



# **"The Structural Design of Al-Razi Specialized Hospital"**

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According to the system of the College of Engineering, the supervision of our supervisor and the approval of the members of the examination committee, this project was submitted to the Department of Civil and Architectural Engineering in order to finish the requirements of a bachelor's degree in building engineering.

Supervisor signature

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Examination committee signature

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College head signature

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Dec 2017

## **Dedication**

To our home land Palestine,,, land of heroes

To Palestine capital city,,, land of religions,,, Jerusalem

To our honoured prophet Mohammed (peace be upon him)

To the spring that never stops giving,,,to mother

To who taught us to promote our life stairs wisely and patiently,,,to father

To whose love flows in our veins,,,our brothers and sisters

To our home university,,,Palestine Polytechnic University

To our friend Neda Nemer who gave us the permission to analyse her project

To who make a light through knowledge and success path to guide us ,,our teachers

To who teach and direct us friendly,,,our special supervisor Eng.Inas Shweiki

To everyone who helped us in our project

To everyone who loves us

## **Thanks and appreciation**

The first thank is to Allah, who gave us the ability to start work and complete this task. Lots of thanks to our home university "Palestine Polytechnic University", "Department of Civil and Architectural Engineering" wish it more progress and success.

Moreover, we express our big thanks to our supervisor Eng.Inas Shweiki, who directs and supports us every time we need it, in addition to her knowledge, time, encouragement, supervision and guidance which gave it to us.

Thanks for all teachers who gave us a little of their time and answered our questions. Finally, our deep sense and sincere thanks to our parents, brothers and sisters for their patience and their endless support. In addition to everyone who tried to help us during our work and gave us strength to complete this task.

## **Project abstract**

In this project, we will study the structural design of Al-Razi specialized hospital, which is located in Ber Haram Alrama north of Hebron city. It consists of 7 floors, each floor area is approximately 2700m<sup>2</sup>, and the total project area is about 17000m<sup>2</sup>, this project is supposed to be built on a land with an area around 6 acres with 3 different levels.

Detailed structural study will be made by determining and analysing all the predicted structural elements and loads, then the structural design for the elements and the structural working drawing will be done according to the previous design for all project elements.

The Jordanian code will be used to determine the live loads, the British code (UBC) to determine earthquake loads, and the American code (ACI) to design all the structural elements . Moreover, we will use some structural design programs such as: Atir and Safe programs, drawing programs like AutoCAD program, in addition to Microsoft office programs.

At the end of this project, it is expected to be able to make complete detailed structural working drawings that ensure achieving all project goals and carrying it out in reality.

## ملخص المشروع

سوف يتضمن المشروع التصميم الإنشائي لمستشفى الرازي التخصصي والذي يقع في منطقة بئر حرم الرامة شمال الخليل ، حيث يتكون من 7 طوابق ، بمساحة طابقية تقدر ب 2700 متر مربع , ومساحة اجمالية تقدر ب 17000 متر مربع , على ارض مساحتها 6 دونم بثلاث مستويات.

بإذن الله سوف نقوم بعمل دراسة إنشائية تفصيلية من تحديد وتحليل للعناصر الإنشائية والأحمال المختلفة المتوقعة ومن ثم التصميم الإنشائي للعناصر وإعداد المخططات التنفيذية بناء على التصميم المعد لجميع العناصر الإنشائية التي تكوّن الهياكل الإنشائية للمستشفى.

سوف يتم استخدام الكود الاردني لتحديد الاحمال الحية , والكود البريطاني (UBC) لتحديد احمال الزلازل , والكود الامريكي (ACI) لتصميم العناصر الانشائية المختلفة , بالإضافة الى استخدام بعض البرامج التصميمية مثل برنامج العتير والسيف , وبرنامج الرسم الاوتوكاد , وبرنامج ميكروسوفت اوفيس.

يتوقع في نهاية هذا المشروع ان نكون قادرين على اعداد مخططات انشائية تفصيلية كاملة تحقق الاهداف المرجوة من المشروع وتضمن تنفيذه على ارض الواقع.

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## List of Abbreviation

- **Ac** = area of concrete section resisting shear transfer.
- **As** = area of non-prestressed tension reinforcement.
- **Ag** = gross area of section.
- **Av** = area of shear reinforcement within a distance (S).
- **At** = area of one leg of a closed stirrup resisting tension within a (S).
- **b** = width of compression face of member.
- **bw** = web width, or diameter of circular section.
- **DL** = dead load.
- **d** = distance from extreme compression fiber to centroids of tension reinforcement.
- **Ec** = modulus of elasticity of concrete.
- **Fy** = specified yield strength of non-prestressed reinforcement.
- **I** = moment of inertia of section resisting externally applied factored loads.
- **Ln** = length of clear span in long direction of two-way construction, measured face-to-face of supports in slabs without beams and face to face of beam or other supports in other cases.
- **LL** = live load.
- **Ld** = development length.
- **M** = bending moment.
- **Mu** = factored moment at section.
- **Mn** = nominal moment.
- **Pn** = nominal axial load.
- **S** = spacing of shear or in direction parallel to longitudinal reinforcement.
- **Vc** = nominal shear strength provided by concrete.
- **Vn** = nominal shear stress.
- **Vs** = nominal shear strength provided by shear reinforcement.
- **Vu** = factored shear force at section.
- **Wc** = weight of concrete. (Kg/m<sup>3</sup>).