Hearst Headquarters

LOCATION:

New York, USA

SUBMITTING FIRM:

WSP USA

FIDIC MEMBER:

American Council of Engineering Companies (ACEC)

HEARST HEADQUARTERS
Project Description

The First Diagrid High-Rise Building in the Americas

300 West 57th Street in Manhattan, the landmark headquarters for the Hearst Corporation, is a 46 story, 600 ft tall glass and steel skyscraper that rises from the 6 story landmark art deco base building. With two underground levels, it comprises a total of 856,000 gross ft².

The original masonry façade building, completed in 1928, was commissioned by the magazine owner, William Randolph Hearst, as the first stage of a corporate headquarters for his vast publishing empire. The building was intended to accommodate seven additional floors, which were never built. With its limestone façade featuring columns and allegorical figures representing music, art, commerce and industry, the "important monument in the architectural heritage of New York", was designated as a Landmark Site by the New York Landmarks Preservation Commission in 1988.

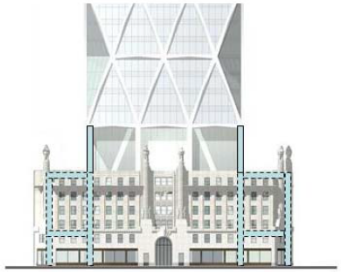
In 2001, the team of WSP structural engineers and Foster and Partners Architects were hired by the Hearst Corporation to design its new headquarters at the site of its existing building.

An important design specification was the preservation of the existing landmark façade and its incorporation into a new tower design providing architectural character of the highest standards. This necessitated the demolition of the interior of the existing building which had never been designated a landmark, while retaining its six story façade at the three exterior faces on 56th and 57th Streets and Eighth Avenue.

On plan, the original six story building had a horseshoe shape with an approximate footprint of 200' by 200'. The design for the new tower, however, required a footprint of 160' by 120', and was to be situated on new foundations behind the landmark façade. Furthermore, the client also requested a new, 90 foot high, interior atrium to be formed by the existing façade and the tower above.

By removing the existing support structure for the landmark façade, a new design was required due to the larger unbraced height condition of the façade. Therefore, a new framing methodology was incorporated for the structural stability of the existing wall in order to address the new design condition as well as construction phase issues. The supporting perimeter steel columns and spandrel beams of the original building were

maintained. They provided full vertical support for the façade system. However, an additional grid of vertical and horizontal framing members was provided behind the façade following lateral stability and seismic requirement studies. Furthermore, the new



and existing framing are in turn laterally braced by the new tower's 3rd floor framing system as well as the new skylight framing system at the top of the sixth level spanning approximately 40 feet from the tower columns to the top of the existing façade.

The tower has two distinct zones, with the office zone starting at 110 ft above street level from the 10th floor to the top of the building. Composite steel and concrete floors with 40 ft. interior column-free spans were utilized for open office planning. The other zone below the10th floor contains the street level lobby and entrance, a cafeteria and an auditorium at the 3rd floor with a 90 ft. high interior open space. A water feature named the 'Ice Falls' extends from the third floor down to the ground level and is diagonally crossed by three escalators approaching the main lobby.

For interior layout efficiency, the service core zone was placed asymmetrically toward the west side of the tower as this is the only side of the building that is not open to the surrounding streets and shares a common lot line with an existing high rise building. Naturally, the eccentric position reduces the core's structural benefit as the main spine of the tower. Therefore, the design team decided to focus on the opportunities that the perimeter structure could provide in order to address the overall stability of the tower. This led to an evolutionary process in the conceptual design of the tower by evaluating the effectiveness and benefits of various structural systems. Finally, a diagrid system was proposed that would wrap around all four sides of the tower due to a number of benefits specific to the project.

The diagrid creates a highly efficient tube structure composed of a network of triangulated trusses which interconnect all four faces of the tower. The diagrid system is inherently highly redundant by providing a structural network allowing multiple load paths. This provides a higher standard of performance under extreme stress conditions than national and international codes strive to achieve.

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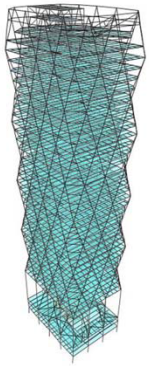
The system provides inherent lateral stiffness and strength and therefore results in significant advantages for the general stability requirement of the tower under gravity, wind and seismic loading. This highly efficient structural system was constructed with 20% less steel than an equivalent conventional moment frame structure would have used for the project. This, together with the fact that over 90% of the project's structural steel contains recycled material, contributed towards Hearst Tower becoming the **first** building to receive a Gold LEED NC certified rating for "core and shell and interiors" in New York City.

Although diagrid systems possess inherent strength and stiffness in comparison to conventional moment frames, it was necessary to brace the diagonal elements at the floor level between the nodal levels, considering that the height from node to node spans an entire four floors. This approach necessitated a secondary lateral system in the form of a braced frame at the service core area connected to the common diaphragm floors. This design addressed the stabilizing requirements, taking into account the total loads at each level that resulted from gravity and lateral forces.

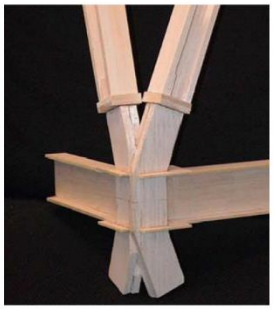


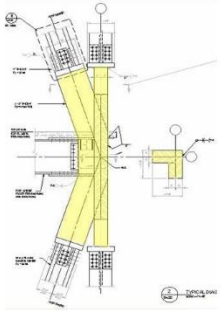
The main dimensions for the diagrid system were based on its nodes being set on a 40 ft. module placed four floors apart. A natural evolution of the refinement of the structural and architectural options led to chamfered corner conditions referred as *"Birds' Mouths"*. This not only accentuates the aesthetic character of the diagrid but also solves the otherwise inherent structural vibration concern of having 20 ft. cantilever conditions at every eight floors on each corner of the tower.

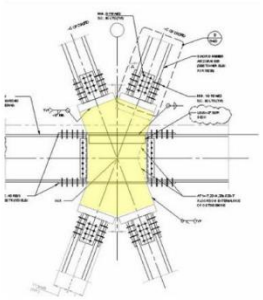
Typically wide flange Grade 65 rolled steel sections were used for the diagrid members with all nodes being prefabricated and installed at the site using bolted connections.

The diagrid nodes are formed by the intersection of the diagonal and horizontal elements. The nodes, from both a structural and architectural viewpoint, were one of the key design elements in the project. Structurally, they act as hubs for redirecting the member forces. Architecturally, they were required to be no larger than the cross dimension of the diagrid elements in order to maintain a pure appearance.

There are two types of nodes; the interior and corner nodes, with the former being planar and transferring loads in two dimensional space, whereas the latter transfer loads in three dimensional space and thus form a more complicated arrangement. As the dimensions of the nodes could have a significant effect on the viability of the overall concept, particularly regarding cladding, aesthetics, and ultimately the structural system, it was decided that the nodes were to be designed early on during the Conceptual Design phase rather than waiting for the more usual Detail Design phase.







Even with modern computer software at hand, the time tested method of model making was utilized for alternate studies of the corner nodes. The key was to have a less labor intensive node design even at the cost of marginally increased material quantities. The outcome satisfied not only the structural and architectural requirement but also the fabrication requirement in such a way that the design concept was wholly accepted by the steel fabricator.

A series of perimeter mega columns support the diagrids at the 10th floor and are continued down to the foundation. The lateral system below this level is provided by a robust composite core shear wall comprised of steel braced frames encased in reinforced concrete walls. Two sets of super-diagonals further enhance the core wall lateral stiffness. The mega column system positioned around the perimeter of the tower footprint was utilized to give this part of the building's structure the appropriate stability for the large unbraced height of the 90 ft. high interior atrium.

Mega columns are primarily made out of built-up steel tubes and strategically filled with concrete. In order to create the interior open space for the lobby, two of the tower interior columns are also transferred out to the perimeter of the tower via a series of super diagonals below the 10th floor. The horizontal component of the load in the mega diagonals intersecting with the mega columns, is resisted through in-plane ring beams and trusses located around the 3rd floor lobby opening that interconnects all the thrust points.

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Steel erection was completed in February 2005 and Hearst Headquarters opened in September 2006 on time and on budget. Through the incorporation of innovative engineering techniques, the iconic tower harmonizes flawlessly with its historic facade below, providing a new 21st Century gem to the Manhattan skyline.

CONSTRUCTION COSTS

Total Project Budget: $500 million

Owner:	The Hearst Corporation
Developer:	Tishman Speyer Properties
Architect:	Foster & Partners, Adamson Associates
Structural Engineer:	WSP (formerly WSP Cantor Seinuk)
Construction Manager:	Turner Construction
MEP:	WSP (formerly WSP Flack & Kurtz)
Steel Fabricator:	Cives Steel Company, Gouverneur, NY
Steel Erector:	Cornell and Company, Woodbury NJ

REMOVE UNLESS REQUIRED FOR THE SUBMITTAL **Short Description To A Public Audience On Why The Project Is Unique:**

"The new Hearst Headquarters incorporates innovative engineering techniques to provide a highly aesthetic and unique skyscraper. At the forefront of structural efficiency and environmental sustainability, this new gem on the Manhattan skyline harmonizes flawlessly with its historic facade below and was delivered cost effectively and on schedule."