



Project Summary

Project:

Khatib Office Complex

Organization:

Professional Engineering Consultants Ltd.
www.p-e-consultants.com

Location:

Amman, Jordan

Project Objectives:

Deliver 9,250-square-meter multi-use office complex

Software Used:

- RAM Structural System
- RAM Connection
- RAM Elements

Fast Facts

- PEC was founded in 2005
- Engineers easily learned Bentley software from tutorials
- This 9-storey building underwent three major revisions
- RAM Structural System made modifications quick and easy
- The design achieved structural integrity and cost control

ROI

- Using Bentley software reduced design time by about 25 percent and saved another 15 percent during revisions for a total of 40 percent
- Converting the straight facade to a recessed facade would have taken additional time if done manually. Bentley software enabled PEC to make the changes quickly and easily
- Bentley software gave the team confidence that structural integrity could be achieved when cost constraints were factored in

RAM Structural System Cuts PEC's Total Design and Revision Time Almost in Half

Satisfied Project's Structural Integrity Requirements With Minimal Analytical Time While Providing Client With Construction Cost Savings

Cuts Revision Time

Professional Engineering Consultants, Ltd., (PEC) is a small engineering firm specializing in low- to mid-rise commercial, industrial, and residential buildings. Located in Amman, Jordan, the 15- to 20-person office serves clients in the Middle East, where owners are notorious for shopping around for the best pricing on available materials after a design concept has been approved. It is not unusual for a client's material selections to significantly alter the building design, so being able to make changes quickly and easily is crucial.

Using RAM Structural System saved PEC significant hours the firm would have spent making revisions to layouts, loads, and lateral conditions.

On the \$3 million Khatib Office Complex, PEC anticipated extensive changes after the concept phase and before final construction. Using RAM Structural System™ saved PEC many hours the firm would have spent making revisions to layouts, loads, and lateral conditions. These savings were possible despite this being the first job on which PEC had used the software.

"Using this software was extremely easy," said Khubaib Jallad, PEC general manager.

"I was able to make effective use of it within an extremely short period of time. It did exactly what I wanted it to do." Jallad taught

himself how to use the software by taking the tutorial, which took less than four hours. He immediately applied his new skills on the Khatib project. "We utilized RAM Structural System for the complete design of the structure, including the foundations for isolated footings."

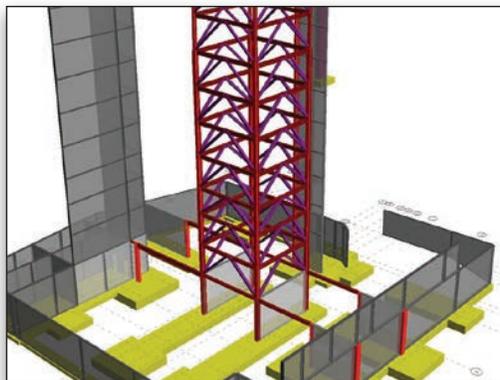
Anticipated Design Changes

The 9,250-square-meter office complex was designed with nine storeys above ground and a 41-car parking garage below ground. Lower levels will house commercial operations, and upper levels will be the headquarters of NegemCo For Engineering & Contracting. The structural system included a reinforced concrete basement floor with internal and external gravity retaining walls. Upper floors were of composite structural steel and deck, with a relatively low floor-to-floor height of 3.3 meters. Lateral systems used central core braced frames supplemented with stair shear walls. The building facade was designed for glass-and-metal-clad precast panels.

As a multi-use commercial building, the office complex had to meet the owner's specifications and yet provide flexible space for tenants. "Due to the nature of the building, we anticipated extensive changes and revisions," Jallad said. "These changes ranged from architectural facades to internal layouts to structural methods and configurations applied."

For example, the facade changed three different times during the project, which required recalculation as the building load changed. Converting the straight facade to a recessed facade required modifications to the layout of the main building entrance. All this would have taken additional time if the changes

had to be made manually. But with Bentley software, changes were made quickly and easily.



A screen capture of the concrete and steel framing progression using RAM Structural System, RAM Connection, and RAM Elements.

“RAM Structural System is made to work the way a structural engineer thinks.”

— Khubaib Jallad,
General Manager
Professional Engineering
Consultants, Ltd.

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The original design also featured a central core that was open from roof to basement. This feature was eventually closed to allow tenants more space. As a result, the lower floor design with concrete floor slab had to be changed to a composite steel floor slab, some of the shear walls had to be removed, and openings had to be made in the webs of the beams to accommodate new mechanical layouts. With each change, the structure had to be reanalyzed.

“With the RAM Structural System, this was extremely easy to do,” Jallad said. “The design worked out to be exactly what we had predicted.”

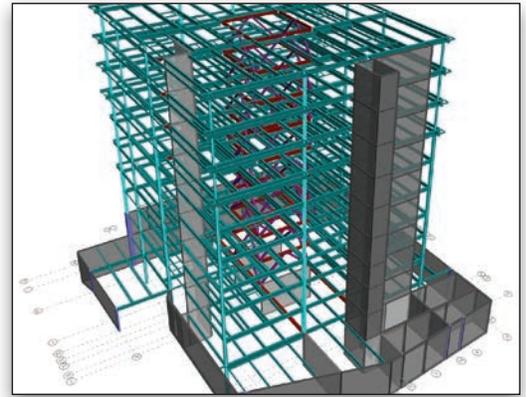
The Right Software for the Job

RAM Structural System and RAM Elements™ provided the structural solution needed for the job. “It was able to handle the continuous changes throughout the project, which was seamless in almost all cases – resulting in design time savings and cost savings,” Jallad said. “Seamless, to us, means that when we make changes, it is easy to do. Load inputs, beam settings, locations of members, etc., adapt to the changes without any concern of major errors.”

PEC had acquired RAM Structural System to use for building analysis and design after having tried other structural solutions that were unsatisfactory. The Bentley software included modules for steel and concrete design. PEC also added RAM Elements for finite element analysis and specific structural tasks related to beams, footings, walls, and other elements. RAM Connection™ provided everything the firm needed to design the steel bracing connections.

The integration among the software packages and modules made for seamless workflows. “Everything has a flow chart,” Jallad said. “As you design certain things, it’s a simple flow diagram. It worked just like the flow diagram.” The short learning curve enabled Jallad to be immediately productive, and to manage the requested changes. As questions arose, he found the Bentley support to be timely and responsive; the suggested solutions were simple to implement.

Using RAM Structural Systems is so intuitive because it is designed by structural engineers for structural engineers. From design inputs to criteria selection to model output,



A screen capture of the completed steel framing design using RAM Structural System.

each action correlates to the structural engineer’s understanding of the process. “To us, this is extremely important,” Jallad said. “Any engineering software that is not made for its engineering discipline will result in errors.”

Following the Bentley software workflow results in fewer errors and a higher quality design. For example, when working in RAM Elements to design steel frames, the software indicates the correct settings to use, practically eliminating the possibility of mistakes. The same holds true for RAM Structural System.

Jallad said: “RAM Structural System is made to work the way a structural engineer thinks.”

Construction Cost Control

All told, using Bentley software reduced design time by about 25 percent and saved another 15 percent during revisions. These savings were passed on to the client.

With cost savings as a primary client objective, PEC also considered construction costs during building analyses. The software gave the team confidence that structural integrity could be achieved when cost constraints were factored in. “Using RAM Structural System satisfies the structural integrity with minimal analytical time while providing the client with the resultant construction cost savings,” Jallad said. “Both client and engineer win.”



These construction photos are of the Khatib Office Complex in progress.