

Transportation, Past, Present and Future

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Transportation engineering is a sub-discipline of Civil engineering that focuses on moving people and goods efficiently, safely, and in a manner conducive to a vibrant community. The transportation engineer specifies, designs, constructs and maintains transportation infrastructure that includes streets, canals, highways, rail systems, airports, ports and mass transit. The ASCE Los Angeles Section Centennial is a fitting moment to review the impact the civil engineer has had in the development of an integrated transportation infrastructure in the Los Angeles Basin. What is amazing is to contrast the benign development of transportation during the first half of the past century (1913 to 1963) with the exponential growth of transportation during the last half of the past century (1963 to 2013). Even more amazing is what the future will bring.



The Los Angeles County transportation system serves as a regional, national and international hub for people and goods traffic. The integrated system includes the United States' largest port complex; an extensive freight and passenger rail infrastructure, including light rail lines and

subway lines; numerous airports and bus lines; and an extensive freeway and road system. The technical expertise of the transportation engineer along with the social demand and political will of the population has made it all possible.

The first half of the past century was dominated by rail. It peaked in the 1920's when over 1100 miles of track connected four counties and was celebrated with what is considered the last of the Great Rail Stations – Union Station- which opened in 1936. The system was privately owned by Pacific Electric and commonly called the Red Car system. It consisted of electrically powered streetcars, light rail, and buses and was the largest electric railway system in the world. It was organized around the city centers of Los Angeles and San Bernardino and connected Los Angeles, Orange, San Bernardino and Riverside County. In concert with the Red Line the Los Angeles Railway –a system of streetcars - called the Yellow Car line operated in central Los Angeles and the immediate surrounding neighborhoods.

At about the same time, the first freeway – Pasadena Freeway – opened. It was an unobtrusive opening and little did the designers envision what was to come. By today's standards the Pasadena freeway had narrow lanes, sharp turns, short ramps and no shoulders. It was designed for slow travel and small traffic volumes.

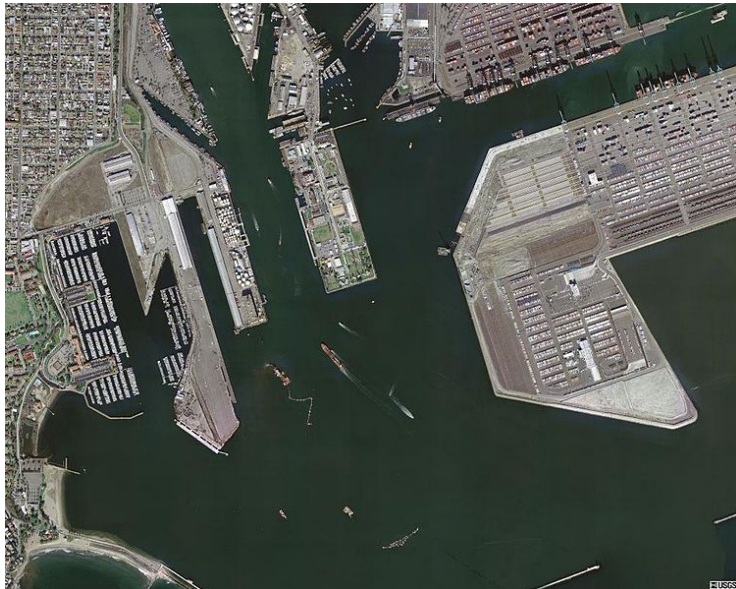


Rail would slowly decline as cars began their phoenix like growth and herald in suburbanization, an extensive freeway system, and downtown parking garages. By 1963, rail was gone as a major passenger carrier. Car and airplane had

become the transportation of choice. Rail would not re-emerge as a viable alternative until 1985. The second half of the past century brought robust build out of roads, expansion of the Los Angeles and Long Beach Ports, expansion of airports and containerization would transform the movement of goods. New modes of transportation – Metrolink, the Alameda Corridor and engineered bicycle trails – would emerge.

Port of Los Angeles

The first major wharf was completed in 1912. The 1930's embraced a massive expansion including a two mile breakwater, three miles offshore and an inner breakwater off Terminal Island with docks. The Port serviced



major shipbuilding during WW II and containerization began in 1959. 1963 ushered in the opening of the Vincent Thomas Bridge. Over one million containers were handled in 1985. The largest dredging and landfill program in America was completed in 2000 with the opening of Pier 400.

The Port processed 7.8 million containers in 2010. Trade with our top five trading partners exceeded \$184 billion delivering such goods as furniture, footwear, toys, auto parts

and women's and infant apparel. The Port also hosts the World Cruise Center, transporting over one million passengers annually.

The future will include deepening the Port to accommodate the draft of the world's largest container ships. Environmentally, the Port is focused on substantially reducing air pollution. It will develop new and cleaner-burning equipment, provide alternate marine power to replace ship power while the ship is in dock and provide community buffer zones with green space.



The Port of Long Beach is also impressive with the 44-year old Gerald Desmond Bridge about to be replaced with an iconic cable stayed bridge. Five hundred foot tall main towers will support a one thousand foot long main span.

Alameda Corridor

The Alameda Corridor was born in 1994 when the Ports of Long Beach and Los Angeles purchased, from the Southern Pacific, its twenty mile right-of-way between the Ports and downtown Los Angeles. At the same time it created the Alameda Corridor Transportation

Authority (ATAX). April 15, 2012, marked the tenth anniversary of the first train. In ten years the corridor has moved 150,000 trains and more than twenty million containers.

The environmental benefits of the corridor are colossal. Two hundred grade crossings were eliminated with new bridges, over and under passes, street improvements and the signature “mid-corridor trench.” The result is significant air emission reduction and reduced traffic impacts. Many fewer trucks now travel the I-710. Futuristic engineering envisions these trucks rolling down a dedicated E-Highway. An E-Highway is a trolley like system that relies on overhead electric wires to power specially equipped freight trucks down the roadway. The future extends the corridor from downtown LA, east to connect with the transcontinental rail network at Colton. It incorporates a similar “San Gabriel trench” and extends the benefits of the Alameda Corridor.

Air Transportation

Air transportation in the first half of the century was benign. Los Angeles International Airport (LAX) began in 1928 when 640 acres were reserved. The first structure was erected in 1929 and the first flight occurred in 1930. Runways were reconfigured and lengthened in the 1950’s. A new concept to share space, a tunnel, was built to allow two runways to pass over Sepulveda Boulevard. The Boeing 707 landed in 1956 and by 1957, nine major airlines serviced LAX with domestic and international routes. The second half of the century saw air traffic grow to support six major airports with LAX the signature airport. LAX is referred to as “The Gateway to the Pacific Ring.” It is the sixth busiest airport in the world, servicing sixty two million passengers in 2011. It holds the title as “the world’s busiest origin and destination airport.”

The “jet age” arrived in 1961 and a new terminal area made extensive use of underground tunnels to move passengers. In 1981, in preparation for the 1984 Summer Olympics, a \$700 million expansion began. In 1996, a new 227 foot traffic control tower was built. In 2000, to celebrate the Democratic National Convention numerous glass pylons - up to ten stories high – were erected. In 2007 a major runway was shifted fifty five feet to prepare for the new Airbus A 380 and a new \$1.2 billion, ten gate terminal was begun.

Currently, LAX is in the midst of a \$4 billion expansion to accommodate the next generation of aircraft, such as the Boeing 787 Dreamliner. Environmentally friendly, the Dreamliner is made of carbon fiber composite and is recyclable, uses less fuel with fewer emissions and is quieter.

Freeways

The years 1963 to 1990 were dominated by the build out of today’s Los Angeles County freeway system. The signature freeways, the I-405, I-5, I-605 and I-10 have national recognition for their routine gridlock. The population’s love affair with the car, compounded by truck and bus traffic, has greatly contributed to the high volume usage. However, by the late seventies, the public came to realize that other means of mass transportation, to supplement buses, was necessary. Environmental concerns,



population increase and high gas prices were causing the public to take a second look at mass transit. In 1976, the State of California formed the forerunner to today's Metropolitan Transportation Authority (Metro) to begin planning an integrated transportation system. A centerpiece would be the re-emergence of rail.

The freeway system is and will continue to remain a major component of the integrated transportation system in Los Angeles County. The California Department of Transportation (Caltrans) is responsible for planning, design, construction, maintenance and operation of the state highway system. Locally, this mandate is carried out by District 7. The District is responsible for forty two freeways and highways. Currently, an average of 100 million vehicle miles is traveled daily in the District which includes Ventura County. In Los Angeles County there are nine hundred and fifteen freeway and highway miles.

The transportation engineer is meeting the challenges of the future in various ways that use emerging technology. Los Angeles County leads the nation in "smart grid" traffic control that allows synchronization of traffic signals to improve traffic flow. The build out and use of High Occupancy Vehicle (HOV) lanes is maturing. A prime example was the engineering and construction challenges incorporating HOV lanes on the I-405 thru the Sepulveda Pass. The introduction of High Occupancy Toll lanes is in its infancy with test projects on the I-10 and the I-110. HOT lanes operate under the concept that drivers will pay a premium to maintain an average speed of forty miles per hour. The lanes have controlled access and the travel speed is monitored in real time. As traffic volume increases, so does the toll per mile. In 2005, the nation's first dedicated busway opened between the North Hollywood subway station and

Warner Center. It was extended to Chatsworth in June, 2012. The line operates the nation's first, sixty five foot, articulated, compressed natural gas (CNG), bus. It is dubbed the "metro liner." The bus seats sixty six passengers and can carry one hundred with standing passengers.

Last but not least, the region is well on its way to becoming bike friendly.

Transportation engineers will plan and design approximately seventeen hundred miles of dedicated bikeway in the next thirty years. To encourage usage, a four thousand bike rental program is planned.

AND, lest we forget the lowly "pothole"; selected streets will be torn up and rebuilt from scratch with more robust pavement design to handle future traffic volumes and vehicle weights.

Mass Transit

Impetus for mass transit coalesced when Metro was formed by consolidating various transportation agencies in 1993. Metro's mandate was to plan and prioritize project funding and implementation for Los Angeles County. It would carry out this mandate by developing a Long Range Transportation Plan (LRTP). The LRTP would need a financial vehicle. The vehicle would be a bond issue known as Measure R. Measure R proposed a half cent sales tax on the citizens for the next thirty years and was estimated to return approximately \$40 billion dollars. The dollars would proportional fund quality of life, rail/rapid transit construction, rail facilities, Metrolink, highway, city enhancements and operations. The voters approved Measure R in 2008.

The return of rail –after twenty seven years- was the opening of the Blue Line to Long Beach from downtown LA in 1990. This was followed by the first segment of the subway from Union Station to Westlake/MacArthur Park in 1993. The Green Line from Redondo Beach to



Norwalk was opened in 1995. The subway in its current configuration was completed to North Hollywood in 2000. The Gold Line to Pasadena was completed in 2003 and to the Eastside (Atlantic) in 2009. The EXPO line from downtown to Culver City was completed in 2012. Metro light and heavy rail operates over a combined length of approximately ninety miles with recent daily passenger boarding's exceeding 361,000.

The future in concert with the LRTP and revenue stream from Measure R will fund light rail projects to include the Gold Line extension to Azusa, the EXPO extension to Santa Monica, the Crenshaw/LAX Transit Corridor and the Gold Line eastern extension. Funding for heavy rail projects will include the Regional Connector and the Westside extension. The funding must be augmented by Federal assistance and Public-Private-Partnerships (PPP) may be encouraged. In concert with these signature projects the LRTP promises local street improvements, improved bus service and improved traffic flow on freeways

Metrolink

Metrolink did not exist until 1991. It was created after the purchase of one hundred seventy five miles of track and facilities from Southern Pacific and the rights to use Union Station from



Union Pacific. Metro now owns Union Station. It operates under the Southern California Regional Rail Authority (SCRRA). The SCRRA is a joint powers authority governed by five county level transit agencies; Los Angeles, Orange,

Riverside, San Bernardino and Ventura. The average weekday ridership is forty one thousand and it is estimated that ridership replaces twenty five thousand vehicle trips per weekday.

Metrolink envisions an ambitious expansion along with quality safety enhancements. Two significant safety enhancements are fleet conversion to the Hyundai Rotem cab car and the “positive train control crash avoidance system.” The new car better absorbs energy in case of a collision. The “positive train control crash avoidance system” can sense a potential crash and shut down the train.

Hi-Speed Rail - The Future

In giving his endorsement to California Hi-Speed rail, our current Federal Railroad Administrator, Joseph C. Szabo stated, “With twenty million more people expected to be in California within the next forty



years, we can't build enough highways and airport runways to accommodate the demand."

Ground is expected to be broken in the fall of 2013 for the initial 130-mile Northern California section in the Central Valley. Estimated completion at Union Station is projected for the year 2028. The estimated cost for this Blended Phase I is \$68 billion. Blended is defined as shared use of electrified/upgraded Caltrain and Metrolink corridors. The Phase I blended project between San Francisco and Los Angeles/Anaheim is 520 miles. The overall system will eventually extend to San Diego with a total length of 800 miles. Top speed will reach 220 miles per hour. Daily ridership is estimated at two hundred and sixty thousand.

The Next Century

It would be presumptuous to predict the future of Los Angeles County transportation beyond what is forecast thru 2050. We can predict that today's forward thinking social and political impetus to continue design and build out of a first class, integrated, transportation system in Los Angeles County will superbly challenge the new cohort of civil-transportation engineers. It will take his/her creativity, mastery of emerging intelligent technology(IT), mastery of engineering fundamentals and innovative financing to efficiently design, build and maintain our people and goods future mobility.