Toc38403596)

[5.1. Experimental Work 6](#_Toc38403597)

[5.1.1. Test Specimens 6](#_Toc38403598)

[5.1.2. Instrumentation and Testing 7](#_Toc38403599)

[5.1.3. The ………………………………………………………………………………………… 7](#_Toc38403600)

[5.2. Analytical modeling 7](#_Toc38403601)

[6. SCHEDULE OF RESEARCH PLAN 8](#_Toc38403602)

[7. BUDGET 8](#_Toc38403603)

[8. REFERENCES 9](#_Toc38403604)

# LIST OF FIGURES

[Figure 1. Application examples of the use of adhesive anchors. 5](#_Toc38403581)

# LIST OF TABLES

[**Table 1.** Test parameters 6](#_Toc38403575)

[**Table 4.** Schedule of research plan 8](#_Toc38403576)

[**Table 5.**  Budget for proposed research. 8](#_Toc38403577)

# INTRODUCTION

The bridge decks are often strengthened for flexure by external bonding of Fiber Reinforced Polymer (FRP) sheets but the consequent enhancement in shear strength is generally low and not well known. Many previous studies have examined the punching shear strength of FRP strengthened RC slabs; however, there are some theoretical deficiencies in the conventional theory, which are not able to explain the influence of FRP strengthening on punching resistance of RC slabs. Errors in predicting the punching shear capacity have been known to cause catastrophic failures resulting in huge loss of life and property. One such failure is the collapse of the six-year old, five-storey Sampoong Department store (originally designed as an office block and later converted to department store with reckless structural modifications) in Seoul, Korea in 1995. This collapse under service conditions led to several casualties (Gardner et al., 2002).

Curing period must pass before the anchors are loaded. ACI Committee 349-80 (Appendix B) and its amendments provide the basis for all steel embedment design and testing. Examples of adhesive anchors in concrete are shown in Figure 1.



Figure 1. Application examples of the use of adhesive anchors.

# LITERATURE REVIEW

## Concrete structure

Punching shear failure of reinforced concrete (RC) slabs is a major concern for the structural designers of buildings and bridges. This type of failure is more common in bridge decks supported by girders under the action of repeated wheel loads (Meier, 1992;Hassanzadeh and Sundqvist, 1998;Malvar et al., 2000;Oh and Sim, 2004).

Ahmed and Kodur (2011), observed when a connection was subjected to elevated temperatures and the bond temperature approaches the glass transition temperature, the reduction in mechanical properties such as strength, deflection, stiffness, strain and stresses was phenomenal.

# GAPS IN RESEARCH

There is no study for the effect of the following parameters on the performance of adhesive anchors in concrete:

* Effect of existing……………………..,

# RESEARCH OBJECTIVES

The following objectives will be achieved in this research:

* To study the effect of the ……………………………………...
* To investigate …………………….
* To validate …………………..

# RESEARCH METHODOLOGY

The procedures and techniques to be used in this research project are explained in the following:

## Experimental Work

### Test Specimens

The test specimens will be in the form of concrete blocks with an installed anchor (Figure 7). The test parameters of the study are listed in Table 1………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

**Table 1.** Test parameters

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| **Common test parameters** | |
| Concrete grade | NSC (~ 30 MPa) and HSC (~ 60 MPa) |
| Concrete rebar | Commercially available |

### Instrumentation and Testing

### The …………………………………………………………………………………………

## Analytical modeling

# SCHEDULE OF RESEARCH PLAN

**Table 4.** Schedule of research plan

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Assignment | Time (months) | | | | | | | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| Literature review |  |  |  |  |  |  |  |  |  |  |  |  |
| Detailed Experimental Plan |  |  |  |  |  |  |  |  |  |  |  |  |
| Experimentation |  |  |  |  |  |  |  |  |  |  |  |  |
| Result Analysis and Discussion |  |  |  |  |  |  |  |  |  |  |  |  |
| xxxxxxxx |  |  |  |  |  |  |  |  |  |  |  |  |
| Thesis & paper writing |  |  |  |  |  |  |  |  |  |  |  |  |

# BUDGET

The proposed budget to carry out this research project is expected to be:

**Table 5.**  Budget for proposed research.

|  |  |  |
| --- | --- | --- |
| No. | Item | Amount (SR) |
|  | Materials and molds | 1,000 |
|  | Accessories | 1,000 |
|  |  |  |
|  |  |  |
|  | |  |

# REFERENCES

Datla, N. V., Papini, M., Ulicny, J., Carlson, B., & Spelt, J. K. (2011). The effects of test temperature and humidity on the mixed-mode fatigue behavior of a toughened adhesive aluminum joint. Engineering Fracture Mechanics, 78(6), 1125-1139

Omran, M., Fabritius, T., Elmahdy, A. M., Abdel-Khalek, N. A., El-Aref, M., & Elmanawi, A. E. H. (2014). Effect of microwave pre-treatment on the magnetic properties of iron ore and its implications on magnetic separation. Separation and Purification Technology, 136, 223-232.

Al-Salloum, Y. A., Siddiqui, N. A., Elsanadedy, H. M., Abadel, A. A., & Aqel, M. A. (2011). Textile-reinforced mortar versus FRP as strengthening material for seismically deficient RC beam-column joints. Journal of Composites for Construction, 15(6), 920-933.