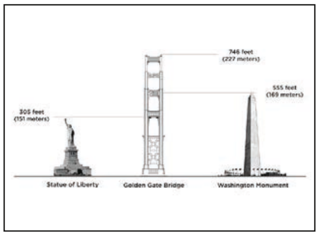
ILLUSTRATED LIST OF EXHIBITS

LOCATED AT THE ENTRANCE TO THE LOWER LEVEL

Facts & Figures About the Bridge
Answers some of the most frequently asked questions about the Golden Gate Bridge, such as: "If all the wires in the main cables were one continuous length, how far would they reach?" or "What is the span of the Bridge and its total length?"

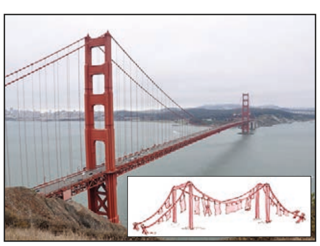


Tall and Strong - The Bridge Towers (includes "What is a Rivet?")
The entire weight of the bridge deck, with vehicles, pedestrians, bikes, etc., is supported by the two towers. Many people assume the towers are solid steel, they are actually made up of connected cells and are incredibly strong. This exhibit also explains how rivets were used to permanently clamp the pieces of steel together.

Fog, Steel, Salt, Rust, and Paint
The International Orange color of the Golden Gate Bridge is very much part of its landmark signature. The paint also plays a critical role in protecting the Bridge in the wet and salty environment of the California coastline. A painted and unpainted steel sample on this exhibit illustrate the effects of corrosion.

Art Deco on a Grand Scale
The Golden Gate Bridge is known for its architectural detailing, designed in the style of Art Deco. The design can be found in the shape of the towers, the deck lights, in the strut covers connecting the two tower legs, and in the chevron design used throughout the structure.

Types of Bridges
A visual description of the major kinds of bridges: suspension, arch, cable-stayed, truss and beam. It is interesting to note the longest-spanning bridges in the world, like the Golden Gate Bridge, are suspension bridges.



How the Bridge Spans the Golden Gate
An illustrated guide to the load path of the Bridge – how the weight of the road deck and its traffic is carried up to the main cables by suspender ropes, then transferred to the tops of the towers and down to the earth, with the ends of the main cables firmly anchored in concrete to resist the tension (pulling) forces. There is a flip door that graphically communicates these points in a cartoon illustration.

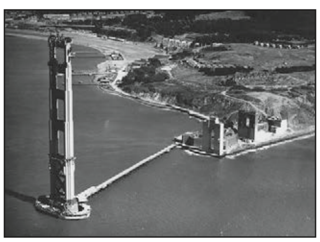
LOCATED ON THE LOWER LEVEL BY THE STAIRS

THE HISTORY OF THE DESIGN AND CONSTRUCTION OF THE BRIDGE

Bridging the Gate - The Beginning
The idea of building the Bridge had been discussed for many years, and it took many more years to overcome much adversity to establish the Bridge District to oversee the building of the Bridge and to issue bonds to cover the cost of construction; Chief Engineer Joseph Strauss is credited with leading the effort to win official approval and public support.

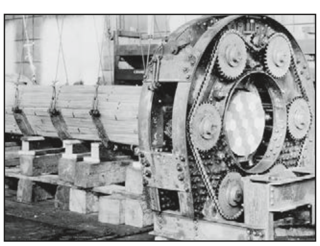
Engineering the Design
A great deal of planning, testing, and calculations went into the the final design of the Golden Gate Bridge. The design you see today is not what was originally planned.

Working Under Water
The South Tower was located offshore in water almost 100 ft (30 m) deep. Workers with diving helmets and air hoses descended to the ocean floor to prepare the surface for the concrete foundation. The cold, murky water and strong currents made the work very difficult. The divers could only work when the current diminished as the tide changed.



A Bathtub for the South Tower
Visitors cannot see the massive concrete foundation that extends from above water to the seafloor. A ring, or fender, was originally constructed to allow for the pouring of concrete for the tower base. The fender walls were left in place to protect the South Tower from impact by wayward ships.

World’s Tallest Bridge Towers
To build the world’s tallest towers special machinery was required, such as climbing derricks, and workers without a fear of heights. Catwalks, made out of wood planks and rope, were used to travel to the construction site, hundreds of feet above the water.



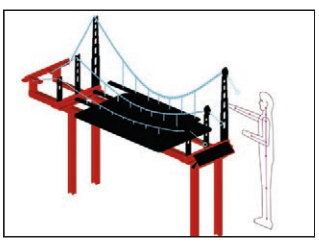
Spinning the Main Cables
The two main cables were fabricated and installed by the company established by John A. Roebling in the 1800s, using a “spinning” process he invented. Each main cable is made up of thousands of individual wires about as thick as a pencil. Although each cable is made up of 27,572 wires, the work was completed in only six months.

Hanging the Roadway Deck
After the towers had been completed, and the main cables were in place, 250 pairs of steel suspender ropes were installed. From these suspender ropes was hung the sections of the roadway deck that were incrementally installed in order to balance the weight on the main cables during construction.

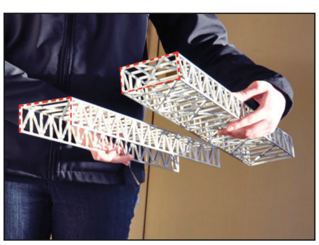
All in a Day's Work
In the depth of the Depression, construction jobs on the Bridge were highly sought after. Fog, wind, and freezing temperatures made the work difficult. Safety measures were enforced; however, even though a safety net was installed during construction, 11 men fell to their deaths when a piece of scaffolding came loose and tore through the net.

A Lasting Monument
Continual maintenance to guard against rust is required to sustain the Bridge. To keep up with the increase of engineering knowledge that has occurred since the Bridge was finished in 1937, retrofits have been implemented to protect it from earthquakes and high winds.

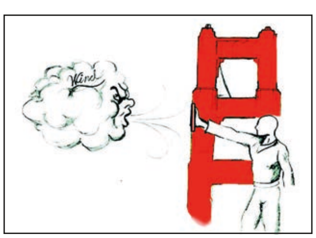
Battery Lancaster - Defending The Golden Gate
At one-time large cannon were installed behind walls of concrete and earth to protect the Golden Gate strait. The large metal "doorknockers" in the concrete-walled gun pit, called a battery, were used to maneuver the cannon in that area, using ropes or chains. Never fired in battle, the cannon was eventually removed, and the rings and battery remains.



Suspension Cable Tension vs. Tower Height
Engineers must calculate trade-offs and consider multiple design factors.
Taller towers would have reduced the tension stress in the main cables. But taller towers also mean more structural and construction problems and more cost. Models of different height towers allow the visitor to experience the difference in cable tension stress.



Resisting The Twisting - Bridge Deck Torsional Resistance Retrofit
Completed in 1937, the design of the Golden Gate Bridge did not benefit from knowledge about the collapse of the Tacoma Narrows Bridge in 1940, which twisted itself to collapse in a moderate breeze. The Golden Gate Bridge was retrofitted in 1954 to make the deck much harder to twist, which is felt by the visitor with this hands-on exhibit of small models of pre- and post-retrofit bridge decks.



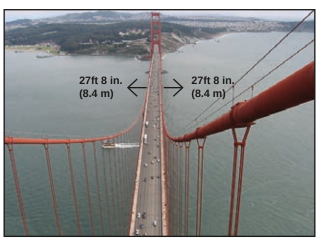
Wind Speed and Wind Pressure
The Golden Gate is a very breezy place, because it is the only gap in the coast range for hundreds of miles. Cool, dense, high pressure air over the cold ocean pushes its way into the Bay. Wind force varies as the square of the velocity, a fact the visitor can intuitively sense by pushing on this exhibit.

LOCATED ON THE UPPER LEVEL BY THE FLAGPOLE

How the Bridge Vibrates
The Bridge has many modes of vibration, or ways in which it can move in response to wind or earthquakes. This mechanical hands-on exhibit lets visitors “excite” (shake) the model in varying ways to see how it responds.

When It’s Foggy - Foghorns
When it’s foggy, visitors may not be able to see the Bridge, but they get to hear the foghorns. The speed of sound is experienced by the visitor by comparing arrival times of foghorn sounds through the air versus calling a phone installed near the foghorn on the Bridge to hear the sound almost instantly.

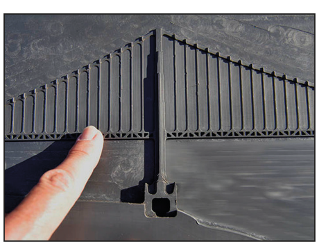
Fort Point Arch
To preserve a historic brick and masonry building called Fort Point, an arch was built into the supports under the south end of the Bridge. It’s interesting to note, inverting an arch makes it look like the sagging main cables, but each experience compression and tension in a different ways.



Bridge Deck Deflection
Suspension bridges are flexible structures. The Bridge was designed to accommodate swaying in strong winds. This exhibit shows the visitor how far the roadway deck is designed to move sideways.

LOCATED NEAR THE PAVILION

LIFETILES: Animatation of the Construction of the Bridge
Using the technology developed by Rufus Butler Seder, this glass tile mural animates as the visitor walks past it, displaying first the Golden Gate before the Bridge was built, then the stages of construction (foundations and towers, main cables, vertical suspender cables, deck).



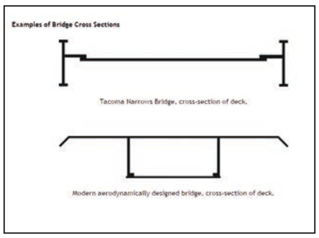
Braille / Tactile Model of the Bridge
A bronze tactile-readable tabletop model of the Bridge with Braille captions and an 18-inch high replica of a tower depicts the structure and shows why the towers were placed so far apart. Putting them closer together would have meant building foundations in deep water, and underwater construction was one of the most difficult tasks in the project.

Cross-section of a Main Cable - *an original Golden Gate Bridge exhibit*
This classic exhibit has been at the Bridge for decades, touched and photographed by millions of visitors. The cross-section shows how each cable is composed of thousands of individual steel wires.

LOCATED UNDER THE BRIDGE ON WEST SIDE

Seismic Retrofits & Historic Preservation: Lattice Strut Seismic Retrofit
The original bracing members (struts) in the arch structure and adjacent approach spans were made of hundreds of small pieces of steel riveted together. A seismic retrofit has replaced many of these lattice truss struts with modern one-piece steel tubes – but with triangles carefully laser-cut out so the replacement struts look like the originals. The exhibit explains how U. C. Berkeley tested a replica strut in the laboratory to measure its strength.

Seismic Retrofits & Historic Preservation: Isolator Seismic Retrofit
Approach spans to the suspension bridge have been retrofitted with seismic isolators. In an earthquake, the isolator deforms sideways in a "squishy" manner, resulting in the structure above the isolators experiencing a less violent level of shaking.



Bridge Deck Aerodynamics
Wind blowing across (transversely to) the deck of a suspension bridge can make it begin to twist – a very undesirable type of structural response. This exhibit has two scale-model bridge decks next to each other. One model is aerodynamically more stable in a breeze; the other model noticeably twists. Excessive twisting can result in self-destruction as shown in photos of the Tacoma Narrows Bridge.

Plate Tectonics
Earth's crust is divided into about a dozen large areas or plates, and at the boundaries of these plates, where they rub and push against each other, strain is built up that is released by earthquakes. Offshore of the Bridge to the west is the San Andreas Fault, the fault that slipped in 1906 and caused the San Francisco Earthquake. That fault is the dividing line between the North American plate where the Bridge is sited and the Pacific Plate.

Ships of the Golden Gate
The Golden Gate is one of the best places in the world to watch ships. This exhibit illustrates the basic kinds of vessels one sees going in or out of the Bay.

LOCATED ON SELECT GGBHTD FERRY BOATS

What Suspends a Suspension Bridge - ***section of original steel suspender rope***
Relates the strength of the Bridge's steel suspender ropes to the weight of a ferry, using a short section of actual suspender rope.

GOLDEN GATE BRIDGE
HIGHWAY & TRANSPORTATION DISTRICT

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