LERA

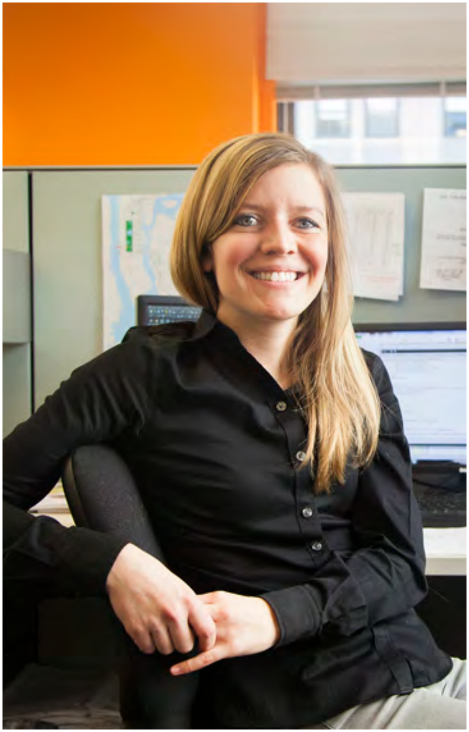
Turning imaginative designs into realities, Leslie E. Robertson Associates provides structural engineering services to architects, owners, contractors, and developers. Since our founding in 1923, our long tradition of innovative design together with our advances in technology has brought LERA to the forefront of the engineering profession. LERA works closely with all members of the design and construction team to design projects of the highest quality. Our dynamic partnership and our group of highly motivated individuals design cutting edge and iconic structures. Our approach has helped us accomplish a wide array of unique and award winning designs.

LERA

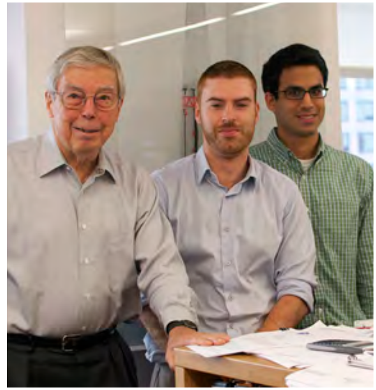
Leslie E. Robertson Associates

Consulting Structural Engineers

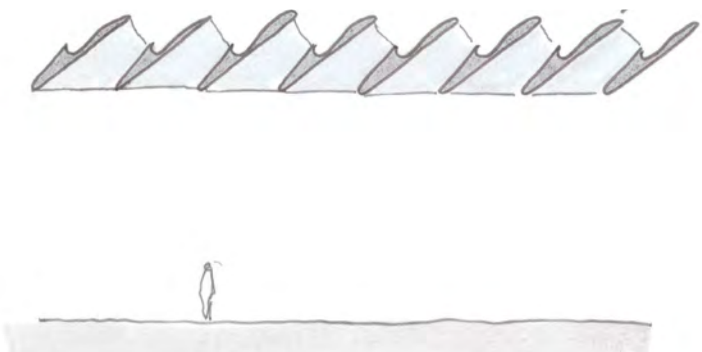
New York | Mumbai | Shanghai | Hong Kong




LERA

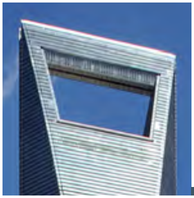







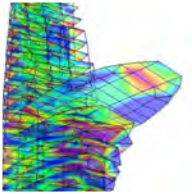
Who We Are

Designers



Problem Solvers

Innovators

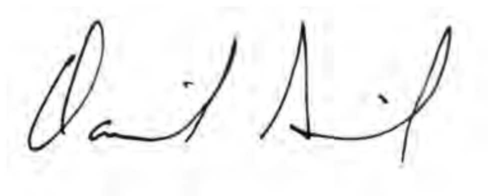


Evaluators

Detailers

Communicators

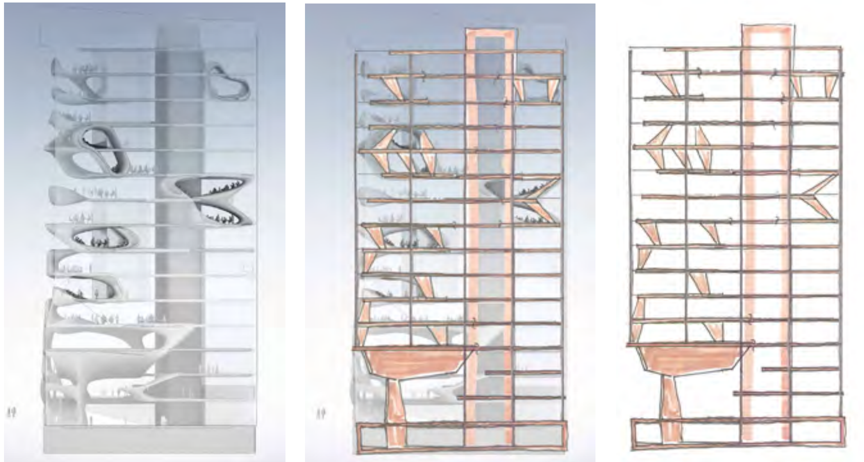
“The Evolution of an idea is contingent upon the interplay between creative players; quality design comes from the energies of a group. That is why designs evolve and you exchange six or eight ideas and they evolve into another six or eight ideas and it becomes extraordinary.”



Designers

Committed to the flow of the Cascade from conception, the team's design dialogue focused on the spatial relationships between floors to develop an overall structural approach to supporting the building. The structural design of the CU Medical Education Building relies on interconnectivity between groups of floors, coupled with post tensioning, to allow for cantilevering floors and shifting supports.

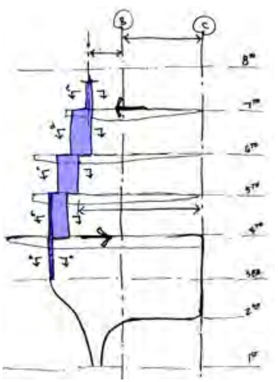
In the upper floors the structure morphs into the architecture: interconnecting walls permit each floor plan arrangement to vary dramatically and provide sufficient stiffness to allow for only two sloping columns throughout the Cascade.



Concept Design Development of Core and Cascade Walls

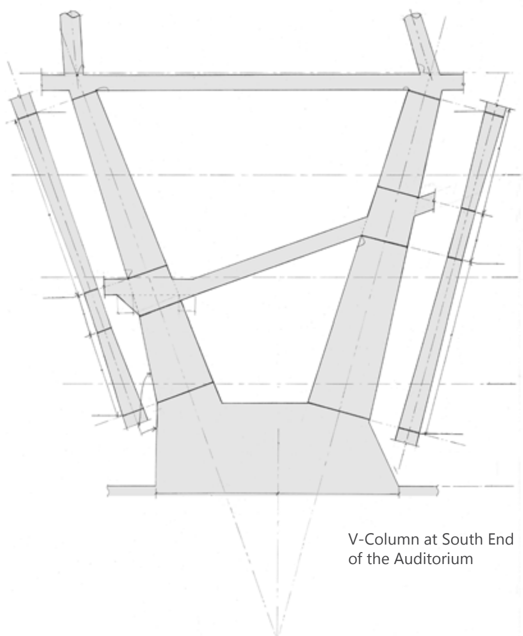
At the base of the building, the structural transfer of the Cascade around the auditorium is accomplished via a V-shaped column, whose shape is derived to balance the eccentricities of the building loads above. Developed through a series of exchanged sketches, the V-column is architecturally exposed and central to the expression of the building's entry. Simply put, the structure becomes an integral part of the architecture.

Matthew Melrose, Project Manager

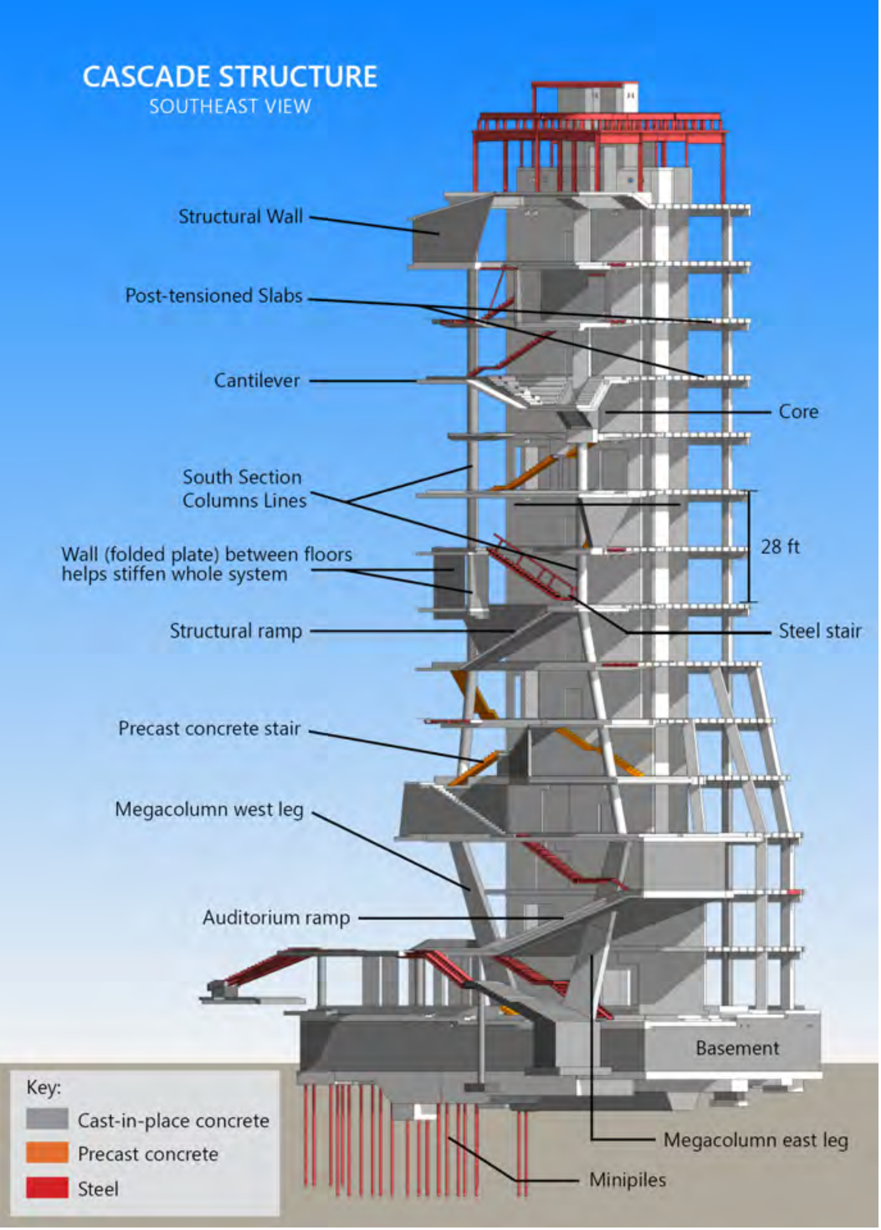


Stepped Column Around the Auditorium
Option 1

Sloped Column Around the Auditorium
Option 2



V-Column at South End of the Auditorium


CASCADE STRUCTURE
SOUTHEAST VIEW
Structural Wall
Post-tensioned Slabs
Cantilever
Core
South Section
Columns Lines
28 ft
Wall (folded plate) between floors
helps stiffen whole system
Structural ramp
Steel stair
Precast concrete stair
Megacolumn west leg
Auditorium ramp
Basement
Key:
Cast-in-place concrete
Precast concrete
Steel
Megacolumn east leg
Minipiles

Columbia University Medical Center Graduate & Education Building

New York, NY

Owner

Columbia University

Lead Designer

Diller Scofidio & Renfro

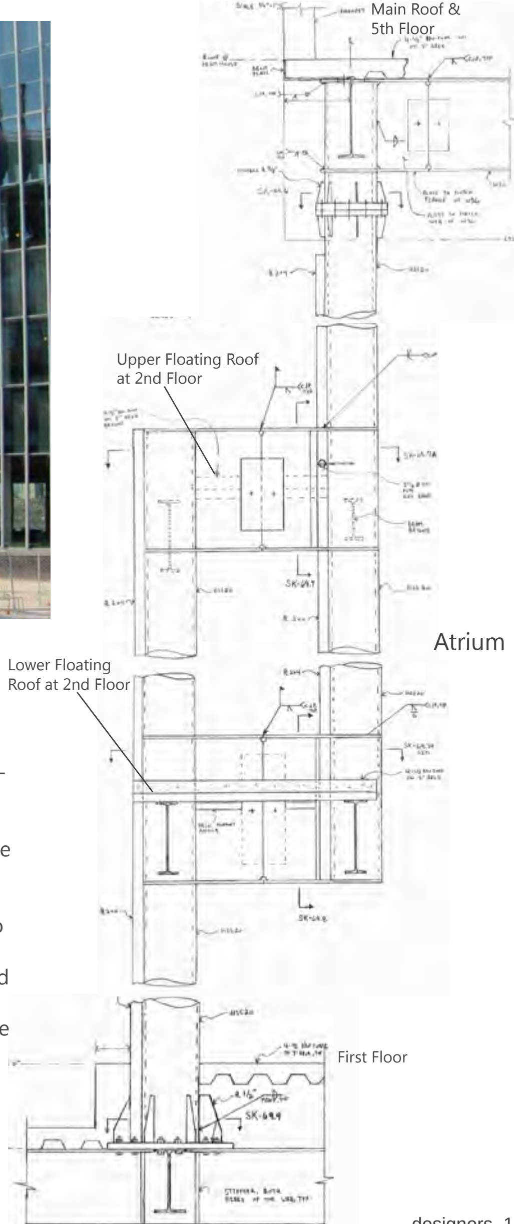
Executive Architect

Gensler

Advanced Science Research Center
City University of New York
New York, NY

Owner
City University of New York

Architects
Flad & Associates
Kohn Pedersen Fox Associates



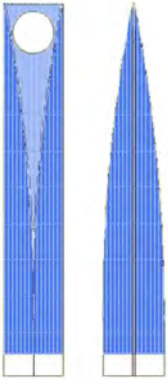
As part of CUNY's designated "Decade of Science" renewal commitment, CUNY desired a state-of-the-art science facility. We contributed the structural design which responds to the building's functionality and complements the architect's vision. Highlighted are the undulating curved glass façades. Adjacent to one of the undulating façades, the elevated floors jog inward, away from the façade, creating an atrium space and the need for a curtain wall structural support. In response to these unique conditions, we designed a bent column which supports the main roof over the atrium and two floating roofs at the undulation offsets, and also helps resist four stories of lateral loads acting on 67 feet of the façade. Segments of the bent column will be exposed in the atrium, diving in and out of the Architectural finishes. As occupants of the building begin to inhabit their new facility, the column will blend seamlessly into their place of research and study.

Thomas Sabol, Project Manager
Advanced Science Research Center

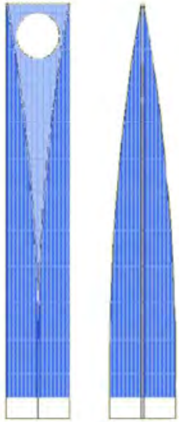
“The more challenging the problem is, the more opportunities there are for us to create wonderful and innovative designs. We do not innovate for innovation’s sake; it comes about through the design and problem-solving process.”

Saw Teen See

Problem Solvers



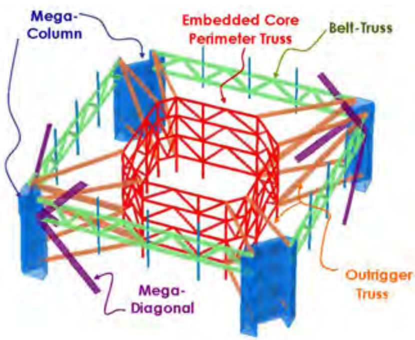
Original (460-m)



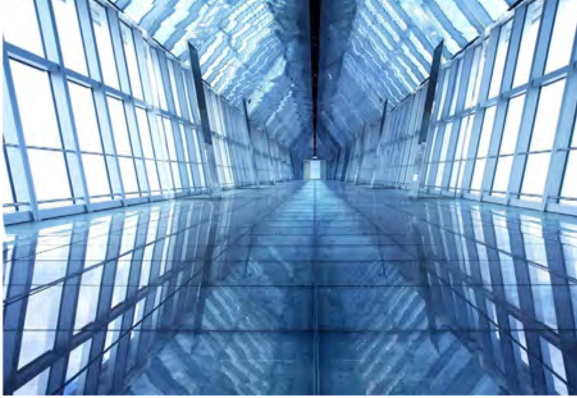
Proposed (492-m)

We see every challenge as an opportunity to achieve something better. When the developer decided to increase the height of the Shanghai World Financial Center to 1614ft (492m), we developed an innovative structural system that allowed the building to be supported by the existing pile foundation originally designed for a building height of 1509ft (460m). Our solution not only saved materials and construction time, but also enhanced robustness and reliability.

Winnie (Wing-Pin) Kwan, Project Manager



OUTRIGGER TRUSSES



Shanghai World Financial Center

Shanghai, China

Owner

Mori Building Company

Architect

Kohn Pedersen Fox Associates

Union Square North Pavilion

New York, NY

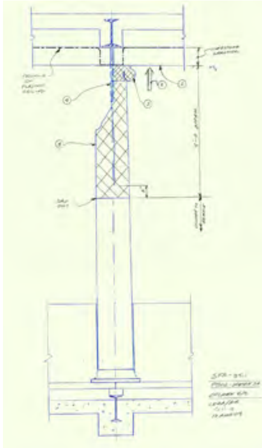
Owner

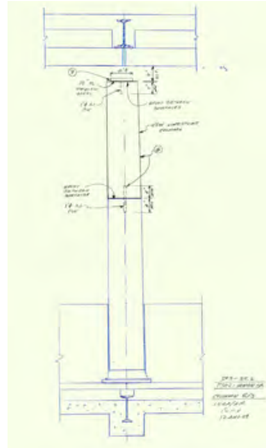
Union Square Partnership

Architects

Architecture Research Office

Michael Van Valkenburgh Associates

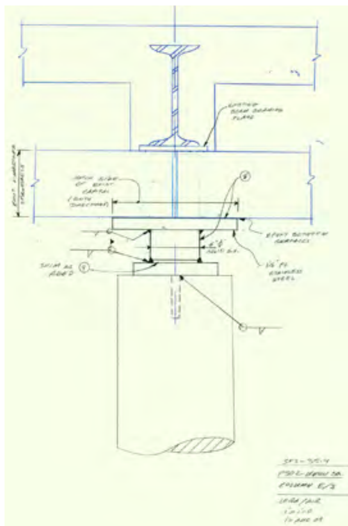





The restoration of landmark buildings offers exciting challenges. During construction, we noticed that some of the original limestone columns of the pavilion had been damaged from years of exposure to the elements. We engineered a solution that allowed the removal and replacement of only the top portion of these columns. The result blends seamlessly with the rest of the original structure. Combining modern and old construction methods and materials, we gave new life to a historical building.

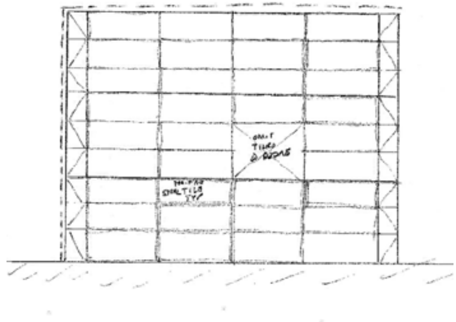
Antonio Rodriguez, Project Manager



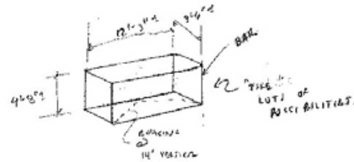



"Innovation is the thoughtful adaptation of proven systems, methods and techniques of construction to new applications. Successful innovation is founded on experience: successful and similar past experience which informs the new application. The breadth and depth of LERA's experience with complex, challenging projects worldwide is comparable to that of a much larger firm. All of that experience by a relatively small group of individuals makes LERA's engineers uniquely suited for innovation."

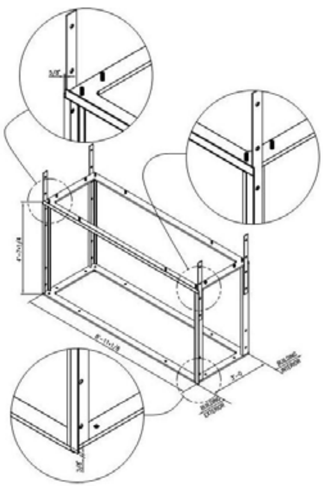
Innovators



A response to the need for transparency and cost effectiveness at the main entrance, we designed a modular prefabricated system inspired by the stacking of “lobster pots”. This innovative system allowed the structural efficiency for light members and created a striking openness. Repetition of the boxes provided efficiency in construction and erection. Each box dimension matched the size of the glass panel attaching to it and the connections were hidden within the depths of the vertical and horizontal members themselves. We couldn’t be more pleased with the final product- a testament to a great architectural vision and thoughtful execution throughout design, fabrication, and erection.



Jason Stone, Project Manager



Gateway Center
Westchester Community College

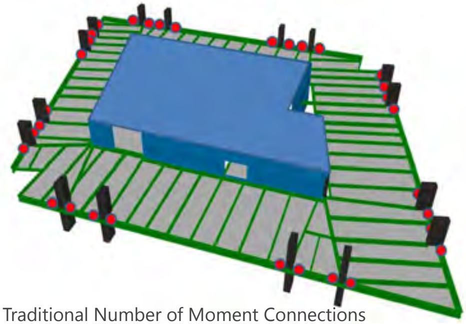
Valhalla, NY

Owner
State University of New York

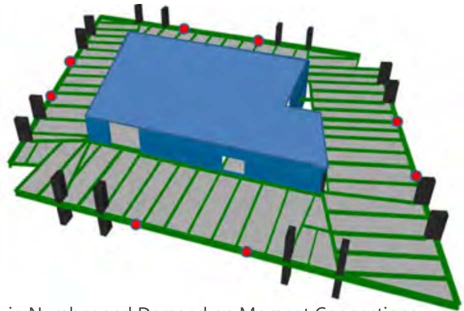
Architect
Ennead Architects


4


4

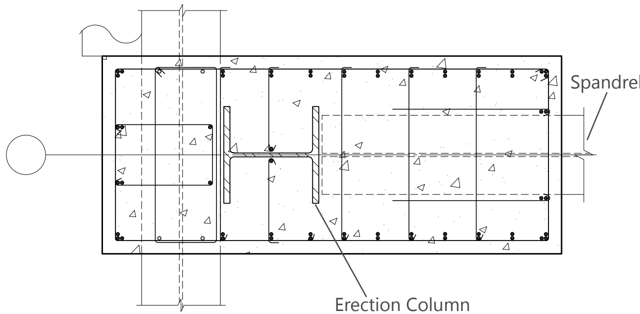


Traditional Number of Moment Connections



Reduction in Number and Demand on Moment Connections

Column locations are critical to the structural and programmatic efficiency for all buildings. On 4 World Trade Center, LERA worked closely with the design architect to balance these efficiencies and create open space. Together we achieved six column-free building corners and four 80-foot long clear spans allowing expansive views of the cityscape. Corner cantilevers range in length from 20ft (6.10m) to 45ft (13.7m).



Offset Spandrel to Reduce Number of Moment Connections

Structural efficiency was further increased by utilizing composite columns. By wrapping the structural steel erection frame in reinforced concrete, we were able to enhance the structural steel with less high strength concrete. By offsetting the spandrel girder from the steel erection column, we maximized the piece length (increasing speed of erection by reducing the number of crane pricks per floor) and reduced the number of moment connections by 75%. These reductions from more traditional design and construction techniques enabled the cantilever and long-span layout of 4 columns per side to achieve the architectural vision.

Richard Garlock, Project Manager

4 World Trade Center

New York, NY

Owner

Silverstein Properties

Architect

MAKI & Associates

“Sophisticated software has done so much to empower designers to reach new forms. The key to getting them built is to balance innovations with good old-fashioned horse sense.”

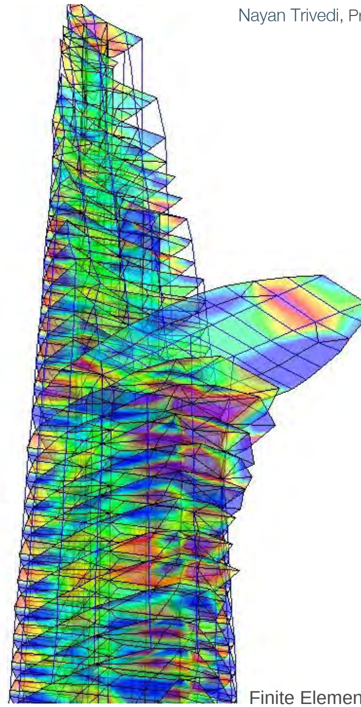
Evaluators

Located in Historic District 1 of Ho Chi Minh City, the Bitexco Financial Tower uses at its reference the Lotus flower to build upon Vietnam's history and make a statement that Vietnam has arrived and is capable of competing with the global marketplace. The tower is currently Vietnam's tallest building.

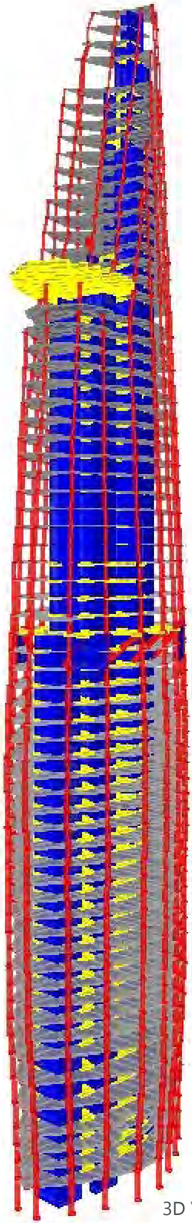
Poor soil conditions and the height and slenderness of the tower presented significant challenges for the design of the Bitexco Financial Tower. By combining a donut-style, top-down construction with a tower foundation located above the basement construction, we were able to increase the speed of construction despite the poor soil conditions.

Human comfort under wind-induced building sway was achieved using a combination of reinforced concrete walls and a structural steel outrigger and belt truss system, providing a system that is optimized for economy and speed of construction for the Vietnamese market.

Nayan Trivedi, Project Manager



Finite Element Analysis Model



3D View of Analysis Model


BITEXCO
FINANCIAL
TOWER

Bitexco Financial Center

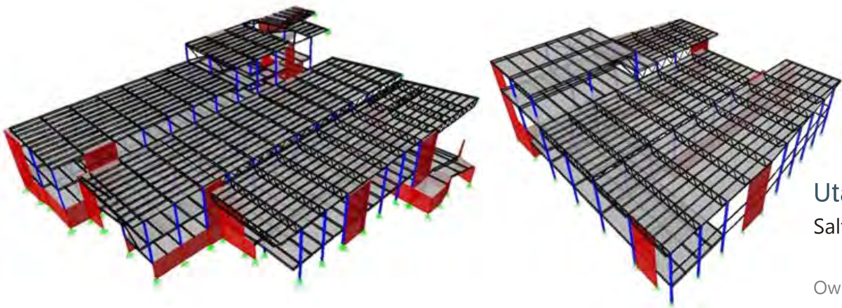
Ho Chi Minh City, Vietnam

Owner

Bitexco Group of Companies

Architect

Carlos Zapata Studio



North Building

South Building

Analysis Models of Main Building Structure

Utah Museum of Natural History

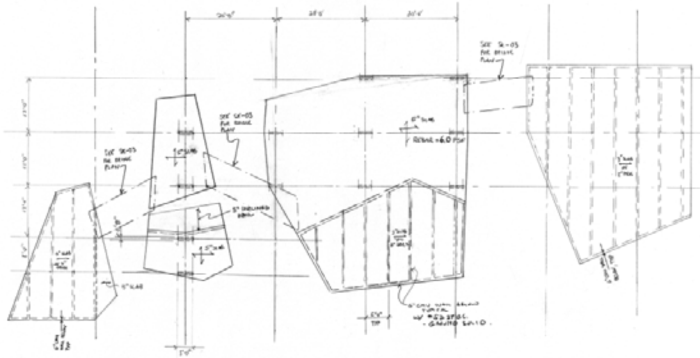
Salt Lake City, UT

Owner

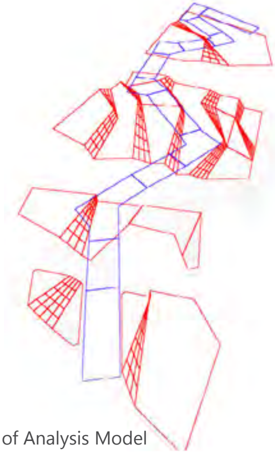
University of Utah

Architects

Ennead Architects



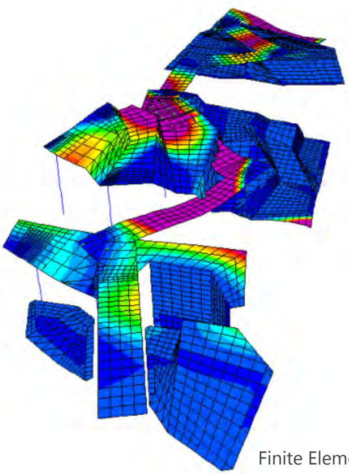
Plan View of Dinosaur Exhibit



3D View of Analysis Model

Museums often present opportunities to explore new structural systems, as it was with the Utah Museum of Natural History. In addition to designing the structural systems for the main buildings through the design development phase, we also participated in the design of the exhibit structures. One such exhibition consists of fossils displayed on a landscape crossed by pedestrian bridges, allowing the museum visitors to walk among the dinosaur bones. Folded, thin and elevated reinforced concrete shells support the fossils and create a flowing landscape, blurring the line between

Antonio Rodriguez, Project Manager

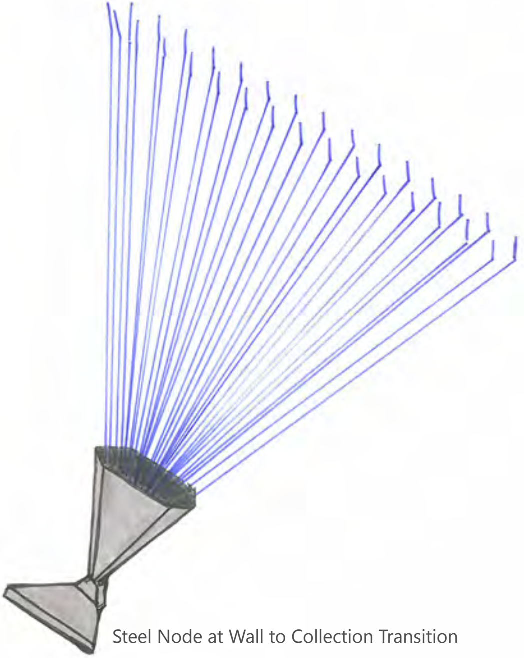


Finite Element Analysis Model

“Anyone who has been in construction for a time knows the importance of the detail. The importance may be different for different people: for a developer or owner, economy may lie within the detail; for a builder, speed of construction; for an architect, beauty. But we all know that attention to detail separates the extraordinary from the ordinary. We pay attention.”

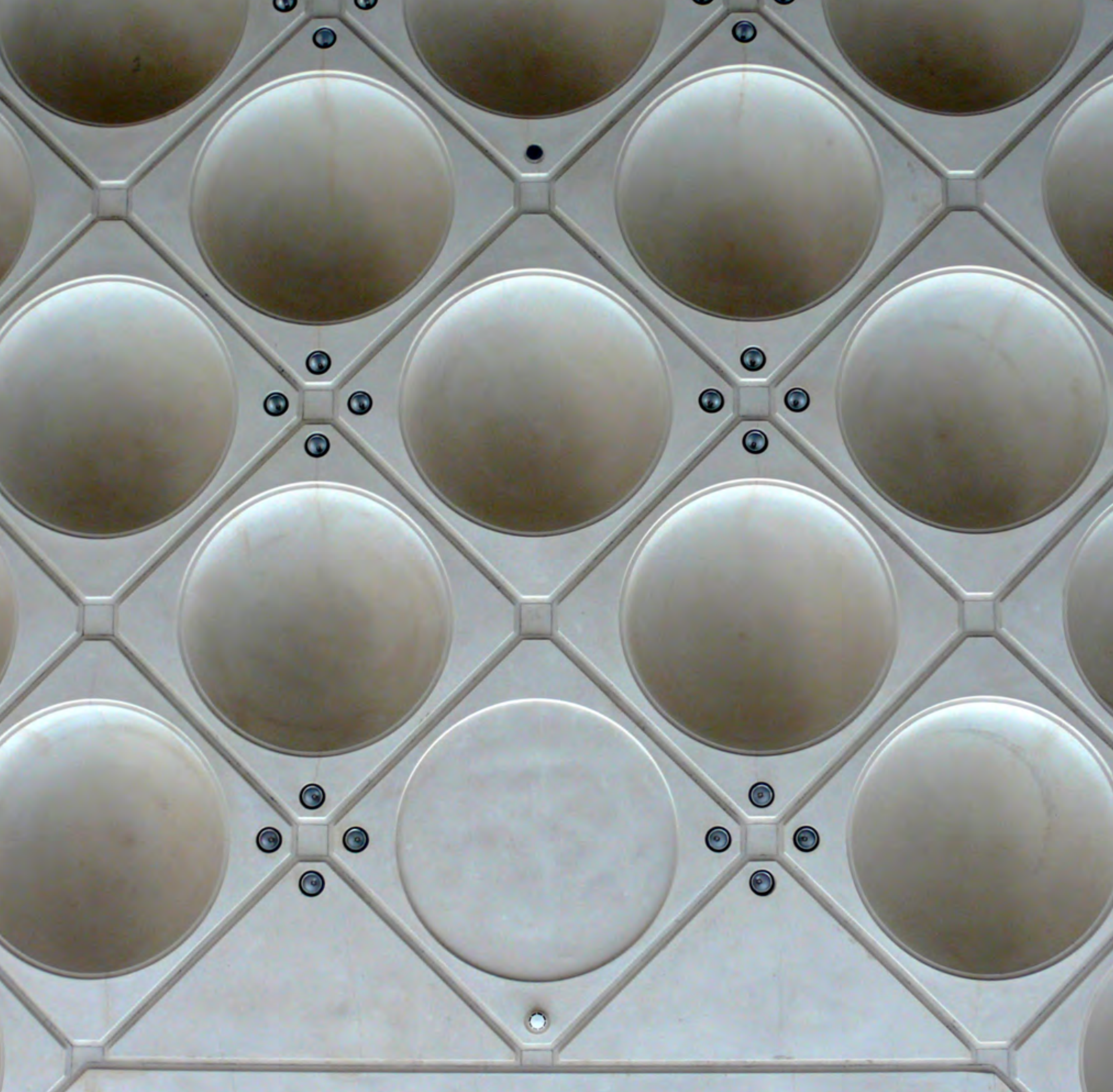
N. Triuccoli

Detailers



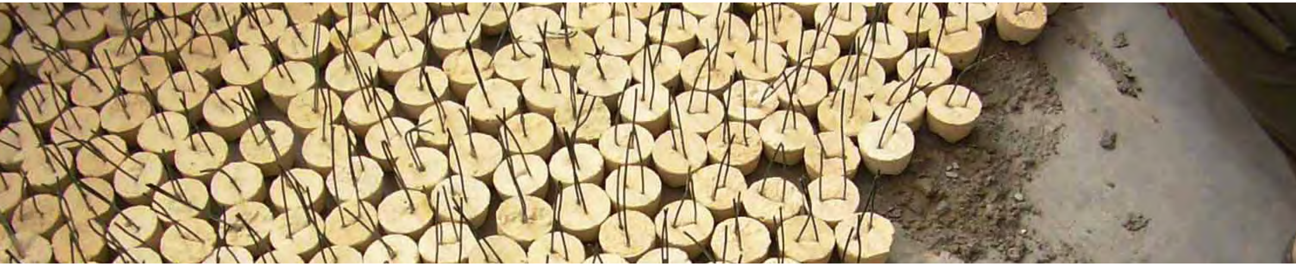
Steel Node at Wall to Collection Transition

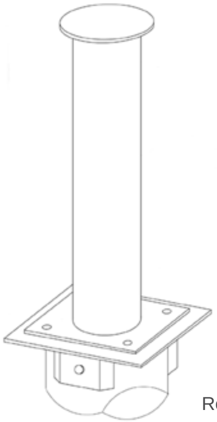
A feature of the museum’s atrium is the support of the dome tower onto four column supports via inclined triangular walls. To make the joint as small as possible, the transition from a wall to a column is achieved through a steel node. The force in the concrete wall is transferred to the steel node via shear studs welded inside the node assembly. The node also acts as the form from which the wall rebar



Making sure the surface of the architecturally exposed concrete slabs were free of stains and artifacts was important to the success of the project. Since conventional slab reshores can stain the surface of the concrete, LERA designed a reshoring detail to reshore the slab through the light fixture recess. We also worked with the architect and contractor to develop the shape of the rebar chair made from the slab concrete mix

Sami Matar, Project Manager





Reshoring Detail

Museum of Islamic Art

Doha, Qatar

Owner

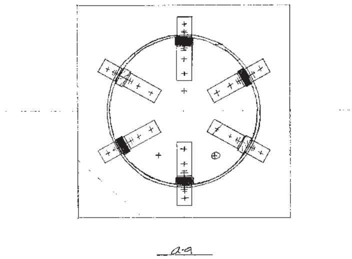
Qatar Museums Authority

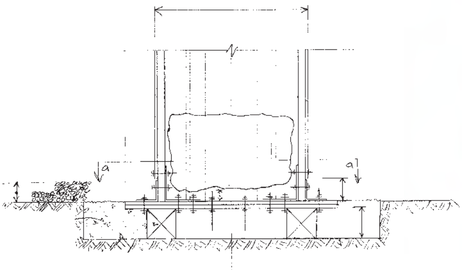
Architect

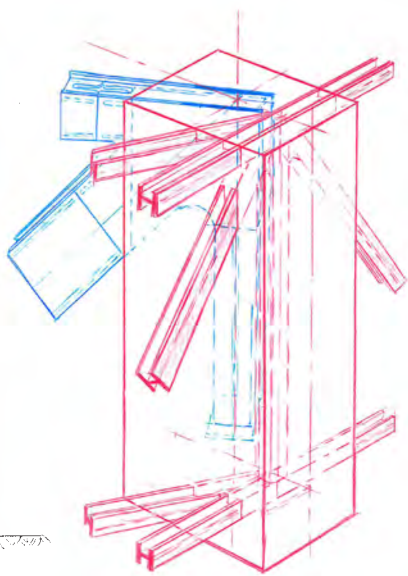
I.M. Pei
in association with Pei Partnership

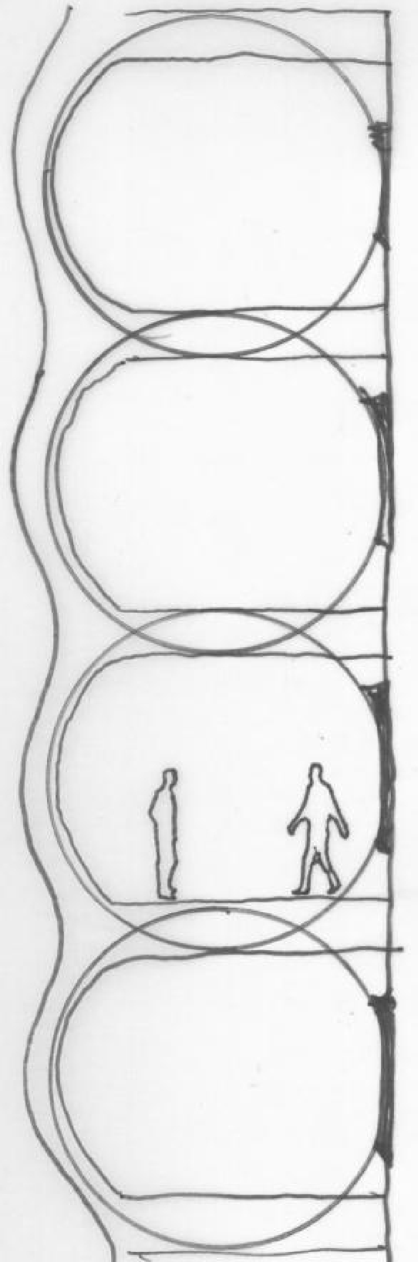
“Beautiful and elegant designs are accomplished through the continual exchange of ideas between consultants.”

Communicators



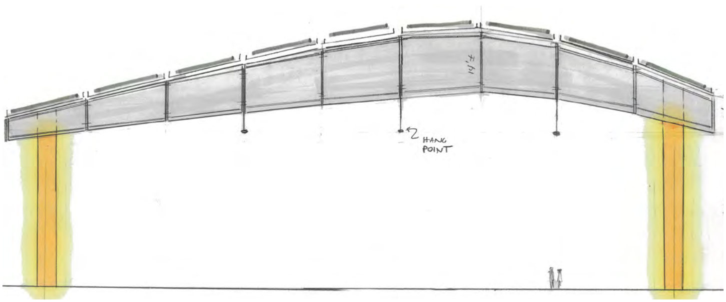


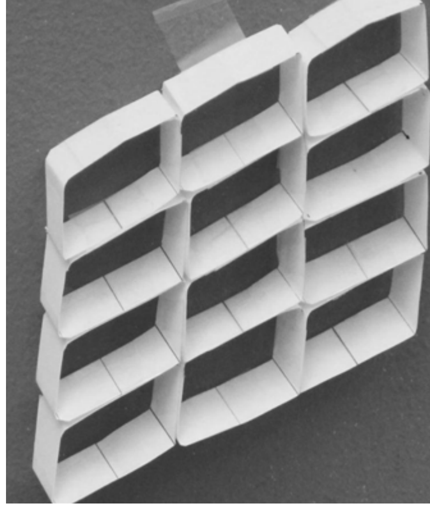
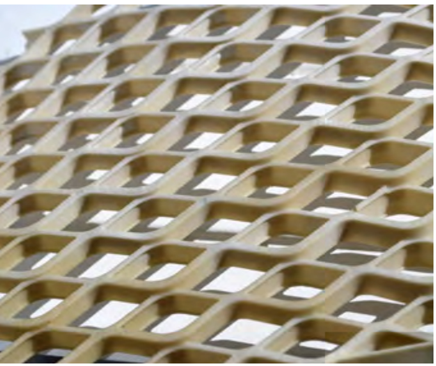


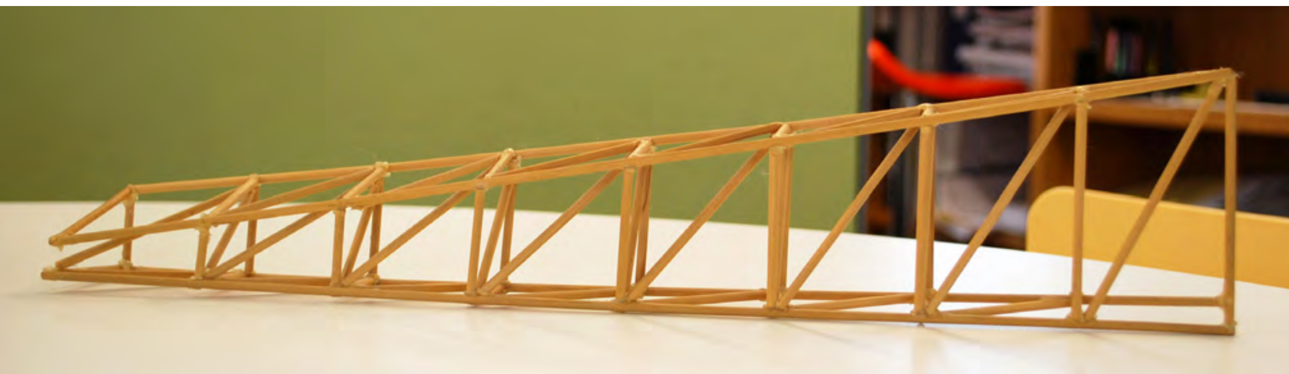


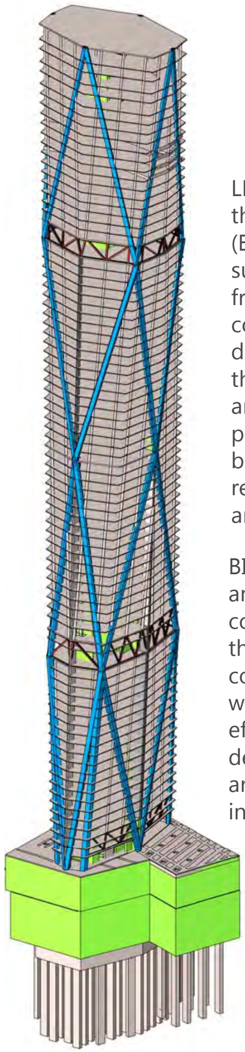
We feel effective communication between our colleagues and our clients builds solid relationships that last. We communicate to persuade creativity, to solve challenges, to freely express new ideas and to build confidence in the designs of others. The process of exchanging ideas with our clients allows for all aspects of a design to be explored and results in the most aesthetically beautiful and unique solutions that are structurally efficient, cost effective and constructible. LERA encourages all of our employees to communicate their creativity and thoughts wholly, with little constraint. This freedom allows us to concentrate on the idea at-hand and use as many communication tools at our disposal.

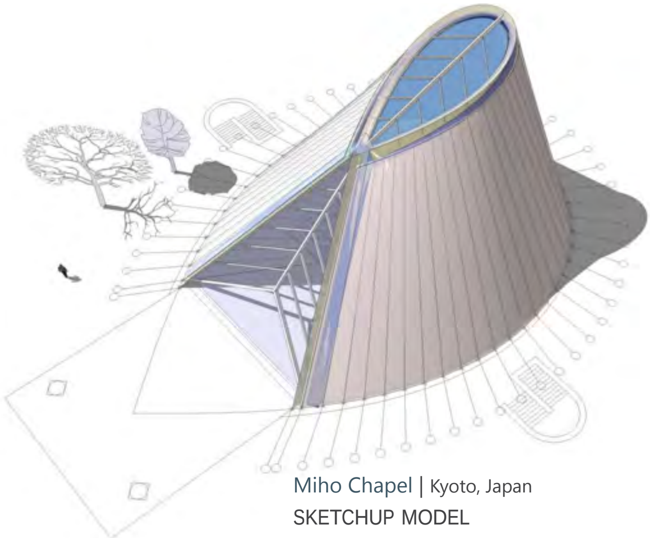
Patrick Hopple, Project Manager



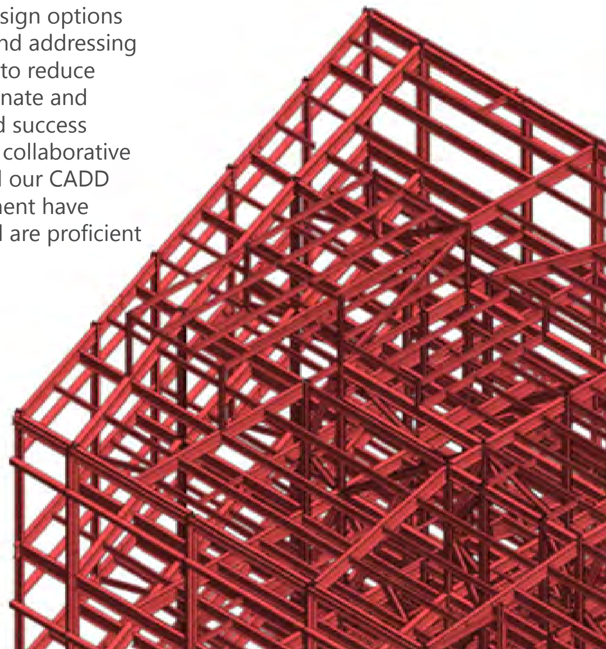




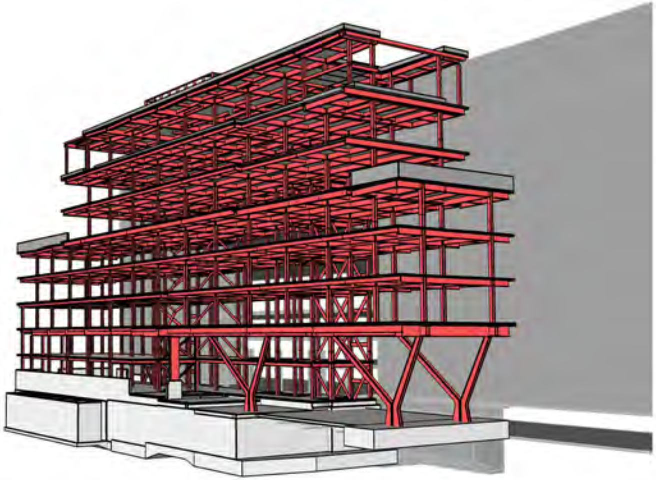
LERA has been actively involved in the Building Information Modeling (BIM) effort since 2005. We have successfully handled projects from schematic design through construction documents phases. To date, we have worked with some of the industry's leading architectural and MEP consultants on various BIM projects. These projects consist of, but are not limited to, educational, residential, institutional, healthcare and research facilities.

Miho Chapel | Kyoto, Japan
SKETCHUP MODEL

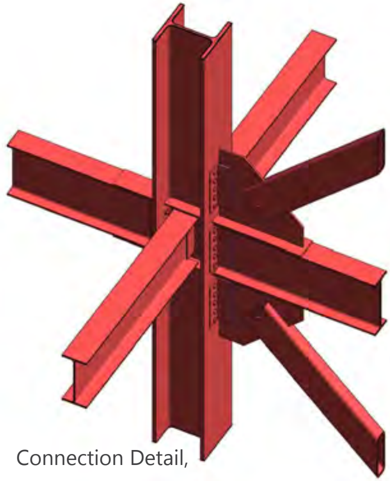
BIM enables LERA to investigate different design options and alternative materials, while identifying and addressing constructability issues. BIM also helps LERA to reduce the number of man hours required to coordinate and complete project documents. Our continued success with BIM can be attributed to the vision and collaborative efforts between our structural engineers and our CADD department. The staff of our CADD department have architectural and structural backgrounds and are proficient in Revit and BIM software.



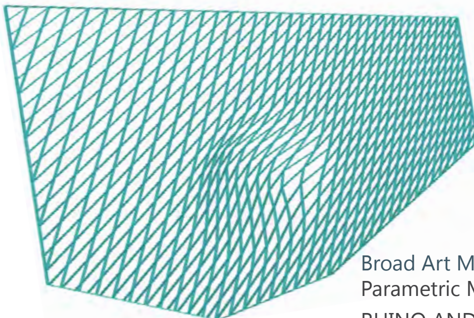
Hermitage Plaza | Paris, France
REVIT MODEL



New Academic Building, School of Public Health,
SUNY Downstate | Brooklyn, NY
REVIT MODEL



Connection Detail,
REVIT MODEL



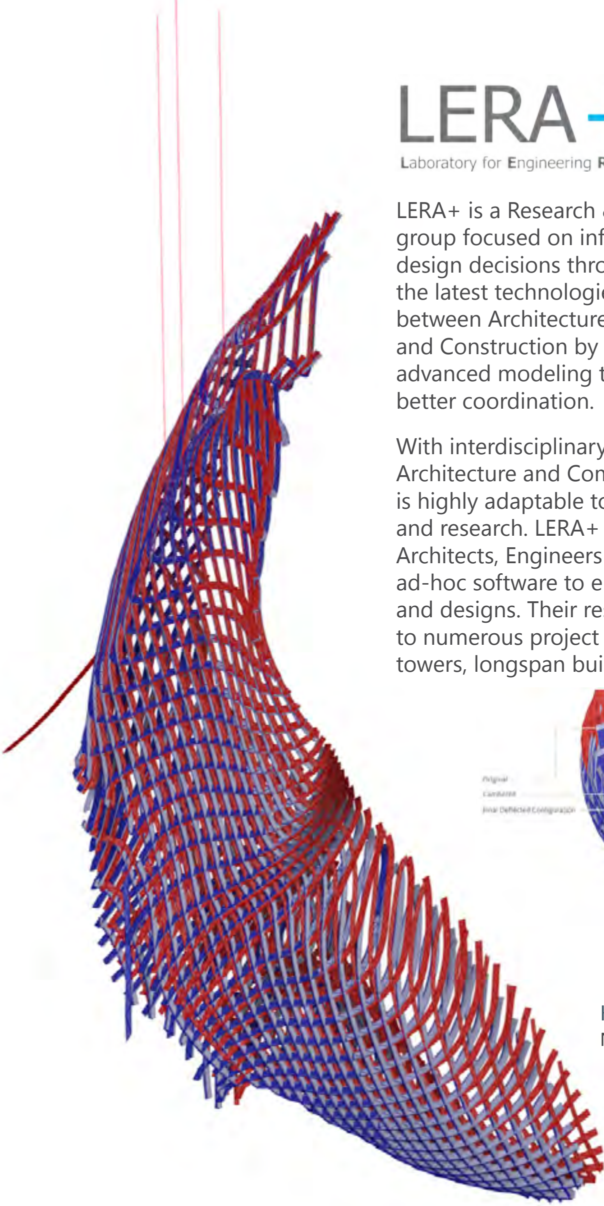
Kimmel Pavillion
NYU Medical Center | New York, NY
REVIT MODEL

Broad Art Museum, | Los Angeles, CA
Parametric Model of the Veil
RHINO AND GRASSHOPPER

Modular Unit Study
RHINO MODEL

LERA PLUS

Laboratory for Engineering Research and Automation

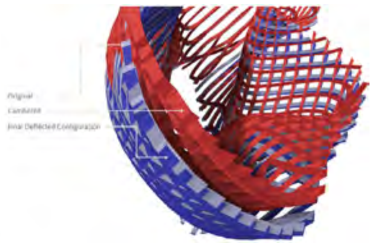


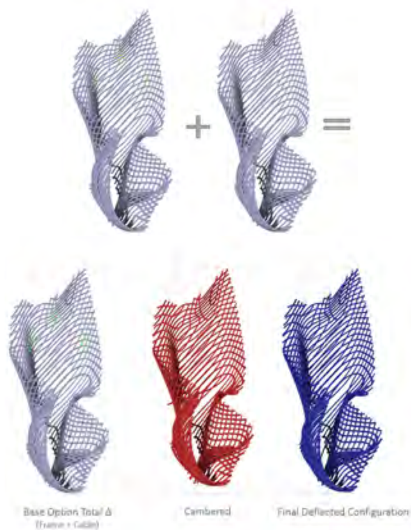
LERA+ is a Research & Development group focused on informing better design decisions through the use of the latest technologies, filling the gap between Architecture, Engineering and Construction by providing advanced modeling techniques for better coordination.

Ed Carpenter
New York, NY

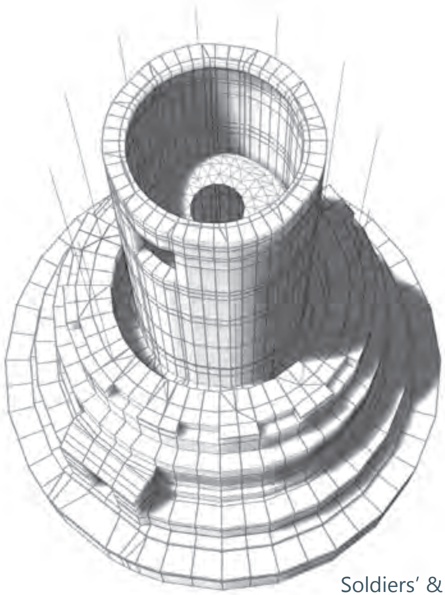
With interdisciplinary backgrounds in Engineering, Architecture and Computer Science, the group is highly adaptable to a large variety of projects and research. LERA+ collaborates with Artists, Architects, Engineers and BIM experts to develop ad-hoc software to enhance project workflows and designs. Their research has been applied to numerous project types, including supertall towers, longspan buildings and art sculptures.

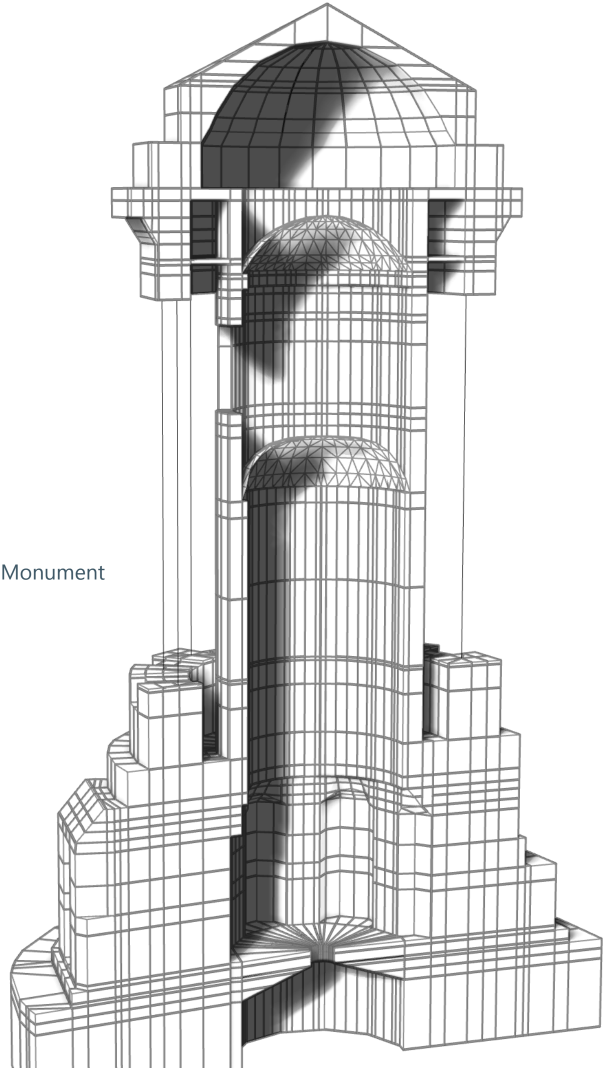
Dee Briggs Sculpture
New York, NY



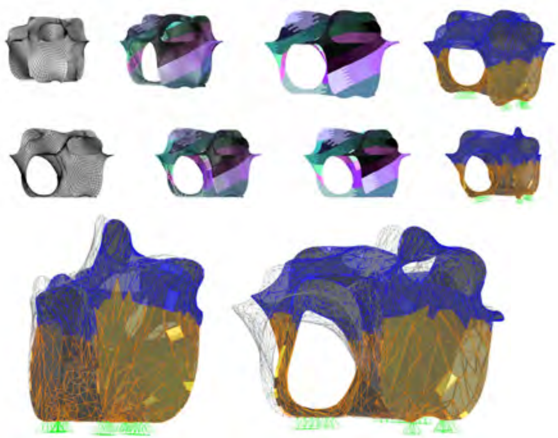


Kimmel Sculpture
New York, NY





Soldiers' & Sailors' Monument
New York, NY



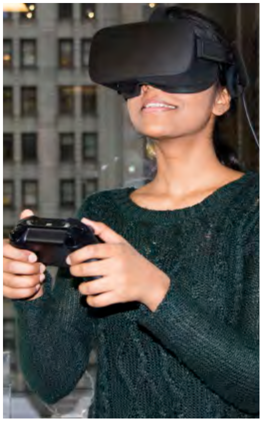
Manifold Surface Sculpture
New York, NY

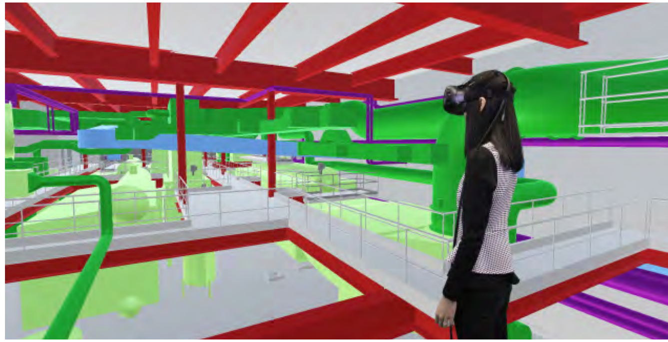
LERA IMMERSE

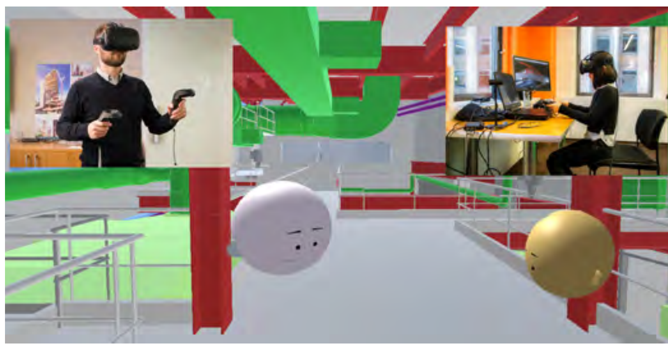
Project coordination often requires the communication of complex concepts. Such concepts can be communicated more clearly by placing them in a visual context at a real scale. As the user explores a virtual design, they are able to understand elements and features more immediately than if they were simply viewing a drawing or 3D model. Accordingly, Virtual Reality can be used as a presentation tool to relate complicated information effectively to a non-technical audience, for both existing structures and future designs.

Virtual Reality provides Designers with an enhanced level of information and control, helping them to develop their project more precisely, in a timely manner. By experiencing building models during design, at a human scale, the user is able to quickly identify areas that need to be further developed more intuitively than by looking at a 3D representation on a 2D screen. The user can also highlight areas using a real time notation system, leading to more agile and effective coordination.

With proprietary Virtual Reality software developed by LERA, a user can experience future spaces with a sense of presence and scale—in a setting that feels natural—before they are built. A virtual walkthrough of a proposed design allows the Owner to get a more accurate view of their project, thus allowing them to manage their expectations and make more informed decisions.







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Expert Witness & Litigation
Special Inspections
Facade Inspections

Arts Consultations
BIM & Drafting
Computational Design
Virtual Reality

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Utah Museum of Natural History
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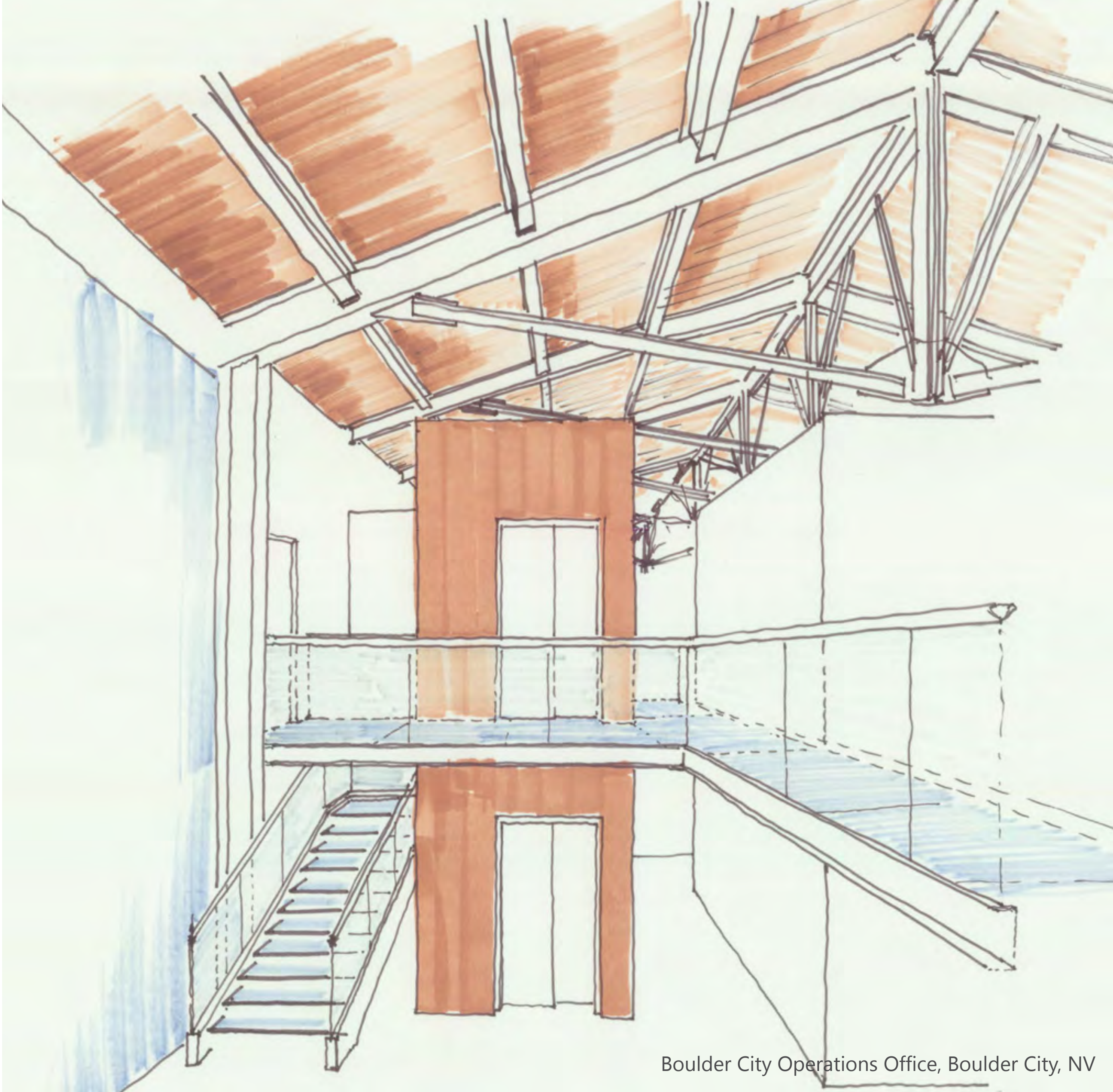

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