



Dedication

To my father who is guiding and supporting me in all of my life

To my lovely mother who taught me the meaning of life

To my Wife for supporting and encouraging me

To my brother and sister

To all those whom I love

To my subject teacher who never failed to teach and guide me

*To all my colleagues in the study in the Masters
Division in Sudan University of Science and
Technology*

And most of all to God who gives me strength and good health while doing this



Acknowledgment

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I am making this project not only for marks but to also increase my knowledge.

Thanks again to all who helped me



ABSTRACT

Errors in planning or construction due to insufficient design dimensions and/or insufficient reinforcing steel or damage to structural parts. This is due to aging of construction materials also Load increases due to higher live loads. The concrete structures must be Strengthen.

This research discusses strengthening of reinforced concrete structures, (Columns, Beams, Foundations and Slabs) for a local building. This building is subjected to failure due to bad construction methods and the difference between the design detailing and the structural section for existing building.

Based on the analysis results the following conclusions had been drawn: The capacity of the footings was checked for adequacy to carry the obtained footing loads under load combination 2 (Service Load). The results show that 30 of the 60 footing in the analyzed part of the building were inadequately sized by more than 30%. After re-designed of the foundations, the Pad Foundation enlarge to Raft foundation to meet the code requirements to make the building safe.

The results after re-design were to increase all the Internal Columns sections 250 x 600mm for (short, ground, first and second floor columns) to column section 550 x 900 with steel reinforcement (4 Ø 20mm + 8 Ø 12mm) by strengthening the columns with concrete jacket to increase the section capacity to carry the load.



And also to increase all the External Columns sections 300 x 600mm for (short, ground, first and second floor columns) to column section 450 x 900mm with steel reinforcement (4Ø20mm+5Ø12mm) by strengthening the columns with concrete jacket to increase the section capacity to carry the load.

The Slabs in the building (case study) were structurally analyzed under ultimate loads (load combination 1) using the three dimensional model. Reinforcement module and the needed reinforcements for the slab section were checked and the results indicate that the slab design for this building is adequate.



المستخلص

الاطءاء في التخطيط او التنفيذ بسبب عدم كفاية أبعاد التصميم أو عدم كفاية حديد التسليح أو تدهور بعض الأعضاء الإنشائية بسبب عدم جودة مواد البناء أو التدهور بسبب زيادة الاحمال الحية في المبني, عليه يجب تقوية الهيكل الخرسانى.

يهدف هذا البحث مناقشة موضوع تقوية أو تعزيز أعضاء هياكل الخرسانة المسلحة ل (أعمدة, أيبام, أساسات و بلاطات) لمبني تعرض للخطأ أثناء التنفيذ السيء وعدم مطابقة الرسومات التصميمية مع التنفيذ.

وبناء على نتائج تحليل المبني تم التوصل الى عدم قدرة الاساسات على تحمل الاحمال المسلطة عليها وظهرت النتائج ان 30من 60 قاعدة بها زيادة في التحميل اكثر من 30%. وبعد اعادة التصميم تم التوصل الى تكبير القواعد الخرسانية الى اساس حصىرة لجعل المبني آمن.

وبعد اعادة تصميم الاعمدة تم زيادة المقاطع الخرسانية للأعمدة الداخلية من 250*600ملم الى 550*600ملم وايضا زيادة حديد التسليح بمعدل

(4 Ø 20mm + 8 Ø 12mm) لزيادة قدرة تحمل الاعمدة الداخلية.

وبعد اعادة تصميم الاعمدة الخارجية تم زيادة المقاطع الخرسانية للاعمدة من 300*600ملم الى 450*600ملم وايضا زيادة حديد التسليح بنفس معدل الاعمدة الداخلية لزيادة قدرة التحمل.

وبعد مراجعة التصميم للبلاطات الخرسانية تحت تأثير الحمل التصميمي الاقصى وجد ان البلاطات ملائمة لتحمل الاحمال الواقعة عليها. وعليه وبعد عمل المعالجات يكون المبني آمناً للاستخدام.



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List of Symbols

#	Description
B.C	Allowable bearing capacity
f_{cu}	Characteristic strength of concrete
f_y	Characteristic strength of reinforcement
K	Effective length factor for a compression member
l_a	lever arm factor = z/d
N_x	Axial load subject to member
M_x	Bending moment in x-x axis of member
M_y	Bending moment in y-y axis of member
M_z	Bending moment in z-z axis of member
Q_y	Shear force in y-y direction
Q_z	Shear force in z-z direction
P_u	Ultimate design load
R_z	Axial reaction at footing
R_x	Horizontal reaction in x-x axis at footing
R_y	Horizontal reaction in y-y axis at footing
R_{xx}	Bending moment force at footing level in axis x-x
R_{yy}	Bending moment force at footing level in axis y-y
v	Longitudinal shear per unit length