



## PROJECT SUMMARY

### Organization:

Martin/Martin  
Consulting Engineers

### Solution:

Structural

### Location:

Denver, CO

### Project Objective:

- Structural analysis, design and documentation of a \$132 million Civic Center Office Building

### Products used:

RAM<sup>®</sup> Structural System

# CIVIC CENTER OFFICE BUILDING, DENVER, CO MARTIN/MARTIN, RAM STRUCTURAL SYSTEM

RAM IS A HUGE TIME SAVER

Martin/Martin, an engineering firm in Wheat Ridge, Colorado, has designed many structures with dynamic shapes, including Bank One Ballpark and Incheon International Airport Passenger Terminal in Seoul, Korea, and now the new \$132 million Civic Center Office Building in Denver, opening in October 2002.

The design-build project consists of a new 12-story elliptical tower, the renovation of the historical, four-story Annex One Building and an underground parking structure. The project will become a signature landmark building punctuating the city's downtown landscape, creating a pedestrian thoroughfare that connects the civic and business areas to the commercial district, the 16th Street Mall.

Designing it was no easy task. It features multiple roof levels, atriums, canopies and balconies, and cantilevered corners, according to Tim Lack, an associate at Martin/Martin. "This building has all sorts of complicated geometry. The RAM Structural System<sup>™</sup> helped us navigate our way through the intricate details of the design process."

Complicating the project were dual sets of seismic design criteria: the city's and the standard Denver Building Code. The city of Denver

classified the Civic Center building as "essential" so that it would remain functional in the case of an earthquake, and asked Martin/Martin to design and detail for seismic zone 4. The two sets of requirements were entirely different. The city demanded higher detailing requirements while the Denver Building code required more force, setting the stage for a delicate balancing act. RAM<sup>™</sup>, however, made this challenge negligible. "RAM saved our hides more than once on seismic analysis. It was seamless," raves Lack. "RAM let us analyze both criteria with the click of a button. The RAM Special Seismic Provisions for Steel Module made designing for Zone 4 detailing much easier. We could see what the impacts were from one set of criteria to another set of criteria literally by simply changing a few input values. It made what could have been a huge headache very easy." With the use of the software, Martin/Martin was able to change seismic criteria and check this 600,000 square-foot complex in a short time – giving the firm a considerable advantage.

In addition to the stringent seismic requirements, this project was complicated by a very aggressive schedule. With just six months to

## FAST FACTS

- Project consisted of a new 12-story elliptical tower, the renovation of the historical, four-story Annex One Building and an underground parking structure.
- Two sets of seismic design requirements were easily met by using RAM Structural System
- RAM Structural System saved an estimated time of 1200-1800 hours of design engineering
- Software provides a competitive advantage



*"The fact that it designs and checks the footings is a also big plus..."*

*Also, the ease of implementation, short learning curve, and responsive customer support system."*

#### ABOUT BENTLEY

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#### BENTLEY OFFICES

##### Corporate Headquarters

685 Stockton Drive  
Exton, PA 19341 USA  
1-800-BENTLEY (1-800-236-8539)  
Outside the US +1 610-458-5000

##### Bentley Systems Europe B.V.

Wegalaan 2  
2132 JC Hoofddorp  
Netherlands  
+31 23 556 0560

##### Bentley Asia

Unit 1402-06, Tower 1,  
China Central Place,  
No. 81 Jianguo Road,  
Beijing, 100025, China  
+86 108 518 5220

design the Civic Center, Martin/Martin was still designing the steel structure of the high-rise while contractors were pouring the garage foundations below. With the use of RAM, the engineers were able to produce an early structural steel mill order package before the construction documents were issued. Along the way, there were many challenges that truly put the software to the test: Late in the process, the manufacturer drastically changed the elevator machine room layout and the loads for a legal library on an upper floor. Perhaps one of the biggest ongoing challenges for the firm was that the fascia changed from precast panels to curtain wall, and then back again. The curtain wall, which was originally supported off of every story, eventually hung from every other floor. But Martin/Martin was able to stay on top of the client's demands.

"RAM helped a ton by giving us a fast response time. As things changed, we were able to change our models and make them current that same day," says Lack. "We came back in no time with whole floors re-analyzed for the new loads. Our clients were very impressed with our fast response." Martin/Martin estimates that they eliminated 1200-1800 hours of design engineering time thanks to the software – a cost savings of \$165,000 throughout the process of designing the Civic Center Office Building. "RAM is a huge timesaver," boasts Lack. "Without it, we would have needed at least 2 more people for a 4-month period for this project. It produces drawings and bracing elevations, column schedules and base plate designs. In short, RAM is a real workhorse."

Martin/Martin has found that using the RAM software has changed the way they function as an engineering firm. "It has changed the way we work," says Lack. "We can use fewer people on design because of the dramatic time savings provided by the RAM Structural System. It allows us to spend less time on design and analysis, which basically frees us up to work on the drawings. It gives us more time for checking and coordinating with the total design team."

As loyal RAM users since the first year of the software's distribution, Martin/Martin has used the program to design more than 100 buildings, including the JD Edwards Office Park in the Denver Tech Center and the current \$268 million expansion of the Colorado Convention Center. Martin/Martin became RAM converts soon after trying the application; not only because of the program's features, but also because of its strong customer support."

We like the fact that RAM is so much more automated and has such great technical support," says Lack. "We were so impressed with RAM as a company – especially with their vision – that we pretty much immediately shelved most of our other software products." Martin/Martin believes that RAM's technical support services are well worth the cost. "We pay for support on several programs, but RAM is one where we can certainly say we get our money's worth... and then some." RAM saves Martin/Martin time, which allows them to consider more options, and improves their ability to service their clients. Says Lack, "RAM is the only program that we feel gives us a competitive advantage."

For more information visit [www.Bentley.com/Structural](http://www.Bentley.com/Structural)

