

## Spartak Moscow Eagerly Awaits Its New Stadium and the 2018 World Cup

*Foundations in place within seven months of design concept using structural BIM*

WITH the slogan “Ready to Inspire!” and the prospect of a new stadium on the horizon, Russia was selected as the host for the 2018 FIFA World Cup. Spartak Moscow, one of Russia’s high profile soccer teams, regularly qualifies for the UEFA Champions League but has always shared facilities with other teams. As the team readies itself to host 2018 World Cup matches, it also eagerly awaits its first custom-designed venue.

The 45,000-seat complex has to meet FIFA World Cup design standards and also withstand significant temperature variations and high snow and ice loads. AECOM, a global provider of professional technical and management support

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services, was selected to design and manage the delivery of the stadium.

The complexity and scale of the project called for the AECOM’s structural engineers to use an integrated 3D structural modeling and analysis process. AECOM selected Nemetschek’s Scia Engineer for the task. “In our Building Engineering practice in the UK, we use Scia

***Having the ability to model and analyze the entire structure in one program increased the project team’s time- and cost-efficiencies.***

Engineer on many projects. Its unique ability to integrate advanced nonlinear analysis and multi-material design, with physical structural modeling, and its interoperability with various other software programs, like Revit Structures, made it invaluable on this project,” said Tom Webster, Principal Engineer at AECOM’s European Building Engineering practice.

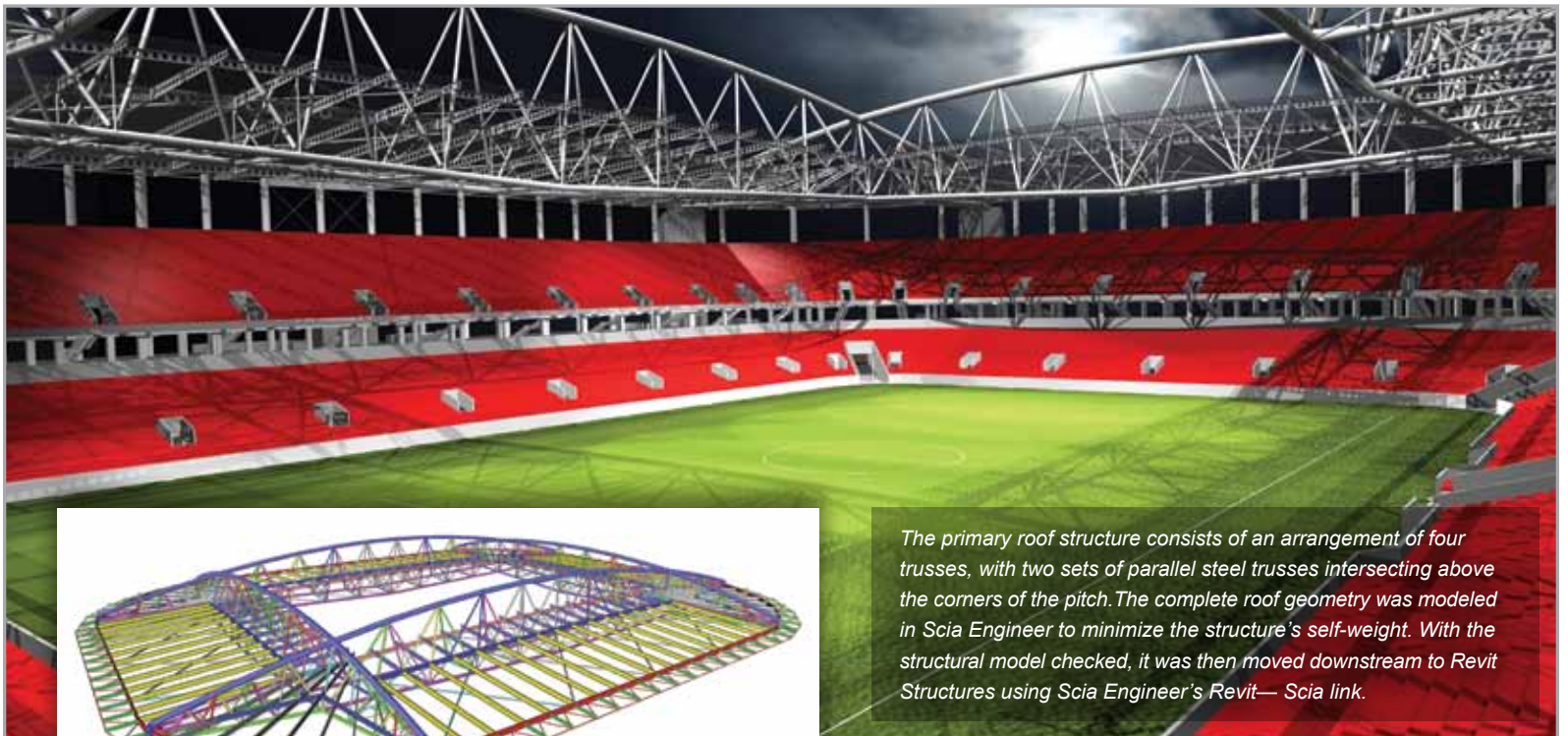
AECOM was able to model, analyze, check, document and collaborate using Scia Engineer’s integrated structural design capabilities. Having the ability to model and analyze the entire structure in one program increased the project team’s time- and cost-efficiencies. As with most stadia, the roof structure was particularly



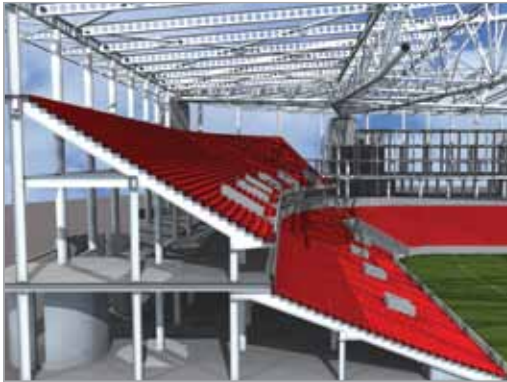
*Spartak Stadium, the new home of FC Spartak Moscow football club, is schedule for completion December 2013.*

challenging. The primary roof structure consists of an arrangement of four steel trusses, with two sets of parallel steel trusses intersecting above the corners of the pitch with the longest trusses spanning 217 m. The integrated analysis options made it possible to optimize the roof geometry for various load conditions such as snow, wind and thermal loadings. In addition, the effects in geometry changes were considered including the use of large displacement nonlinear analysis and thermal expansion and contraction.

The grandstands consist of cast-in-place reinforced concrete frames with precast concrete seating units. Counter-terrorism requirements presented AECOM with additional design challenges. With Scia Engineer AECOM performed a nonlinear analysis of the concrete structure supporting the grandstands. The results were used to investigate the



*The primary roof structure consists of an arrangement of four trusses, with two sets of parallel steel trusses intersecting above the corners of the pitch. The complete roof geometry was modeled in Scia Engineer to minimize the structure’s self-weight. With the structural model checked, it was then moved downstream to Revit Structures using Scia Engineer’s Revit— Scia link.*



Scia Engineer's nonlinear analysis was used to investigate the effects of sudden column removal, satisfying a key counter-terrorism requirement.

effects of sudden column removal. This not only ensured the stability of the structure but also saved time not having to use a separate analysis tool for this task.

With the structural model optimized and checked, it was then moved downstream to Revit Structure to create the construction documentation. This model included both the complex steel roof and concrete grandstands. This ability to start with an

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analysis model, then explore design ideas, refine and check the design, then push an optimized model to Revit Structure for documentation was an important workflow in this project. AECOM also found collaborating with the architect more efficient with Scia Engineer's ability to automatically generate 3D-CAD files.

"Scia Engineer enabled us to take this project from a blank piece of paper to foundations in the ground within seven months" said Webster. "Scia Engineer has made an impact on our productivity and project team communications and we anticipate using it extensively for our structural engineering projects." The Spartak Stadium is slated to be completed in December of 2013.

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## Project Details

**Owner:** Spartak Moscow Football Club

**Architect:** AECOM in association with Sports Concept

**Building engineering and design project management:** AECOM

**Contractors:** Concrete North and West Stand – Glavstroy (Russian), Concrete East and South Stand – Satory (Russian), Steel Roof – TBC

**Construction Period:** From September 2010 to December 2013

**Location:** Moscow, Russian Federation

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Images courtesy of AECOM UK

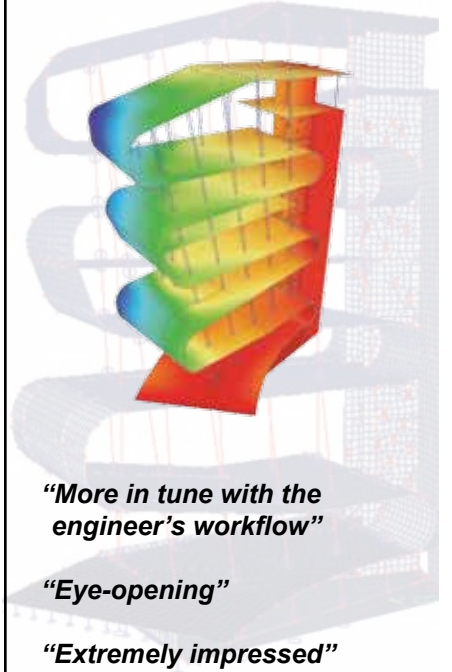
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