

NEW SIMULATION STRATEGIES SLASH PROJECT TIMES AND COSTS

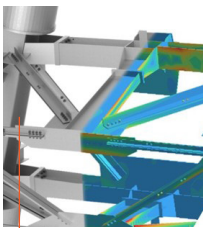
Today, architectural design firms face two primary and often conflicting challenges: increased project complexity and compressed delivery schedules. Owing to the large-scale nature of AEC projects, frequent change orders, and on-time delivery pressure, the use of traditional simulation methods for design guidance and validation is often time and resource prohibitive. This situation is further exacerbated when trying to achieve an aggressive design aesthetic, working with new materials, and balancing form and function with sustainability initiatives and construction safety standards.

A New Approach

The recent introduction of novel simulation technologies now enables a broader community of designers and civil engineers to apply simulation earlier and throughout AEC projects. Here, leading AEC design firms describe how this transformational shift has given their business a positive impact on project times and costs by leveraging Altair simulation solutions.

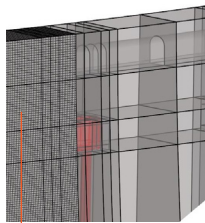


[Zaha Hadid Architects](#) - Competition entry for the Museum of the 20th Century, Berlin, a radical approach by applying new advances in technology to generate structural and architectural expression.



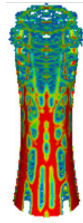
Rapid Design

Analyze complex CAD assemblies in minutes using breakthrough mesh-free technology. Explore more alternatives within existing timeline, reduce cost, deliver best structure and minimize risk.



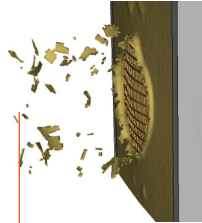
Accelerated Modeling

Easily deliver unparalleled quality mesh and quickly consider design changes with best-in-class tool and customization capabilities.



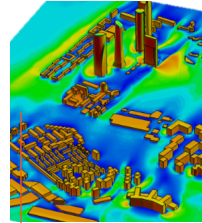
Advanced Optimization

Apply state-of-the-art optimization techniques to ensure safety with efficient structures. Reduce structural weight and costs guaranteeing feasibility.



Protective Design

Accurately simulate resilience against blast and explosion events to design safer structures overcoming long and costly destructive tests.



Aerodynamics Insights

Consider accurately wind effects on structures and people. Explore design options to mitigate risks and ensure safety of clients' visionary buildings.

Overview of Altair's High-performance Design (HPD) Solutions for AEC

Altair has developed a multi-disciplinary optimization workflow that allows clients to understand structural performance sooner, accelerate design cycles to reduce cost, and virtually validate designs to reduce risk. High Performance Design is a holistic approach for developing feasible, safe, and robust structures with a simulation-driven approach. Applying simulation early helps designers explore design alternatives and new solutions while also enabling robust, optimized results across the entire design process.

[View the full webinar presentation.](#)

Simulation-driven Workflows for Early Design

HKS is an international design firm with an extensive portfolio of projects, from commercial to residential use. HKS Line, a research entity of HKS, exploits Altair's globally interoperable optimization platform for simulation at various design stages. This allows them to synthesize structures, workflows, material technologies, and envelope automation to yield faster and more reliable results.

Applying simulation early in the design process is now a recognized path to efficiency. Successful adoption, however, relies on the ease-of-use and interoperability of these tools. Simulation must work in harmony with existing industry-preferred tools without a steep learning curve.

Combining Rhinoceros® [1] and Grasshopper visual programming with analysis and optimization tools from Altair, HKS developed an efficient workflow for architectural design. Suitable for new users and non-engineers, this nimble, integrated design and structural analysis process offers feedback earlier in the design exploration process and allowed HKS to quickly and efficiently assess complex systems at scale.

[1] Rhinoceros (typically abbreviated Rhino, or Rhino3D) is a registered trademark of Robert McNeel & Associates, Seattle, USA.



C1.01 - Structural Synthesis

Design integration optimization for complex structural systems. Implementation across scaled with emphasis on lightweight and long-span solutions.

C1.02 - Envelope Automation

Design and automation for direct-to-fabrication protocols.

C1.03 - Material Technology

Process, prototyping, and performance driven explorations. Provides testing and proof-of-concept across various research domains.

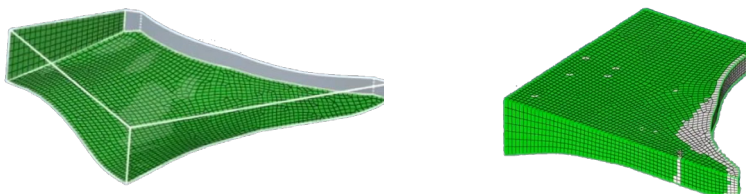
Preparing Complex FE Models Faster

Today, HDR's portfolio comprises numerous large and complex, international infrastructural projects from more than 200 offices around the globe.

Large dam infrastructure projects require understanding of the combined effects of many different variables, such as geometry (topology and structure), materials (geology, water, structural components), physics (hydrology, hydraulics, fluid-structure interactions), along with seismic effects, all of which need to be considered to produce an accurate simulation.

When setting up a mesh for these large dam models, often consisting of 10 to 17 million elements and nodes, the aim is to deliver sufficient accuracy across multiple domains within an acceptable runtime. A too coarse mesh gives inaccurate results, while a mesh that's too fine may impede solver run time and overtax computing resources.

HDR leverages Altair HyperWorks™ to reduce meshing time while retaining the ability to inspect the model, refine element quality, and maintain control over auto-generated meshes. HyperWorks gives them the capability to cut, simplify, and control geometry in the single interface. With process automation and precise control over mesh quality, HDR can deliver accurate simulation results much faster.



We can have the model running in one day instead of a few days [when we optimize the size of the mesh and capture the topology]. We can deliver better results earlier to our clients.

Omid Abdi, Senior structural engineer, HDR

Shear Wall Layout Optimization using Computational Design

Founded in 1931, the engineering firm of [Walter P. Moore](#) have expanded their capabilities to become a global presence in large, complex AEC projects, with several notable firsts in its portfolio.

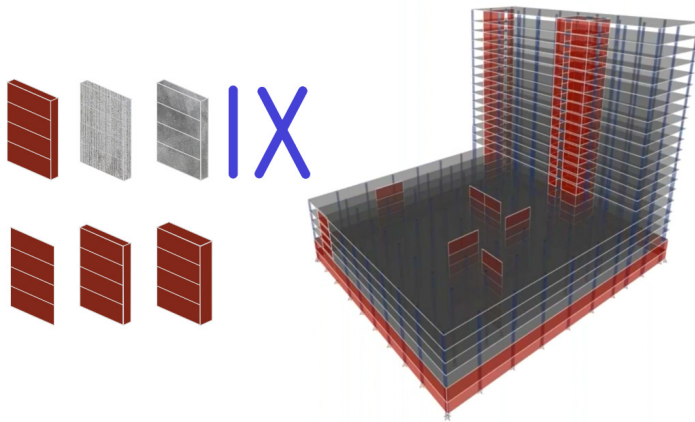
When designing shear wall-type buildings, their intended use can vary at different levels (resident, parking, commercial). For medium to large building projects, the design complexity and number of variables make design exploration untenable using standard approaches. Typically analysis for validation processes requires multiple iterative cycles that can take weeks to find a feasible solution.

To attain an optimized design faster, Walter P. Moore applied Altair HyperStudy™ within their workflows. Without having to build a finite element (FE) model or learn new skills, Walter P. Moore exploited the Design of Experiment (DoE) functions within HyperStudy to find an optimized shear wall layout and delivered the top 10 variables that influenced the behavior of the building. By applying the Global Response Search Method (GRSM), and include the DoE results, this workflow significantly reduces the overall time to reach the optimal solution.



“Altair HyperStudy easily integrates with your existing workflow, so you don’t have to build your finite element model or to learn new skills. Thanks to HyperStudy, you learn how the building is behaving in a fraction of the time compared with other methods.”

Sridhar Baldava, Principal & Senior Structural Engineer, Walter P Moore



3D Printing for Construction

HKS was looking to optimize a connection component made by additive manufacturing (AM). They employed Altair Inspire™ to first create a small-scale node design to explore structural synthesis. By developing standardized fixation and connection points across the bespoke component, HKS simplified the assembly and ensured the part could be manufactured. HyperWorks was used for sizing and topology optimizations before moving on to explore discretization and assembly, bringing together structural performance optimization with the constraints imposed by AM.

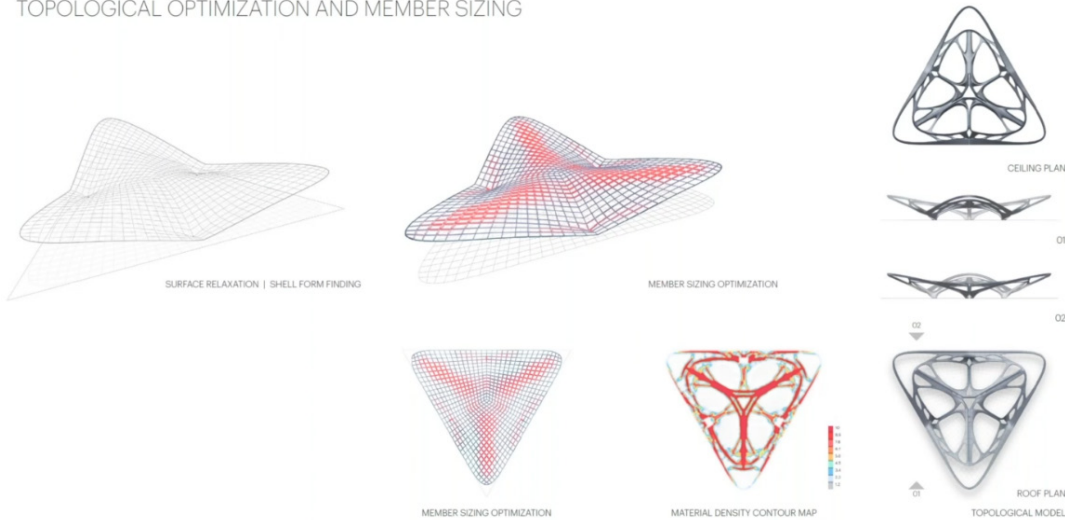
[Learn more about Altair’s solutions for Additive Manufacturing.](#)



For our structural synthesis, automation and material technology research work, HKS Line have leveraged Altair’s optimization platform to enable our engineers to engage with Altair’s robust solvers.

James Warton, HKS

TOPOLOGICAL OPTIMIZATION AND MEMBER SIZING



Analyze Complex and Large Assemblies

Conceived to analyze complex parts or large assemblies not practical with traditional FEA, [Altair SimSolid™](#) was investigated by Austria-based [Doppelmayr Seilbahnen GmbH](#), a market leader in ropeway engineering and cable car transport systems.



We read a 49 m high truss support into the software. A normal workstation defined over 2000 contacts within 2 minutes. For the fixed boundary condition at the bottom and displacements at the top, the first results were already visible in 20 seconds. Then we activated the refinements according to stresses, selected notched parts and evaluated them within 5 minutes. For us this means a considerable reduction in workload and time savings. Fascinating!

Eugen Schwab, Simulation Engineer, Doppelmayr Seilbahnen GmbH

[Learn more about Altair solutions for Architectural, Engineering & Construction.](#)

About Altair

Altair is a global technology company that provides software and cloud solutions in the areas of product development, high performance computing (HPC) and data analytics. Altair enables organizations across broad industry segments to compete more effectively in a connected world while creating a more sustainable future.

To learn more, please visit [altair.com](https://www.altair.com)



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