BUSWAY OPERATIONS & SAFETY
LOS ANGELES ORANGE LINE BUSWAY

ITE 2015 INTERNATIONAL ANNUAL MEETING AND EXHIBIT

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Metro Orange Line - BRT

- Opened in October 2005
- Construction cost of $330 million
- 14 mile route across San Fernando Valley
- Dedicated Busway with two 13-foot lanes along and Exclusive Right-of-Way
- Over 30,000 riders on an average weekday
- CNG powered, low floor 60-foot articulated buses
- Provides signal priority to improve bus run time & performance
- Reduced 25% total travel time
• 55 Traffic signals
• 26 Major crossings
• 88 Loop detector antennas
Project Objectives

- Reduce signal delays for Metro Rapid Buses including Orange Line along major transit corridors in the City of Los Angeles
- Maintain even headways between buses
- Minimize adverse impacts on cross street traffic
- Maintain a safe environment for all users
- Provide a real-time passenger information system
PRIORITY BUS LINES IN THE CITY OF LOS ANGELES
Transit Priority

- Automated bus detection using loops and transponders
- Designed to reduce bus delay and maintain bus spacing
- Designed to minimize impact on cross-traffic
- Provide bus performance reporting from actual bus time points
Loop Based Detection System
On-Bus Transponder
Busway Operations

- Signals connected to the City’s centralized Traffic Control System
- Synchronized signals for bus progression through busway
- Coordinated operation at all signalized intersections
- Once-per-second real-time data communications to each intersection
- Primarily far-side stations
- Coordinated arrivals
- Coordinated with Metro Rapid service
Coordinated Arrivals
Signal Design Elements

- Dedicated Bus Rapid Transit (BRT) phase and signal indications
- Loop based BRT detection system
- Semi-actuated traffic signals
- Updated traffic signal equipment
- Concurrent movements allowed with BRT phase
- Progression set for bus operation and accounts for station stops
Signal Design Elements (Con’t)

- Priority provides early green and green extension to facilitate variations in bus speeds
- Lead or lag left turns to minimize conflicts
- Programmed visibility heads for BRT phase
- BUS warning signs activate with approaching buses
- Pre-signals at many locations to stop traffic in advance of Busway crossing
Pre-Signal at Busway Crossing
Time Space Diagram
Bus Priority Operation

- **EARLY GREEN** - Phase is started earlier than normal to minimize delays to stopped or approaching buses

- **GREEN EXTENSION** - Phase is held past normal endpoint to help buses pass through critical intersections

- **PHASE HOLD** - Phase held in green until bus arrives, typically used for left turns
Design Features

- Dedicated Right-of-Way
- Two 13-foot lanes with bus pullouts
- Asphalt surface with concrete at stations and through intersections
- Adjacent pedestrian and bicycle path
- Fencing throughout to restrict access
- Landscaping installed as part of project
Dedicated Right of Way

Landscaping

Adjacent Bike Path

Signalized Crossings
Turning Management

- Left and right turn storage bays
- Protected-only left and right turns across Busway
- BUS signs for all approaching moves
- Static turn restriction signs for permissive moves across Busway at some intersections
- Photo-enforcement at some locations
Left Turns Precede Busway Phase
Protected Right Turn Across Busway
Busway Intersection Alignment

- Intersection geometry
- Intersection signal phasing
- Pedestrian and bicycle facilities considerations
- Station Location
- Adjacent intersection consideration
Four-Legged Intersection
Busway with Pre-Signal
Centerline Busway
Five-Legged Intersection
Diagonal Busway Crossing
Station Design

- Side platform stations
- Proof-of-Payment system
- Ticket Vending Machines on all platforms
- ADA-compliant ramps to all platforms
- Signalized pedestrian crosswalks at stations
- Artistic design with shelter and lighting
- Estimated time of arrival message signs
Median Busway Station

Nearside Busway Station

Farside Busway Station

Median Busway Station

Pay Stations
Busway Signs and Markings

- Bus Only pavement markings
- Keep Clear and Wait Here pavements markings
- Special Bus Xing signs for motorists
- Look Both Ways signs for pedestrians
- Do Not Enter – Transit Vehicles Exempt signs
Median Pedestrian Crossing
Pedestrian & Bicycle Treatments

- Signalized pedestrian crossings
- Adjacent pedestrian and bicycle path
- Signage to warn pedestrians of facility
- Staggered crosswalks at stations
- Bike Path signage and markings
Staggered Pedestrian Crossing
Pedestrian Warning Sign
Additional Features

- Photo Enforcement
- In-pavement Roadway Lights
- Enhanced bus driver information
- Passenger information system
Passenger Information System
Sherman Way & Busway
Performance Evaluation

- Analyzed more than 1000 bus trips and run time data
- The Metro Rapid Bus achieved 25% reduction in total travel time
- Transit Priority System alone contributed to 30% of the total travel time saving
- Bus delays at signalized intersections were reduced by 33-39%
- Minimal impacts to cross street traffic
QUESTIONS?
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