

## Article

### Diaz Yourman & Associates

#### Anaheim Regional Transportation Intermodal Center (ARTIC)



The Anaheim Regional Transportation Intermodal Center — ARTIC for short — is a regional transportation hub and iconic landmark in the heart of Orange County. Each day, ARTIC serves commuters, businesses, visitors, leisure travelers and others with room to meet the region's transit needs for decades to come.

In ARTIC's first year of operation, the station is having a significant impact on the community and economy. Each workday, more than 2,400 commuters use ARTIC to get to work throughout Southern

California, attend conventions in Anaheim, visit the Disneyland Resort or travel for fun throughout the region. Still others walk to the station, stop in as they cycle down the neighboring Santa Ana River Trail or drop by to take photos of ARTIC's stunning architecture. In all, ARTIC is the center of more than 5,300 trips as people come to, depart from or arrive at the station.

When there are games, concerts or other events at neighboring Angel Stadium of Anaheim and Honda Center, ARTIC's commuter ridership is more than 3,800 as people opt for an easy way to enjoy all that Anaheim has to offer.

On a typical workday, ARTIC commuters are reducing the number of miles traveled on freeways and streets by 79,494 — equal to taking 1,063 vehicles off the road. At the same time, ARTIC commuters are helping to prevent the release of 31.8 million metric tons of greenhouse gases into our air each workday.

ARTIC also is playing an important role in economic revitalization of Anaheim. The transit hub is in the Platinum Triangle, an 820-acre district including Angel Stadium, Honda Center, City National Grove of Anaheim, condominiums, apartments, offices, restaurants, retail and a hotel, with another planned.



As of early 2016, more than \$1.2 billion is being invested in the Platinum Triangle to further create an urban district built around sports, entertainment, shopping and dining, jobs and

homes. ARTIC is a critical Platinum Triangle component, providing transit options for commuters, residents and visitors.

ARTIC brings together the rail, bus and shuttle services of the Orange County Transportation Authority, Metrolink, Amtrak, Anaheim Resort Transportation, Megabus.com, Tres Estrellas de Oro, Greyhound and taxi service. ARTIC caters to cyclists with onsite bike lockers and bike-accessible transportation.



The 67,000-square-foot hub, owned and built by the City of Anaheim, and managed by Lincoln Property Co., also is designed as the southern end point of the California high-speed rail system, which is projected to connect Southern California to the Bay Area around 2030.

The City of Anaheim started planning ARTIC in 1992. The goal was to build an iconic transportation hub to serve needs today and to accommodate future growth.

Design of the project began in 2009, and September 2012 saw the symbolic turning of dirt to signal the start of construction. With ARTIC's grand opening in December 2014, the vision came true. The City of Anaheim relied on many amazing partners to make ARTIC a reality. Major parties involved in the decision-making process for the development from the design to construction include:

- City of Anaheim
- Orange County Transportation Authority
- Metrolink
- Caltrans
- PB America and HOK
- Thornton Tomasetti
- Diaz•Yourman & Associates
- Hayward Baker
- Clark Construction

As one of the most sustainable buildings in Southern California, ARTIC is designed to achieve LEED Platinum certification from U.S. Green Building Council. LEED Platinum is the highest certification and recognizes buildings that conserve energy, water and other resources and provide a healthy environment for users.

The subsurface soils underneath ARTIC area consisted of undocumented artificial fill and natural alluvial materials, or natural soils. The upper 20 to 25 feet of the subsurface soils consisted of loose to dense sands, including undocumented fill that resulted from filling a 1950s quarry in the area. Subsurface soils 20 to 35 feet below ground surface (bgs) consisted of loose to dense natural silty sands and low plastic silts. At depths between 35 and 83 feet bgs, the subsurface soils were predominantly soft to very stiff sandy lean clay and silty clay. Below a

depth of 83 feet bgs, the soils were predominantly very dense, poorly graded sand and poorly graded gravel.

The project site was located within a liquefaction zone, and some of the subsurface soils below historic groundwater levels were subject to liquefaction. Liquefaction calculations indicated that the site and structures would be subjected to both significant vertical settlement and lateral spreading toward the adjacent Santa Ana River during an earthquake.

To address the issue, the design team initially considered a deep foundation option because of potential liquefaction. Deep dynamic compaction (DDC) was discussed but considered unfavorable because of noise and vibration issues as well as the technical feasibility of reducing liquefaction potential and densifying the undocumented fills at deeper depths. Then, deep soil mixing (DSM) was selected as the feasible option. In addition to liquefaction mitigation, the DSM ground improvement was also



selected because it would mitigate the effects of the existing undocumented fill. Elimination of a proposed basement beneath ARTIC, a relaxation of a previously imposed zero vibration policy during construction, and increased sensitivity to project costs made DDC ground improvement more likely and feasible. DYA's previous DDC design and construction experience combined with published technical papers and federal highway design manuals helped convince the stakeholders that DDC was feasible and could result in significant cost and schedule savings. Based on discussions and direction from the City, DDC was selected to address project and owner requirements, site conditions, value, safety, and risk, balancing effectiveness versus cost. A comprehensive post-DDC-ground-improvement testing program confirmed DYA's design assumptions. With the increased density of the existing subgrade soils, liquefaction potential and post-construction settlement of the undocumented fills were minimized and shallow foundations and slab-on-grade were used to support the main building. The owners of adjacent property did not report any vibration-related complaints during the DDC operations. An isolation trench was dug prior to the DDC operations, and vibration was monitored. (Vibration measurements during the DDC process confirmed that off-site



properties were not affected by DDC-induced vibrations.

As the project footprint was within the jurisdictions of the City of Anaheim, OCTA, Metrolink, and Caltrans, obtaining encroachment permits from various agencies was necessary. In addition to this, the design had to be performed to satisfy the following regulatory agencies: City, County of Orange, Caltrans, Metrolink, and U.S. Army Corps of Engineers. Both Caltrans and AASHTO seismic design guidelines were adopted in designing the concourse bridge. AREMA standards were used in designing the Douglass Road Underpass Bridge. In addition, the Douglass Road Underpass Bridge, new pedestrian platforms, tunnels, and retaining walls had to be completed without affecting existing rail traffic.

The innovative use of DDC ground improvement and shallow foundations saved the City and its residents more than \$1 million compared to other more traditional foundation options.

ARTIC has received numerous awards including the following:

- Pacific Coast Builders Conference Gold Nugget Award, Outstanding On-The-Boards Site Plan, 2009.
- American Planning Association Orange County Chapter, Outstanding Planning Award for Focused Issue Planning, 2009.
- Southern California Association of Governments Compass Blueprint, 2010.
- Orange County Business Council Turning Red Tape into Red Carpet, Real Estate Redevelopment and Reuse, 2011.
- American Institute of Architects San Fernando Valley Design Award, Merit in the Mixed Use Category, 2011.
- U.S. Building Green Council, Eco City Award, 2012.
- World Architecture News shortlisted for Transportation Award Finalist, 2012.
- American Institute of Architects OC, Honor Award, Design Award, 2012.
- American Institute of Architects, Technology in Architectural Practice Knowledge Community citation, Stellar Architecture Using BIM, 2014.
- Orange County Business Council Turning Red Tape into Red Carpet, World Class Partnerships, 2014.
- Engineering News Record California, Project of the Year, Airport/Transit, 2014.
- American Society of Civil Engineers Orange County, Project of the Year, 2015.
- American Society of Civil Engineers Orange County, Structural Engineering Project of the Year. 2015.
- American Society of Civil Engineers, Orange County, Stellar Architecture Using BIM, 2015.
- Orange County Engineering Council, Project Achievement Award, 2015.
- Southern California Association of Governments, President's Award for Sustainability, Green Region Initiative, 2015.

- CREW Orange County SPIRE Award, Superior Performance in New Construction, March 2015.
- Association of Public Works, Public Works Project of the Year Award, 2015.
- Urban Land Institute Orange County, Best of the Best Award, 2015.
- 26th Annual California Transportation Foundation CTF Transportation Awards, Transit/Rail Project Award Winner, 2015.
- American Council of Engineering Companies Orange County, Award of Excellence, 2015.
- Western Council of Construction Consumers' Chairman's Project Achievement Award, 2015.
- Western Council of Construction Consumers' Sustainability Excellence Award, 2015.
- Western Council of Construction Consumers' Innovative Solutions Distinction Award, 2015.
- American Society of Civil Engineers Los Angeles, Architectural Engineering Project of the Year, 2015.
- American Institute of Steel Construction, Innovative Design in Engineering and Architecture with Structural Steel (IDEAS2) Award, 2015.
- American Institute of Architects, OC, Honor Award, Design Award, 2015.
- CMAA Southern California Chapter, Transportation, More than \$100 Million, 2016.
- The Governor's Environmental and Economic Leadership Award, Sustainable Practices, Community or Facilities, 2016.