

A New Monument on

America's Main Street

Polshak Partnership Architects



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Transparent construction featured in this “museum of news” reflects the ideals of openness and accessibility.

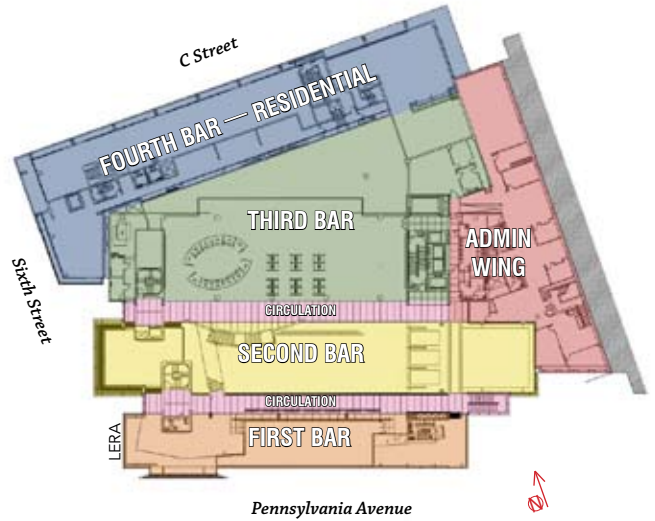
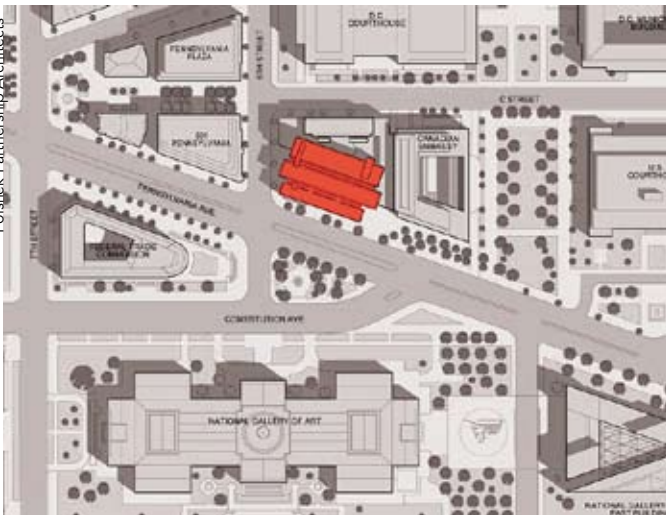
ON INAUGURATION DAY 2009, as the new president of the United States paraded down Pennsylvania Avenue from the U.S. Capitol, the Newseum was brimming full of people and on prominent display for the entire world. Having opened the previous year to record crowds and publicity, Washington’s newest monument was envisioned from the beginning to be an iconic building and highly symbolic of the role of the First Amendment to the Constitution and a free press in our society.

The original Newseum operated from 1997 to 2002 in a much smaller facility in Arlington, Va. In 2000, The Freedom Forum, a non-partisan foundation dedicated to free press, free speech, and free spirit for all people, purchased the last available site along Pennsylvania Avenue in Washington to be its new location. The Forum engaged Polshak Partnership Architects, New York, to design a new building to house its expanded and more technologically advanced Newseum. Ralph Appelbaum Associates, New York, was selected to design the highly interactive state-of-the-art exhibit galleries, which educate the public about the role of the press and free speech.

The resulting Newseum/Freedom Forum Foundation World Headquarters provides a forum where the media and the public can gain a better understanding of each other. Successfully completing the structure of this complex project required the active participation of the owner, the designers, and the builders. The dialogue first started between the owner, architect, and exhibit designer, extending to the structural engineer, New York-based LERA, and ultimately to the contractor team. This collaborative spirit allowed for open thinking about structure, resulting in proven structural technologies being effectively used and combined in innovative ways.

The Project

The Newseum was originally conceived, and ultimately built, as a series of three distinct rectangular bars. The bars vary in length and height and in their amount of transparency, each reflecting the ideals of openness and accessibility, creating both a functional and metaphorical public forum. Between the bars are distinct circulation zones that allow for architectural and programmatic transitions



Standing as a monument to the historical and ongoing importance of the First Amendment to the U.S. Constitution, the Newseum is located along the main corridor connecting the U.S. Capitol and the White House.

between spaces. An additional fourth bar comprises the residential component of the project, which is separate from the museum.

The bars rise from a common below-grade podium, which covers the full extent of the site between Pennsylvania Avenue and C Street on the south and north, and between 6th Street and the Canadian Embassy building on the west and east, respectively. Three basement levels plus a mezzanine below street level are all framed in reinforced concrete. The first two bars, forming the public face of the Newseum, are framed with structural steel long spans and cantilevers so as to best achieve the openness and transparency of the front of the building.

First Bar: Entry, Window, Broadcast Studio, Exhibits

The first bar provides a smooth transition in streetscape along Pennsylvania Avenue by setting the ground level columns back from the street. While the adjacent Canadian Embassy is set back from the street, the upper levels of the first bar cantilever toward Pennsylvania Avenue affording the first bar, and the broadcasting studio housed within it, unobstructed views of the Capitol Building.

Second Bar: Public Assembly, Vertical Transportation, Exhibits, Conference Center

The middle portion of the second bar contains a 90-ft-tall atrium, the project’s primary public assembly space. The multiple levels of exhibit galleries are oriented around this central open space. The atrium, and the 50-ft by 32-ft media screen suspended within, can be viewed from Pennsylvania Avenue through the first bar.

Third Bar: Core Exhibits, The Walter & Leonore Annenberg Theater, Building Services, Offices

The First Bar and Second Bar are framed in steel and present the Newseum’s public face on Pennsylvania Avenue.

The most enclosed portion of the museum, the third bar houses many of the core elements of the news exhibits and contains the galleries requiring the most controlled environments for videos and media displays. Adjacent to the third bar is the administration wing containing the Freedom Forum offices. The third bar is a cast-in-place concrete structure, containing two large concrete cores, which form the primary lateral load-resisting system of the building.

The 643,000-sq.-ft mixed-use building includes not only the 250,000-sq.-ft museum, but a 22,000-sq.-ft conference center, 54,000 sq. ft of office space for the Freedom Forum, 147,000 sq. ft of residential housing in nine stories, and two levels of below-grade parking. The Newseum itself features seven levels of galleries, theaters, retail spaces, and visitor services. It also contains a 535-seat auditorium equipped with 4D technology and two state-of-the-art black box broadcast studios.

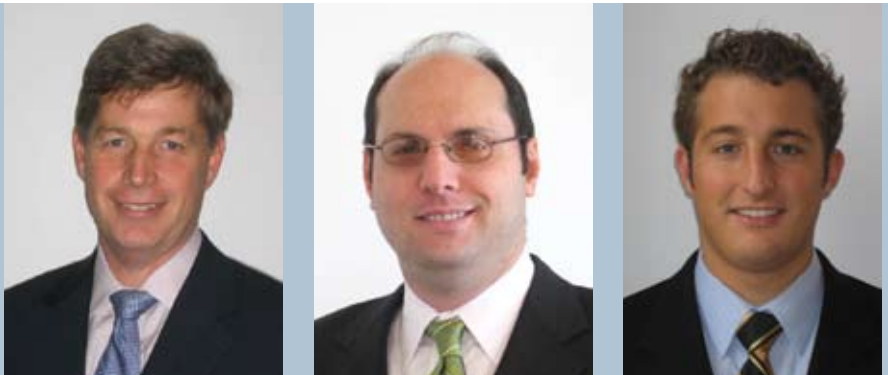
Complex Structure

The Newseum is a complex building. To accommodate the architectural and exhibit design and the many program elements throughout, it is packed with almost every modern structural system. In all, more than 20 structural systems are used throughout the Newseum.

“LERA faced enormous technical challenges in designing the building...The brilliance and beauty of their efforts here will be studied and admired for decades.”

—Max C. Page, former deputy director and vice president of the Newseum

Daniel A. Sesil, P.E. (left), is a partner at LERA and has been with the firm since 1983. He has extensive experience in the design of special atrium structures and long span, column free spaces. Douglas P. González, P.E. (center), is a senior associate at LERA and was the firm’s project manager for the Newseum. Matthew D. Melrose, P.E., is a LERA senior associate and came to the company in 2002. He also is an adjunct assistant professor of architecture at Columbia University.





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Erection of the 252-ft truss that spans the atrium. Its top and bottom chords are interconnected with prefabricated web trusses to create a long rectangular box. Photo: LERA

The stone rendering of the First Amendment and the very large window, affording a clear view of the main atrium, are the primary elements of the building facade.

The first bar contains several structural steel systems. Its main façade, on Pennsylvania Avenue, was designed by Polshek Partnership Architects to consist of multiple glass curtain wall systems, thereby symbolizing the openness of the press. One section of this façade contains highly transparent glass and a minimal long span cable structure forming a window for viewing the main interior atrium from outside the building. West of the Big Window is a 74-ft-high plane of stone engraved with the 45 words of the First Amendment. The stone is attached to a braced frame incorporating columns that support the first bar floors behind it. East of the Big Window is the first bar studio curtain wall, which is framed by an architecturally exposed, vierendeel-type wall of built-up structural boxes. These members form the frame for the studio views of the Capitol Building and Pennsylvania Avenue.

Both the First Amendment and studio structures are cantilevered past the face of the first bar at street level. This cantilever of the upper levels of the first bar, 22 ft at its maximum, is accomplished with a series of 28-in.-deep built-up torsional box girders at Level 2 that are supported by steel columns set back from the street.

The second bar contains its own series of long-span steel structures. Above the atrium is the second bar truss. In addition, the second bar contains several steel ramps, stairs, and bridges, which cross the atrium space to connect the first and third bars. Some of the bridges act as axial load collector elements, connecting the eastern portion of the first bar across the atrium to the concrete core walls at the east side of the third bar.

Using Proven Technologies in New and Innovative Ways

While the facility uses numerous structural systems to accommodate the building's programmatic complexity, a clearly established order exists within each part of the building helping to ensure a logic and economy to the building's composition and construction. The innovation of the structural design lies not in reinventing everything, but in combining proven technologies in ways that work within the unique space. The structure of the Big Window in the first bar is an example.

Big Window

The first bar's monumental window wall facing Pennsylvania Avenue measures 52 ft high by 74 ft wide and is accomplished via a unique one-way cable net system, supported by vertical architecturally exposed steel trusses. This transparent facade embodies the value of openness and the responsibility of the press to society. Starting with sketches and working closely with the Polshek Part-

nership and curtain wall consultant R.A. Heintges, we reversed the "tennis racket" approach to cable wall structures in which the grid of cables sits close to the glass, and instead separated the systems and isolated individual elements.

Typically, in the gridded system, horizontal and vertical cables would be anchored all around the perimeter of the wall. For the Newseum, we departed from that practice and designed a one-directional system to carry the wind load in the horizontal tensioned cables, thereby simplifying tuning of the system. Wind loads are resisted by the cables while the glass weight is supported by vertical hanger bars. The glass panels are supported from corner nodes that are organized in pairs. Only every other connection provides vertical support, which effectively halved the number of hangers and, in turn, opened up the vision area of the wall. The fixed vertical support offers stability, and the free horizontal support allows the necessary movement.

In addition to the window wall structure, the



entire first and second bars above the concrete podium are framed in structural steel. Although typical Washington construction is in concrete, steel was the logical choice to achieve the openness, long spans, and cantilevers of the bars closest to Pennsylvania Avenue.

Dialogue with Owner, Architect, and other Designers

Many of the structural systems used for this project were developed early in the structural design dialogue with the architect and owner. This dialogue set the parameters for a structural rigor that informed both later design decisions and the construction process. The clearly defined column layouts and framing that had been developed allowed the structure to act as a consistent framework for other building systems to relate to. In addition, because architecture and structure are closely aligned, the structure reveals itself through the use of exposed steel and concrete elements and unique structural supports. Several key architecturally exposed structural steel systems were developed in close collaboration with the designers.

A major structural component of the Newseum is the second bar truss, a 252-ft structure spanning over the atrium, with chords consisting of the floor framing at Levels 6 and 7. The top and bottom chords are interconnected by two prefabricated web trusses at the north and south sides of the second bar, creating a long rectangular box truss.

The floors above the atrium were initially envisioned being supported by numerous pipe columns along the sides of the atrium; however, a truss achieved the most open atrium space and itself became an important exposed design element. The truss spans 148 ft with the west and east ends cantilevering 36 ft and 48 ft, respectively.

Layering, reflected throughout the organization of the building, is important to the composition of the Newseum. Layering is expressed in the detailing of the second bar truss: the truss diagonals are eccentric to the chords, i.e. they occur in a different vertical



Photos: LERA



Situated on Pennsylvania Avenue between the U.S. Capitol and the White House, which are home to the government's legislative and executive branches, respectively, the Newseum is a bold reminder of the importance of a free press.

plan than the chord members at Levels 6 and 7. The truss diagonals are architecturally expressed, thereby framing the views from the Level 6 conference center. Multiple levels of exhibit space are hung from the cantilever ends of the truss using architecturally exposed steel hangers, which are extensions of the exposed truss diagonals. Hanging these levels allowed for tall story heights without the need for bulky or braced columns accommodating the program elements that require or allow for natural light. Hanging levels are typical slab on metal deck over steel framing construction.

The exposed truss diagonals and hangers typically consist of structural plates whose connections are accomplished by overlapping of those plates. Throughout the project, steel plate assemblies are used for exposed structure, resulting in consistent visual expressions and one family of details for the fabricator.

Vertical Components

Expressed steel plate also is used to form the structure for the elevator tower frame below the second bar truss. This tower frame supports the Newseum's primary circulation elements – three of the world's largest hydraulic elevators. Containing three glass-enclosed cabs, each elevator holds 75 people. Vertical elevator guide rails, which brace the cabs laterally, are supported by the architecturally exposed tower frame that stands in the atrium. The frame is composed of individual prefabricated "tree" frames between the elevators. Its structural members are made of steel plates and tubes.

Stair D

Another key area of design dialogue with the Polshek Partnership concerned the main Newseum stair. To enhance the building's openness, the architects wanted a column-free space at the east end of the first bar to preserve views of the Capitol Building from the monumental Stair D. However, with the need to support the stair, its skylight roof above, the adjacent floor landings, and the

Above, left: Support for several of the structural elements is visible in this construction photo. The framing on the left is for the marble wall engraved with the First Amendment, and the two vertical trusses in the center take the wind loads from the big window.

Left and right side, left: Cable anchorage for the horizontal tensioned cables, fabricated integrally with the vertical truss members.

Below, left: Vertical hanger bars support the weight of the big window while horizontal tensioned cables resist the wind load.



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Above: Using bolted connections for the nodes of the horizontal elements in the rectangular box truss facilitated field installation.

Below: The upper and lower web trusses, which provide the floor framing for levels 6 and 7, were joined on the north and south sides using prefabricated elements.



LEERA

surrounding glass curtain wall from Levels 2 to 6, a structural support was required.

Initial design discussion focused on integrating support within the curtain wall system. However, a preferred solution eventually was achieved by using the stair structure itself as a bent column, eliminating the need for a traditional column at this corner of the building. Composed of moment-connected bent steel box girders, the stair is supported only at its base on a 36-in.-deep portion of the reinforced concrete ground floor construction. This street-level concrete transfer slab, which extends for the full width of the site on Pennsylvania Avenue, supports the cantilevered portion of the first bar and provides a column layout in the levels below that is independent from the streetscape above.

Exhibit Systems

Exhibit systems structure also benefited from the design dialogue, allowing for consistency with the other exposed structures in the building. The original Newseum in Arlington contained a Journalists Memorial with glass plaques honoring journalists who have died in the line of work. Working with the exhibit designers for the new building, the intent was to provide a minimal floating support for new glass panels each etched with a journalist's name. Contained within a double story space at the western end of Level 3 in the second bar, the final design consists of the glass panels supported from behind by blades of exposed steel plate suspended from the floor above.

On the eastern side of the second bar, on display within the 9/11 Gallery, is an artifact from Tower One of the World Trade Center that was recovered from Ground Zero: the mangled top portion of the broadcast antenna that extended above the original roof to elevation 1,700 ft. Working carefully not to upstage the artifact, a built-up steel member inconspicuously rises from the floor to provide support. Throughout the Newseum, the floor structure has been designed to support and accommodate the loading of numerous artifacts. Additional casework structure has been installed in close coordination with the exhibits and galleries designed by Ralph Appelbaum Associates.

Design Documentation Emphasizing Constructability

As the design dialogue evolved, it was crucial to clearly and cohesively document structural systems so they could be communicated effectively within the design team and ultimately to the builder. Accordingly, we defined feature structural systems, such as the Big Window and the second bar truss, in separate drawing sets that contained plans, elevations, and details grouped together for easy reference. The S300 series of Special Structures drawings provided a useful means of identifying the key elements of the building for construction as well as providing construction sequence and design criteria assumptions critical to structural stability.

With the start of construction, the contractor team joined the dialogue with the design team and the owner. Turner Construction, Washington, was the construction manager/general contractor for the project. While emphasis had been placed on discrete and logical structural systems for the Newseum, there were still numerous interrelationships between the structural systems, which were discussed at length with Turner and its subcontractors.

Fabrication of the structural steel systems for the build-

ing was accomplished by Canam Steel, Point of Rock, Md., Close dialogue between LERA, Polshek Partnership, and Canam resulted in high quality pre-fabricated architectural exposed structural steel elements. LERA and Canam's connection design engineers and detailers collaborated frequently regarding connection design and detailing.

As the podium construction reached grade level and the construction of the various bars advanced, it became clear that the project would benefit from a continuous dialogue at the site with the contractors, the owner, and design team. Therefore, LERA provided surveillance engineering services on site. The relationship between the concrete construction and the structural steel erection of the first two bars, being accomplished by Derr Steel Erection, Euless, Texas, working for Canam Steel, was critical and the subject of significant coordination. As planned by Turner due to site logistics and schedule, the concrete work proceeded ahead of the steel work. For example, much of the concrete work of the third bar was completed prior to the commencement of the major steel erection.

LERAs surveillance engineers were present at the site for approximately one year assisting the team during construction of the concrete and steel bars above the podium. This presence allowed for continuous communication among the contractors, LERA, and the architect's main offices, in New York. LERA's on-site representative had two primary goals: assisting contractor in identifying and planning for key construction sequence items; and helping prevent, address, and mitigate construction issues associated with site conditions, design coordination, and shop drawing review. This was just another example of the key teamwork required to design and build this complex project.

Situated prominently in the nation's capital, the new Newseum is a bold icon for Washington and the nation. Its building and structure were developed through independent thinking and extensive dialogue of all involved—the very same principles the Newseum represents. **MSC**

Owner

The Freedom Forum, Washington

Developer

Tishman Speyer, Washington

Architect

Polshek Partnership Architects, New York

Structural Engineer

Leslie E. Robertson Associates, New York

Construction Manager

Turner Construction (AISC and IMPACT Member)

Steel Fabricator

Canam Steel, Point of Rocks, Md. (AISC Member)

Steel Erector

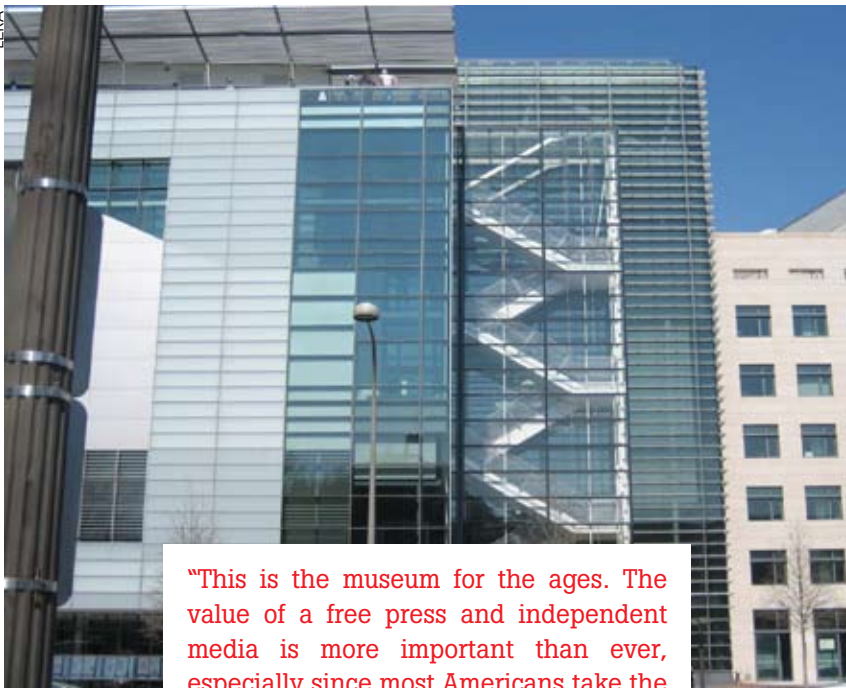
Derr Steel Erection, Euless, Texas (AISC and IMPACT Member)

Structural Engineering Software

ETABS, SAP, SAFE, RISA, LARSA, ADAPT

Using the stair structure at the southeast corner of the building as a bent column eliminated the need for a traditional column and preserved a clear view of the Capitol from the stairs. Shown during construction (lower right) and completed (upper right).

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"This is the museum for the ages. The value of a free press and independent media is more important than ever, especially since most Americans take the First Amendment for granted."

**—Peter S. Prichard,
former president of the Newseum**



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