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The Gold Line Bridge Project Details

The Gold Line Bridge is a 584-linear-foot bridge stretching diagonally across the Eastbound I-210 Freeway in Arcadia, California. The \$18.6 million dual track bridge is the first element of the 11.5-mile Metro Gold Line Foothill Extension (Foothill Extension) light rail project from Pasadena to Azusa to be completed, providing connection between the existing Sierra Madre Villa Station in the city of Pasadena and the future Arcadia Station.

The Foothill Extension is overseen by the Metro Gold Line Foothill Extension Construction Authority (Construction Authority), an independent transportation agency responsible for the project's planning, design and construction. The Construction Authority, with the help of award-winning public artist Andrew Leicester, envisioned the Gold Line Bridge as a memorable expression of the community, past and present. Mr. Leicester was selected through a competitive national call process which the Construction Authority initiated in 2009.

The Construction Authority hired Mr. Leicester as the Design Concept Advisor before the contractor and architect, re-imagining the design process for infrastructure projects. This ground-breaking collaboration resulted in the creation of a sculptural bridge, which could be built for the same cost as was originally estimated for a typical structure of its make-up.

Skanska USA Civil (Skanska), one of the largest general contractors and construction managers in the country, is building the bridge. The company hired Los Angeles-based AECOM, to be the project's architectural and engineering lead, and turn the Construction Authority's vision into a constructible reality. The design for the bridge was approved in November 2011, while site preparation activities began in April 2011. The project is on budget and schedule and will be completed in December 2012.

General Statistics:

- Length: 584-linear-feet from end to end
- Width: 115-feet between centerlines of the 2 signature support columns
- Height: Rail vehicle wheels will be 33-feet above the freeway surface
- Clearance: Bottom of bridge is 19 ½-feet over the freeway surface
- Exposure: 255,000 vehicles pass the Gold Line Bridge daily, as they travel along the I-210 Freeway between Baldwin and Santa Anita Avenues, in Arcadia, CA
- Materials: The bridge is constructed of steel reinforced concrete (more than 92% from local, domestic sources)

- The project has 6,500 cubic yards of concrete and 1.3 million pounds of rebar
- Project cost: \$18.6 million
- Completion date: December 15, 2012

Design Concept

The design concept was developed by award-winning public artist, Andrew Leicester who has completed several large scale public art works throughout the United States. His bridge design was inspired by the local indigenous peoples and wildlife, as well as the roadside attractions of Route 66 with its oversized architectural landmarks. These inspirations permeate all elements of the structure. Most notable are the two 25-foot tall, 17-foot diameter sculptural baskets flanking the sides of the main superstructure, tied together visually by the relief-pattern on the outrigger beam. The superstructure's serpentine main underbelly of the bridge contains casted grooves and hatch marks which simulate the patterns found on the Western Diamondback snake and metaphorically reference the connectivity of the transit system.

Facts/Details: The complex patterns of weaving on the outrigger beam and ribbed pattern on the superstructure were created using hand-crafted wood formwork with rubber formliners. The formwork acted as a mold into which concrete was poured. Once removed, the intricate patterns on the surface of the structures were revealed.

Each woven basket is comprised of 60 individually pre-cast segments. Each basket also has 16 reeds at the top which range from two to ten feet in height. All pre-cast custom pieces were fabricated by Moonlight Molds in Gardena, California. The weave sections are six feet long and weigh 900 pounds each. The pre-cast segments for the basket are made of a unique aggregate mix developed specifically for the Gold Line Bridge. The concrete blend contains black stone, as well as clear, grey and mirrored glass to provide a subtle reflective quality to the material which responds to the atmospheric conditions of the site.

Engineering

AECOM, an innovator in design consulting services, led the project's design and engineering. The Los Angeles-based firm was responsible for taking the conceptual design developed by Mr. Leicester and the Construction Authority, and addressing the many challenging constructability issues of the bridge. Adding to the challenge of the unique artistic design was the need to create a long span crossing an active seismic fault. To address these issues, AECOM designed a three-span, cast-in-place post-tensioned box girder supported by a single column bent and one outrigger bent spanning the freeway. Due to large vertical and lateral demands of the structure, AECOM designed three, large-diameter cast-in-drilled-hole (CIDH) foundations - each 110 feet deep and 11 feet in diameter.

Smart Column Technology: AECOM integrated time domain reflectometry (TDR) technology into the three CIDH foundations, applying a known technology into a new application. In the occurrence of an extreme seismic event, this "smart column" technology will allow engineers to make assessments regarding the integrity of the foundations below grade. TDR provides for electronic data to be assessed at the site rather than the traditional method of digging inspection trenches adjacent to areas where engineers suspect damage might be found.

Lighting/Landscaping

The construction team will install aesthetic lighting so that the bridge design may be appreciated at night. The freeway median and shoulder will also be landscaped with a variety of native plants to enhance the natural beauty of the site and stabilize the soil.

Project Safety

More than 80,000 incident free “work-hours” have been logged on the Gold Line Bridge from April 2011 through September 2012. The success of the safety program is the result of careful pre-construction planning and diligent oversight on behalf of Skanska and the Construction Authority. Skanska has created a culture of safety on the project. Everyone on the job site is responsible for making sure the site is safe with a unified goal of zero workplace incidents. The risks posed around any major construction project are real and significant. With this project they are intensified because of the uniquely confined site, which sits adjacent to an active and heavily used freeway, and nearly 100 nights of night time work activity between Midnight and 5 AM.

Economic Development

The Gold Line Bridge has boosted the local economy in several important ways. More than 92 percent (\$2 million worth) of the materials used in the Gold Line Bridge’s construction are from local and regional sources. Additionally, nearly two dozen certified Small Business Enterprises participated on the design-build team. Together, their contracts represented more than 12 percent of the total bridge project cost, valuing more than \$2.3 million.

Regional Transit History

Transit is the historical foundation of the San Gabriel Valley. Ranches and orange groves used rail to transport goods to market in the 1880s. Housing, retail and schools developed near rail stations as these agricultural areas developed into towns and communities. Today, transit plays just as integral a role. Current projections indicate that the region of 1.9 million residents could add a half-million more residents over the next 25 years. Cities are planning for that growth by encouraging increased density and mixed-use development near the existing and future Gold Line stations.

Last year alone, the Gold Line achieved a record one million monthly riders. As of September 2012, nearly 42,000 riders are served by the line each weekday – a number that has consistently increased since the line opened in 2003. Even as gas prices have fluctuated, ridership has remained strong on the Gold Line. The Foothill Extension will continue that trend, adding connections to important regional destinations, including colleges and universities, hospitals, research institutions, historic downtowns and entertainment venues.

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Credits

Through the collaborative process instituted by the Construction Authority, hundreds of people helped make the Gold Line Bridge a reality, including planners, designers, engineers, trades workers, support professionals, an artist and others. Although we would like to provide credits for each, here is a highlight of some of the key players:

Metro Gold Line Foothill Extension Construction Authority Staff:

Chief Executive Officer	Habib F. Balian
Chief Project Officer	Chris Burner
Director of Construction	Gary Baker
Director of Public Affairs	Lisa Levy Buch
Public Art Program Manager	Lesley Elwood
Media Relations	Rodrigo Gonzalez
Community Relations	Sylvia Beltran
Station Coordinator	Tanya Patsaouras
Structural Engineer	Wei Koo
Design Concept Advisor	Andrew Leicester, Artist

Design Builder

Skanska USA	Lawrence Damore, Project Executive Mike Aparicio, Executive Vice President Tim Wilson, Vice President Operations John Yen, Project Executive Jeff Jonker, Superintendent Troy Marak, Superintendent Justin Waguespack, Project Engineer Andrew Grubb, Project Engineer Kenny Glover, Project Engineer Trevor Kelly, Project Engineer John Ostler, Quality Assurance and Control Glen Curtis, Inspector Joseph Hernandez, Community Liaison
AECOM	Pat Nicholson, Design Team Manager Rivka Night, Architect David Yee, Bridge Structural Engineer
Moonlight Molds	Supplier of specialty pre-cast basket weave segments
Masonry Concepts, Inc	Installation of the casted segments
Anderson Drilling	CIDH Installation
CMC Rebar	Reinforcing Steel Installer
Dywidag	Bridge Post Tensioning
Group Delta	GeoTech
National Ready Mix	Concrete Supplier
Fitzgerald Formliners	Formliners

About the Metro Gold Line Foothill Extension Construction Authority



The Construction Authority is an independent transportation planning and construction agency created in 1999 by the California State Legislature. Its purpose is to extend the Metro Gold Line light rail line from Union Station to Montclair, along the foothills of the San Gabriel and Pomona Valleys. The Construction Authority built the initial segment from Union Station to Pasadena in 2003, on time and under budget; and is currently underway on the next segments of the line, collectively referred to as the Foothill Extension.

The Foothill Extension is a nearly \$1.6 billion project that will connect Pasadena to Montclair in two construction segments. The first segment, Pasadena to Azusa, is funded by Los Angeles County's Measure R and currently underway. The 11.5-mile Pasadena to Azusa segment will be completed in late 2015 and includes future stations in the cities of Arcadia, Monrovia, Duarte, Irwindale and Azusa. Three design-build contracts, totaling more than \$500 million will be overseen by the Construction Authority to complete the Pasadena to Azusa segment, including the \$18.6 million Gold Line Bridge project awarded to Skanska USA in June 2010. The Azusa to Montclair segment is currently undergoing final environmental review.

The Construction Authority is governed by an eight-member board of directors. Five members are voting members, while three are non-voting. Each member is appointed by a city or other government entity and each represents a corridor city. In addition, cities from South Pasadena to Ontario are represented on two advisory boards to the Construction Authority, the Joint Powers Authority (comprised of elected officials) and Technical Advisory Committee (comprised of city managers or their staff appointees). **For more information, visit: www.foothillextension.org.**

About Skanska USA

With 39 offices nationwide, Skanska USA is one of the largest general contractors, developers and construction managers in the country. From the bridges of New York City to the historic Pacific Coast Highway, Skanska's experience truly spans coast to coast.

Even in a global economy, local expertise is a hallmark of quality construction. Every Skanska office is staffed by local teams with core team members who are lifelong residents of each region. Skanska's people know their contractor communities, clients and unique working conditions. Combining local know-how with global resources helps position Skanska as an innovative leader wherever it operates.

Skanska's history in the Golden State stretches back to 1919 when Yeager Construction was founded. One of the premier heavy construction firms in the state, Yeager's work literally paved the freeways and infrastructure that supported the growth of Southern California and the Inland Empire. When Yeager joined Skanska in 2002, the people who made Yeager a household name stayed on board to steer Skanska into the market. While the name changed, the commitment to quality, integrity and safety did not. Both Skanska and Yeager understood that construction is a catalyst for economic health, and Skanska's California leadership remains committed to involving local contractors in all of its work.

Today, Skanska is a full-service construction firm serving every corner of the state with four offices. Skanska USA civil remains a fixture in highway, bridge and infrastructure work statewide and has started compiling an impressive portfolio of transit work both in northern and southern California.

For more information on Skanska, please visit usa.skanska.com.

About AECOM

AECOM is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. With approximately 45,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation and technical excellence in delivering solutions that create, enhance and sustain the world's built, natural, and social environments. A *Fortune 500* company, AECOM serves clients in more than 130 countries and had revenue of \$8.3 billion during the 12 months ended June 30, 2012. More information on AECOM and its services can be found at www.aecom.com.

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