REVERSIBLE TRAFFIC LANES

Description

Reversible traffic lanes add peak-direction capacity to a two-way road and decrease congestion by borrowing available lane capacity from the other (off-peak) direction. Reversing lanes reduces congestion for handling special event traffic, during morning and evening commutes when an incident blocks a lane, or when construction or maintenance activity is present on the road.

Roads can be adjusted ranging from becomng a one-way street or having one middle lane operate in the peak direction. These adjustments, indicated by changeable message signs and/or arrows, occur at specified times of day, or when volume exceeds certain limits including for handling short-term special events.

Cost:	●●●○○
Time:	**Short**
Impact:	**Corridor**
Who:	**City/State**
Hurdles:	**Public Awareness/ Operation**

Target Market

- Roads with highly directional congestion.
- Bridges, tunnels, and toll booth areas difficult to widen.
- Surrounding or leading to/from special event centers.
- Emergency use (hurricane evacuation).

How Will This Help?

- Reduce congestion by temporarily "borrowing" capacity from the other direction.
- Postpone the need to add capacity through conventional lane additions.
- Hasten evacuation during weather events or other natural disasters.

Implementation Examples

In 2009, the City of Arlington constructed a reversible lane system on two major and one minor arterial roads used for event traffic at The Ballpark in Arlington and the Cowboys Stadium. The lanes were developed as part of a traffic management plan developed by PB Sports and Entertainment for the Cowboys Stadium. Using overhead signage, Collins Street converts to a four-lane roadway for all outbound traffic from Cowboys Way to Abram Street. Division Street converts to a three-lane roadway for all inbound and outbound traffic. The electronic signage allows traffic engineers to adjust plans based on projected traffic demands for special events. The overhead signage also reduces the number of cones and barrels along Collins and Division Streets. City officials believe the system has mitigated congestion in the stadium area before and after games and events, but no formal study on sytem effectiveness has yet been performed.

In downtown Houston, West Alabama Street and North Main Street are both three-lane roadways that operate in a two-inbound, one-outbound configuration during morning peak hours and a one-in, two-out configuration during the evening peak hours. During off-peak hours, the roadways are operated as one lane in each direction with a continuous left turn lane.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

Application Techniques and Principles

Several factors influence the planning and design of reversible lanes. These include:

- Cost and the level of complexity and sophistication of traffic control.
- Functional type of roadway on which it is used.
- Purpose and/or intended goals for which it is used.
- Agency responsible for the planning, design, implementation, and management.

The decision to consider reversible lanes is usually based on the need to mitigate recurrent congestion. Its use is most applicable on multi-lane roadways with a directional imbalance in excess of 65/35 percent with a predominance of through traffic and predictable congestion patterns. Reasons agencies give for using reversible lanes include: congestion mitigation, queue length, the need to decrease travel time, and to improve the overall corridor level of service. Planning of specific reversible facilities does not differ substantially from conventional facilities.

The vast majority of reversible lanes are implemented on lanes not originally planned or designed for bidirectional use. Most reversible lanes are incorporated into conventionally designed roadways that were later reconfigured for permanent or periodic flow conversions using various permanent or temporary design and control features. The exceptions to this case are applications on freeways, in particular freeway high occupancy vehicle (HOV) and transit reversible lanes, where transition termini and lane separations are planned, designed, and constructed specifically for the purpose of a reversible lane.

Researchers have noted that the American Association of State Highway and Transportation Officials (AASHTO) *Green Book* does not provide specific design criteria for installation of a reversible lane. It suggests that reversible lanes on arterial roadways should be designed as a normal travel lane. This lack of information has led several transportation agencies to develop their own design guidelines to address design issues, particularly for retrofitting existing facilities. These local design standards cover areas such as guardrails, crash attenuators, roadway cross-section width, and approach/termination zone design.

Issues

Proper communication and public participation are crucial to ensuring the strategy's success. Local agencies should identify the best locations for implementation and ensure the public and agencies understand the concept and operation. The terminus treatment requires particular care and attention—common treatments extend across an intersection, requiring complex signals and signal timing strategies. If poorly executed, these intersections may become expensive and confusing. Locating a safe mid-block left turn across the favored travel direction can also be difficult. Impacted businesses may complain of denial to traffic, and there is an increased potential for crashes depending on left turn demand, mid-block geometric conditions, and platooning of the favored traffic direction.

Who Is Responsible?

For reversible lanes on freeways, TxDOT would be primarily responsible. For and state-maintained surface streets in urban areas, TxDOT would approve use but the municipality may bear the responsibility for construction and operation. For municipal major arterials, the local city would implement and maintain the lanes. In several cases studied, the state police or local police department have operated the reversible lanes on both freeways and arterials. Municipalities may share the operation of these lanes between law enforcement and engineering staff.

Project Timeframe

Reversible lane systems require approximately one year to design and implement on existing roadways. Systems with moveable barriers and greater distance installed on freeways would be closer to the full year, while lanes on major and minor arterials will require less time.

Cost

The costs associated with a reversible lane system vary according to the facility type and the extent of equipment needed to operate the desired system.

- In 2009, the City of Arlington constructed a reversible lane system on two major and one minor arterial roads used for event traffic at The Ballpark in Arlington and the new Dallas Cowboys Stadium at a cost of $3 million. The system utilizes signage and dynamic overhead lane-control signs.
- The Colorado DOT recently conducted a study for a proposed 13-mile reversible lane system pilot program with movable barriers on IH 70 in Denver. Analysts estimated a one-time capital cost of $22.2 million with annual costs of $710,000.
- In Phoenix, a 2009 proposal to add overhead beacons and lane-control signs to their existing reversible lane system was estimated to cost a total of $18.3 million.

Data Needs

The quantity and distribution of traffic volume on the roadway are the primary parameters for determining the potential for a reversible lane(s). Traffic counts should be taken at several locations along the segment to determine the location where additional capacity is no longer needed or where capacity in the minor direction needs to be maintained.

Reversible Traffic Lanes Best Practice

- Type of Location: Multi-lane roadways in which a directionally unbalanced traffic flow leaves one or more of the minor flow direction lanes underutilized and, in particular, segments with minimal turning and stopping maneuvers.
- Agency Practices: Corridor analysis for location suitability, traffic law enforcement.
- Frequency of Reanalysis: Two to three years in order to identify safety improvements or issues and assess congetstion mitigation benefits.
- Supporting Policies or Actions Needed: Regional MPO and local city adoption of program and budgeting of funds.
- Complementary Strategies: Event management programs.

For More Information

1. National Cooperative Highway Research Program. *Convertible Roadways and Lanes: Synthesis 340,* Washington, D.C., 2004.

2. American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets*. Washington, D.C.