The western span of the San Francisco-Oakland Bay Bridge

Coordinates: 37°49'5"N 122°20'48"W

Carries: 10 lanes of I-80 throughout, and pedestrians and bicycles east of Yerba Buena Island (YBI)

Crosses: San Francisco Bay via YBI

Locale: San Francisco and Oakland

Owner: Caltrans

Maintained by: Caltrans and the Bay Area Toll Authority

ID number:
- 34 0003 (West)
- 34 0004 (YBI Tunnel)
- 33 0025 (East)[1]

### Characteristics

**Design**
- Double-decked suspension spans (two, connected by center anchorage), tunnel, cast-in-place concrete transition span, self-anchored suspension span, precast segmental concrete viaduct

**Material**
- Steel, concrete

**Total length**
- West: 10,304 ft (3,141 m)
- East span: 10,176 ft (3,102 m)
- Total: 4.46 miles (7.18 km) excluding approaches

**Width**
- West: 5 traffic lanes totaling 57.5 ft (17.5 m)
- East: 10 traffic lanes totaling 258.33 ft (78.74 m)

**Height**
- West: 526 ft (160 m)[2]
- West: two main spans 2,310 ft (704 m)
- East: one main span 1,400 ft (430 m)

**Longest span**
- East: one main span 2,310 ft (704 m)
- Westbound: 14 feet (4.3 m), with additional clearance in some lanes
- Eastbound: 14.67 feet (4.47 m)

**Clearance above**
- West: 220 feet (67 m)
- East: 191 feet (58 m)

**Clearance below**

**History**

Designer: Charles H. Purcell
San Francisco–Oakland Bay Bridge (known locally as the Bay Bridge) is a complex of bridges spanning San Francisco Bay in California. As part of Interstate 80 and the direct road between San Francisco and Oakland, it carries about 240,000 vehicles a day on its two decks. It has one of the longest spans in the United States.

The toll bridge was conceived as early as the gold rush days, but construction did not begin until 1933. Designed by Charles H. Purcell and built by American Bridge Company, it opened on November 12, 1936, six months before the Golden Gate Bridge. It originally carried automobile traffic on its upper deck, and trucks and trains on the lower, but after the Key System abandoned rail service, the lower deck was converted to all-road traffic as well. In 1986 the bridge was unofficially dedicated to James Rolph.

The bridge has two sections of roughly equal length; the older western section, officially known as the Willie L. Brown Jr. Bridge (after former San Francisco Mayor and California State Assembly Speaker Willie L. Brown Jr.), connects downtown San Francisco to Yerba Buena Island and the newer unnamed eastern section connects the island to Oakland. The Willie Brown bridge (west span) is a double suspension bridge with two decks, westbound traffic being carried on the upper deck while eastbound is carried on the lower one. The largest span of the original eastern section was a cantilever bridge. During the 1989 Loma Prieta earthquake, a section of the eastern span’s upper deck collapsed onto the lower deck and the bridge was closed for a month. Reconstruction of the eastern section of the bridge as a causeway connected to a self-anchored suspension bridge began in 2002; the new bridge opened September 2, 2013 at a reported cost of over $6.5 billion. Unlike the west span and the original east span, the new east span is a single deck with the eastbound and westbound lanes on each side making it the world's widest bridge, according to Guinness World Records, as of 2014. Demolition of the old east span is expected to last until 2018.

Composition
Bridges in the San Francisco Bay

The bridge consists of two crossings, east and west of Yerba Buena Island, a natural mid-bay outcropping inside San Francisco city limits. The Western crossing (the Willie L. Brown Jr. Bridge) between Yerba Buena and downtown San Francisco has two complete suspension spans connected at a center anchorage[12] Rincon Hill is the western anchorage and touch-down for the San Francisco landing of the Brown bridge connected by three shorter truss spans. The eastern crossing, between Yerba Buena Island and Oakland, was a cantilever bridge with a double-tower span, five medium truss spans, and a 14-section truss causeway. Due to earthquake concerns, the eastern crossing was replaced by a new crossing that opened on Labor Day 2013.[13] On Yerba Buena Island, the double-decked crossing is a 321-foot (98 m) concrete viaduct east of the west span's cable anchorage, a 540-foot (160 m) tunnel through the island's rocky central hill, another 790.8-foot (241.0 m) concrete viaduct, and a longer curved high-level steel truss viaduct that spans the final 1,169.7 feet (356.5 m) to the cantilever bridge.[14]

The toll plaza on the Oakland side (since 1969 for westbound traffic only) has eighteen toll lanes, of which six are FasTrak-only. Metering signals are about 1,000 feet (300 m) west of the toll plaza. Two full-time bus-only lanes bypass the toll booths and metering lights around the right (north) side of the toll plaza; other high occupancy vehicles can use these lanes during weekday morning and afternoon commute periods. The two far-left toll lanes are high-occupancy vehicle lanes during weekday commute periods. During the morning commute hours, traffic congestion on the Oakland approach stretches back to the three feeder highways, Interstate 580, Interstate 880, and Interstate 80 toward Richmond, California.[15] Since the number of lanes on the San Francisco approach is structurally restricted, backups are frequent in the eastbound direction during evening commute hours. The Willie Brown bridge portion of the bay bridge is currently restricted to motorized freeway traffic. Pedestrians, bicycles, and other non-freeway vehicles and devices are not allowed to cross this section. A project to add bicycle/pedestrian lanes to the eastern Brown span has been proposed but is not finalized. A California Department of Transportation (Caltrans) bicycle shuttle operates during peak commute hours for $1.00 each way.[16]

Freeway ramps next to the tunnel provide access to Yerba Buena Island and Treasure Island. Because the toll plaza is on the Oakland side, the western span is a de facto non-tolled bridge; traffic between the island and the main part of San Francisco can freely cross back and forth. Those who only travel from Oakland to Yerba Buena Island, and not the entire length to the main part of San Francisco, must pay the full toll.

History

Pre-construction

San Francisco, at the mouth of the bay, was perfectly placed to prosper during the California Gold Rush. Almost all goods not produced locally arrived by ship. But after the first transcontinental railroad was completed in May 1869 San Francisco was on the wrong side of the Bay, separated from the new rail link. The fear of many San Franciscans was that the city would lose its position as the regional center of trade. The concept of a bridge spanning the San Francisco Bay had been considered since the Gold Rush days. Several newspaper articles during the early 1870s discussed the idea. In early 1872, a “Bay Bridge Committee” was hard at work on plans to construct a railroad bridge. The April 1872 issue of the San Francisco Real Estate Circular contained an item about the committee:

The Bay Bridge Committee lately submitted its report to the Board of Supervisors, in which compromise with the Central Pacific was recommended; also the bridging of the bay at Ravenswood and the granting of railroad facilities at Mission Bay and on the water front. Wm. C. Ralston, ex-Mayor Selby and James Otis were on this committee. A daily newspaper attempts to account for the advice of these gentlemen to the city by hinting that they were afraid of the railroad company, and therefore made their recommendations to suit its interests.[17]

The self-proclaimed Emperor Norton I saw fit to decree several times that a suspension bridge be constructed to connect Oakland with San Francisco. Later in 1872, frustrated that nothing had happened, Norton decreed:

WHEREAS, we issued our decree ordering the citizens of San Francisco and Oakland to appropriate funds for the
survey of a suspension bridge from Oakland Point via Goat Island; also for a tunnel; and to ascertain which is the best project; and whereas the said citizens have hitherto neglected to notice our said decree; and whereas we are determined our authority shall be fully respected; now, therefore, we do hereby command the arrest by the army of both the Boards of City Fathers if they persist in neglecting our decrees.

Given under our royal hand and seal at San Francisco, this 17th day of September, 1872.

Sketch of the proposed "Rush San Francisco Trans-Bay Suspension Bridge" (1913)

Unlike most of Emperor Norton's eccentric ideas, his decree to build a bridge had wide public and political appeal. Yet, the task was too much of an engineering and economic challenge since the bay was too wide and too deep there. In 1921, over forty years after Norton's death, a tunnel was considered, but it became clear that one would be inadequate for vehicular traffic. Support for a trans-bay crossing finally grew in the 1920s with the increasing popularity and availability of the automobile. In 1929, the California Legislature established the California Toll Bridge Authority with the responsibility of connecting San Francisco and Alameda County with a bridge.

To make the bridge feasible, its route was chosen to pass through Yerba Buena Island (formerly known as Goat Island in the 1870s), reducing the material and labor needed. Yerba Buena Island was a U.S. Navy base at the time (and until 1997). So the approval of the U.S. Congress, which regulates the armed services and supervises all naval and military bases, was necessary for this island to be used. After a great deal of lobbying, California received Congressional approval to use the island on February 20, 1931.

Construction

The Bay Bridge under construction at Yerba Buena Island in 1935

The chief engineer was Ralph Modjeski, a Polish-American. Construction began on July 9, 1933. Ultimately, twenty-four men would die constructing the bridge. The western span of the bridge between San Francisco and Yerba Buena Island presented an enormous engineering challenge. The bay was up to 100 feet (30 m) deep in places and the soil required new foundation-laying techniques. A single main suspension span some 4,100 feet (1.2 km) in length was considered but rejected, as it would have required too much fill and reduced wharfage space at San Francisco, had less vertical clearance for shipping, and cost more than the design ultimately adopted. The solution was to construct a massive concrete anchorage halfway between San Francisco and the island, and to build a main suspension span on each side of this central anchorage.

East of Yerba Buena Island, the bay to Oakland was spanned by a 10,176-foot (3.102 km) combination of double cantilever, five long-span through-trusses, and a truss causeway, forming the longest bridge of its kind at the time. The cantilever section was longest in the nation and third-longest anywhere.

Much of the original eastern span is founded upon treated wood. Because of the very deep mud on the bay bottom it was not practical to reach bedrock, although the lower levels of the mud are quite firm. Long wooden pilings were crafted from entire old-growth Douglas fir trees, which were driven through the soft mud to the firmer bottom layers.

Yerba Buena Tunnel
Traveling through the westbound Yerba Buena tunnel

Connecting the two halves of the bridge is the Yerba Buena Tunnel, 76 feet (23 m) wide, 58 feet (18 m) high, and 540 feet (160 m) long. It is the largest diameter transportation bore tunnel in the world.

Reminders of the long-gone bridge railway survive along the south side of the lower Yerba Buena Tunnel. These are the regularly spaced “deadman holes” along the wall, into which track workers could duck if a train came along. (The north side, which always carried only motor traffic, lacks these holes.)

Opening day

The bridge opened on November 12, 1936 at 12:30 p.m. In attendance were the former U.S. president Herbert Hoover, Senator William G. McAdoo, and the Governor of California, Frank Merriam. Governor Merriam opened the bridge by cutting gold chains across it with an acetylene cutting torch. The San Francisco Chronicle report of November 13, 1936 read:

The illuminated bridge as seen from the Embarcadero (San Francisco).

Schematic drawing of the Bay Bridge

the greatest traffic jam in the history of S.F., a dozen old-fashioned New Year’s eves thrown into one—the biggest and most good-natured crowd of tens of thousands ever to try and walk the streets and guide their autos on them—This was the city last night, the night of the bridge opening with every auto owner in the bay region, seemingly, trying to crowd his machine onto the great bridge.

And those who tried to view the brilliantly lighted structure from the hilltops and also view the fireworks display were numbered also in the thousands.

Every intersection in the city, particularly those near the San Francisco entrance to the bridge, was jammed with a slowly moving auto caravan.

Every available policeman in the department was called to duty to aid in regulating the city’s greatest parade of autos.

One of the greatest traffic congestions of the evening was at Fifth and Mission Streets, with downtown traffic and bridge-bound traffic snarled in an almost hopeless mass. To add to the confusion, traffic signals jammed and did not synchronize.

Police reported that there was no lessening of the traffic over the bridge, all lanes being crowded with Oakland- or San-Francisco-bound machines far into the night.

The total cost was $77 million. Before opening the bridge was blessed by Cardinal Secretary of State Eugene Cardinal Pacelli, later Pope Pius XII. Because it was in effect two bridges strung together, the western spans were ranked the second and third largest suspension bridges. Only the George Washington Bridge had a longer span between towers.

As part of the celebration a United States commemorative coin was produced by the San Francisco Mint. A half dollar, the
The obverse portrays California's symbol, the grizzly bear, while the reverse presents a picture of the bridge spanning the bay. A total of 71,424 coins were sold, some from the bridge's tollbooths.[31]

**Roadway plan**

A double balanced cantilever bridge, five truss bridges, and two truss causeways that connected Yerba Buena Island to Oakland (demolished).

The original western approach to (and exit from) the upper deck of the bridge was a long ramp to Fifth, branching to Harrison St for westward traffic off the bridge and Bryant St for eastward traffic entering. There was an on-ramp to the upper deck on Rincon Hill from Fremont Street (that later became an off-ramp) and an off-ramp to First Street (later extended over First St to Fremont St). The lower deck ended at Essex and Harrison St; just southwest of there, the tracks of the bridge railway left the lower deck and curved northward into the elevated loop through the Transbay Terminal that was paved for buses after rail service ended.

Until the 1960s the upper deck (58 feet (18 m) wide between curbs) carried three lanes of traffic in each direction and was restricted to automobiles only.[20] Eastward view after freeways The lower deck carried three lanes of truck and auto traffic on the north side of the bridge.[20] In the 1950s traffic lights were added to set the direction of travel in the middle lane, but still with no divider. Two railroad tracks on the south half of the lower deck carried the electric commuter trains.[32] In 1958 the tracks were replaced with pavement, but the reconfiguration to what the traffic is today didn't take place until 1963.

The Federal highway on the bridge was originally a concurrency of U.S. Highway 40 and U.S. Highway 50. The bridge was re-designated as Interstate 80 in 1964, and the western ends of U.S. 40 and U.S. 50 are now in Silver Summit, Utah and West Sacramento, California, respectively.

The off-ramps for Treasure Island and Yerba Buena Island are unusual in that they are on the left-hand side both in the eastbound and westbound directions. The eastbound off ramp presents an unusual hazard - drivers must slow within the normal traffic flow and move into a very short off-ramp that ends in a short radius turn left turn (a 15 MPH advisory is posted). The turn has been further narrowed from its original design by the installation of crash pads on the island side. Eastbound and westbound on-ramps are on the usual right-hand side, but they do not have dedicated merge lanes; drivers must await a gap in the traffic and then accelerate from a stop sign to traffic speeds in a short distance.

**Rail service**

In 1939 the San Francisco Transbay Terminal opened and electric commuter trains started running across the south side of the lower deck of the bridge. The terminal originally was supposed to open the same time as the Bay Bridge, but delays caused it to be postponed. The trains were handled by the Sacramento Northern Railroad, the East Bay Electric Lines and the Key System. Freight trains never used the bridge. The tracks left the lower deck in San Francisco just southwest of the end of 1st St. The tracks went over several streets on a ramp into the terminal. Trains could turn around on the loop back onto the bridge when finished unloading. The tracks left the lower deck in Oakland just after the bridge ended. The East Bay Electric Line tracks ran along Engineer Rd and over the Southern Pacific yard on trestles (some of it is still standing and visible from toll road ramps) onto the Oakland streets. The Sacramento Northern and Key System tracks went under the SP tracks through a tunnel (which is also still standing) and onto 40th St. Due to falling ridership, Sacramento Northern and East Bay Electric Lines service ended in 1941. After WWII, Key System ridership began to fall as well. Despite the vital role the railroad played, the last train went over the bridge in 1958. The tracks were removed and replaced with pavement on the Transbay Terminal ramps and Bay Bridge. The Key System handled buses over the bridge until 1960 when its successor, AC Transit, took over operations. It still handles service today. There have been several attempts to restore rail service on the bridge, but none have been successful.

**Later events**

Modification to remove rail service
Automobile traffic increased dramatically in the ensuing decades while the Key System declined, and in October 1963, the Bay Bridge was reconfigured with five lanes of westbound traffic on the upper deck and five lanes of eastbound traffic on the lower deck. The Key System originally planned to end train operations in 1948 when it replaced its streetcars with buses, but Caltrans did not approve of this. Trucks were allowed on both decks and the railroad was removed.[29] Owing to a lack of clearance for trucks through the upper-deck portion of the Yerba Buena tunnel, it was necessary to lower the elevation of the upper deck where it passes through the tunnel, and to correspondingly excavate to lower the elevation of the lower portion.[33] Additionally, the upper deck was retrofitted to handle the increased loads due to trucks, with understringers added and prestressing added to the bottom of the floor beams. This retrofit is still in place and is visible to Eastbound traffic.

1968 aircraft accident

On February 11, 1968, a U.S. Navy training aircraft crashed into the cantilever span of the bridge, killing both reserve officers aboard. The T2V SeaStar, based at NAS Los Alamitos in southern California, was on a routine weekend mission and had just taken off in the fog from nearby NAS Alameda. The plane struck the bridge about 15 feet (5 m) above the upper deck roadway and then sank in the bay north of the bridge.[34] There were no injuries among the motorists on the bridge.[35] One of the truss sections of the bridges was replaced due to damage from the impact.[36]

Cable lighting

The series of lights adorning the suspension cables was added in 1986 as part of the bridge’s 50th-anniversary celebration.[37]

Ship accident

In 2007 a container ship named the Cosco Busan (now the Hanjin Venezia) hit the bridge resulting in the Cosco Busan oil spill.

2013 public light show installation

On March 5, 2013, a public art installation called “The Bay Lights” was activated on the western span’s vertical cables. The installation was designed by artist Leo Villareal and consists of 25,000 LED lights originally scheduled to be on nightly display until March 2015.[38] However, on December 17, 2014 the non-profit Illuminate The Arts announced that it had raised the $4 million needed to make the lights permanent; the display was temporarily turned off starting in March 2015 in order to perform maintenance and install sturdier bulbs and then re-lit on January 30, 2016.[39][40]

In order to reduce driver distractions, the privately funded display is not visible to users of the bridge, only to distant observers. This lighting effort is intended to form part of a larger project to “light the bay”[41] Villareal used various algorithms to generate patterns such as rainfall, reflections on water, bird flight, expanding rings, and others. Villareal’s patterns and transitions will be sequenced and their duration determined by computerized random number generator to make each viewing experience unique.[42] Owing to the efficiency of the LED system the estimated operating cost is only US$15.00 per night.

Earthquake damage and subsequent upgrades
a view of Bay Bridge lights from a pier next to the Ferry Building in San Francisco

A view of Bay Bridge lights from a pier next to the Ferry Building in San Francisco

A collapsed section of roadway deck after the 1989 earthquake

A collapsed section of roadway deck after the 1989 earthquake

During the evening of October 17, 1989, the Loma Prieta earthquake, which measured 6.9 on the moment magnitude scale,[43] a 50-foot (15 m) section of the upper deck of the eastern truss portion of the bridge at Pier E9 collapsed onto the deck below, indirectly causing one death. The bridge was closed for just over a month as construction crews repaired the section. It reopened on November 18 of that year. The lighter pavement of the replacement section is visible in aerial photographs, at the east end of the through-truss part of the bridge (37°49′08″N 122°20′39″W / 37.8189°N 122.3442°W).

**Western span retrofitting**

The western suspension span has undergone extensive seismic retrofitting. During the retrofit, much of the structural steel supporting the bridge deck was replaced while the bridge remained open to traffic. Engineers accomplished this by using methods similar to those employed on the Chicago Skyway reconstruction project.[44]

The entire bridge was fabricated using hot steel rivets, which are impossible to heat treat and so remain relatively soft. Analysis showed that these could fail by shearing under extreme stress. Therefore, at most locations each given rivet was removed by breaking off the head with a jack-hammer [rivet buster] and punching out the old rivet, the hole precision reamed and the old rivets replaced with heat-treated high-strength tension-control [TC] bolts and nuts. Most bolts had domed heads placed facing traffic so they looked similar to the rivets that were removed.[Caltrans contract 04-0435U4, 1999-2004]. This work had to be performed with great care as the steel of the structure had for many years been painted with lead based paint, which had to be carefully removed and contained by workers with extensive protective gear.

Obsolete hot riveted laced ties (left, eastern span) and bolted box beam retrofit (right, western span)

Most of the beams were originally constructed of two plate beams joined with lattices of flat strip or angle stock, depending upon structural requirements. These have all been reconstructed by replacing the riveted lattice elements with bolted steel plate and so converting the lattice beams into box beams. This replacement included adding face plates to the large diagonal beams joining the faces of the main towers, which now have an improved appearance when viewed from certain angles.

Diagonal box beams have been added to each bay of the upper and lower decks of the western spans. These add stiffness to reduce side-to-side motion during an earthquake and reduce the probability of damage to the decking surfaces.

Analysis showed that some massive concrete supports could burst and crumble under likely stresses. In particular the western supports were extensively modified. First, the location of existing reinforcing bar is determined using magnetic techniques. In areas between bars holes are drilled. Into these holes is inserted and glued an L-shaped bar that protrudes 15
to 25 centimeters (6 to 10 inches). This bar is retained in the hole with a high-strength epoxy adhesive. The entire surface of the structure is thus covered with closely spaced protrusions. A network of horizontal and vertical reinforcing bars is then attached to these protrusions. Mold surface plates are then positioned to retain high-strength concrete, which is then pumped into the void. After removal of the formwork the surface appears similar to the original concrete. This technique has been applied elsewhere throughout California to improve freeway overpass abutments and some overpass central supports that have unconventional shapes. (Other techniques such as jacket and grout are applied to simple vertical posts; see the seismic retrofit article.)

The western approaches have also been retrofitted in part, but mostly these have been replaced with new construction of reinforced concrete.

**Eastern span replacement**

Main article: Eastern span replacement of the San Francisco–Oakland Bay Bridge

For various reasons, the eastern span would have been too expensive to retrofit compared to replacing it, so the decision was made to replace it.

The replacement span underwent a series of design changes, both progressive and regressive, with increasing cost estimates and contractor bids. The final plan included a single-towered self-anchored suspension span starting at Yerba Buena island, leading to a long viaduct to the Oakland touchdown.

Separated and protected bicycle lanes are a visually prominent feature on the south side of the new east span. The bikeway will carry recreational and commuter cyclists between Oakland and Yerba Buena Island. Until that time cyclists and pedestrians must turn around and return to Oakland. The original eastern cantilever span had firefighting dry standpipes installed. No firefighting dry or wet standpipes were designed for the eastern span replacement, although, the firefighting wet standpipes do exist on the original western suspension span visible on both the north-side upper and lower decks.

The original east span closed permanently to traffic on August 28, 2013, and the replacement span opened for traffic five days later. [45]

- Eastern span: original and replacement


- Substantial progress (2011)

- The completed replacement and the old bridge (2013)

- Rest of old and new bridge (June 2015)

- Artist's simulation of final appearance after old span demolition
October 2009 eyebar crack, repair failure and bridge closure

During the 2009 Labor Day weekend closure for a portion of the replacement, a major crack was found in an eyebar, significant enough to warrant bridge closure.[46] Working in parallel with the retrofit, California Department of Transportation (Caltrans), and its contractors and subcontractors, were able to design, engineer, fabricate, and install the pieces required to repair the bridge, delaying its planned opening by only 1 1/2 hours. The repair was not inspected by the Federal Highway Administration, who relied on state inspection reports to ensure safety guidelines were met.[47]

On October 27, 2009, during the evening commute, the steel crossbeam and two steel tie rods repaired over Labor Day weekend[48] snapped off the Bay Bridge's eastern span and fell to the upper deck.[49][50][51] The cause may have been due to metal-on-metal vibration from bridge traffic and wind gusts of up to 55 miles per hour (90 km/h) causing failure of one rod, which broke off, which then led to the metal section crashing down.[52] Three vehicles were either struck by or hit the fallen debris, though there were no injuries.[53][54][55][56] On November 1, Caltrans announced that the bridge would probably stay closed at least through the morning commute of Monday, November 2, after repairs performed during the weekend failed a stress test on Sunday.[57] BART and the Golden Gate Ferry systems added supplemental service to accommodate the increased passenger load during the bridge closure.[58] The bridge reopened to traffic on November 2, 2009.

The pieces that broke off on October 27 were a saddle, crossbars, and two tension rods.[59][53][59]

Name

The bridge was unofficially "dedicated" to James B. "Sunny Jim" Rolph, Jr.[60] but this was not widely recognized until the bridge's 50th-anniversary celebrations in 1986. The official name of the bridge for all functional purposes has always been the "San Francisco–Oakland Bay Bridge", and, by most local people, it is referred to simply as "the Bay Bridge".

Rolph, a Mayor of San Francisco from 1912 to 1931, was the Governor of California at the time construction of the bridge began. He died in office on June 2, 1934, two years before the bridge opened, leaving the bridge to be named for him out of respect.[60] However, due to the opposition of Joseph R. Knowland, publisher of the Oakland Tribune at the time, recognition of Rolph was withheld. In 1932, with an inability to finance the bridge, Joseph R. Knowland, (a former U.S. Congressman) travelled to Washington and helped to persuade President Herbert Hoover and the Reconstruction Finance Corporation to advance $62 million for the building of the bridge.

A plaque honoring Rolph's contribution originally was placed at the west end of the bridge in San Francisco, then was moved to the corner of Fifth and Bryant Streets in 1986 and removed entirely by Caltrans in 2006.

Emperor Norton naming campaigns

In 1872, the San Francisco entrepreneur and eccentric Emperor Norton (c.1818-1880) issued three proclamations calling for the design and construction of a suspension bridge between San Francisco and Oakland via Yerba Buena Island (formerly Goat Island).[61]

A 1939 plaque honoring Emperor Norton for the original idea for the Bay Bridge was dedicated by the fraternal society E. Clampus Vitus and was installed at The Cliff House in February 1955. In November 1986, in connection with the bridge's 50th anniversary, the plaque was moved to the Transbay Terminal, the public transit and Greyhound bus depot at the west end of the bridge in downtown San Francisco. When the terminal was closed in 2010, the plaque was placed in storage.[62]

There have been two recent campaigns to name all, or parts, of the Bay Bridge for Emperor Norton.[63]

2004

In November 2004, after a campaign by San Francisco Chronicle cartoonist Phil Frank, then-San Francisco District 3 Supervisor Aaron Peskin introduced a resolution to the San Francisco Board of Supervisors calling for the entire two-bridge system, from San Francisco to Oakland, to be named for Emperor Norton.[64]

On December 14, 2004, the Board approved a modified version of this resolution, calling for only "new additions" — i.e., the new eastern crossing — to be named "The Emperor Norton Bridge".[65] Neither the City of Oakland nor Alameda County passed any similar resolution, so the effort went no further.

2013

In June 2013, nine members of the California State Assembly, joined by two members of the California State Senate, introduced Assembly Concurrent Resolution No. 65 (ACR 65) to name the western crossing of the bridge for former California Assembly Speaker and former San Francisco Mayor Willie Brown.[66]

A petition launched in July 2013 and drafted by John Ginn called for the western span of the bridge to be named instead for
A second, ongoing petition, drafted by John Lumea, was launched in August 2013, and — echoing Aaron Peskin’s original 2004 resolution — calls for the entire two-bridge system to be named for Emperor Norton. This petition has received coverage from the *San Francisco Bay Guardian* [88], SFist [89], *Laughing Squid* [70], and *The Raw Story* [71] as well as from Mozilla and Netscape co-founder Jamie Zawinski [72]. It has 5,300-plus signatures as of 2016.

In September 2013, Lumea founded *The Emperor’s Bridge Campaign* to carry forward the call of his petition. Today, the Campaign is a nonprofit that works on a variety of fronts — including research, education and advocacy — to honor the life and advance the legacy of Emperor Norton. The Campaign continues its efforts to name the Bay Bridge for Emperor Norton.

2014

The state legislative resolution naming the western span of the Bay Bridge the *Willie L. Brown, Jr., Bridge* passed the Assembly in August 2013 and the Senate in September 2013 [23]. A ceremony was held on February 11, 2014, marking the resolution and the installation of signs on either end of the span [24].

The larger entity of which the western span is a part retains the separate and independent designation “San Francisco-Oakland Bay Bridge” [60].

**Alexander Zuckermann Bike Path**

The pedestrian and bicycle route on the eastern span opened on September 3, 2013, and is formally named after Alexander Zuckermann, founding chair of the East Bay Bike Coalition [25]. This forms a transbay route for the *San Francisco Bay Trail*. As of July 2016, the path does not connect to Yerba Buena and Treasure Island sidewalks, due to the need to demolish more of the old eastern span before final construction, but opening of this connection is expected in the summer of 2016 [76].

**Financing and tolls**

When the Bay Bridge opened in 1936, the toll was 65 cents, collected in each direction [37]. Within months, the toll was lowered to 50 cents in order to compete with the ferry system, and finally to 25 cents since this was shown sufficient to pay off the original revenue bonds on schedule. As with other bridges of the era, passage was supposed to become free after completion of the repayment of the original bonds.

In the interest of reducing the cost of collecting tolls and of building additional toll booths, all bridges in the Bay Area were converted to collect tolls in only one direction, with the toll amount collected doubled. Tolls on the Bay Bridge are now only collected from westbound traffic. Because the toll plaza is on the Oakland side, the western span became a *de facto* non-tolled bridge, as traffic between Yerba Buena Island and the main part of San Francisco can now freely cross back and forth.

Tolls were subsequently raised to finance improvements to the bridge approaches, required to connect with new freeways, and to subsidize public transit in order to reduce the traffic over the bridge.

*Caltrans*, the state highway transportation agency, maintains seven of the eight San Francisco Bay Area bridges. (The Golden Gate Bridge is owned and maintained by the *Golden Gate Bridge, Highway and Transportation District*.)

The basic toll (for automobiles) on the seven state bridges was raised to $1 by Regional Measure 1, approved by Bay Area voters in 1988 [77]. A $1 seismic retrofit surcharge was added in 1998 by the state legislature, originally for eight years, but since then extended to December 2037 (AB1171, October 2001) [78]. On March 2, 2004, voters approved Regional Measure 2, raising the toll by another dollar to a total of $3. An additional dollar was added to the toll starting January 1, 2007, to cover cost overruns concerning the replacement of the eastern span.

The *Metropolitan Transportation Commission*, a regional transportation agency, in its capacity as the Bay Area Toll Authority, administers RM1 and RM2 funds, a significant portion of which are allocated to public transit capital improvements and operating subsidies in the transportation corridors served by the bridges. Caltrans administers the “second dollar” seismic surcharge, and receives some of the MTC-administered funds to perform other maintenance work on the bridges. The Bay Area Toll Authority is made up of appointed officials put in place by various city and county governments, and is not subject to direct voter oversight [79].

Due to further funding shortages for seismic retrofit projects, the Bay Area Toll Authority again raised tolls on all Bay Area bridges in its control (this excludes the *Golden Gate Bridge*) in July 2010 [80]. The toll rate for autos on other Bay Area bridges was increased to US$5, but in the Bay Bridge *variable pricing tolling* scheme based on congestion was implemented. The Bay Bridge *congestion pricing* scheme charges a US$6 toll from 5 a.m. to 10 a.m. and 3 p.m. to 7 p.m., Monday through Friday. During weekends cars pay US$5. *Carpools* before the implementation were exempted but now they pay US$2.50, and the carpool toll discount is now also available only to drivers with *FastTrak* electronic toll devices. The toll remained at the previous toll of US$4 at all other times on weekdays [81][82]. The Bay Area Toll Authority reported that by October 2010 fewer users are driving during the peak hours and more vehicles are crossing the Bay Bridge before and after the 5-10 a.m. period...
See also

- Bridges portal
- California portal
- San Francisco Bay Area portal
- 49-Mile Scenic Drive
- Bay Bridge Troll
- Cosco Busan oil spill
- Treasure Island Development

Notes

2. "San Francisco-Oakland Bay Bridge Archived" November 1, 2010, at WebCite
Brown, Jr. Bridge

↑ November 1, 2010.

↑ October 29, 2009.

↑ Chronicle


↑ Francisco Examiner

↑ Elsevier. p. 2010

↑ it had raised the needed $4 million to reinstall the “Bay Lights” as a permanent fixture on the western end of the bridge.

↑ Times

↑ ISBN

↑ Retrieved from the original on November 1, 2010.

↑ California Legislature, 2013-14 Regular Session,

↑ The Emperor’s Bridge Campaign,

↑ The Emperor’s Bridge Campaign,

↑ "Bay Bridge will remain closed for ‘a few days

↑ Jason Dearin; Sudhin Thanawala (October 28, 2009).

↑ "Bay Bridge light display dazzles San Francisco

↑ "World’s Largest Bridge rest on sunken skyscrapers" Popular Science, February 1935

↑ Petroski, p. 340

↑ Reisner, p. 113

↑ San Francisco-Oakland Bay Bridge Lower Deck Eastbound Drive


↑ Bay Bridge Half Dollar


↑ "Long-Overshadowed Bay Bridge Will Go From Drab Gray to Glowing": The New York Times.

↑ Egelko, Bob (December 17, 2014). "Bay Bridge light show will go on” San Francisco Chronicle. Archived from the original on December 31, 2014. Retrieved May 7, 2015. "...the nonprofit Illuminate the Arts announced Wednesday that it had raised the needed $4 million to reinstall the "Bay Lights" as a permanent fixture on the western end of the bridge."


↑ The Bay Lights (thebaylights.org)


↑ Cabanatuan, Michael (September 13, 2013). "Bay Bridge eastern span opens”: San Francisco Chronicle.


↑ Michael Cabanatuan; Jaxon Van Derbeken; Jill Tucker; Carolyn Jones (October 29, 2009). "Bridge parts couldn’t take the wind”: San Francisco Chronicle. Archived from the original on November 1, 2010.


↑ photograph of bridge damage by commuter directly behind itArchived October 31, 2009, at the Wayback Machine.

↑ Bay Bridge closed indefinitely. KGO-TV-7 ABC7News. October 28, 2009, 9:33pm.


↑ Jason Dearin; Sudhin Thanawala (October 28, 2009). "No estimate when Bay Bridge will open“ San Francisco Chronicle. Archived from the original on October 30, 2009.

↑ Michael Cabanatuan; Justin Berton (October 28, 2009). "Bay Bridge closed after repair falls apart” San Francisco Chronicle. Archived from the original on November 1, 2010.

↑ "Bay Bridge will remain closed for ‘a few days” Los Angeles Times. October 28, 2009. Archived from the original on October 29, 2009.


↑ KSBW Action News Sunrise (5-7am). October 28, 2009

↑ "Named Freeways, Highways,Structures and Other Apparitions in California”, California Department of Transportation, 2013, p. 43.

↑ The Emperor's Bridge Campaign, "Emperor Norton's Bridge Proclamations”.


References


External links

- Wikimedia Commons has media related to San Francisco–Oakland Bay Bridge.

Official sites:

- baybridgeinfo.org Site by Caltrans about all current construction on the bridge.
- California Department of Transportation (Caltrans) official Bay Bridge site

Books:

- "San Francisco To Have World's Greatest Bridge”. March 1931. Popular Science
- "The Titan Of Bridges”, January 1933. Popular Mechanics
- "Giant Switchboard Controls Lights on Longest Bridge" Popular Mechanics. January 1937

Media:

- Building the San Francisco–Oakland Bay Bridge (1937 documentary) United States Steel movie documentary on the building of the Bay Bridge (YouTube video 17 minutes).
- Film of the building of the San Francisco–Oakland Bay Bridge.
EarthCam San Francisco-Oakland Bay Bridge Construction time-lapse
Lower Deck Rail and Roadway Off Ramps, 1939, Dorothea Lange photo
San Francisco-Oakland Bay Bridge Construction Collection MSS 722, Special Collections & Archives, UC San Diego Library.

Other:

- "Symphonies in Steel: Bay Bridge and the Golden Gate" at The Virtual Museum of the City of San Francisco
- "New Bay Bridge", Archived from the original on August 19, 2007.
- San Francisco–Oakland Bay Bridge (New East Span) at Structurae
- San Francisco–Oakland Bay Bridge (West Span) at Structurae
- San Francisco–Oakland Bay Bridge (Old East Span) at Structurae
- HAER CA-32 (scanned) Historic American Engineering Record (SFOBB), history to 1999, 322 pages.
- Live Toll Prices for San Francisco–Oakland Bay Bridge

Crossings of the San Francisco Bay

<table>
<thead>
<tr>
<th>South</th>
<th>San Francisco–Oakland Bay Bridge</th>
<th>North</th>
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</thead>
<tbody>
<tr>
<td>San Mateo–Hayward Bridge</td>
<td></td>
<td>Transbay Tube</td>
</tr>
</tbody>
</table>

The Transbay Tube crosses the San Francisco–Oakland Bay Bridge, so it is both north and south of the San Francisco–Oakland Bay Bridge.

San Francisco attractions

- 49-Mile Drive
- Alcatraz
- Bay Bridge
- Cable Cars
- The Castro
- Chinatown
- City Hall
- Cliff House
- Coit Tower
- F-Market Streetcar
- Fairmont Hotel
- Federal Reserve Bank
- Ferry Building
- Fisherman's Wharf
- Fort Mason
- Fort Point
- Ghirardelli Square
- Golden Gate Bridge
- Grace Cathedral
- Haight-Ashbury
- Jack Kerouac Alley
- Lombard Street
- Mark Hopkins Hotel
- Market Street
- Mission Dolores
- Nob Hill
- North Beach
- Old U.S. Mint
- Painted ladies
- Palace of Fine Arts
- Pier 39
- Public Library
- Sutro Baths
- Transamerica Pyramid
- Treasure Island
- Treasure Island
- Union Square

Landmarks
- Asian Art Museum
- Aquarium of the Bay
- Cable Car Museum
- California Academy of Sciences
- Palace of the Legion of Honor
- Cartoon Art Museum
- Chinese Historical Society Museum
- Conservatory of Flowers
- Contemporary Jewish Museum
- The Walt Disney Family Museum
- de Young Museum
- Exploratorium
- Haas-Lilienthal House
- Musée Mécanique
- Museo ItaloAmericano
- Museum of Performance & Design
- Museum of the African Diaspora
- Precita Eyes
- Randall Museum
- Ripley's Believe It or Not!
- San Francisco Museum of Modern Art
- San Francisco Maritime
- Railway Museum
- USS Pampanito
- Wattis Institute for Contemporary Arts
- Zeum

- Alamo Square
- Candlestick Point
- Corona Heights
- Crissy Field
- Dolores Park
- Glen Canyon
- Golden Gate National Recreation Area
- Golden Gate Park
- Lafayette Park
- Lake Merced
- Marina Green
- McLaren Park
- Mount Davidson
- Ocean Beach
- The Presidio
- San Francisco Bay Trail
- San Francisco Zoo
- Stern Grove
- Twin Peaks
- Yerba Buena Gardens
Views
- Coit Tower
- Twin Peaks
- Seal Rocks/Ocean Beach
- Baker Beach
- Golden Gate Bridge
- Fort Funston
- Hamon Observation Tower at the de Young Museum
- Strawberry Hill
- Crissy Field
- Pacific Heights
- Alamo Square/Painted Ladies
- Top of the Mark
- Alcatraz
- Treasure Island
- Lombard Street
- Powell-Hyde Cable Car
- Ferry Building
- Bernal Hill
- 49-Mile Scenic Drive
- Hawk Hill
- Fort Baker

Entertainment
- American Conservatory Theater
- Bill Graham Civic Auditorium
- Cow Palace
- The Fillmore
- War Memorial and Performing Arts Center
- Yerba Buena Center for the Arts

Sports
- San Francisco Giants
- AT&T Park
- Candlestick Park
- Kezar Stadium

Food and drink
- Anchor Steam
- Boudin Bakery
- Buena Vista Cafe
- Dungeness crab
- Ghirardelli
- Tadich Grill
- Tonga Room & Hurricane Bar
- Top of the Mark

Shopping
- Metreon
- Stonestown Galleria
- Union Square
- Westfield San Francisco Centre

National Register of Historic Places listings in San Francisco

U.S. National Register of Historic Places

Topics
- Architectural style categories
- Contributing property
- Historic district
- History of the National Register of Historic Places
- Keeper of the Register
- National Park Service
- Property types
- Alabama
- Alaska
- Arizona
- Arkansas
- California
- Colorado
- Connecticut
- Delaware
- Florida
- Georgia
- Hawaii
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Louisiana
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Mississippi
- Missouri
- Montana
- Nebraska
- Nevada
- New Hampshire
- New Jersey
- New Mexico
- New York
- North Carolina
- North Dakota
- Ohio
- Oklahoma
- Oregon
- Pennsylvania
- Rhode Island
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Vermont
- Virginia
- Washington
- West Virginia
- Wisconsin
- Wyoming

- American Samoa
- Guam
- Minor Outlying Islands
- Northern Mariana Islands
- Puerto Rico
- Virgin Islands

- Federated States of Micronesia
- Marshall Islands
- Palau

- District of Columbia
- Morocco
## Economy
- Port of Oakland
- List of companies

## Higher education
- California College of the Arts
- Holy Names University
- Laney College
- Lincoln University
- Merritt College
- Mills College
- Samuel Merritt University
- Patten University

## Primary and secondary education
- Castlemont Community of Small Schools
- Fremont Federation of High Schools
- The Crucible
- Bishop O'Dowd High School
- Oakland Unified School District
- The College Preparatory School
- Head-Royce School
- McClymonds High School
- Oakland High School
- Oakland Technical High School
- Oakland School for the Arts
- Skyline High School
- St. Elizabeth High School

## Government
- Mayors
- City Hall
- City Council
- Fire Department
- Police Department

## History
- Oakland Army Base
- Key System
- Naval Supply Depot
- Black Panther Party
- 1989 Loma Prieta earthquake
- Oakland firestorm of 1991
- Oscar Grant shooting
- Oakland Police shootings
- Riders scandal
- Your Black Muslim Bakery
- Occupy Oakland
- Oakland Tribune
- 2016 warehouse fire
- Timeline

## Sports
- Golden State Warriors
- Oakland Athletics
- Oakland Raiders
Transportation

- San Francisco–Oakland Bay Bridge
- Caldecott Tunnel
- Posey and Webster Street Tubes
- MacArthur Maze
- Interstate 580
- Interstate 880
- Warren Freeway
- International Boulevard
- Cypress Street Viaduct
- Bay Area Rapid Transit
- 19th Street BART
- 12th Street Oakland City Center BART
- Lake Merritt BART
- MacArthur BART
- Oakland Coliseum Station
- Rockridge BART
- West Oakland BART
- Oakland – Jack London Square Amtrak
- Oakland International Airport
- AC Transit

Other

- Neighborhoods
- Notable people
- Books about Oakland
- Tallest buildings
- Children's Hospital
- Mountain View Cemetery
- Lake Merritt
- Temescal Creek
- Sausal Creek
- Crime

San Francisco Bay watershed

Outline

- Hydrography
- Ecology
- List of tributaries
- List of lakes

Subdivisions

Major
- San Francisco Bay
- Suisun Bay
- San Pablo Bay

Minor
- Golden Gate
- Grizzly Bay
- Richardson Bay
- San Rafael Bay
- Richmond Inner Harbor
- San Leandro Bay

Former
- Yerba Buena Cove
- Mission Bay
Waterways

Rivers
- San Joaquin
- Sacramento
- Napa
- Guadalupe
- Petaluma

Creeks (discharging into the Bay)
- Alameda
- Baxter
- Cerrito
- Codornices
- Coyote (Santa Clara)
- Coyote (Marin)
- San Leandro
- San Lorenzo
- Schoolhouse
- Temescal
- Sausal
- Redwood
- San Mateo
- Sonoma
- Corte Madera
- Arroyo Corte Madera del Presidio
- San Rafael
- Miller
- Novato
- Tolay
- San Francisquito
- Pacheco
- Alhambra
- Adobe
- Rodeo
- Refugio
- Pinele
- Garrity
- Rheem
- Karlson
- San Pablo
- Castro
- Wildcat
- Fluvius Innominatus
- Marin (Alameda County)
- Strawberry
- Easton
- Mission Creek

Reservoirs
- Calaveras Reservoir

Straits and estuaries
- Sacramento–San Joaquin River Delta
- Carquinez Strait
- Oakland Estuary
- Raccoon Strait
Parks and protected areas

- Don Edwards National Wildlife Refuge
- San Pablo Bay National Wildlife Refuge
- Eden Landing Ecological Reserve
- Hayward Regional Shoreline
- Hayward Shoreline Interpretive Center
- Crown Memorial State Beach
- Eastshore State Park
- Emeryville Crescent State Marine Reserve
- Point Isabel Regional Shoreline
- César Chávez Park
- Brooks Island Regional Shoreline
- Point Pinole Regional Shoreline
- Antioch Dunes National Wildlife Refuge
- Coyote Point Park
- Middle Harbor Shoreline Park
- National Estuarine Research Reserve
- China Camp State Park
- San Francisco Maritime National Historical Park
- SF Bay Trail
- Oyster Bay Regional Shoreline
- Big Break Regional Shoreline

Islands and peninsulas

Major islands
- Alameda
- Alcatraz
- Angel
- Treasure Island
- Yerba Buena

Minor
- Brooks
- Bair
- Bay Farm
- Belvedere
- Brother
- Castro Rocks
- Coast Guard
- Mare
- Red Rock
- The Sisters
- Marin Islands
- Roe
- Ryer
- Seal Islands

Peninsulas/infill
- Albany Bulb
- Point Isabel
- Foster City
- Fleming Point
- Hunters Point
- Steamboat Point
- Potrero Point

Wetlands

- Chelsea
- Cordelia
- Crissy Field
- Hoffman
- Meeker
- Mowry
- Napa Sonoma
- Point Molate
- Seal
- Stege
- Suisun
- Westpoint
Bridges
- San Francisco–Oakland Eastern span replacement
- Richmond–San Rafael
- San Mateo–Hayward
- Dumbarton
- Golden Gate
- Benicia–Martinez
- Antioch
- Carquinez
- Leimert
- Fruitvale

Tubes
- Posey/Webster Street
- Transbay

Ports and marinas
- Port of San Francisco
- Port of Oakland
- Port of Richmond
- San Francisco Naval Shipyard
- Mare Island Naval Shipyard
- Port of Redwood City
- Berkeley Marina
- Oyster Point Marina/Park
- Clipper Yacht Harbor
- Westpoint Harbor
- Foster City Marina (proposed)

Other
- Discovery Site
- Humphrey the Whale
- Cosco Busan oil spill
- Delta and Dawn
- Golden Gate Biosphere Reserve
- California clapper rail
- Reber Plan
- San Leandro Oyster Beds
- Thicktail chub
- Delta smelt
- Richmond Shipyards
- U.S. Army Corps of Engineers Bay Model
- Guadalupe Watershed
- Clifton Court Forebay
- Conservation and Development Commission
- The Watershed Project
- Save The Bay
- Harold Gilliam
- Marincello
- Citizens for East Shore Parks
- Friends of Five Creeks
- Urban Creeks Council
- Cargill salt infill
- Ferry service/SF Bay Ferry
- 1971 oil spill
- Greenbelt Alliance
- The Bay Institute
- San Francisco Baykeeper
- San Francisco Estuary and Watershed Science
- Water Trail
- Estuary Partnership
- Leslie Salt

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The San Francisco-Oakland Bay Bridge is one of the greatest American bridges. Built during the Great Depression, the bridge soon became known as the “working horse of Northern California,” carrying the heaviest traffic in the region. General Information. The San Francisco – Oakland Bay Bridge opened to traffic in 1936. It connects San Francisco and Oakland and is the busiest vehicular link in Northern California (Figure 1). Figure 1: Bay Bridge with new east crossing. The bridge is actually several structures with distinctly different systems, strung together to form about a 8.5-mile (13.7-km) The San Francisco-Oakland Bay Bridge is the region's workhorse bridge, carrying more than a third of the traffic of all of the state-owned bridges combined. It is made up of two bridge segments: a skyway structure/single anchored suspension bridge between Oakland and Yerba Buena Island, and a suspension span from the island to San Francisco. Connecting the two is the largest. MTC is the transportation planning, financing and coordinating agency for the nine-county San Francisco Bay Area. Get the latest on MTC’s COVID-19 response. Skip Navigation. Bay Bridge Projects. Corridor Overview. Protecting the Environment. Oakland Touchdown Detour. East Span Demolition. Design. Toll Bridge Program Oversight Committee meetings are open to the public and media. Attendees are encouraged to print their own materials, as copies of memos and other documents will not be available at the meeting; agendas will be available. Access to archived materials and agendas, along with the upcoming meeting information, can be found here. Subscribe to RSS Feed. Toll Bridge Program Oversight Committee. Next TBPOC Scheduled Meeting: No Further Meetings Scheduled. The San Francisco–Oakland Bay Bridge is a complex of bridges that span the San Francisco Bay in California. It is notable for having one of the longest spans in the United States. It featured in the episode Bound and Buried. During the 1989 Loma Prieta earthquake, a section of the eastern span's upper deck collapsed, providing a clue to how long the bridge would remain standing in a Life After People. Despite the violence of the quake, it would take 100 years for even one of the spans to collapse. By You may have seen the San Francisco-Oakland Bay Bridge on postcards. The notable bridge once held a world title as the longest and most costly bridge. Driving over the bridge will make your excursion a great deal speedier and smoother setting out to and from the east and west.