Colorado Street Bridge
Spanning the Arroyo Seco at Colorado Boulevard
Pasadena
Los Angeles County
California

HAER No. CA-58

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

PHOTOGRAPHS

Historic American Engineering Record
Western Regional Office
National Park Service
U.S. Department of the Interior
San Francisco, California 94102

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HISTORIC AMERICAN ENGINEERING RECORD
COLORADO STREET BRIDGE
HAER No. CA-58

Location:	Spanning the Arroyo Seco at Colorado Boulevard Pasadena, Los Angeles County, California
Quad:	Pasadena, CA
UTM:	11.392710.3778610
Date of Construction:	1912-1913
Engineer:	Joseph Alexander Low Waddell (Design modified by J.D. Mercereau, Builder, and C.K. Allen, Consulting Engineer)
Builder:	John Drake Mercereau
Present Owner:	City of Pasadena 100 North Garfield Avenue Pasadena, California
Present Use:	Vehicular and pedestrian bridge
Significance:	The Colorado Street Bridge is an eleven-arched reinforced concrete structure, the longest and highest bridge of its time. It was the first high bridge across the Arroyo Seco, and is an important visual landmark in Pasadena. Through its design and construction, the bridge represents the advancing concrete technology of the twentieth century and the ornamental aesthetic of the late nineteenth century. The Colorado Street Bridge was designed by one of the nation's foremost bridge engineers, and constructed by a well-known California builder. The local community played an important role in planning and funding construction.
Report Prepared by:	Deborah Slaton Architect/Historian Wiss, Janney, Elstner Associates, Inc. 29 North Wacker Drive, Suite 555 Chicago, Illinois 60606
Date:	December 1988

PART I: HISTORICAL INFORMATION

A. History of the Arroyo Seco

The Colorado Street Bridge crosses the Arroyo Seco, a large ravine and riverbed which follows the course of a tributary of the Los Angeles River. The Arroyo begins near the north slope of Mount Wilson, and traverses a 20-mile course across hills and lowlands to the Los Angeles River. The name Arroyo Seco means "dry wash" in Spanish, and the winter-flowing river is nearly dry in the summer and autumn of each year. The Arroyo Seco has long been known for its springs, groves and meadows, and as a wildlife sanctuary.

Early settlers of the Arroyo included the Gabrielino Shoshone Indians. The Arroyo is at the western fringe of a region settled by the Indiana Colony, which arrived in Pasadena in 1874. The remains of adobe structures built during the 1880s indicate that Mexican settlers attempted to farm and raise cattle in the area, which was called Rancho San Pasqual. By the turn of the century, houses in the Craftsman style for which Pasadena was to become famous began to appear in the Arroyo, and the area became a bustling center of the Arts and Crafts movement.

However, the Arroyo was never heavily settled. From the early 1880s, an active preservation movement sought to conserve its natural environment and wildlife. While early settlers trapped game and held shooting contests, the Arroyo gradually became more popular as a bird and wildlife preserve, and as a park and picnic area. Orange groves, olive orchards and extensive gardens were planted along the hillsides.

During the late 1880s and 1890s, improvements were made near the base of the Arroyo by its principal landowner, J.W. Scoville. Scoville was a prominent citizen of Chicago and Oak Park, Illinois, who first came to Pasadena in 1883 and settled there permanently in 1889. He was well-known for his philanthropic efforts on behalf of the communities in which he lived. Among his interests was the creation of public parks along the Arroyo.

Scoville and his wife had a large house at the northwest corner of Colorado Street and Orange Grove Avenue, and owned all of the land west across Arroyo Seco to the crest of hills beyond. While he was interested in creating parks so that the public could enjoy the beauty of the Arroyo, Scoville was also responsible for most of the early construction in the ravine. In the late 1880s, he built a bridge, dam, and power station approximately 100 feet north of the present bridge. Rocks from the stream bed were used to build these structures. The dam created a beautiful lake on the property, and a nearby pump house provided water to the orange trees on the hillside above. The power house, with its water turbine, was built above the dam on the east side of the ravine. On west side of the ravine, just above the dam, the Scovilles built a shooting lodge and terrace of river rock. The Scovilles also built the first bridge over the Arroyo at this location, as described below. Eventually, rock and rubble from winter floods filled the lake, and passed over the top of the dam. However, the Scoville Bridge was used to cross the Arroyo until completion of the Colorado Street Bridge in 1913.

The building boom of the mid-1880s was followed by a financial depression in Pasadena. Scoville, a firm believer in practical charity, created projects which would provide jobs for the local unemployed. From 1887 to 1893, he hired workers to construct rockwork embankments on the hills of the Arroyo Seco near the dam. Workers were paid the then generous sum of $1.00 per day, and the number of days a person was allowed to work was dependent in part on his need and the size of his family. The embankments were intended to contain the river, which flooded its banks every rainy season. The rock walls were located on the north and south sides of the Colorado Street Bridge, between Arroyo Boulevard and the western ridge of the Arroyo Seco.

In the early 1900s, the San Gabriel Land and Water Company began granting rights to loggers to harvest timber in the Arroyo. This practice was opposed by conservationists including Charles F. Lummis, who had begun his efforts to preserve the Arroyo in 1885 and became the first president of the Arroyo Seco Foundation. In an effort to conserve the area as open land, sixty acres in the bed of the Arroyo were designated as a park on March 25, 1923. [1] Attempts to preserve the Arroyo as parkland have generally been successful ever since.

B. History of the Colorado Street Bridge

1. The Need for a Bridge

In the Pasadena Community Book of 1955, a crossing of the Arroyo in 1885 was described by Mrs. Marguerite Fuller Dobson:

> Never will I forget the thrill of that ride and the little twinge of fright as we climbed to our seats on that high-swung vehicle....In those days there were not bridges over the Arroyo and driving on the narrow road down the steep hill into the bed of the Arroyo required very skillful handling of the lively horses and the swaying coach. We splashed across the stream and up the other side of the Arroyo and onto Colorado Street.... [2]

In order to avoid the very steep but direct crossing at Colorado Boulevard, travelers could instead cross far to the north or south of this part the city. In the rainy season, the Arroyo was simply not passable for months at a time.

The first bridge across the Arroyo at Colorado Boulevard was constructed in the late 1880s. This was a trestle bridge constructed near the bottom of the Arroyo by the Scoville family. The Scoville bridge stood beneath the present location of the Colorado Street Bridge, and was built from a segment of railway bridge trestle left over from construction of a Santa Fe Railway bridge nearby. The trestle was placed upside-down across the stream bed, and set in a concrete foundation on either side. Scoville's original bridge survived until the flood of 1914, when the trestle was carried all the way down the Arroyo Seco and into the Los Angeles River. Only part of one span was ever located. [3]

Other bridges along the Arroyo were constructed in the 1880s and 1890s, but none provided an efficient solution for travelers between Pasadena and Los Angeles. Late in the year 1886, a suspension bridge over the Arroyo was constructed by the West Pasadena Street Railway company. This bridge, which was 18 feet wide and 80 feet above the riverbed, provided a route between Pasadena and Linda Vista. A horse-drawn rail car operated over the bridge, which was found to be unprofitable and was demolished in 1892. In 1898, a private bridge was constructed across the Arroyo at the site of La Loma Bridge. This bridge was later replaced by a public wood and steel bridge.

The crossing down the steep embankment, across the narrow trestle bridge, and up the steep hillside, was arduous for horses and pedestrians and even more difficult for the increasingly popular motor car. By 1915, Pasadena claimed more autos per capita than any other city in the world, 5,000 for 40,000 persons. [4] As far as vehicular transportation was concerned, the Colorado Street Bridge was constructed out of necessity.

2. Planning and Fundraising

The Pasadena Board of Trade, under the guidance of executive director Edwin Sorver, led community efforts for a new bridge across the Arroyo. Sorver wanted to link Pasadena with Los Angeles, and the idea of a bridge was formally considered by the city in 1909. The Pasadena City Council first proposed a new low bridge, since the old Scoville bridge was inadequate to handle traffic. Highway Commissioner C.D. Daggett estimated the construction cost of a new bridge at about $250,000. The new bridge was to be part of the county boulevard system, so the county supervisors appropriated $100,000 to match the funding provided by the City of Pasadena. Because the bridge would reach Los Angeles at its western end, Sorver then approached the Los Angeles City Council, which agreed to provide $98,640 for construction and ownership of western right of way. [5]

In the Spring of 1912, Pasadena voters overwhelmingly approved a 40-year, $100,000 bond issue to fund their city's part of the construction. With its long-term payment scheme, the measure passed easily, but still did not provide enough money for construction and right of way costs. The city made a commitment to finance the extra funding, and the decision was finally made to construct a high bridge at the level of the city streets rather than a low bridge near the bottom of the Arroyo. The site selected for construction of the new bridge was just south of Scoville Bridge, over one of steepest parts of gorge. This route led directly onto Orange Grove and Colorado Boulevards. The right of way property was purchased, principally from the Scoville family, and selection of an engineer began.

3. The Engineer and the Design

Final competition to design the new bridge over the Arroyo Seco included three firms: the Young Construction Company of Los Angeles; the engineering firm of Parker and Mayberry of Los Angeles; and the engineering firm of Waddell and Harrington of Kansas City, Missouri. The commission to design the Colorado Street Bridge was awarded to the latter firm under the direction of Dr. John Alexander Low Waddell, an internationally-known bridge engineer. Waddell was born at Port Hope, Ontario, and educated at Renssalaer Polytechnic Institute at Troy, New York. After teaching engineering at the Imperial University in Tokyo, Japan, Waddell returned to the United States and launched a career as a bridge engineer in 1887. He achieved great success in this country and was also awarded many foreign decorations, being knighted by the Emperor of Japan in 1888; decorated by Grand Duchess Olga of Russia in 1907; and honored by Japan in 1921, China in 1922, and by the King of Italy in 1923 with rank of Cavaliere. In 1931, the American Association of Engineers awarded him the Clausen Gold Metal for having done the most to advance the interests of engineering in this country in the preceding 50 years.[6]

Waddell and Harrington were responsible for the design of many bridges in the United States during the late nineteenth and early twentieth centuries. Examples of their work include the Columbia River Interstate Bridge between Vancouver, Washington, and Portland, Oregon; a series of bridges in Tacoma, Washington, and many other bridges. Waddell and Harrington also published widely. Waddell in particular wrote numerous articles and books about bridge design, the engineering profession, and engineering education.

Waddell was the originator of the vertical lift span which became an extremely popular method of construction for bridges. More importantly in the case of the Colorado Street Bridge, Waddell had already dealt with the problem of "intermittent foundation." In designing the Colorado Street Bridge, Waddell was faced with two major problems: the proposed direct east-west crossing was not over an area of continuous sound substrate, and the east bank of the Arroyo was thirty feet higher than the west. The bedrock under the bridge is irregularly distributed, changing from a wide to narrow shelf.

Waddell's bridge was to follow the most direct east-west route across the Arroyo. His design for the bridge had 11 principal arch supports, the highest of which was 223 feet wide at the base of the span and rose 149 feet above the riverbed. The piers were located to spread the load of the bridge evenly. The original design addressed the uneven height of the banks by proposing to dig out the east bank, a scheme which was strongly opposed by the local citizenry and which was not utilized in the final design. [7]

Waddell's decision to design and build the bridge in reinforced concrete reflects the increasing popularity of the medium for large-scale construction projects. Reinforced concrete, which had been developed in France as early as the 1850s, was used for building construction in the United States by the 1860s but did not come into common use until after 1880. At that time, innovations developed by Ernest L. Ransome made the widespread use of reinforced concrete more practicable. In 1884, Ransome patented his idea for the use of cold-twisted, square reinforcing bars. Six years later, Ransome built the Stanford Museum in San Francisco, a reinforced concrete building which survived the 1906 earthquake with very little damage. By the 1890s, the use of reinforced concrete for buildings and bridges was gaining wide acceptance in this country. With the invention of the horizontal rotary kiln, cheaper and more uniform cement could be produced. This innovation helped lead to a rapid increase in the use of concrete after the turn of the century.[8] With increasingly competitive costs, concrete could provide low maintenance, durability, and the opportunity for ornamental designs on exterior surfaces. By 1909, the journal Architect and Engineer noted that "about everything except wearing apparel and table utensils is now made of reinforced concrete."[9]

In his book De Pontibus, published in 1905, Waddell defined three classes of highway bridges: Class A, which are subjected to continuous application of heavy loads; Class B, which are subjected to occasional application of heavy loads; and Class C, which carry only light traffic.[10] The Colorado Street Bridge was designed for a live load in accordance with Waddell's Class B bridge type, assuming a load varying from 123 psf for a loaded length of 100 feet, up to a maximum load of 166 psf.[11] The design calculations carefully addressed various combinations of partial loadings of single and adjacent spans.

The cost of construction of Waddell's design was estimated at $241,640, about $6,000 more than had been anticipated by the city. When Waddell insisted that costs could not safely be reduced, Sorver sought the assistance of John Drake Mercereau, a Los Angeles contractor who had built the pier structures at the Hermosa, Venice, and Huntington beaches in California. Mercereau had submitted the low bid for construction of Waddell's design, and been awarded the contract with the stipulation that he attempt to reduce the cost of construction. Mercereau worked with Waddell and Harrington's resident consulting engineer, C.K. Allen, to revise and modify Waddell's design.

The bridge was redesigned with a curve to take advantage of stronger substrate. The eastern 813 feet of the bridge were placed on a center line curve with a 916 foot radius, and the central angle of the curve was approximately 52 degrees. The bridge was 1,467-1/2 feet long and 28 feet wide, with two five-foot walkways. The revised plans called for a uniform grade of 2.655% descending from east to west, less than was originally planned. [12] The revised design created a bridge which was therefore longer but less complicated than Waddell's original design, and could be built at a lower cost.

An Engineering News article published soon after the bridge was completed noted that the bridge design "has many points of interest, particularly low cost, a curved plan and a peculiar system of centering." [13] Each pier is formed by two shafts on separate footings. The shafts are connected below the spring of the arch by concrete diaphragms which vary from six to eight feet in width in different spans. The tops of the shafts are connected by two transverse girders which frame into the shafts and support the roadway slab. On the curved section of the bridge, the inside of the curve has a single shaft while the outside has a double shaft. The piers along the curve were designed with a trapezoidal section. This permitted the arches to follow straight line chords while the roadway was curved.

The lightness of the design was achieved through the detailing of the arch spans, which were all of the same general form but varied in size. Each arch is made up of two parabolic ribs which are approximately square in section. These ribs carry spandrel columns, which in turn carry transverse and longitudinal beams into which the reinforced concrete slabs are framed. [14] The arch ribs in each span of the bridge are tied together by six tie beams regularly placed in the span, and by cross girders which are part of the floor system.

The concrete deck was constructed with slab thicknesses ranging from nine to 11 inches in the various spans. The roadway was paved with a three-inch thick coating of asphalt. The concrete slab sidewalks were constructed with a thickness of 4-1/2 inches. Refuge areas with seating were provided along the outer edge of the sidewalk at each side of the bridge. At the outer edge of the walk, an ornamental fascia girder 18 inches in depth supported an ornamental artificial stone balustrade with urn-shaped balusters. At each pier, artificial stone buttresses were surmounted by ornamental cast iron light posts. Each post had five large lights, with 18 inch diameter globes at the center and 12 inch diameter globes at the brackets.

4. Construction of the Bridge

Work on the new bridge began in mid-July of 1912 on the eastern slopes, under a contract let to the Mercereau Bridge & Construction Company for a lump-sum construction cost of $188,000. [15] The project was supervised by F.W. Crocker of the Mercereau firm. Construction took 18 months, and reportedly employed up to 40 to 100 men at a time. Workers were paid $2.00 to $4.50 per day, excellent pay in 1912.

Timber for construction of the formwork was brought down the gorge's steep sides by horse cart. Gravel for the concrete was carried from the bed and hillsides of the Arroyo. Steel reinforcing and timbers were hoisted by horses to the level of the work. Hundreds of wooden forms were built to construct the many arches, girders, spandrels, and decorative details. [16]

The centering for the arches consisted of 8 x 8 inch timber posts with 2 x 6 inch bracing, and 12 x 12 inch timber for caps. The forms for tie beams between the arch ribs were carried on small wood trusses. The formwork for the concrete consisted of planed-timber forms. Special sheet metal forms were used for capitals on the spandrel columns and other decorative projections. [17]

One of the cost-saving factors introduced into construction of the bridge was the limitation of equipment at the site to only what was essential to construction. A concrete mixing plant was set up at the site, with a gasoline-driven concrete mixer. Concrete was poured, a half yard at a time, from this single cement mixer. A rail track carrying dump cars was constructed on a trestle supported on the wood framework, and later on the partially-finished bridge. The dump cars, pulled along this track by an engine and cable, were used to transport concrete along the bridge. The concrete was poured from the cars into a movable distribution hopper, and then into steel troughs from which it was placed in the formwork. Usually, a team of two men worked the concrete mixer, with four to six men placing the concrete in the forms. This six to eight-man team could place as much as 120 cubic yards of concrete in a day. [18]

Approximately 11,000 cubic yards of concrete and 600 tons of reinforcement were used in construction of the bridge. The specifications called for the concrete in the upper parts of the bridge to consist of one part cement to 2 parts sand to 4 parts stone or gravel sized to pass a one-inch ring. The mix was varied in the piers, with a higher proportion of larger stone or gravel incorporated in the concrete. Reinforcing was composed of corrugated bars rolled from open-hearth steel. Ultimate strengths of 60,000 to 70,000 pounds, with a minimum elastic limit of 35,000 pounds, were required. [19]

In order to limit the cost of construction, no special finish was specified for the surface of the concrete. However, the formwork was to be carefully made to provide a pleasing surface for the finished concrete, with any treatments to be undertaken as desired in the future.

Three men were killed during construction of the bridge, and a fourth later died of injuries received at the job. Work conditions were difficult, as the wet hillsides provided slippery footing. The Colorado Street Bridge was completed in December, 1913. Construction had cost $235,430, of which Los Angeles County had paid about $98,640. [20] About $13,000 in subscriptions were paid by the towns of San Rafael Heights and Pasadena. [21]

The dedication ceremony at the opening of the bridge was held on December 13, 1913. A crowd of 3,000 persons attended the ceremony. Conspicuous by their absence were Mercereau, who had died before construction was completed, and Waddell, who may have objected to the modification of his design. After the ceremony, a procession of decorated cars led by Chamber of Commerce President Edwin Sorver drove across the bridge to the music of high school bands. The attendees enjoyed views of the Arroyo and mountains, and contemporary publications lauded the beauty and efficiency of the structure. The Colorado Street Bridge rapidly became a source of pride and admiration for Pasadenans.

5. **Alterations to the Colorado Street Bridge**

In 1915, the eastern access of the Colorado Street Bridge was widened for safety reasons. The $80,000 cost of the work was borne by subscription, with much of the funding provided by nearby residents including the Scoville family.

A few years after the bridge was finished, the first suicide victim jumped to his death from the structure. In following years, 95 persons followed suit, including many during the Depression era: nine in 1933, 10 in 1934, and 12 in 1935. Rather than detract from the appearance of the structure by adding a fence, the city considered having a nine-man police team stationed on the bridge, or policemen disguised as ice-cream vendors at either end of the structure. In 1937 a woman threw her small child over the edge of the bridge and jumped off herself. The child fell into a tree and survived, and the city immediately instituted measures to provide a fence.

City engineer Harvey Hincks designed five different fences for the bridge, and the City Council alloted $7,500 to build one of the designs. The woven steel wire fence extended seven feet in height along either side of the bridge. This was later replaced with a galvanized steel fence, and the original balusters were removed. However, some suicide victims still managed to jump off.

In 1934, the Colorado Street Bridge was declared part of the state highway system. One year later, it was declared obsolete and Works Progress Administration funding was appropriated to tear it down and build a new, wider bridge. However, this plan was dropped and the bridge survived this first major threat to its survival.

By the late 1940s, plans were underway to construct a new, six-lane highway, and to use the existing bridge only for local cross-town traffic. Strong consideration was initially given to demolishing the old bridge, since it was too narrow for modern traffic and could be superceded by the proposed new structure. The city council and a strong public letter writing campaign worked successfully to save the old bridge, although 20 feet of the western approach was removed to accommodate new work.

At this writing, a rehabilitation program for the Colorado Street Bridge has been proposed and studies are underway. The rehabilitation will involve some alterations to the existing superstructure, as well as restoration of original bridge elements that were lost over the years. Alterations are necessary to meet current seismic and safety standards. Along the deck area the roadbed will be widened from 28 to 30 feet. The sidewalk and bridge railing will be moved back one foot to accommodate the wider roadbed. The deck overhang area will be rebuilt to its original appearance. A steel traffic barrier meeting Caltran's safety standards will be located at the edge of the roadway, on the curb side of the sidewalk. This will permit replication of the existing recessed alcove seating areas at the piers.

The original piers will be repaired in place by removing the damaged concrete to a depth of six inches and replacing it with new concrete to retain the original pier dimensions.

The arches will be strengthened near the columns and web walls, and pier cross ties will be replaced, to meet seismic standards.

The rehabilitation project will also restore original elements which have been lost over the years, including the four-globe bracket under the main globe of each light fixture, and the urn-shaped members of the original balustrade. These elements will be designed in accordance with the original bridge plans.

The rehabilitation treatments will alter the original appearance of the bridge by widening the deck and increasing the deck overhang by one foot on each side; providing a standard traffic barrier to meet safety standards; and adding some additional thickness to the arches. These alterations will be rendered unobtrusive by coloring and forming the new concrete to match the original in color and texture.

C. The Parker-Mayberry Bridge

1. The Decision to Build the Bridge

In the year following completion of the Colorado Street Bridge, a flood through the Arroyo destroyed the old Scoville Bridge and weakened some of the new understructure of the new bridge. While reinforcing was being completed, a second, smaller bridge was built below the first.

A guiding force behind construction of the new low bridge was William Smith Mason, described as a Chicago capitalist.[22] Mason wanted the bridge built to provide a route to his orchards and property on the hillsides of the Arroyo. He selected architect Myron Hunt, who later received the commissions for Smith's house and gate lodge in 1928, as the designer. [23]

Hunt presented to the City a request for a permit for construction of a new low bridge to run between the piers of the larger Colorado Street Bridge. He spoke as representative of the Assets Realization Company, which owned 65 acres adjoining the west end of the Colorado Street Bridge. The permit was granted based on the argument that the purpose of the new bridge was to replace the old Scoville bridge and dam. Public opposition to the design, suggested by the fear that the low bridge would spoil the effect of the new high bridge, was successfully overridden. The estimated cost of construction of the new bridge was $30,000 to $40,000. [24]

2. The Architect and the Engineers

The architect for the Parker-Mayberry Bridge was Myron Hunt, FAIA, (1868-1952). Hunt was born in Sunderland, Massachusetts, and received his architectural education at Northwestern University and the Massachusetts Institute of Technology. He studied for two years in Europe and practiced in Chicago before settling in Pasadena in 1903. Hunt established a partnership with Elmer Grey in Los Angeles, after which he practiced independently from 1908 to 1920. He then opened an office with Harold Coulson Chambers, FAIA, with whom he remained in partnership until his retirement in 1947.

In his early work, Hunt was particularly interested in applications of reinforced concrete, and in the relationship of buildings and structures to their surroundings. Better known works of his early practice include the Henry E.

Huntington Residence at San Marino and the First Riverside Congregational Church at Riverside. Other well-known designs include the Pasadena Community Hospital, Pasadena Public Library, the Ambassador Hotel in Los Angeles, Throop Hall at the California Institute of Technology, the Rose Bowl, and many other public and institutional buildings and structures.

In addition to his architectural contributions to Pasadena, Myron Hunt was active in community affairs. It is particularly interesting that he served as chairman of a committee established to preserve and protect the Arroyo Seco. Hunt developed plans for an Arroyo Seco Park in 1916, and later provided volunteer services for the design of La Casita del Arroyo and the Municipal Golf Park in the Arroyo. It was most likely his interest in the Arroyo that brought about his involvement in the design of the small bridge during his years of independent practice. Hunt, who had lost the competition to design the high bridge over the Arroyo, apparently felt that there was some poetic justice in his receiving the commission to design the new low bridge.

Engineering for the new structure was provided by the Los Angeles consulting firm of Mayberry & Parker. Edward L. Mayberry, Jr. was born in Sacramento, California, in 1871. His father, a carpenter, came to San Francisco in 1852 from Maine. During the trip around Cape Horn, the captain of the ship on which Mayberry was traveling was lost overboard. Mayberry assumed command and brought the ship safely to San Francisco, where he established one of the first contracting businesses in California. His son studied at the University of California and at the Massachusetts Institute of Technology, graduating in 1906. He worked as a design engineer for the Los Angeles contracting firm of Carl Leonardt until 1907, when he entered into partnership with Parker.

Llewellyn Adelbert Parker was born in Denver in 1882, and his family moved to Oakland when he was a child. Like Mayberry, Parker studied at the Massachusetts Institute of Technology, from which he graduated in 1906. He worked as design engineer in charge of the engineering department of Charles F. Whittlesey and Company, Architects, of San Francisco and Los Angeles until 1907 when he entered in partnership with Mayberry. Their practice continued with great success until the First World War. Having served with the Army Engineer Reserve Corps in 1917, Mayberry reapplied to the Corps in 1918. At that time, Mayberry and Parker dissolved their partnership.

The firm of Mayberry & Parker had offices in Los Angeles, and specialized in structural steel and reinforced concrete engineering. Major projects included the Majestic Theater, Panorama Theater, Luckenbach Building, Elks Building, and Bryan Building in Los Angeles; many other buildings in southern California; and several buildings in Phoenix, Arizona, and elsewhere. The firm also designed a number of bridges including the well-known Linda Vista Viaduct across the Arroyo Seco in Pasadena. This bridge, constructed in 1909, was the first reinforced concrete, viaduct-type highway bridge in the United States. They also designed a similar bridge which was curved in plan, across the Arroyo Seco at Prospect Avenue in Pasadena. Many of their other bridge designs in California utilized Mayberry's patented arch-rib floor system for reinforced concrete construction. This system was different from the more common longitudinal concrete-encased steel girders or reinforced concrete floor girders of the period.

3. **Construction**

A contract for construction of the new low bridge was awarded to the Putnam-Stone Construction Company, for a budget of $38,575. The contract included a new, reinforced concrete arch bridge, retaining walls, and dam under the Colorado Street Bridge over the Arroyo Seco.[25] The Parker-Mayberry Bridge was built directly under the Colorado Street Bridge near the center of the span. The bridge is a three-span arch structure, approximately 150 feet long, 18 feet wide at the eastern end, and 60 feet wide at the western end. Approximately 150 feet of retaining wall with a maximum height of 26 feet, surmounted by a three-pipe railing, was constructed along the stream. Hunt designed the ornamental features of the bridge in the Neo-Classical style. The new low bridge was completed in 1914.

PART II: DESCRIPTION

A. The Context

1. The Arroyo Seco

The Arroyo Seco canyon is a rural retreat close to the city, providing a scenic backdrop to the delicate arched span of the Colorado Street Bridge. The lower part of the Arroyo in the vicinity of the Colorado Street Bridge remains undisturbed by development with the exception of the bridge itself and the Arroyo Channel. From the Arroyo, a few houses can be seen along the top of the bluffs. The sides of the canyon are covered with grasses, low brush, and wildflowers, while trees and shrubbery cover the upper parts of the bluffs. The park-like canyon is popular for hiking, horseback riding, and other recreational pursuits.

2. Prehistoric Resources

Recent archaeological studies in the Arroyo have indicated that the property surrounding the bridge has been developed and altered to the extent that any surface indicators of prehistoric sites in the area are now obscured. Work in the Arroyo and on the hillsides in connection with the Scoville's improvements to the site in the late 1800s removed traces of previous developments there. Construction of the Colorado Street Bridge in 1912-1913, the major flood of 1914, and construction of the Parker-Mayberry Bridge and the Pioneer Bridge further eradicated traces of older structures. There are no recorded archaeological sites in the immediate area of the bridge.

3. Arroyostone Embankments

Remains of the Scoville pump house and several arroyostone embankments still exist in the Arroyo. Other arroyostone structures were destroyed during construction of the Pioneer Bridge or have eroded away. Most of the remaining embankments have not been modified since their construction, but deterioration of the rock walls has occurred over time.

4. Arroyo Channel

According to records of the Los Angeles County Flood Control District, the channel was constructed during the 1930s as a Works Progress Administration project. However, no plans were found to have been filed. The channel begins immediately north of the Colorado Street Bridge and extends southward to the Los Angeles River. The section of the channel located under the Parker-Mayberry Bridge was apparently the last section to be constructed. The poured concrete retaining walls and water slide were completed in 1939.

5. U.S. Army Reserve Center

The Reserve Center consists of four structures and a paved parking lot. Records at the Reserve Center indicate that the buildings and lot were constructed in 1956 by the U.S. government. These recent structures are not historically or culturally significant.

B. The Colorado Street Bridge

The Colorado Street Bridge is an open spandrel arch bridge of reinforced concrete construction. It was designed as a series of nine large parabolic arches. The arches include five spans of 113 feet at the base, one span of 114 feet, two spans of 151.5 feet, and one span of 223 feet. There are also six small girder spans also in the form of arches and abutments at each end. The total length of the structure is 1,467.5 feet, and its maximum height above the bed of the Arroyo is 148.5 feet.

Each of the longer arch spans consists of two continuous elliptical arch ribs carrying spandrel columns and in part spandrel walls. The spandrel columns are embellished with decorative bases and capitals. Each span is divided into ten panels by cross girders, which are supported by columns resting on arch ribs.

The bridge's 28-foot wide, two-lane roadway and 5-foot wide sidewalks are supported by a deck system of hollow spandrel construction. The cantilever of each sidewalk is supported by small arched brackets located above each spandrel column and along the spandrel walls and piers. A precast concrete railing and eight-foot refuge bays over each pier are provided for both sidewalks. The classical balusters of the railing no longer remain, but the lower pilasters and moldings are still in place. The bridge is lit by single spherical lights on ornate cast iron posts with finely detailed bases, two lampposts per bay.

C. The Parker-Mayberry Bridge

The Parker-Mayberry Bridge, was built directly under the Colorado Street Bridge near the center of the span, between Piers 9 and 10 of the larger bridge. The smaller bridge, which crosses the

Arroyo Seco Channel, is approximately 150 feet long. Its width varies form 18 feet at the eastern terminus to 60 feet at the western approach. Constructed of reinforced concrete like the larger bridge above, the Parker-Mayberry Bridge is a continuous girder structure supported by four wall piers. The design of the bridge is characteristic of the Neo-Classical style popular at the time, with flat, smooth surfaces, limited ornament, and corbelling beneath the deck overhang.

D. The Pioneer Bridge

Construction of the "Pioneer Bridge" adjacent to the Colorado Street Bridge began in April, 1951. The new bridge was part of a new freeway between Glendale and San Bernadino via Pasadena. In an article in California Highways, C.H. Darby, a state engineer, noted that the old bridge is "an impressive pleasing structure on a beautiful site....Its presence placed definite limitations on structural and architectural features of any structure proposed in this vicinity." [26] The old bridge could not be duplicated due to cost and functional requirements, so the new bridge had to harmonize with existing bridge. The three-arch span, single deck reinforced concrete structure was designed by the Guy F. Atkinson Co. with state engineers. Constructed at a cost of approximately $2,500,000 and dedicated on October 8, 1953, the Pioneer Bridge is slightly lower than the older bridge, with a maximum height of 131 feet above the riverbed. The longest span is 319 feet, while the other spans are 230 feet. The simple design of the bridge is intended to complement the more ornamented, eleven-arched span of the historic bridge nearby.

PART III: SIGNIFICANCE

A. Historical Significance

The Colorado Street Bridge was listed on the National Register of Historic Places on February 12, 1981. It was designated an Historic Civic Engineering Landmark by the Los Angeles section of the American Society of Civil Engineers in 1975, and a Cultural Heritage Landmark of the City of Pasadena in 1979. The bridge is located in the Lower Arroyo Seco, which was designated a Cultural Heritage Landmark by the City of Pasadena in 1979.

The National Register Nomination cites the bridge as having historical significance in commerce, transportation, and engineering. Completed in 1913, the bridge was the first street level crossing linking Pasadena and Los Angeles. It later became part of the state highway system, and a link in the transcontinental highway system called the National Old Trails Route. Pasadena therefore became part of a through-route for automobile traffic. Today, the Colorado Street Bridge is the primary alternate route for the Ventura Freeway (State Route 134).

The bridge is an important man-made feature of the Arroyo Seco, a significant historic region in the founding and development of Pasadena. The Arroyo Seco has long been a focal point of Pasadena's cultural development and aesthetic quality. The Arroyo itself has long been the subject of preservation efforts, yet the Colorado Street Bridge was lauded as a beautiful addition to the natural environment of the site. The Parker-Mayberry Bridge and Pioneer Bridge later constructed nearby similarly respected the beauty of the Arroyo as well as of the older bridge.

The history of the Colorado Street Bridge is linked to the life and work of James W. Scoville, one of Pasadena's foremost citizens and philanthropists. It also represents the efforts of Edwin Sorver and other members of the Chamber of Commerce, who were determined to encourage the growth of Pasadena and its link with Los Angeles. The fundraising efforts of several generations of Pasadena's citizens helped to build and retain the bridge. The bridge has contributed significantly to Pasadena's development and has long been an object of civic pride.

Some interesting historical events related to the bridge are connected to the movie industry. In 1932, Eddie Cantor drove a chariot underneath the bridge for the movie "Roman Scandals." Movie star William Holden, while in high school, walked across the outer edge of the bridge on a dare. And in an old Paramount newsreel, pilot Al Goebel flew a bi-plane under the bridge witb a girl hanging from each wing to celebrate Flag Day, 1926.

B. Architectural and Engineering Significance

The Colorado Street Bridge has long been lauded for its impressive scale and beauty. A contemporary source called it "one of the few bridges that can properly be classified as a work of art." [27] A contemporary newspaper reviewer noted that "Many consider the Colorado Street Bridge the most beautiful such structure in the world and it is no secret that people have traveled far just to see this noble span." [28] Its curved plan and imposing yet delicate arched structure made the bridge a popular landmark. J.C. Wright, writing in Western Engineering in June, 1914, commented that "The designers, Waddell and Harrington, deserve real credit in the judgement of selecting a type of bridge which would harmonize in the landscape and their efforts have been marked with entire success." [29]

Technically and visually impressive, the bridge was called "the highest concrete bridge in the world" at its completion in 1913. It was the longest and highest bridge of its day, although some other bridges were either longer or higher. The bridge was designed by Joseph Alexander Low Waddell of the engineering firm of Waddell and Harrington of Kansas City, renowned for the design of bridge structures. Waddell was recognized in the United States and abroad for his contributions to engineering design, technology, and education. The bridge was constructed by John Drake Mercereau and the Mercereau Bridge Company, well-known for the construction of bridge and pier structures in California. The Parker-Mayberry Bridge, constructed directly beneath the center of the Colorado Street Bridge, also represents the work of master: architect Myron Hunt of Pasadena and the engineering firm of Mayberry and Parker of Los Angeles.

Both the Colorado Street Bridge and its smaller companion represent the increasing importance of reinforced concrete as a medium for bridge construction. The engineer-designers of both structures were pioneers and advocates of reinforced concrete construction technology in this country. It is of interest to note that the smaller bridge replaced a wood trestle bridge, an example of the earlier generation of preferred construction technology.

In design and construction, the Colorado Street Bridge is a transitional structure. It combines modern scale and the advancing concrete technology of the early twentieth century with style and detailing which reflect the design aesthetic of the late nineteenth century. Remarkable as a design triumph, engineering effort, and aesthetic success at construction, the Colorado Street Bridge is no less remarkable in all of these area today.

PART IV: SOURCES OF INFORMATION

A. Sources and Archives

1. Published documents (See Bibliography, below.)
2. Newspaper accounts (See Bibliography, below.)
3. Historic photographs (See Field Documentation.)
4. Archives and other information sources
    a. Huntington Library
    b. Pasadena Public Library
    c. Pasadena Historical Society
    d. Pasadena Heritage Society
    e. Pasadena Historical Museum
    f. University of California at Santa Barbara, Architectural Archives, Architectural Drawing Collection
    g. City of Pasadena, Urban Conservation Department

B. Bibliography

1. American Society of Civil Engineers, Los Angeles Section. Certificate of Recognition to the City of Pasadena for the Old Arroyo Seco Colorado Street Bridge in Pasadena, California as an Historic Civil Engineering Landmark. September 1975.

2. "Arroyo Seco," Sunset, January, 1977, page 40-43.

3. "Bridge of Size Now is Pasadena Attraction," Pasadena Star, Tournament of Roses Number, Pasadena, California, January 1, 1914

4. "Bridge Over the Arroyo Seco, Pasadena, California," transcription of original, 1913 handwritten documentation of construction changes attached to the original design calculations of 1912.

5. "Bridges and Culverts: Pasadena," Southwest Contractor and Manufacturer, August 1, 1914.

6. "Bridges: Pasadena," Southwest Contractor and Manufacturer, August 26, 1911.

7. Chapin, Lon F. Thirty Years in Pasadena, with an Historical Sketch of Previous Eras. Volume 1.

8. City Facts, "Colorado Street Bridge One of City Wonders," Volume 1, Number 4, December, 1923.

9. City of Pasadena. Designation of Colorado Street Bridge as a Cultural Heritage Landmark. April 1979.

10. "Colorado Street Bridge is to have Baby Sister Built at Cost of $30,000," Pasadena Star, July 14, 1914, page 1.

11. "Colorado Street Bridge over the Arroyo Seco, Pasadena, Calif.," Engineering News, Volume 70, No.4, July 24, 1913, pages 146-150.

12. Coney, William B. "Preservation of Historic Concrete: Problems and General Approaches," Preservation Brief Number 15. Denver, Colorado: U.S. Department of the Interior, National Park Service, Rocky Mountain Regional Office, Division of Cultural Resources, 1987.

13. "Construction of the Linda Vista Bridge," Southwest Contractor and Manufacturer, undated.

14. Crocker, Donald W. Within the Vale of Annandale: A Picture History of South Western Pasadena and Vicinity. A Fund Raising Project of Scout Troop 35. Third edition, undated.

15. DeLeuw, Cather and Company. Environmental Assessment/Initial Study for the Colorado Street Bridge Rehabilitation Project. San Francisco, California: DeLeuw, Cather and Company, 1988.

16. DeLeuw, Cather and Company. Colorado Street Bridge: Inspection Findings and Rehabilitation Report. San Francisco, California: DeLeuw, Cather and Company, 1988.

17. DeLeuw, Cather and Company. Historic Property Survey Report for the Colorado Street Bridge Rehabilitation Project. San Francisco, California: DeLeuw, Cather and Company, 1987.

18. DeLeuw, Cather and Company. Request for Determination of Eligibility for the Arroyostone Embankments Located in the Lower Arroyo Seco in Pasadena, California. San Francisco, California: DeLeuw, Cather and Company, 1987.

19. DeLeuw, Cather and Company. Request for Determination of Effect for the Proposed Rehabilitation of Colorado Street Bridge (including the Parker-Mayberry Bridge). San Francisco, California: DeLeuw, Cather and Company, 1987.

20. DeLeuw, Cather and Company. Technical Clarification to the Historic Register Nomination for the Colorado Street Bridge located in Pasadena, California. San Francisco, California: DeLeuw, Cather and Company, 1986.

21. "The Funeral of J.W. Scoville," Pasadena Daily Evening Star, November 4, 1893.

22. Gebhart, David and Robert Winter. A Cuide to Architecture in Los Angeles and Southern California.

23. Green, Mel, and Associates. Study of Colorado Street Bridge pursuant to its restoration and preservation. 1980.

24. Hall, Harlan W. "Rubblestone Works in Arroyo Stand as Pioneer's Memorial," Post, September 15, 1940.

25. Harrington, John Lyle, editor. The Principal Professional Papers of Dr. J.A.L. Waddell, first edition. New York: Virgil H. Hewes, 1905.

26. Harrington, John Lyle and Ernest E. Howard. Final Report: The Columbia River Interstate Bridge. Kansas City, Missouri: John Lyle Harrington and Ernest E. Howard, 1918.

27. "His Deeds Live After Him," Los Angeles Times, November 11, 1893. (J.W. Scoville)

28. Hool, George A. Bridges and Culverts. New York: McGraw-Hill Book Company, 1916.

29. Howard, E.F. "Colorado Street Bridge Over Arroyo Seco," Engineering Record, volume 67, Number 21, May 24, 1913.

30. In Memoriam, James W. Scoville, from collection of the Chicago Historical Society.

31. "Is Concrete Good for Everything?" The Architect and Engineer, Volume 19, Number 1, November, 1909, page 79.

32. Israel, Paul Bryan. "Spanning the Golden State: A History of Highway Bridges in California." M.A. thesis. Santa Barbara, California: University of California, 1980.

33. "J.W. Scoville Dies: He Passes Away at His Residence in Pasadena, Cal.," Chicago Tribune, November 3, 1893.

34. "Low Bridge Meets with Opposition," Pasadena Star, July 16, 1914.

35. Mayberry, Edward L., C.E. "Unique Reinforced Concrete Bridge," The Architect and Engineer, Volume 19, Number 1, November, 1909, pages 73 - 78.

36. McCormac, Jack C. Design of Reinforced Concrete. New York: Harper & Row Publishers, 1978.

37. "Myron Hunt, FAIA," Journal of the American Institute of Architects, October, 1952, page 165 - 167.

38. Myron Hunt, 1868-1952: The Search for a Regional Architect. Exhibition catalog. Pasadena, California: Baxter Art Gallery, California Institute of Technology, 1984, page 49.

39. National Register of Historic Places Nomination Form, Parker-Mayberry Bridge (Technical Clarification to the Colorado Street Bridge Nomination)

40. "Panorama Section," Pasadena Star News, December, 1978.

41. "Pioneer Bridge Dedication Ceremonies Awaited," Pasadena Star-News, September 27, 1953.

42. Reid, Hiram. History of Pasadena. Pasadena, California: Pasadena History Company, Publishers, 1895.

43. Scheid, Ann. Pasadena, Crown of the Valley. Northridge, California: Windsor Publications, Inc., 1986, pages 101-123.

44. Schmidt, Richard. "Weathered Crossing," Westways, December, 1978.

45. Shoop, C.F. "Auld Lang Syne: Crossing Arroyo Was Once Tedious Work for Horses," Pasadena Star-News, no date.

46. Shoop, C.F. "Auld Lang Syne: History of Pasadena's Famous Colorado Street Bridge Recalled," Pasadena Star-News, May 15, 1949

47. Shoop, C.F. "Auld Lang Syne: Pioneer Water Projects Altered Verdant Canyon," Pasadena Star, September 6, 1953

48. Shoop, C.F. "Auld Lang Syne: Pioneer Bridge Dedication Ceremonies Awaited," Pasadena Star-News, September 27, 1953.

49. Sweet, Robin and Michael Corbett. "National Register of Historic Places Nomination Form, Vista del Arroyo Hotel and Bungalows." Prepared for Charles Hall Page & Associates, San Francisco, California, September 10, 1980.

50. Waddell, J.A.L. Bridge Engineering, Volumes 1 and 2. New York: John Wiley & Sons, 1916.

51. Waddell, J.A.L. De Pontibus: A Pocket-Book for Bridge Engineers, second edition. New York: John Wiley & Sons, 1905.

52. Waddell, J.A.L. The Engineering Profession Fifty Years Hence. Reprinted from The Scientific Monthly, Volume VI, Number 6, 1918, and Volume VII, Numbers 1 and 2, July and August, 1918.

53. Waddell, J.A.L. Memoirs and Addresses of Two Decades, first edition. Easton, Pennsylvania: Mack Printing Company, Publishers, 1928.

54. Waddell, J.A.L. and John Lyle Harrington, editors. Addresses to Engineering Students. Kansas CIty, Missouri: Waddell & Harrington, 1912.

55. Winter, Robert W. "The Arroyo Culture," California Design 1910, Catalog for Exhibit at Pasadena Center, October 15-December 1, 1974.

56. Wood, J.W. Pasadena Historical and Personal, published by the author, 1917.

57. Wright, J.C. "Colorado Street Bridge, Pasadena, Cal.," Western Engineering, Volume 4, Number 6, June, 1914.

58. Zimny, Michael, Pasadena Heritage, Pasadena, California. "National Register of Historic Places Nomination Form, Colorado Street Bridge." Prepared for Pasadena Heritage, Pasadena, California, June 24, 1980.

C. Footnotes

1 Donald W. Crocker, Within the Vale of Annandale: A Picture History of South Western Pasadena and Vicinity (A Fund Raising Project of Scout Troop 35. Third edition, undated).

2 Pasadena Community Book, 1955, cited in Within the Vale of Annandale: A Picture History of South Western Pasadena and Vicinity.

3 Harlan W. Hall, "Rubblestone Works in Arroyo Stand as Pioneer's Memorial," Post, September 15, 1940.

4 Ann Scheid, Pasadena, Crown of the Valley (Northridge, California: Windsor Publications, Inc., 1986), pages 101-123.

5 Richard Schmidt, "Weathered Crossing," Westways, December, 1978.

6 C.F. Shoop, "Auld Lang Syne: History of Pasadena's Famous Colorado Street Bridge Recalled," Pasadena Star-News, May 15, 1949.

7 "Weathered Crossing," page 5.

8 William B. Coney, "Preservation of Historic Concrete: Problems and General Approaches," Preservation Brief Number 15 (Denver, Colorado: U.S. Department of the Interior, National Park Service, Rocky Mountain Regional Office, Division of Cultural Resources, 1987), page 2.

9 "Is Concrete Good for Everything?" The Architect and Engineer, Volume 19, Number 1, November, 1909, page 79.

10 J.A.L. Waddell, De Pontibus: A Pocket-Book for Bridge Engineers, second edition (New York: John Wiley & Sons, 1905), pages 213.

11 "Colorado Street Bridge over the Arroyo Seco, Pasadena, Calif.," Engineering News, Volume 70, No.4, July 24, 1913, page 148.

12 "Bridge Over the Arroyo Seco, Pasadena, California," transcription of original, 1913 handwritten documentation of construction changes attached to the original design calculations of 1912.

13 "Colorado Street Bridge," Engineering News, page 146.

14 Ibid, page 147.

15 Ibid, page 150.

16 "Weathered Crossing," pages 57-58.

17 "Colorado Street Bridge over the Arroyo Seco," page 149.

18 Ibid.

19 Ibid.

20 "Auld Lang Syne: History of Pasadena's Famous Colorado Street Bridge Recalled."

21 "Bridge of Size Now is Pasadena Attraction," Pasadena Star, Tournament of Roses Number, Pasadena, California, January 1, 1914.

22 "Colorado Street Bridge is to have Baby Sister Built at Cost of $30,000," Pasadena Star, July 14, 1914, page 1.

23 Myron Hunt, 1868-1952: The Search for a Regional Architect. Exhibition catalog. (Pasadena, California: Baxter Art Gallery, California Institute of Technology, 1984), page 49.

24 "Colorado Street Bridge is to have Baby Sister."

25 "Bridges and Culverts: Pasadena," Southwest Contractor and Manufacturer, August 1, 1914.

26 C.F. Shoop, "Auld Lang Syne: Pioneer Bridge Dedication Ceremonies Awaited," Pasadena Star-News, September 27, 1953.

27 Pasadena, Crown of the Valley, pages 101-123.

28 C.F. Shoop, "Auld Lang Syne: Crossing Arroyo Was Once Tedious Work for Horses," Pasadena Star-News, no date.

29 J.C. Wright, "Colorado Street Bridge, Pasadena, Cal.," Western Engineering, Volume 4, Number 6, June, 1914.