The Commuter Lane: A New Way To Make the Freeway Operate Better

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ABSTRACT

In an attempt to improve traffic flows on urban freeways, the California Department of Transportation (Caltrans) has recently implemented a demonstration project on a Southern California freeway to test the traffic operational features of a special commuter lane. The lane is being provided by allowing high-occupancy vehicles to drive on the median shoulder during peak commuter hours when the freeway is congested. In developing the project, Caltrans took into consideration several points relative to the operation of high-occupancy-vehicle lanes, the need for added capacity, and the conversion of shoulders into traffic lanes, which are discussed. Several factors are being reviewed in evaluating the operation of the project: accident experience, violation rates, operations associated with weaving and merging movements, travel times, congestion relief, and public acceptance. Results are presented and discussed.

On June 10, 1985, the California Department of Transportation (Caltrans) implemented a demonstration project to test the traffic operational features of a special commuter lane. The lane, stretching along 8 mi of the Artesia Freeway in southern Los Angeles County and costing about $200,000, was created by permitting high-occupancy vehicles (HOVs) to drive on the median shoulder during the peak period. At all other times, the shoulder is restored for emergency parking only.

For several years, Caltrans has been seeking low-cost ways to add critically needed people-moving capacity to congested freeways. The advantages of HOV lanes have been repeatedly demonstrated on a host of projects across the nation, including the El Monte Busway in Los Angeles. After more than 10 years of operation, the busway is now carrying almost three times as many people during a peak hour as an adjacent freeway lane. But construction of the 11-mi busway took several years, and it cost in excess of $60 million in the early 1970s. Similar widening of the freeway and construction of the lanes in the median of the freeway would exceed $150 million today, which is not exactly a low-cost solution.

In reviewing successful HOV-lane projects throughout California and other states, it was concluded that several features were highly desirable in such an installation:

- The lane should be a through or express lane, with a limited number of ingress and egress points.
- The lane should be separated from adjacent freeway lanes, either by a physical barrier or by a buffer formed with delineation or traffic control devices or both.
- The lane should be located along a congested freeway, so that HOVs can bypass congestion on the freeway lanes. Ideally, the special lane should be operated so that free flow is maintained. Without these conditions, the HOV lane will provide little or no incentive to rideshare, and the fundamental idea of the special lane is voided.
- Areas to conduct enforcement activities should be provided adjacent to the special lane, so that violators do not have to be escorted across freeway lanes to the right shoulder.

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As may be expected, the greatest use of HOV lanes--and thus the most ridesharing--occurs during the commute hours on the trip to or from work. Accordingly, if ridesharing is to be increased, it is the home-to-work trip that provides the greatest potential; the best payoff from special lanes to encourage sharing rides will be during the commuter hours.

Experience with the ill-fated Santa Monica Diamond Lane project in 1976 had clearly shown Caltrans that two other features are essential if HOV-lane projects are to be acceptable to the public:

1. Lanes must be provided without taking any capacity away from mixed-flow traffic, and
2. Enough vehicles must travel in the lane so that it is not perceived by the public to be an empty lane.

It is believed at this time that peak volumes in the range of 800 to 1,000 vehicles per hour will be seen as reasonable use.

For several years Caltrans has eliminated bottlenecks on many freeways by converting shoulders to lanes, particularly in the Los Angeles area. The added lanes have been created by slightly narrowing the freeway lanes and adding the width gained to the shoulder width. Without exception, the accident experience of the overall freeway has improved with this type of installation; any reduction in safety resulting from loss of the shoulder has been more than offset by an improvement in the accident picture due to reduced congestion.

Looking at the need for added capacity, it is apparent that the increase is needed only during the hours of congestion, generally during the commuting hours. On the other hand, for motorists with disabled vehicles, the safety features of shoulders are probably most needed during the high-speed off-peak hours, particularly during darkness. These facts suggest that the space occupied by a shoulder can play a dual role that best serves the needs of the

FIGURE 1 Route 91 commuter lane.

motoring public at a particular time--as a lane during peak traffic hours when the addition of capacity is critical and as a shoulder during off-peak hours to provide needed safety features.

Caltrans brought all of these concepts together into the commuter lane developed for the demonstration project on the Artesia Freeway.

PROJECT FEATURES

The demonstration project, about 8 mi long, allows carpools, vanpools, and buses to use the median shoulder of the eastbound Route 91 (Artesia Freeway) from 3:00 to 7:00 p.m. each weekday. Two north-south freeways, the Long Beach Freeway and the San Gabriel River Freeway, intersect the Artesia Freeway within the project limits (Figure 1).

Buffer

A buffer area 2 ft wide has been striped between the freeway lanes and the commuter lane, using special striping (Figure 2). No other traffic control devices have been placed within the buffer area. It is illegal to cross this special striping during hours when the shoulder is being used as a commuter lane.

Definition of HOV

Counts of the existing traffic stream revealed that during the peak, about 250 vehicles per hour (about 3 percent) carried three or more occupants; slightly in excess of 1,000 vehicles per hour, or 15 percent, had two or more. The two-or-more category provided enough vehicles to present a reasonably full lane, yet not so many that flows in the lane would become congested; therefore, a two-or-more definition is being used. Under this definition and the expected use, the commuter lane would carry more people during the peak than each adjacent lane.

Hours and Limits of Operation

Commuter-lane hours were selected to correspond to the hours when congestion existed on the freeway,

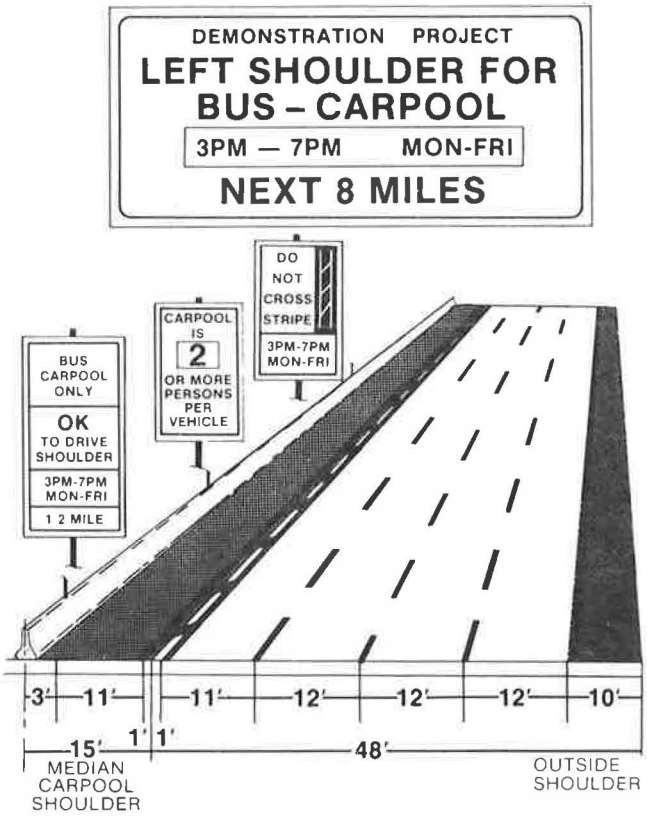

FIGURE 2 Project details.

between 3:00 and 7:00 p.m. At all other times, the shoulder area is available for emergency parking only. The location of congestion on the freeway dictated the limits of the lane.

Lane Width

The commuter lane is 11 ft wide, with a side clearance to the median barrier wall of 2 ft. The left-

most freeway lane has been narrowed to 11 ft (Figure 2).

Signing

Static signing was installed atop the median barrier wall and overpasses (Figure 2). Since the initial installation, signing has been modified; changeable-message signs to provide "real-time" operation information have been installed (Figure 3). These flip-type signs, which are manually changed twice each day, provide messages relative to the proper use of the shoulder at any particular time. Plans are currently under way to provide power to the new signs and to add signal-head indicators (red X's and green arrows) to reinforce sign messages (Figure 4).

FIGURE 3 Changeable-message real-time signing.

Points of Ingress and Egress

Two entry points and two exit points have been provided by discontinuing the special striping and leaving openings in the buffer (Figure 5). No direct connections into the commuter lane have been provided; HOVs simply move into or out of the commuter lane by using the adjacent freeway lane.

Drivers making a normal right-hand entry into the freeway who wish to use the commuter lane must weave across four regular freeway lanes to reach the ingress points. Similarly, a commuter-lane user wishing to exit the freeway must make his way across the freeway lanes.

Enforcement Area

An enforcement area has been provided adjacent to the median barrier wall by shifting (through restriping) the entire freeway onto the right-hand shoulder (Figure 5). A barrier wall has been installed to shield this area from oncoming traffic.

The California Highway Patrol is providing enforcement of the commuter lane. Motorcycle officers

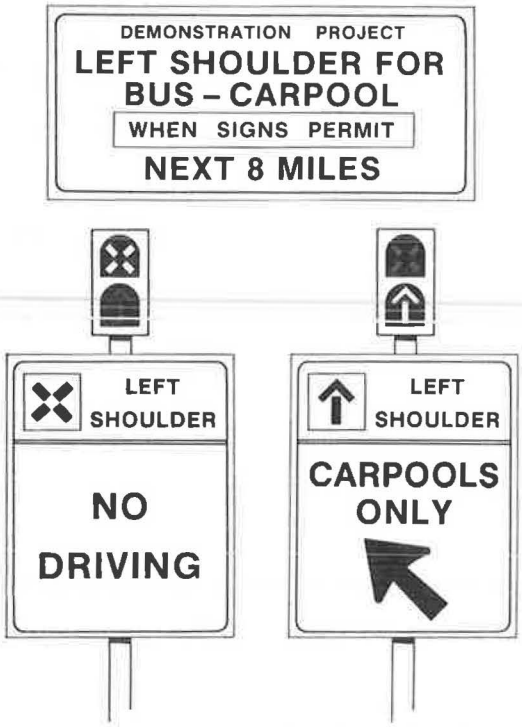

FIGURE 4 Powered real-time signing with signal-head indicators.

patrol throughout its length; other officers are stationed at the enforcement area and direct any single-occupant automobiles into the enforcement area.

Public Awareness Program

During the development of the project, an extensive public awareness program was conducted to build the public support needed to implement and operate the commuter lane. A Public Advisory Committee, made up of representatives of elected officials, major employers, and the transportation community, was formed early in the project. The committee has provided input to the design and has helped develop criteria by which to evaluate the project: lane use, safety, delays, violation rates, and public attitudes. The committee continues to meet to review and evaluate the operation and to make suggestions for the improvement of the project.

The committee has been instrumental in developing a public awareness of the commuter lane, its purposes, and its proper use. Much of the community acceptance of the project and the support for its continued operation are directly attributable to the activities of the advisory committee.

PROJECT OPERATION

After almost 1 year of operation, the project continues to perform extremely well. Use of the commuter lane has shown some growth; the safety experience has been excellent; travel times in both the commuter lane and on the freeway lanes have been significantly reduced; violation rates have not seriously affected the operation; the weaving and merging movements have operated well; and public attitudes and support for the project have been very high.

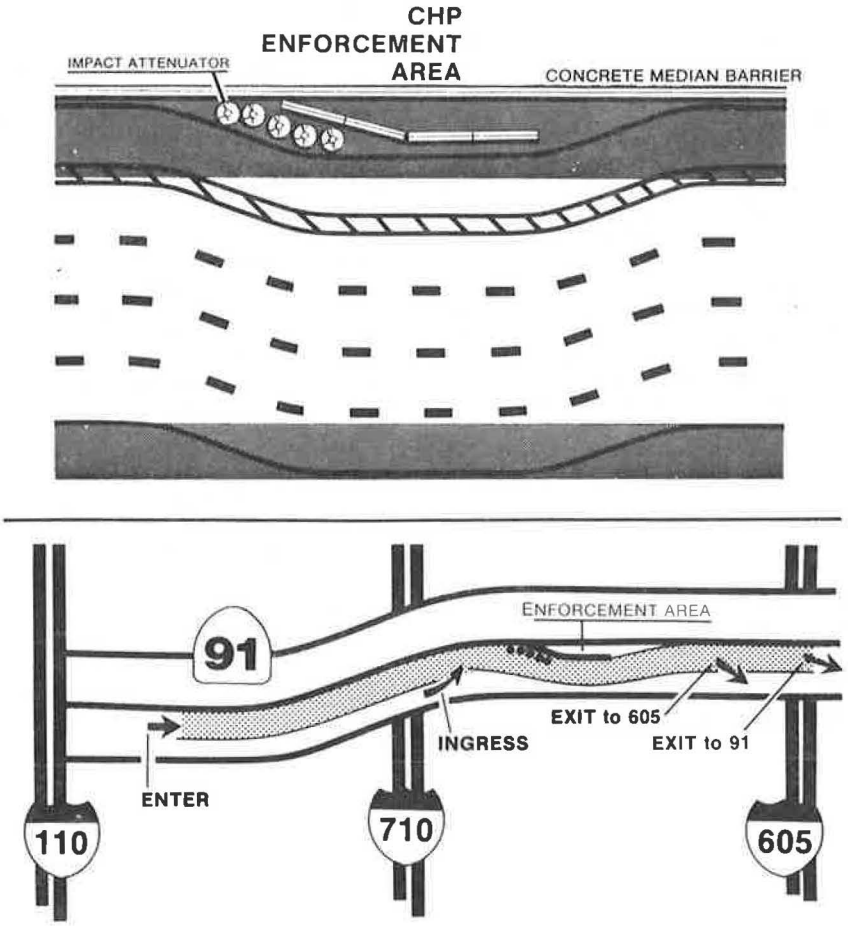

FIGURE 5 Entry and exit points and enforcement area.

Commuter-Lane Use

Following the initial break-in period, there was a growth in the use of the commuter lane, increasing from about 1,000 vehicles during the peak hour to 1,400 to 1,500 vehicles per hour after 2 months of operation. Use during the peak hour then leveled off at about the 1,350-vehicle/hr level and has now climbed to about 1,450 vehicles/hr.

More people are now moving through the corridor in a given time than before the project. During the average peak hour, the commuter lane carries about 3,200 persons (2.2 persons per vehicle); the adjacent freeway lanes each carry more than 2,200 persons (1.17 persons per vehicle) during the peak hour. During the 4-hr peak period, the commuter lane carries about 24 percent of those moving along the freeway; each freeway lane carries about 19 percent of the remaining 76 percent.

Freeway Use

Operation on the mixed-flow freeway lanes has improved somewhat with the implementation of the commuter lane. As carpools and vanpools have shifted to the commuter lane, both the limits of congestion and the hours of congestion have been reduced. Freeway volumes have remained much the same as they were before the project.

Travel Times

Delays through the corridor have been significantly reduced with the introduction of the commuter lane. On the regular freeway lanes, travel times have been cut from about 30 to 35 min before the project to a current 15 to 20 min for the 8-mi trip. Travelers in the commuter lane experience little or no delay, with travel times now averaging 8 to 9 min.

Violations

Three types of violations are being monitored: vehicle-occupancy violations (single-occupant vehicles using the commuter lane), buffer violations (vehicles entering or leaving the commuter lane, or both, at other than designated entry or exit points), and time-of-day violations due to driving on the shoulder when it has been designated for emergency parking only.

Occupancy violations have held steady at 3 to 7 percent. It has been noted that this type of violation is directly tied to the level of congestion on the freeway (the more congestion, the greater the number of violations).

Buffer violations vary greatly depending on the specific location. In some reaches, more than 30 percent of the commuter-lane users enter or leave the lane illegally. It is noted, however, that no significant safety or operational problems have resulted from illegal buffer crossings. Better signing and increased levels of enforcement are now being considered as steps to reduce these violations.

Time-of-day violations have presented a significant problem in the operation, for they indicate that attempts to regain the shoulder for emergency parking have not proven totally successful. Most of the violations occur during daylight hours, both

weekdays and weekends, when traffic volumes on the freeway lanes are fairly high (even though congestion does not exist). During operation with static-type signing, an average of 600 to 700 motorists illegally traveled on the shoulder each day.

Since flip-type real-time signing has been added and additional levels of enforcement have been provided, time-of-day violations have been dramatically reduced. Immediately after the changes were made, violations dropped into the range of 65 to 75 per day, held fairly stable at that level for a couple of months, and then gradually grew to about 130 violations per day. Steps are now being taken to add signal-head indicators (red X's and green arrows) to supplement sign messages in an attempt to further reduce this type of violation. In a further attempt to reduce violations during hours of nearly congested operation, the hours of commuter-lane operation have recently been broadened to 2:00 to 7:00 p.m.

Safety

There has been no perceptible change in accident rates nor in severity of accidents since the introduction of the commuter lane. Normally about six to eight accidents per week occur on this stretch of the freeway. To date, there have been no fatalities associated with the commuter-lane operation.

Public and Media Reaction

Many positive newspaper articles and editorials dealing with the project have been published; more than 90 percent of the contacts from the public have expressed support for the project. Recently there has been virtually no media attention and very few calls or letters regarding the project. There has been a request by the community to implement a similar lane in the westbound direction.

The commuter-lane project cannot yet be declared an unqualified success; it is premature for that. Much more operating experience under a variety of conditions is still needed. The results to date have been most encouraging, though, so much so that a second step in the evolution of the concept has been taken. Similar commuter lanes, in use full-time, were implemented in November 1985 in both directions on about 12 mi of the Costa Mesa Freeway in Orange County; similar excellent results are being observed.

Results to date suggest that the part-time use of shoulders for added capacity and operating the added lane for HOVs may well be one of the best transportation system management techniques yet to come down the freeway.

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