**Gateway Arch St. Louis**

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| **Gateway Arch** |
| The Gateway Arch in January 2008 |
| **Alternative names** | Gateway to the West, St. Louis Arch |
| **General information** |
| **Architectural style** | [Structural expressionism](http://en.wikipedia.org/wiki/High-tech_architecture) |
| **Location** | Memorial Drive, [St. Louis](http://en.wikipedia.org/wiki/St._Louis), Missouri, United States |
| [**Coordinates**](http://en.wikipedia.org/wiki/Geographic_coordinate_system) | [38°37′28″N 90°11′05″W﻿ / ﻿38.62452°N 90.18471°W﻿ / 38.62452; -90.18471](http://toolserver.org/~geohack/geohack.php?pagename=Gateway_Arch&params=38.62452_N_-90.18471_E_type:landmark)[Coordinates](http://en.wikipedia.org/wiki/Geographic_coordinate_system): [38°37′28″N 90°11′05″W﻿ / ﻿38.62452°N 90.18471°W﻿ / 38.62452; -90.18471](http://toolserver.org/~geohack/geohack.php?pagename=Gateway_Arch&params=38.62452_N_-90.18471_E_type:landmark) |
| **Construction started** | February 12, 1963; 50 years ago (1963-02-12) |
| **Completed** | October 28, 1965; 47 years ago (1965-10-28) |
| **Inaugurated** | May 25, 1968; 44 years ago (1968-05-25) |
| **Cost** | [US$](http://en.wikipedia.org/wiki/US%24)13 million (c. $95,900,000 today |
| **Height** | 630 ft (192 m) |
| **Design and construction** |
| **Architect** | [Eero Saarinen](http://en.wikipedia.org/wiki/Eero_Saarinen) |
| **Architecture firm** | Saarinen and Associates |
| **Structural engineer** | [Severud Associates](http://en.wikipedia.org/wiki/Severud_Associates) |
|  |
| [U.S.](http://en.wikipedia.org/wiki/United_States) [National Register of Historic Places](http://en.wikipedia.org/wiki/National_Register_of_Historic_Places) |
| [U.S. National Historic Landmark](http://en.wikipedia.org/wiki/National_Historic_Landmark) |
| **Governing body:** | [National Park Service](http://en.wikipedia.org/wiki/National_Park_Service) |
| **NRHP Reference#:** | 87001423 |
| **Significant dates** |
| **Added to NRHP:** | May 28, 1987 |
| **Designated NHL:** | May 28, 1987 |
| **Main contractor** | Mcddsa |

The **Gateway Arch** is an arch that is the centerpiece of the [Jefferson National Expansion Memorial](http://en.wikipedia.org/wiki/Jefferson_National_Expansion_Memorial) in [St. Louis](http://en.wikipedia.org/wiki/St._Louis), Missouri. It was built as a monument to the [westward expansion of the United States](http://en.wikipedia.org/wiki/Westward_expansion_of_the_United_States). At 630 feet (192 m), it is the tallest man-made monument in the United States, [Missouri's tallest accessible building](http://en.wikipedia.org/wiki/List_of_tallest_buildings_in_Missouri#Missouri.27s_tallest_accessible_buildings), and the largest architectural structure designed as a weighted or flattened [catenary](http://en.wikipedia.org/wiki/Catenary) arch.

The arch is located at the site of St. Louis' foundation, on the west bank of the Mississippi River where [Pierre Laclède](http://en.wikipedia.org/wiki/Pierre_Lacl%C3%A8de), just after noon on February 14, 1764, told his aide, [Auguste Chouteau](http://en.wikipedia.org/wiki/Ren%C3%A9_Auguste_Chouteau), to build a city.

The Gateway Arch was designed by [Finnish-American](http://en.wikipedia.org/wiki/Finnish-American) architect [Eero Saarinen](http://en.wikipedia.org/wiki/Eero_Saarinen) and [German-American](http://en.wikipedia.org/wiki/German-American) structural engineer [Hannskarl Bandel](http://en.wikipedia.org/wiki/Hannskarl_Bandel) in 1947. Construction began on February 12, 1963, and ended on October 28, 1965, costing [US$](http://en.wikipedia.org/wiki/US%24)13 million at the time (approximately $95,900,000 in 2013). The monument opened to the public on June 10, 1967.

**Background**

See also: [History of the Jefferson National Expansion Memorial](http://en.wikipedia.org/wiki/Jefferson_National_Expansion_Memorial#History)

**Inception and early funding (1933–1935)**

Around late 1933, civic leader [Luther Ely Smith](http://en.wikipedia.org/wiki/Luther_Ely_Smith), returning to St. Louis from the [George Rogers Clark National Historical Park](http://en.wikipedia.org/wiki/George_Rogers_Clark_National_Historical_Park) in [Vincennes, Indiana](http://en.wikipedia.org/wiki/Vincennes%2C_Indiana), beheld the crumbling St. Louis riverfront area and envisioned that building a memorial there would both revive the riverfront and stimulate the economy. He communicated his idea to mayor [Bernard Dickmann](http://en.wikipedia.org/wiki/Bernard_Dickmann), who on December 15, 1933, raised it in a meeting with city leaders. They sanctioned the proposal, and the nonprofit Jefferson National Expansion Memorial Association (JNEMA—pronounced "Jenny May") was formed. Smith was appointed chairman and Dickmann vice chairman. The association's goal was to create:

A suitable and permanent public memorial to the men who made possible the western territorial expansion of the United States, particularly President Jefferson, his aides Livingston and Monroe, the great explorers, Lewis and Clark, and the hardy hunters, trappers, frontiersmen and pioneers who contributed to the territorial expansion and development of these United States, and thereby to bring before the public of this and future generations the history of our development and induce familiarity with the patriotic accomplishments of these great builders of our country.

Many locals did not approve of depleting public funds for the cause. SaLees, Smith's daughter, related that when "people would tell him we needed more practical things", he would respond that "spiritual things" were equally important.

The association expected that $30 million would be needed to undertake the construction of such a monument. It called upon the federal government to foot three-fourths of the bill ($22.5 million).

The St. Louis riverfront after demolition

The suggestion to renew the riverfront was not original, as previous projects were attempted but lacked popularity. The Jefferson memorial idea emerged amid the economic disarray of the [Great Depression](http://en.wikipedia.org/wiki/Great_Depression) and promised new jobs. The project was expected to create 5,000 jobs for three to four years. Committee members began to raise public awareness by organizing fundraisers and writing pamphlets. They also engaged Congress members, planning budgets and preparing bills, in addition to researching ownership of the land they had chosen, "approximately one-half mile in length ... from Third Street east to the present elevated railroad." In January 1934, Senator [Bennett Champ Clark](http://en.wikipedia.org/wiki/Bennett_Champ_Clark) and Representative [John Cochran](http://en.wikipedia.org/wiki/John_J._Cochran) introduced to Congress an [appropriation bill](http://en.wikipedia.org/wiki/Appropriation_bill) seeking $30 million for the memorial, but the bill failed to garner support due to the large amount of money solicited. In March of the same year, [joint resolutions](http://en.wikipedia.org/wiki/Joint_resolution) proposed the establishment of a federal commission to develop the memorial. Although the proposal aimed for only authorization, the bill incurred opposition because people suspected that JNEMA would later seek appropriation. On March 28 the Senate bill was reported out, and on April 5 it was turned over to the House Library Committee, which later reported favorably on the bills. On June 8, both the Senate and House bills were passed. On June 15, then President [Franklin D. Roosevelt](http://en.wikipedia.org/wiki/Franklin_D._Roosevelt) [signed the bill into law](http://en.wiktionary.org/wiki/sign_into_law), instituting the United States Territorial Expansion Memorial Commission. The commission comprised 15 members, chosen by Roosevelt, the House, the Senate, and JNEMA. It first convened on December 19 in St. Louis, where members examined the project and its planned location.

Meanwhile, in December, the JNEMA discussed organizing an architectural competition to determine the design of the monument. Local architect Louis LeBeaume had drawn up competition guidelines by January 1935. On April 13, 1935, the commission certified JNEMA's project proposals, including memorial perimeters, the "historical significance" of the memorial, the competition, and the $30 million budget. Between February and April, the [Missouri State Legislature](http://en.wikipedia.org/wiki/Missouri_General_Assembly) passed an act allowing the use of [bonds](http://en.wikipedia.org/wiki/Bond_%28finance%29) to facilitate the project. On April 15, then [Governor](http://en.wikipedia.org/wiki/List_of_Governors_of_Missouri) [Guy B. Park](http://en.wikipedia.org/wiki/Guy_Brasfield_Park) signed it into law. Dickmann and Smith applied for funding from two [New Deal agencies](http://en.wikipedia.org/wiki/New_Deal_agency)—the [Public Works Administration](http://en.wikipedia.org/wiki/Public_Works_Administration) (headed by [Harold Ickes](http://en.wikipedia.org/wiki/Harold_L._Ickes)) and the [Works Progress Administration](http://en.wikipedia.org/wiki/Works_Progress_Administration) (headed by [Harry Hopkins](http://en.wikipedia.org/wiki/Harry_Hopkins)). On August 7, both Ickes and Hopkins assented to the funding requests, each promising $10,000,000, and said that the [National Park Service](http://en.wikipedia.org/wiki/National_Park_Service) (NPS) would manage the memorial. A local bond issue election granting $7.5 million for the memorial's development was held on September 10 and passed.

On December 21, [Franklin D. Roosevelt](http://en.wikipedia.org/wiki/Franklin_D._Roosevelt) signed [Executive Order](http://en.wikipedia.org/wiki/Executive_order_%28United_States%29) 7253 to approve the memorial, allocating the 82-acre area as the first [National Historic Site](http://en.wikipedia.org/wiki/National_Historic_Sites_%28United_States%29). The order also appropriated $3.3 million through the WPA and $3.45 million through the PWA ($6,750,000 in total). The motivation of the project was twofold—commemorating westward expansion and [creating jobs](http://en.wikipedia.org/wiki/Job_creation_program). Some taxpayers began to file suits to impede the monument, which they called a "[boondoggle](http://en.wikipedia.org/wiki/Boondoggle_%28project%29)".

**Land acquisition, opposition, demolition, and early railroad negotiations (1936–1939)**

Using the 1935 grant of $6.75 million and $2.25 million in city bonds, the NPS acquired the buildings within the historic site—through [condemnation](http://en.wikipedia.org/wiki/Eminent_domain#Condemnation) rather than purchase—and demolished them. By September 1938, condemnation was complete. The legality of the condemnation was subject to many court cases and culminated on January 27, 1939, when the [United States Circuit Court of Appeals](http://en.wikipedia.org/wiki/United_States_courts_of_appeals) ruled that condemnation was valid. $6.2 million in sum was distributed to land owners on June 14. Demolition commenced on October 10, 1939, when Dickmann extracted three bricks from a vacant warehouse.

Led by Paul Peters, adversaries of the memorial delivered to congressmembers in Washington, D.C., a leaflet titled "Public Necessity or Just Plain Pork". The JNEMA's lawyer, Bon Geaslin, found that the flyers did not taint the project but motivated congressmembers to find out more about the same. Although Representative John Cochran wanted to ask Congress to approve more funds, Geaslin believed the association should "keep a low profile, maintaining its current position during this session of Congress". He advised the association to "get a good strong editorial in one of the papers to the effect that a small group of tenants ... is soliciting funds [to fight] the proposed improvement, and stating that these efforts do not represent the consensus of opinion in St. Louis ..., and pointing out that such obstructions should be condemned".

Congress's reduction in spending made it impossible for the allocated funds to be obtained. NPS responded that the city would reduce their funding if the Feds did. It also advanced that the funds were sanctioned by an executive order, but superintendent John Nagle was cautious: what "one Executive Order does, another can undo". In March 1936, Representative Cochran commented during a House meeting that he "would not vote for any measure providing for building the memorial or allotting funds to it". Geaslin found Cochran's statements to be a greater hindrance to the project than Paul Peters' opposition, for Congress may see Cochran's opinions as representative of public opinion.

Peters and other opposition asked Roosevelt to rescind Executive Order 7253 and to redirect the money to the [American Red Cross](http://en.wikipedia.org/wiki/American_Red_Cross). Smith impugned their motives, accusing them of being "opposed to anything that is ever advanced in behalf of the city." In February 1936, a [*The Nation*](http://en.wikipedia.org/wiki/The_Nation) editorial written by Paul W. Ward denounced the project. Smith was infuriated, fearing the impact of attacks from a prestigious magazine, and wanted "to jump on it strong with hammer and tongs". [William Allen White](http://en.wikipedia.org/wiki/William_Allen_White), a renowned newspaper editor, advised Smith not to fret.

Because the Mississippi River played an essential role in establishing St. Louis' identity as the gateway to the west, a memorial commemorating it should be near the river. Railroad tracks that had been constructed in the 1930s on the [levee](http://en.wikipedia.org/wiki/Levee) obstructed views of the riverfront from the memorial. When Ickes declared that the railway must be removed before he would allocate funds for the memorial, President of the St. Louis Board of Public Service Baxter Brown suggested that "a new tunnel ... conceal the relocated tracks and re-grading of the site to elevate it over the tunnel. These modifications would eliminate the elevated and surface tracks and open up the views to the river." Although rejected by NPS architect [Charles Peterson](http://en.wikipedia.org/wiki/Charles_E._Peterson), Brown's proposal formed the basis for the ultimate settlement.

**Design competition (1945–1948)**

... [T]he steel monument one sees today—carbon steel on the interior, stainless steel on the exterior, and concrete in-filling, with an equilateral-triangle-shaped section that tapers from 54 to 17 feet at the top, and the concept of a skin that is also structure—is in essence [Saarinen's] competition design.

*Eero Saarinen: Shaping the Future*, 2006

In November 1944, Smith discussed with [Newton Drury](http://en.wikipedia.org/wiki/Newton_B._Drury), the [National Park Service Director](http://en.wikipedia.org/wiki/National_Park_Service#Directors), the design of the memorial, asserting that the memorial should be "transcending in spiritual and aesthetic values," best represented by "one central feature: a single shaft, a building, an arch, or something else that would symbolize American culture and civilization."

The idea of an architectural competition to determine the design of the memorial was favored at the JNEMA's inaugural meeting. They planned to award cash for the best design. In January 1945, the JNEMA officially announced a two-stage design competition that would cost $225,000 to organize. Smith and the JNEMA struggled to raise the funds, garnering only a third of the required total by June 1945. Then mayor [Aloys Kaufmann](http://en.wikipedia.org/wiki/Aloys_P._Kaufmann) feared that the lack of public support would lead officials to abandon hope in the project. The passage of a year brought little success, and Smith frantically [underwrote](http://en.wikipedia.org/wiki/Underwriting) the remaining $40,000 in May 1946. By June, Smith found others to assume portions of his underwriting, with $17,000 remaining under his sponsorship. In February 1947, the underwriters were compensated, and the fund stood over $231,199.

Local architect Louis LaBeaume prepared a set of specifications for the design, and architect [George Howe](http://en.wikipedia.org/wiki/George_Howe_%28architect%29) was chosen to coordinate the competition. On May 30, 1947, the contest officially opened. The seven-member jury that would judge the designs comprised [Charles Nagel Jr.](http://en.wikipedia.org/wiki/Charles_Nagel_%28architect%29), [Richard Neutra](http://en.wikipedia.org/wiki/Richard_Neutra), [Roland Wank](http://en.wikipedia.org/wiki/Roland_Wank), [William Wurster](http://en.wikipedia.org/wiki/William_Wurster), LaBeaume, [Fiske Kimball](http://en.wikipedia.org/wiki/Fiske_Kimball), and S. Herbert Hare. The competition comprised two stages—the first to narrow down the designers to five and the second to single out one architect and his design. The design intended to include:

"(a) an architectural memorial or memorials to Jefferson; dealing (b) with preservation of the site of Old St. Louis — landscaping, provision of an open-air campfire theater, reerection or reproduction of a few typical old buildings, provision of a Museum interpreting the Westward movement; (c) a living memorial to Jefferson's 'vision of greater opportunities for men of all races and creeds;' (d) recreational facilities, both sides of the river; and (e) parking facilities, access, relocation of railroads, placement of an interstate highway."

Saarinen working with a model of the arch in 1957

Saarinen's team included himself as designer, J. Henderson Barr as associate designer, and [Dan Kiley](http://en.wikipedia.org/wiki/Dan_Kiley) as landscape architect, as well as [Lily Swann Saarinen](http://en.wikipedia.org/wiki/Lilian_Swann_Saarinen) as sculptor and [Alexander Girard](http://en.wikipedia.org/wiki/Alexander_Girard) as painter. In the first stage of the competition, [Carl Milles](http://en.wikipedia.org/wiki/Carl_Milles) advised Saarinen to change the bases of each leg to triangles instead of squares. Saarinen said that he "worked at first with mathematical shapes, but finally adjusted it according to the eye." At submission, Saarinen's plans laid out the arch at 509 feet (155 m) tall and 592 feet (180 m) wide from center to center of the triangle bases.

On September 1, 1947, submissions for the first stage were received by the jury. The submissions were labeled by numbers only, and the names of the designers were kept anonymous. Upon four days of deliberation, the jury narrowed down the 172 submissions, which included Saarinen's father [Eliel](http://en.wikipedia.org/wiki/Eliel_Saarinen), to five finalists, and announced the corresponding numbers to the media on September 27. Saarinen's design (#144) was among the finalists, and comments written on it included "relevant, beautiful, perhaps inspired would be the right word" (Wank) and "an abstract form peculiarly happy in its symbolism" (Nagel). Hare questioned the feasibility of the design but appreciated the thoughtfulness behind it. Local St. Louis architect [Harris Armstrong](http://en.wikipedia.org/wiki/Harris_Armstrong) was also one of the finalists. The secretary who sent out the telegrams informing finalists of their advancement mistakenly sent one to Eliel rather than Eero. The family celebrated with champagne, and two hours later, a competition representative called to correct the mistake. Eliel "'broke out a second bottle of champagne' to toast his son."

They proceeded to the second stage, and each were given a $10,000 prize. Saarinen changed the height of the arch from 580 feet to 630 feet (190 m) and wrote that the arch symbolized "the gateway to the West, the national expansion, and whatnot." He wanted the landscape surrounding the arch to "be so densely covered with trees that it will be a forest-like park, a green retreat from the tension of the downtown city," according to [*The New York Times*](http://en.wikipedia.org/wiki/The_New_York_Times) architectural critic Aline Bernstein Louchheim The deadline for the second stage arrived on February 10, 1948, and on February 18, the jury chose Saarinen's design unanimously, praising its "profoundly evocative and truly monumental expression." The following day, during a formal dinner at [Statler Hotel](http://en.wikipedia.org/wiki/Hotel_Statler_%28St._Louis%2C_Missouri%29) that the finalists and the media attended, Wurster pronounced Saarinen the winner of the competition and awarded the checks—$40,000 to his team and $50,000 to Saarinen. The competition was the first major architectural design that Saarinen developed unaided by his father.

On May 25, the United States Territorial Expansion Memorial Commission endorsed the design. Later, in June, the NPS approved the proposal. Representative [H. R. Gross](http://en.wikipedia.org/wiki/H._R._Gross), however, opposed the allocation of federal funds for the arch's development.

The design drew varied responses. In a February 29, 1948, [*The New York Times*](http://en.wikipedia.org/wiki/The_New_York_Times) article, Louchheim praised the arch's design as "a modern monument, fitting, beautiful and impressive. Some local residents likened it to a "stupendous hairpin and a stainless steel hitching post." The most aggressive criticism emerged from [Gilmore D. Clarke](http://en.wikipedia.org/wiki/Gilmore_David_Clarke), whose February 26, 1948, letter compared Saarinen's arch to an arch imagined by fascist [Benito Mussolini](http://en.wikipedia.org/wiki/Benito_Mussolini), rendering the arch a fascist symbol. This allegation of plagiarism ignited fierce debates among architects about its validity. [Douglas Haskell](http://en.wikipedia.org/wiki/Douglas_Haskell) from New York wrote that "The use of a common form is not plagiarism.... [T]his particular accusation amounts to the filthiest smear that has been attempted by a man highly placed in the architectural profession in our generation." Wurster and the jury refuted the charges, arguing that "the arch form was not inherently fascist but was indeed part of the entire history of architecture." Saarinen considered the opposition absurd, asserting, "It's just preposterous to think that a basic form, based on a completely natural figure, should have any ideological connection."

By January 1951, Saarinen created 21 "drawings, including profiles of the Arch, scale drawings of the museums and restaurants, various parking proposals, the effect of the levee-tunnel railroad plan on the Arch footings, the Arch foundations, the Third Street Expressway, and the internal and external structure of the Arch." [Fred Severud](http://en.wikipedia.org/wiki/Fred_Severud) made calculations for the arch's structure.

**Railroad agreement (1949–1952)**

There were several plans for the relocation of the railroad. The so-called La Beaume-Terminal plan, opposed by Saarinen and the NPS, proposed "three tracks on a contained fill along the lines of the elevated tracks." The Bowen plan and the Bates-Ross plan recommended that a tunnel enclose the tracks, which would cross the memorial site diagonally. Saarinen warned that should the railroad be located between the memorial and the river, he would not architect the memorial. The Levee-Tunnel plan, proposed by Frank J. McDevitt, president of the St. Louis Board of Public Service, proposed to lower the tracks into a tunnel concealed by walls and landscaping. The Hill-Tunnel plan, supported by Saarinen and NPS engineer Julian Spotts, favored a tunnel below Second and First Streets to contain the tracks. On July 7, 1949, in Mayor [Joseph Darst](http://en.wikipedia.org/wiki/Joseph_Darst)'s office, city officials decided on the Levee-Tunnel plan, rousing JNEMA members who held that the decision had been pressed through when Smith was away on vacation. Darst notified Secretary of the Interior [Julius Krug](http://en.wikipedia.org/wiki/Julius_Krug) of the city's selection of the Levee-Tunnel plan. Krug planned to meet with Smith and JNEM but canceled the meeting and resigned on November 11. His successor, [Oscar L. Chapman](http://en.wikipedia.org/wiki/Oscar_L._Chapman) rescheduled the meeting for December 5 in Washington with St. Louis, JNEM, railroad, and Federal delegates. A day after the conference, they ratified a [memorandum of understanding](http://en.wikipedia.org/wiki/Memorandum_of_understanding) as the relocation plan: "The five tracks on the levee would be replaced by three tracks, one owned by the [Missouri Pacific Railroad](http://en.wikipedia.org/wiki/Missouri_Pacific_Railroad) and two by the TRRA [Terminal Railroad Association of St. Louis], proceeding through a tunnel not longer than 3,000 feet. The tunnel would be approximately fifty feet west of the current elevated line." Chapman sanctioned the document on December 22, 1949. The relocation plan involved an 18-foot (5.5 m) clearance in the tunnel, lower than the regular requirement of 22 feet (6.7 m). JNEM garnered the approval of the [Missouri Public Service Commission](http://en.wikipedia.org/wiki/Missouri_Public_Service_Commission) on August 7, 1952.

Efforts to appropriate congressional funds began in January 1950 but were delayed until 1953 by the [Korean War](http://en.wikipedia.org/wiki/Korean_War)'s depletion of federal funds.

In August 1953, the relocation controversy reemerged when Secretary of the Interior [Fred A. Seaton](http://en.wikipedia.org/wiki/Fred_Andrew_Seaton) declared that the Department of the Interior and the railroads should come to an agreement on the relocation before authorization could be rehashed. In October, NPS and the TRRA decided that the TRRA would employ a surveyor endorsed by Spotts to "to survey, design, estimate, and report on" the expenses of the relocation. They chose Alfred Benesch and Associates, which released its last report on May 3, 1957, estimating the cost of two relocation plans at high values—over $11 million and over $14 million, respectively. NPS director [Conrad Wirth](http://en.wikipedia.org/wiki/Conrad_L._Wirth) enjoined Saarinen to make small modifications to the design. In October, Saarinen redrafted the relocation plans, suggesting:

[the placement of] the five sets of railroad tracks into a shortened tunnel 100 feet west of the trestle, with the tracks being lowered sixteen feet. This did not mean that the memorial would be cut off from the river, however, for Saarinen provided a 960-foot long tunnel to be placed over the railroad where a "grand staircase" rose from the levee to the Arch. At the north and south ends of the park, 150-foot tunnels spanned the tracks, and led to the overlook museum, restaurant, and stairways down to the levee. Saarinen designed a subterranean visitor center the length of the distance between the legs, to include two theaters and an entrance by inward-sloping ramps.

On November 29, involved interests signed another memorandum of understanding approving Saarinen's rework; implementing it would cost about $5.053 million. On March 10, 1959, mayor [Raymond Tucker](http://en.wikipedia.org/wiki/Raymond_Tucker) proposed that they "[drop] the tunnel idea in favor of open cuts roofed with concrete slabs," which would cost $2.684 million, $1.5 million below the cost of the approved plan. On May 12, 1958, Tucker, TRRA president Armstrong Chinn, and Missouri Pacific Railroad president Russell Dearmont entered a written agreement that "[t]he TRRA would place $500,000 in escrow for the project, and the city [would] sell $980,000 of the 1935 bonds to match the Federal contribution." Director Wirth and Secretary Seaton approved the plan on June 2.

In July 1953, Representative [Leonor Sullivan](http://en.wikipedia.org/wiki/Leonor_Sullivan) introduced H.R. 6549, a bill authorizing the allocation of no more than $5 million to build the arch. After much negotiation, both houses of Congress approved the bill in May 1954, and on May 18, 1954, then President [Dwight D. Eisenhower](http://en.wikipedia.org/wiki/Dwight_D._Eisenhower) signed the bill into law as Public Law 361. Congress could not afford to appropriate the funds in 1955, so association president William Crowdus resorted to asking the [Rockefeller](http://en.wikipedia.org/wiki/Rockefeller_Foundation) and [Ford Foundations](http://en.wikipedia.org/wiki/Ford_Foundation) for $10 million. The foundations denied the request because their function as [private foundations](http://en.wikipedia.org/wiki/Private_foundation_%28United_States%29) did not include funding national memorials. In 1956, Congress appropriated $2.64 million to be used to relocate the railroad. The remainder of the authorized appropriation was requested via six congressional bills, introduced on July 1, 1958, that revised Public Law 361 to encompass the cost of the entire memorial, increasing federal funds by $12.25 million. A month later the Department of the Interior and the [Bureau of the Budget](http://en.wikipedia.org/wiki/Office_of_Management_and_Budget) endorsed the bill, and both houses of Congress unanimously passed the bill. Eisenhower signed it into law on September 7. The NPS held off on appropriating the additional funds, as it planned to use the already appropriated funds to initiate the railroad relocation.

**Zoning, start of railroad relocation, and appropriation (1959–1968)**

Saarinen and city functionaries collaborated to [zone](http://en.wikipedia.org/wiki/Zoning) buildings near the arch. In April 1959, real estate developer Lewis Kitchen decided to construct two 40-level edifices across from the arch. In July, after the plan was condemned for its potential obstruction of the arch, Kitchen discussed the issue with officials. A decision was delayed for several months because Saarinen had yet to designate the arch's height, projected between 590 and 630 feet (180 and 190 m). By October, Mayor Tucker and Director Wirth resolved to restrict the height of buildings opposite the arch to 275 feet (84 m) (about 27 levels), and the city stated that plans for buildings opposite the arch would require its endorsement. Kitchen then decreased the height of his buildings, while Saarinen increased that of the arch.

Railroad relocation was the first stage of the project. On May 6, 1959, after an official conference, the Public Service Commission called for ventilation to accompany the tunnel's construction, which entailed "placing 3,000 feet of dual tracks into a tunnel 105 feet west of the elevated railroad, along with filling, grading, and trestle work." On June 8 in the Old Courthouse, eight bids for the relocation program were reviewed. The MacDonald Construction Company bid the lowest amount—$2,426,115, less than NPS' estimate of the cost—and garnered the contract. At 10:30 a.m. on June 23, 1959, the [groundbreaking](http://en.wikipedia.org/wiki/Groundbreaking) ceremony occurred with Tucker's spading the first portion of earth. Wirth and Dickmann also delivered speeches.

The NPS acquired the $500,000 in escrow and transferred it to MacDonald to initiate railroad relocation. In August, demolition of the Old Rock Housewas complete, with workers beginning to excavate the tunnel. In November, they began shaping the tunnel's walls with concrete. Twenty-nine percent of the construction was completed by March and 95% by November. On November 17, trains began to use the new tracks. June 1962 was the projected date of fruition.

On May 16, 1959, the [Senate appropriations subcommittee](http://en.wikipedia.org/wiki/United_States_Senate_Appropriations_Subcommittee_on_Interior%2C_Environment%2C_and_Related_Agencies) received from St. Louis legislators a request for $2.4911 million, of which it granted only $133,000. Wirth recommended that they reseek the funds in January 1960.

On March 10, 1959, Regional Director Howard Baker received $888,000 as the city's first subsidy for the project. On December 1, 1961, $23,003,150 in total had been authorized, with $19,657,483 already appropriated—$3,345,667 remained not yet appropriated.

**Construction**

The bidding date, originally December 20, 1961, was postponed to January 22, 1962, to clarify the details of the arch construction. About 50 companies that had requested the construction requirements received bidding invitations. Extending from $11,923,163 to $12,765,078, all four bids exceeded the engineer estimate of $8,067,000. Wirth had a committee led by [George Hartzog](http://en.wikipedia.org/wiki/George_B._Hartzog%2C_Jr.) determine the validity of the bids in light of the government's conditions. Following a meeting with the bidders, the committee affirmed the bids' reasonableness, and Wirth awarded the lowest bidder, MacDonald Construction Company, the contract for the construction of the arch and the visitor center. On March 14, 1962, he signed the contract and received from Tucker $2,500,000, the city's subsidy for the phase. MacDonald reduced its bid $500,000 to $11,442,418. The Pittsburgh-Des Moines Steel Company served as the subcontractor for the shell of the arch.

In 1959, [ground was broken](http://en.wikipedia.org/wiki/Groundbreaking), and in 1961, the foundation of the structure was laid. Construction of the arch itself began on February 12, 1963, as the first steel triangle on the south leg was eased into place. These steel triangles, which narrowed as they spiraled to the top, were raised into place by a group of cranes and [derricks](http://en.wikipedia.org/wiki/Derrick). The arch was assembled of 142 12-foot-long (3.7 m) [prefabricated](http://en.wikipedia.org/wiki/Prefabrication) stainless steel sections. Once in place, each section had its double-walled skin filled with concrete, [prestressed](http://en.wikipedia.org/wiki/Prestressed_concrete) with 252 [tension bars](http://en.wikipedia.org/wiki/Rebar). In order to keep the partially completed legs steady, a scissors [truss](http://en.wikipedia.org/wiki/Truss) was placed between them at 530 feet (160 m), later removed as the derricks were taken down. The whole endeavor was expected to be completed by fall 1964, in observance of St. Louis' bicentennial.

Contractor MacDonald Construction Co. arranged a 30-foot (9.1 m) tower for spectators and provided recorded accounts of the undertaking. In 1963, a million people went to observe the progress, and by 1964, local radio stations began to broadcast when large slabs of steel were to be raised into place.

The project manager of MacDonald Construction Co., Stan Wolf, said that a 62-story building was easier to build than the arch: "In a building, everything is straight up, one thing on top of another. In this arch, everything is curved."

**Delays and lawsuits**

Although an [actuarial](http://en.wikipedia.org/wiki/Actuary) firm predicted thirteen workers would die while building the arch, no workers were killed during the monument's construction. However, construction of the arch was still often delayed by safety checks, funding uncertainties, and legal disputes.

Civil rights activists regarded the construction of the arch as a token of racial discrimination. While African Americans worked on the arch, none were skilled laborers. On July 14, 1964, during the workers' lunchtime, civil rights protesters Percy Green and Richard Daly, both members of [Congress of Racial Equality](http://en.wikipedia.org/wiki/Congress_of_Racial_Equality), climbed up 125-feet on the north leg of the arch to "expose the fact that federal funds were being used to build a national monument that was racially discriminating against black contractors and skilled black workers." As the pair disregarded demands to get off, protesters on the ground demanded that at least 10% of the skilled jobs belong to African Americans. Four hours later Green and Daly dismounted from the arch, to charges of "trespassing, peace disturbance, and resisting arrest” This incident *inter alia* spurred the [United States Department of Justice](http://en.wikipedia.org/wiki/United_States_Department_of_Justice) to file the first [pattern or practice](http://en.wikipedia.org/wiki/Disparate_treatment#Pattern_or_Practice_Discrimination) case against AFL–CIO under [Title VII of the Civil Rights Act of 1964](http://en.wikipedia.org/wiki/Title_VII), on February 4, 1966, but the department later called off the charges.

In 1964, the Pittsburgh-Des Moines Steel Company of Warren, Pennsylvania sued MacDonald for $665,317 for tax concerns. In 1965, NPS requested that Pittsburgh-Des Moines Steel remove the prominent letters "P-D-M" (its initials) from a creeper derrick used for construction, contending that it was promotional and violated federal law with regards to advertising on national monuments. Although Pittsburgh-Des Moines Steel initially refused to pursue what it considered a precarious venture, the company relented after discovering that leaving the initials would cost $225,000 and after that, $42,000 per month, and the NPS dropped its lawsuit.

On October 26, 1965, the International Association of Ironworkers delayed work to ascertain that the arch was safe. After NPS director Kenneth Chapman gave his word that conditions were "perfectly safe," construction resumed on October 27. After the discovery of 16 defects, the tram was also delayed from running. The [Bi-State Development Agency](http://en.wikipedia.org/wiki/Bi-State_Development_Agency) assessed that it suffered losses of $2,000 for each day the trains were stagnant.

On January 7, 1966, members of [AFL–CIO](http://en.wikipedia.org/wiki/AFL%E2%80%93CIO) deserted their work on the visitor center, refusing to work with plumbers affiliated with Congress of Industrial Unions (CIU), which represented black plumbers. A representative of AFL–CIO said, "This policy has nothing to do with race. Our experience is that these CIU members have in the past worked for substandard wages." CIU applied to the [National Labor Relations Board](http://en.wikipedia.org/wiki/National_Labor_Relations_Board) (NLRB) for an [injunction](http://en.wikipedia.org/wiki/Injunction) that required the AFL–CIO laborers to return to work. On February 7, Judge [John Keating Regan](http://en.wikipedia.org/wiki/John_Keating_Regan) ruled that AFL–CIO workers had participated in a [secondary boycott](http://en.wikipedia.org/wiki/Secondary_boycott). By February 11, AFL–CIO resumed work on the arch, and a AFL–CIO contractor declared that ten African Americans were apprenticed for arch labor. The standstill in work lasted a month. Considering how large Federal projects often "go haywire", [Secretary of War](http://en.wikipedia.org/wiki/United_States_Secretary_of_War) [Newton D. Baker](http://en.wikipedia.org/wiki/Newton_D._Baker) said, "This memorial will be like a cathedral; built slowly but surely."

**Topping out and dedication**

The dedication plaque

President [Lyndon B. Johnson](http://en.wikipedia.org/wiki/Lyndon_B._Johnson) and Mayor [Alfonso J. Cervantes](http://en.wikipedia.org/wiki/Alfonso_J._Cervantes) decided on a date for the topping out ceremony, but the arch had not been completed by then. The ceremony date was reset to October 17, 1965, and workers strained to meet the deadline, taking double shifts, but by October 17, the arch was still not complete. The chairman of the ceremony anticipated the ceremony to be held on October 30, a Saturday, to allow 1,500 schoolchildren, whose signatures were to be placed in a time capsule, to attend. Ultimately, the Pittsburgh-Des Moines Steel(Warren, Pa) set the ceremony date to October 28.

The time capsule, containing the signatures of 762,000 students and others, was welded into the [keystone](http://en.wikipedia.org/wiki/Keystone_%28architecture%29) before the final piece was set in place. On October 28, the arch was [topped out](http://en.wikipedia.org/wiki/Topping_out) as then [Vice President](http://en.wikipedia.org/wiki/Vice_President_of_the_United_States) [Hubert Humphrey](http://en.wikipedia.org/wiki/Hubert_Humphrey) observed from a helicopter. A Catholic priest and a rabbi prayed over the keystone, a 10 short tons (9.1 t), 8 feet (2.4 m)-long triangular section. It was slated to be inserted at 10:00 a.m. [local time](http://en.wikipedia.org/wiki/Central_Time_Zone_%28North_America%29) but was done 30 minutes early because [thermal expansion](http://en.wikipedia.org/wiki/Thermal_expansion) had constricted the 8.5-foot gap at the top by 5 inches (13 cm). To mitigate this, workers used fire hoses to spray water on the surface of the south leg to cool it downand make it contract. The keystone was inserted in 13 minutes, only 6 inches (15 cm) remained. For the next section, a [hydraulic jack](http://en.wikipedia.org/wiki/Hydraulic_jack) had to pry apart the legs six feet. The last section was left only 2.5 feet (0.76 m). By 12:00 p.m., the keystone was secured. Some filmmakers, in hope that the two legs would not meet, had chronicled every phase of construction.

The Gateway Arch was expected to open to the public by 1964, but in 1967 the public relations agency stopped forecasting the opening date. The arch's visitor center opened on June 10, 1967 and the tram began operating on July 24.

The arch was dedicated by Humphrey on May 25, 1968. He declared that the arch was "a soaring curve in the sky that links the rich heritage of yesterday with the richer future of tomorrow" and brings a "new purpose" and a "new sense of urgency to wipe out every slum." "Whatever is shoddy, whatever is ugly, whatever is waste, whatever is false, will be measured and condemned" in comparison to the Gateway Arch. About 250,000 people were expected to attend, but rain canceled the outdoor activities. The ceremony had to be transferred into the visitor center. After the dedication, Humphrey crouched beneath an exit as he waited for the rain to subside so he could walk to his vehicle.

**Aftermath**

The project did not provide 5,000 jobs as expected—as of June 1964, workers numbered fewer than 100. The project did, however, incite other riverfront restoration efforts, totaling $150 million. Building projects included a [55,000-seat sports stadium](http://en.wikipedia.org/wiki/Busch_Memorial_Stadium), a 400-unit motel, a 24-story hotel, four parking garages, and an apartment complex. The idea of a Disneyland amusement park that included "synthetic riverboat attractions" was considered but later abandoned. The developers hoped to use the arch as a commercial catalyst, attracting visitors who would use their services. One estimate found that since the 1960s, the arch has incited almost $503,000,000 worth of construction.

In June 1976, the memorial was finalized by federal allocations—"the statue of Thomas Jefferson was unveiled, the Museum of Westward Expansion was previewed, a theater under the Arch was dedicated in honor of Mayor Raymond Tucker and the catenary-like curving staircases from the Arch down to the levee were built."

**Characteristics**

**Physical characteristics**

The windows of the observation deck are located around the apex of the arch.

Both the width and height of the arch are 630 feet (192 m). The arch is the tallest memorial in the United States and the tallest stainless steel monument in the world.

The cross-sections of the arch's legs are [equilateral triangles](http://en.wikipedia.org/wiki/Equilateral_triangle), narrowing from 54 feet (16 m) per side at the bases to 17 feet (5.2 m) per side at the top. Each wall consists of a [stainless steel](http://en.wikipedia.org/wiki/Stainless_steel) skin covering a sandwich of two carbon-steel walls with [reinforced concrete](http://en.wikipedia.org/wiki/Reinforced_concrete) in the middle from ground level to 300 feet (91 m), with [carbon steel](http://en.wikipedia.org/wiki/Carbon_steel) to the peak. The arch is hollow to accommodate a unique tram system that takes visitors to an observation deck at the top.

In January 1970, amid frigid temperatures, the arch shrank 3 inches (7.6 cm). Jefferson National Expansion Memorial superintendent Harry Pfanz said the contraction was normal in cold weather and that safety was not at risk.

The [structural load](http://en.wikipedia.org/wiki/Structural_load) is supported by a [stressed-skin](http://en.wikipedia.org/wiki/Stressed_skin) design. Each leg is embedded in 25,980 short tons (23,570 t) of concrete 44 feet (13 m) thick and 60 feet (18 m) deep. Twenty feet of the foundation is in [bedrock](http://en.wikipedia.org/wiki/Bedrock). The arch is resistant to earthquakes and is designed to sway up to 9 inches (23 cm) in either direction while withstanding winds up to 150 miles per hour (240 km/h). The structure weighs 42,878 short tons (38,898 t), of which concrete comprises 25,980 short tons (23,570 t); structural steel interior, 2,157 short tons (1,957 t); and the stainless steel panels that cover the exterior of the arch, 886 short tons (804 t). This amount of stainless steel is the most used in any one project in history. The base of each leg at ground level had to have an [engineering tolerance](http://en.wikipedia.org/wiki/Engineering_tolerance) of 1⁄64 inches (0.40 mm) or the two legs would not meet at the top.

**Mathematical elements**

The arch is a weighted catenary—its legs are wider than its upper section.

The geometric form of the structure was set by mathematical equations provided to Saarinen by [Hannskarl Bandel](http://en.wikipedia.org/wiki/Hannskarl_Bandel). Bruce Detmers and other architects expressed the geometric form in blueprints with this equation:

,

with the constants

where *fc* = 625.0925 ft (191 m) is the maximum height of centroid, *Qb* = 1,262.6651 sq ft (117 m2) is the maximum cross sectional area of arch at base, *Qt*= 125.1406 sq ft (12 m2) is the minimum cross sectional area of arch at top, and *L* = 299.2239 ft (91 m) is the half width of centroid at the base.

This [hyperbolic cosine function](http://en.wikipedia.org/wiki/Hyperbolic_function) describes the shape of a [catenary](http://en.wikipedia.org/wiki/Catenary). A chain that supports only its own weight forms a catenary; in this configuration, the chain is purely in tension. Likewise, an inverted catenary arch that supports only its own weight is purely in compression, with no shear. The catenary arch is the stablest of all arches since "the thrust passes down through the legs and is absorbed in the foundations, whereas in other arches, the pressure tends to force the legs apart." The Gateway Arch itself is not a common catenary, but a more general curve of the form *y*=*A*cosh(*Bx*). This makes it an *inverted weighted catenary*—the arch is thicker at its two bases than at its vertex. Saarinen chose a weighted catenary over a normal catenary curve because it looked less pointed and less steep. In 1959, he caused some confusion about the actual shape of the arch when he wrote, "This arch is not a true [parabola](http://en.wikipedia.org/wiki/Parabola), as is often stated. Instead it is a catenary curve—the curve of a hanging chain—a curve in which the forces of thrust are continuously kept within the center of the legs of the arch." William V. Thayer, a professor of mathematics at [St. Louis Community College](http://en.wikipedia.org/wiki/St._Louis_Community_College), later wrote to the [*St. Louis Post-Dispatch*](http://en.wikipedia.org/wiki/St._Louis_Post-Dispatch) calling attention to the fact that the structure was a weighted catenary.

**Lighting**

The arch illuminated in pink in honor of [Breast Cancer Awareness Month](http://en.wikipedia.org/wiki/Breast_Cancer_Awareness_Month)

The arch's lighting system

The first proposal to illuminate the arch at night first was announced on May 18, 1966, but the plan never came to fruition. In July 1998, funding for an arch lighting system was approved by St. Louis' Gateway Foundation, which agreed to take responsibility for the cost of the equipment, its installation, and its upkeep. In January 1999, [MSNBC](http://en.wikipedia.org/wiki/MSNBC) arranged a temporary lighting system for the arch so the monument could be used as the background for a visit by [Pope John Paul II](http://en.wikipedia.org/wiki/Pope_John_Paul_II). Since November 2001, the arch has been bathed in white light between 10 p.m. and 1 a.m. via a system of floodlights. Designed by Randy Burkett, it comprises 44 lighting fixtures situated in four pits just below ground level.

On October 5, 2004, the [U.S. Senate](http://en.wikipedia.org/wiki/United_States_Senate), at the pressing of Senators [Jim Talent](http://en.wikipedia.org/wiki/Jim_Talent) and [Kit Bond](http://en.wikipedia.org/wiki/Kit_Bond), approved a bill permitting the illumination in pink of the arch in honor of [breast cancer awareness month](http://en.wikipedia.org/wiki/National_Breast_Cancer_Awareness_Month). Both [Estee Lauder](http://en.wikipedia.org/wiki/Est%C3%A9e_Lauder_Companies) and [May Department Store Co.](http://en.wikipedia.org/wiki/The_May_Department_Stores_Company) had championed the cause. One employee said that the arch would be a "beacon ... for the importance of prevention and finding a cure." While the National Park Service took issue with the plan due to the precedent it would set for prospective uses of the arch, it yielded due to a realization that it and Congress were "on the same team" and because the illumination was legally obligatory; on October 25, the plan was carried out. The previous time the arch was illuminated was on September 12, 1995, under the management of local companies [Fleishman-Hillard](http://en.wikipedia.org/wiki/Fleishman-Hillard) and Technical Productions. A rainbow spectrum was shone on the arch to publicize the debut of [Ringling Bros. and Barnum & Bailey Circus](http://en.wikipedia.org/wiki/Ringling_Bros._and_Barnum_%26_Bailey_Circus)' [*Wizard of Oz on Ice*](http://en.wikipedia.org/wiki/The_Wizard_of_Oz_%281987_musical%29#1990s_productions) at the [Scottrade Center](http://en.wikipedia.org/wiki/Scottrade_Center) (then named the "Kiel Center").

**Public access**

Southern entrance to the subterranean visitor center

In April 1965, three million tourists were expected to visit the arch after completion; 619,763 tourists visited the top of the arch in its first year open. On January 15, 1969, a visitor from [Nashville](http://en.wikipedia.org/wiki/Nashville%2C_Tennessee), [Tennessee](http://en.wikipedia.org/wiki/Tennessee) became the one-millionth person to reach the observation area; the ten-millionth person ascended to the top on August 24, 1979. In 1974, the arch was ranked fourth on a list of "most-visited man-made attraction[s]". Currently, the Gateway Arch is one of the most visited tourist attractions in the world with over four million visitors annually, of which around one million travel to the top. The arch was listed as a [National Historic Landmark](http://en.wikipedia.org/wiki/National_Historic_Landmark) on June 2, 1987, and is also listed on the [National Register of Historic Places](http://en.wikipedia.org/wiki/National_Register_of_Historic_Places).

On December 8, 2009, sponsored by nonprofit CityArchRiver2015, the international design competition "Framing a Modern Masterpiece: The City + The Arch + The River 2015" commenced. It aimed to "design a plan to improve the riverfront park landscape, ease access for pedestrians across Memorial Drive and expand onto the East St. Louis riverfront," as well as to lure visitors. The contest consisted of three stages—portfolio assessment (narrowed down to 8–10 teams), team interviews (narrowed down to 4–5 teams), and review of design proposals The competition received 49 applicants, which were narrowed down to five in the first two stages. On August 17, 2010, the designs of the five finalists were revealed to the public and exhibited at the theater below the arch. On August 26, the finalists made their cases to an eight-member jury, and on September 21, the winner was revealed—[Michael Van Valkenburgh Associates](http://en.wikipedia.org/wiki/Michael_Van_Valkenburgh#Michael_Van_Valkenburgh_Associates.2C_Inc.). The company's plans include a [gondola lift](http://en.wikipedia.org/wiki/Gondola_lift) across the Mississippi River, using more land to the east of the river, and sealing [Memorial Drive](http://en.wikipedia.org/wiki/Memorial_Drive_%28St._Louis%29). The NPS' initial estimate of the cost ($305 million) was raised to $578 million. The execution of the design is set to be completed by October 28, 2015, the fiftieth anniversary of the arch's topping out.

**Visitor center**

Inside the visitor center

The underground visitor center for the arch was designed as part of the National Park Service's [Mission 66](http://en.wikipedia.org/wiki/Mission_66) program. The 70,000 square feet (6,500 m2) center is located directly below the arch, between its legs. Although construction on the visitor center began at the same time as construction for the arch itself, it did not conclude until 1976 because of insufficient funding; however, the center opened with several exhibits on June 10, 1967. Access to the visitor center is provided through ramps adjacent to each leg of the arch.

The center houses offices, [mechanical rooms](http://en.wikipedia.org/wiki/Mechanical_room), and waiting areas for the arch trams, as well as its main attractions: the [Museum of Westward Expansion](http://en.wikipedia.org/wiki/Museum_of_Westward_Expansion) and two theaters displaying films about the arch. The older theater opened in May 1972; the newer theater, called the Odyssey Theatre, was constructed in the 1990s and features a four-story-tall screen. Its construction required the expansion of the underground complex, and workers had to excavate solid rock while keeping the disruption to a minimum so the museum could remain open. The museum houses several hundred exhibits about the United States' [westward expansion](http://en.wikipedia.org/wiki/Westward_expansion) in the 19th century and opened on August 10, 1977.

**Observation area**

Observation area on top of the Gateway Arch

Near the top of the arch, passengers exit the tram compartment and climb a slight grade to enter the arched observation area. There are 32 windows (16 per side), each measuring 7 by 27 inches (180 mm × 690 mm) and allowing views across the [Mississippi River](http://en.wikipedia.org/wiki/Mississippi_River) and southern [Illinois](http://en.wikipedia.org/wiki/Illinois) with its prominent [Mississippian culture](http://en.wikipedia.org/wiki/Mississippian_culture) mounds to the east at [Cahokia Mounds](http://en.wikipedia.org/wiki/Cahokia_Mounds), as well as the city of [St. Louis](http://en.wikipedia.org/wiki/St._Louis) and [St. Louis County](http://en.wikipedia.org/wiki/St._Louis_County%2C_Missouri) to the west beyond the city. The observation deck, 65 feet (20 m) long and 7 feet (2.1 m) wide, has a capacity of about 160 passengers—the capacity of four trams. On a clear day, one can see up to 30 miles (48 km) from atop the arch.

**Modes of ascension**

Interior of the tram capsule in the Gateway Arch

There are three modes of transportation up the arch: two sets of 1,076-step emergency stairs (one in each leg), a 12-passenger elevator to the 372-foot (113 m) height, and a tram in each leg.

Each tram is a chain of eight egg-shaped, five-seat compartments with a small window on the doors. As each tram has a capacity of 40 passengers and there are two trams, 80 passengers can be transported at one time, with trams departing from the ground every 10 minutes The cars swing like [Ferris-wheel](http://en.wikipedia.org/wiki/Ferris_wheel) cars as they ascend and descend the This fashion of movement gave rise to the idea of the tram as "half-Ferris wheel and half-elevator." The trip to the top takes four minutes, and the trip down takes three minutes. At the top, passengers disembark to a 65 feet (20 m)-long observation area.

Waiting area for the north tram

Because of a lack of funds in March 1962, the NPS did not accept bids for the arch's internal train system and considered discarding the idea. In May 1962, the quasi-governmental [Bi-State Development Agency](http://en.wikipedia.org/wiki/Bi-State_Development_Agency) proposed that it issue revenue bonds to obtain the required funds. The Department of the Interior and Bi-State entered into an agreement where Bi-State would construct and operate the tram. Bi-State would have to raise $1,977,750 for the construction of the tram system. It [retired the bonds](http://en.wiktionary.org/wiki/retire#Verb) by setting a $1 riding fee to the top. Two months later, the agency had already received 45 advance reservations for seats on the tram.

Bi-State put in $3.3 million [revenue bonds](http://en.wikipedia.org/wiki/Revenue_bond) and has operated the tram system since. The tram in the north leg entered operation in June 1967, but visitors were forced to endure three-hour long waits until April 21, 1976, when a reservation system was put in place. The south tram was completed by March 1968. Commemorative pins were awarded to the first 100,000 passengers. As of 2007, the trams have traveled 250,000 miles (400,000 km), conveying more than 25 million passengers.

**Incidents**

On July 8, 1970, a six-year-old boy, his mother, and two of her friends were trapped in a tram in the arch's south leg after the monument closed. According to the boy's mother, the group went up the arch around 9:30 p.m. [CDT](http://en.wikipedia.org/wiki/Central_Daylight_Time), but when the tram reached the de-boarding area, its doors did not open. The tram then reportedly traveled up to a storage area 50 feet (15 m) above the ground, and the power was switched off. One person was able to pry open the tram door and the four managed to reach a security guard for help after being trapped for about 45 minutes.

On July 21, 2007, a broken cable forced the south tram to be shut down, leaving only the north tram in service until repairs were completed in March 2008. Around 200 tourists were stuck inside the arch for up to three hours because the severed cable contacted a high-voltage rail, causing a [fuse](http://en.wikipedia.org/wiki/Electrical_fuse) to blow. The north tram was temporarily affected by the power outage as well, but some passengers were able to exit the arch through the emergency stairs and elevator. It was about two hours until all the tram riders safely descended, while those in the observation area at the time of the outage had to wait an additional hour before being able to travel back down. An arch official said the visitors, most of whom stayed calm during the ordeal, were not in any danger; they were later given refunds. The incident occurred while visitors in the arch were watching a fireworks display, and no one was seriously injured in the event. However, two people received medical treatment; one person needed [oxygen](http://en.wikipedia.org/wiki/Oxygen) and the other was [diabetic](http://en.wikipedia.org/wiki/Diabetic). Almost immediately after the tram returned to service, however, it was closed again for new repairs after an electrical switch broke. The incident, which occurred on March 14, 2008, was billed as a "bad coincidence."

On the morning of February 9, 2011, a National Park Service worker was injured while performing repairs on the south tram. The 55-year-old was working on the tram's electrical system when he was trapped between it and the arch wall for around 30 seconds, until being saved by other workers. Emergency officials treated the injured NPS employee at the arch's top before taking him to [Saint Louis University Hospital](http://en.wikipedia.org/wiki/Saint_Louis_University_Hospital) in serious condition.

On March 24, 2011, around one hundred visitors were stranded in the observation area for 45 minutes after the doors of the south tram refused to close. The tourists were safely brought down the arch in the north tram, which had been closed that week so officials could upgrade it with a new electronic transportation system. The National Park Service later attributed the malfunction to a computer glitch associated with the new system, which had already been implemented with the south tram. No one was hurt in the occurrence, but the arch suffered a slight loss in [spring break](http://en.wikipedia.org/wiki/Spring_break) tourism revenue.

Around 2:15 p.m. local time on June 16, 2011, the arch's north tram stalled due to a power outage. The tram became stuck about 200 feet (61 m) from the observation deck, and passengers eventually were told to climb the stairs to the observation area. It took National Park Service workers about one hour to manually pull the tram to the top, and the 40 trapped passengers were able to return down on the south tram, which had previously not been operating that day because there was not an abundance of visitors. An additional 120 people were at the observation deck at the time of the outage and also exited via the south tram. During the outage, visitors were stuck in the tram with neither lighting nor air conditioning. No one was seriously injured in the incident, but one visitor lost consciousness after suffering a [panic attack](http://en.wikipedia.org/wiki/Panic_attack), and a park ranger was taken away with minor injuries. The cause of the outage was not immediately known.

**Safety and security**

The arch in September 2007

On June 16, 1965, the [Federal Aviation Administration](http://en.wikipedia.org/wiki/Federal_Aviation_Administration) cautioned that aviators who flew between the legs of the arch would be fined and their licenses revoked; however, at least ten pilots have disobeyed this order, with the first occurrence on June 22, 1966. In 1973, Nikki Caplan was granted an FAA exception to fly a [hot air balloon](http://en.wikipedia.org/wiki/Hot_air_balloon) between the arch's legs as part of the [Great Forest Park Balloon Race](http://en.wikipedia.org/wiki/Great_Forest_Park_Balloon_Race). The St. Louis park director accompanied her on the flight as the balloon hit the arch and plummeted 70 feet at one point.

The 1995 [Oklahoma City bombing](http://en.wikipedia.org/wiki/Oklahoma_City_bombing) propelled the consideration of a [counterterrorism](http://en.wikipedia.org/wiki/Counterterrorism) program. Two years later, a little over $1 million was granted to institute such a program. Park officials were trained to note the activity of tourists, and inconspicuous electronic detection devices were installed. After the [September 11 attacks](http://en.wikipedia.org/wiki/September_11_attacks) in 2001, security efforts were more prominent, security checkpoints moved to the entrance of the visitor center. At the checkpoints, visitors are screened by [magnetometers](http://en.wikipedia.org/wiki/Magnetometers) and [x-ray](http://en.wikipedia.org/wiki/X-ray) equipment, devices which have been in place since 1997.

The arch also became one of several U.S. monuments placed under [restricted airspace](http://en.wikipedia.org/wiki/Restricted_airspace) during 2002 [Fourth of July](http://en.wikipedia.org/wiki/Fourth_of_July) celebrations. In 2003, 10-feet long, 32-inch high, 4100-lb movable [Jersey barriers](http://en.wikipedia.org/wiki/Jersey_barrier) were installed to impede terrorist attacks on the arch. Later that year, it was announced that these walls were to be replaced by concrete posts encased in metal to be more harmonious with the steel color of the arch. The movable [bollards](http://en.wikipedia.org/wiki/Bollard) can be manipulated from the park's dispatch center, which has also been upgraded.

In 2006, arch officials hired a "physical security specialist," replacing a law enforcement officer. The responsibilities of the specialist include [risk assessment](http://en.wikipedia.org/wiki/Risk_assessment), testing the park's security system, increasing security awareness of other employees, and working with other government agencies to improve the arch's security procedures.

**Stunts and accidents**

In 1976, [U.S. Army](http://en.wikipedia.org/wiki/U.S._Army) [paratroopers](http://en.wikipedia.org/wiki/Paratrooper) were permitted to fly through the legs of the arch as part of [Fourth of July](http://en.wikipedia.org/wiki/Fourth_of_July) festivities. However, the arch has been a target of various other [stunt performers](http://en.wikipedia.org/wiki/Stunt_performer), and while such feats are generally forbidden, several people have parachuted to or from the arch regardless. In June 1980, the National Park Service declined a request by television producers to have a performer jump from the arch; a similar appeal by stuntman Dan Koko was also turned away in February 1986. Koko, who was a [stunt double](http://en.wikipedia.org/wiki/Stunt_double) for [*Superman*](http://en.wikipedia.org/wiki/Superman_%28film%29), wanted to perform the leap during Fourth of July celebrations.

**1980 accident**

On November 22, 1980, at about 8:45 a.m. CST, 33-year-old Kenneth Swyers of [Overland, Missouri](http://en.wikipedia.org/wiki/Overland%2C_Missouri), parachuted on to the top of the arch. (His plan was to release his main parachute and then jump off the arch using his reserve parachute, a "BASE" jump). Unfortunately, after landing the wind blew him to the side, and he slid down the north leg to his death. The accident was witnessed by several people, including Swyers' wife, also a parachutist. She said her husband "was not a hot dog, daredevil skydiver" and that he had prepared for the jump two weeks in advance. Swyers, who had made over 1,600 jumps before the incident, was reported by one witness to have "landed very well" on the top of the arch, but "had no footing." Swyers was reportedly blown to the top of the arch by the wind and was unable to save himself when his reserve parachute failed to deploy. The Federal Aviation Administration said the jump was unauthorized, and investigated the pilot involved in the incident.

On December 27, 1980, St. Louis television station [KTVI](http://en.wikipedia.org/wiki/KTVI) reported receiving calls from supposed witnesses of another stunt landing. The alleged parachutist, who claimed to be a retired professional stuntman, was said to be wearing a [Santa Claus](http://en.wikipedia.org/wiki/Santa_Claus) costume when he jumped off an airplane around 8:00 a.m. CST, parachuted onto the arch, grasped the monument's beacon, and used the same chute to glide down unharmed. KTVI said it was told the feat was done as an act of homage to Swyers, and "apparently was a combination of a dare, a drunk and a tribute." On the day after the alleged incident, authorities declared the jump a hoax. A spokesperson for the [St. Louis Metropolitan Police Department](http://en.wikipedia.org/wiki/St._Louis_Metropolitan_Police_Department) said no calls were received about the jump until after it was broadcast on the news, and the Federal Aviation Administration said the two calls it had received were very similar. One caller also left an out-of-service phone number, while the other never followed up with investigators. Arch officials said they did not witness any such jump, and photos provided by the alleged parachutist were unclear.

**1992 stunt**

Aerial shot of the arch

On September 14, 1992, 25-year-old John C. Vincent climbed to the top of the Gateway Arch using [suction cups](http://en.wikipedia.org/wiki/Suction_cup) and proceeded to parachute back to the ground. He was later charged with two [misdemeanors](http://en.wikipedia.org/wiki/Misdemeanor): climbing a national monument and parachuting in a national park. [Federal prosecutor](http://en.wikipedia.org/wiki/United_States_Attorney) Stephen Higgins called the act a "great stunt" but said it was "something the Park Service doesn't take lightly." Vincent, a construction worker and diver from [Harvey](http://en.wikipedia.org/wiki/Harvey%2C_Louisiana), [Louisiana](http://en.wikipedia.org/wiki/Louisiana), said he did it "just for the excitement, just for the thrill," and had previously parachuted off the [World Trade Center](http://en.wikipedia.org/wiki/World_Trade_Center) in May 1991. He said that scaling the arch "wasn't that hard" and had considered a jump off the monument for a few months. In an interview, Vincent said he visited the arch's observation area a month before the stunt, to see if he could use a maintenance hatch for accessing monument's peak. Due to the heavy security, he instead decided to climb up the arch's exterior using suction cups, which he had used before to scale shorter buildings. Dressed in black, Vincent began crawling up the arch around 3:30 a.m. CST on September 14 and arrived undetected at the top around 5:45 a.m., taking an additional 75 minutes to rest and take photos before finally jumping. During this time, he was seen by two traffic reporters inside the [One Metropolitan Square](http://en.wikipedia.org/wiki/One_Metropolitan_Square) skyscraper.

Vincent was also spotted mid-air by Deryl Stone, a Chief Ranger for the National Park Service. Stone reported seeing Vincent grab his parachute after landing and run to a nearby car, which quickly drove away. However, authorities were able to detain two men on the ground who had been videotaping the jump. Stone said 37-year-old Ronald Carroll and 27-year-old Robert Weinzetl, both St. Louis residents, were found with a wireless communication headset and a video camera, as well as a still camera with a [telephoto lens](http://en.wikipedia.org/wiki/Telephoto_lens). The two were also charged with two misdemeanors: disorderly conduct and commercial photography in a national park. Vincent later turned himself in and initially pleaded not guilty to the charges against him However, he eventually accepted a guilty plea deal in which he testified against Carroll and Weinzetl, revealing that the two consented to recording the jump during a meeting of all three on the day before his stunt occurred. [Federal magistrate judge](http://en.wikipedia.org/wiki/United_States_magistrate_judge) David D. Noce ruled on January 28, 1993 that Carroll had been involved in a [conspiracy](http://en.wikipedia.org/wiki/Conspiracy_%28crime%29) and was guilty of both misdemeanor charges; the charges against Weinzetl had been dropped by federal attorneys. In his decision, Noce stated, "There are places in our country where the sufficiently skilled can savor the exhilaration and personal satisfaction of accomplishing courageous and intrepid acts, of reaching dreamed-of heights and for coursing dangerous adventures," but added that other places are designed for "the exhilaration of mere observation and for the appreciation of the imaginings and the works of others. The St. Louis Arch and the grounds of the Jefferson National Expansion Memorial are in the latter category."

**Symbolism and culture**

The Gateway Arch packs a significant symbolic wallop just by standing there. But the Arch has a mission greater than being visually affecting. Its shape and monumental size suggest movement through time and space, and invite inquiry into the complex, fascinating story of our national expansion.

Robert W. Duffy of the [*St. Louis Post-Dispatch*](http://en.wikipedia.org/wiki/St._Louis_Post-Dispatch), October 4, 2003

The Gateway Arch as seen from southern leg

Built as a monument to the westward expansion of the United States, the arch typifies "the pioneer spirit of the men and women who won the West, and those of a latter day to strive on other frontiers." The arch has become the iconic image of St. Louis, appearing in many parts of city culture. In 1968, three years after the monument's opening, the St. Louis phone directory contained 65 corporations with "Gateway" in their title and 17 with "Arch". Arches also appeared over gas stations and drive-in restaurants. In the 1970s, a local sports team adopted the name "Fighting Arches". Robert S. Chandler, an NPS superintendent, said, "Most [visitors] are awed by the size and scale of the Arch, but they don't understand what it's all about.... Too many people see it as just a symbol of the city of St. Louis."

The arch has also appeared as a symbol of the State of Missouri. On November 22, 2002, at the [Missouri State Capitol](http://en.wikipedia.org/wiki/Missouri_State_Capitol), Lori Hauser Holden, wife of then [Governor](http://en.wikipedia.org/wiki/List_of_Governors_of_Missouri) [Bob Holden](http://en.wikipedia.org/wiki/Bob_Holden) uncovered the winning design for a Missouri coin design competition as part of the [Fifty States Commemorative Coin Program](http://en.wikipedia.org/wiki/50_State_quarters#State_quarter_program). Designed by [watercolorist](http://en.wikipedia.org/wiki/Watercolorist) [Paul Jackson](http://en.wikipedia.org/wiki/Paul_Jackson_%28artist%29), the coin portrays "three members of the [Lewis and Clark expedition](http://en.wikipedia.org/wiki/Lewis_and_Clark_expedition) paddling a boat on the Missouri River upon returning to St. Louis" with the arch as the backdrop. Holden said that the arch was "a symbol for the entire state .... Four million visitors each year see the Arch. [The coin] will help make it even more loved worldwide." A special license plate designed by [Arnold Worldwide](http://en.wikipedia.org/wiki/Arnold_Worldwide) featured the arch, labeled with "Gateway to the West." Profits earned from selling the plates would fund the museum and other educational components of the arch.

Louchheim wrote that although the arch "has a simplicity which should guarantee timeliness", it is entirely modern as well because of the innovative design and its scientific considerations. In [*The Dallas Morning News*](http://en.wikipedia.org/wiki/The_Dallas_Morning_News), architectural critic David Dillon opined that the arch exists not as a functional edifice but as a symbol of "boundless American optimism". He articulates the arch's multiple "moods"—"reflective in sunlight, soft and pewterish in mist; crisp as a line drawing one moment, chimerical the next"—as a way the arch has "paid for itself many times over in wonder".

The Arch sits just above the Mississippi River

In February 1997, Dutch composer [Peter Schat](http://en.wikipedia.org/wiki/Peter_Schat) was struck by the skill of the [Saint Louis Symphony Orchestra](http://en.wikipedia.org/wiki/Saint_Louis_Symphony_Orchestra) as they performed one of his compositions under the conduct of [Hans Vonk](http://en.wikipedia.org/wiki/Hans_Vonk_%28conductor%29). He commissioned the orchestra, with plans "to create a musical equivalent to Eero Saarinen's monumental Gateway Arch." By October of the same year, he finished the composition, which was called *Arch Music for St. Louis*, Op. 44. It premiered on January 8, 1999, at the [Powell Symphony Hall](http://en.wikipedia.org/wiki/Powell_Symphony_Hall). Since Schat did not ascend the arch due to his fear of heights, he used his creativity to depict in music someone riding a tram to the top of the arch:

[T]he traveler head[s] heavenward in his tiny cabin—an imaginary journey intones. Propelled by the motor of a syncopated rhythm (*Syncopated Allegro*), the traveler/listener is hurled, with gigantic force and in one continual movement, to a summit of tranquility of an *Adagio*, his soul—the violin—contemplates the panorama of endless open spaces, the air, the shimmering river and the silently bustling city far below. . . . Forging a musical arch of about fifteen minutes that will do justice to Eero Saarinen's technically and esthetically stunning achievement (a masterpiece, incidentally, that he never saw) requires compositional material with the tensile strength of steel. This metal can be found in the inexhaustibly rich mine of chromatic tonality. This tonality is to diatonic tonality as steel is to wood. Saarinen could never have built this monument out of wood.

[Paul Muldoon](http://en.wikipedia.org/wiki/Paul_Muldoon)'s "The Stoic" also references the Gateway Arch. The poem, "an elegy for a miscarried fetus," describes Muldoon's ordeal standing under the Gateway Arch after his wife telephoned and informed him that the baby they were expecting had been miscarried. During the writing process, Muldoon said, "I've this notion ... that there might be some connection between standing underneath [the Gateway Arch] ... and feeling something of the despair that figures in [Ozymandias](http://en.wikipedia.org/wiki/Ozymandias), and the bleakness and just the terrible isolation of this moment.... I see the Gateway Arch as being a modem [[*sic*](http://en.wikipedia.org/wiki/Sic)] version of the two vast and trunkless legs of stone." A portion of the published poem read: "Rather than shudder like a bow of yew or the matchless Osage orange / at the thought of our child already lost from view / before it had quite come into range, / I steadied myself under the Gateway Arch." Iain Twiddy of *Oxford Journals* wrote that the arch "echoes the 'iced-over canal' of the poem's opening, or the birth canal" and that the mirror-image rhyme scheme of the poem, *abab cdcd efgf fgfe dcdc baba*, is an allusion to the Gateway Arch or the "cervical opening of the poem, as a monument to the dead."

Some have questioned whether St. Louis really was—as Saarinen said—the "Gateway to the West"; [Kansas City](http://en.wikipedia.org/wiki/Kansas_City%2C_Missouri)-born "deadline poet" [Calvin Trillin](http://en.wikipedia.org/wiki/Calvin_Trillin) has commented on this when comparing himself with poet [T. S. Eliot](http://en.wikipedia.org/wiki/T._S._Eliot), a St. Louis native:

"I know you're thinking that there are considerable differences between T.S. Eliot and me. Yes, it is true that he was from St. Louis, which started calling itself the Gateway to the West after Eero Saarinen's Gateway Arch was erected, and I'm from Kansas City, where people think of St. Louis not as the Gateway to the West but as the Exit from the East."

**Awards and recognitions**

In 1966, the arch was given a Special Award for Excellence from the [American Institute of Steel Construction](http://en.wikipedia.org/wiki/American_Institute_of_Steel_Construction) for being "an outstanding achievement in technology and aesthetics." On February 9, 1967, the arch received the [Outstanding Civil Engineering Achievement Award](http://en.wikipedia.org/wiki/American_Society_of_Civil_Engineers#Outstanding_Projects_and_Leaders_.28OPAL.29_awards) of 1967 from the [American Society of Civil Engineers](http://en.wikipedia.org/wiki/American_Society_of_Civil_Engineers). The arch was once among [*Travel + Leisure*](http://en.wikipedia.org/wiki/Travel_%2B_Leisure)'s unofficial rankings for the most-visited attraction in the world, after [Lenin's Tomb](http://en.wikipedia.org/wiki/Lenin%27s_Mausoleum), [Disney World](http://en.wikipedia.org/wiki/Walt_Disney_World_Resort), [Disneyland](http://en.wikipedia.org/wiki/Disneyland), and the [Eiffel Tower](http://en.wikipedia.org/wiki/Eiffel_Tower). On February 22, 1990, the arch received the [American Institute of Architects](http://en.wikipedia.org/wiki/American_Institute_of_Architects)' (AIA) Twenty-Five Year Award for its "enduring significance that has withstood the test of time." It was declared "a symbolic bridge between East and West, past and future, engineering and art" that "embodies the boundless optimism of a growing nation." In 2007, the arch was ranked fourteenth on the AIA's "[America's Favorite Architecture](http://en.wikipedia.org/wiki/America%27s_Favorite_Architecture)" list.

**Maintenance**

Welds on the arch's skin seal gaps between 4-by-8-foot sheets of stainless steel. Graffiti is scratched on the lower five to seven feet of the monument.

The first act of vandalism was committed in June 1968; the vandals etched their names on various parts of the arch. The 1968 expenditure for repairing damage from vandalism was $10,000. The arch was first targeted by [graffiti artists](http://en.wikipedia.org/wiki/Graffiti_artist) on March 5, 1969, but the vandalism was easily removed. In 2010, signs of corrosion were reported at the upper regions of the stainless steel surface. Carbon steel in the north leg has been rusting, possibly a result of water accumulation, a side effect of leaky [welds](http://en.wikipedia.org/wiki/Welding) in an environment that often causes rain inside. Maintenance workers currently use mops and a temporary setup of water containers to mitigate the problem. According to NPS documents, the corrosion and rust pose no safety concerns.

In 2006, architectural specialists studied the corrosion on the arch and suggested additional examination. A 2010 Historic Structure Report was conducted and found that the corrosion required a more comprehensive study. In September 2010, the NPS granted [Wiss, Janney, Elstner Associates, Inc.](http://en.wikipedia.org/wiki/Wiss%2C_Janney%2C_Elstner_Associates%2C_Inc.) a contract for a structural study that would "gather data about the condition of the Arch to enable experts to develop and implement the right long-term solutions."

**See also**

|  |  |
| --- | --- |
|  | [***Missouri portal***](http://en.wikipedia.org/wiki/Portal%3AMissouri) |

* [Eero Saarinen](http://en.wikipedia.org/wiki/Eero_Saarinen)
* [Lily Swann Saarinen](http://en.wikipedia.org/wiki/Lilian_Swann_Saarinen)
* [Architecture of St. Louis](http://en.wikipedia.org/wiki/Architecture_of_St._Louis)
* [List of tallest buildings in St. Louis](http://en.wikipedia.org/wiki/List_of_tallest_buildings_in_St._Louis)
* [Jefferson National Expansion Memorial](http://en.wikipedia.org/wiki/Jefferson_National_Expansion_Memorial)
* [List of National Historic Landmarks in Missouri](http://en.wikipedia.org/wiki/List_of_National_Historic_Landmarks_in_Missouri)
* [National Register of Historic Places listings in St. Louis, Missouri](http://en.wikipedia.org/wiki/National_Register_of_Historic_Places_listings_in_St._Louis%2C_Missouri)

This page was last modified on 25 February 2013 at 16:37.