Primary Guidelines

Congestion

The major factor motivating the establishment of HOV lanes is severe and recurring traffic congestion. An HOV lane should be considered only when there is freeway congestion necessitating more efficient use of the roadway.

Travel Time Savings

An HOV lane should be considered only when it would provide a reliable travel time reduction to HOV users. The single most important predictor of an HOV lane's success is its ability to reduce travel time and to generate a reliable travel time to users. Timesavings realized by HOVs must be on the order of approximately one minute per mile over a typical trip from origin to destination. A four-minute overall travel timesaving is considered a minimum, and a savings of eight minutes is considered desirable. As a point of interest, though not validated by a formal study, the general public typically perceives a two-fold increase of timesavings versus actual savings. In other words, based on the example above, the average person would perceive a timesaving of between 10 and 15 minutes.

Person Throughput

The major goal of HOV lanes is to improve the roadway efficiency by increasing its person moving capacity while minimizing overall person delay. For a lane to be designated for HOV use, the number of persons projected to use the lane should exceed the average number of persons carried in an adjacent mixed flow lane in the same direction. Initially, the HOV facility may not attract this many users, and locally accepted thresholds for minimum person throughput may be adopted. If an HOV facility can move within 20 percent of the average number of persons a mixed-flow lane would carry, this criterion is satisfied.

Another benefit HOV lanes create is an increase in overall corridor average vehicle occupancy. Unless significant congestion occurs, some carpools and vanpools may not travel in the HOV lane itself. Rather they will remain in the mixed-flow lanes. If the travel is impeded by congestion, then they may move into the HOV lane for a free moving trip.

Vehicle Throughput

In order to maintain public acceptance of the HOV lane, its usage should meet certain minimum requirements. This minimum is to avoid the public perception of "empty lane syndrome." Initial usage should be a minimum of 400 to 800 vehicles. Initial usage below these numbers can be considered if there are significant bus transit volumes. Peak-hour bus volumes of 30 to 45 vehicles may, when combined with other HOVs, prove sufficient. As an

estimation procedure for determining two or more occupancy demand, the following procedure is provided:

Primary Diversion: Assume between 70 and 90 percent of the current mainline and service road HOVs will divert into the HOV facility.

Secondary Diversion: Assume between 25 and 50 percent of the currently eligible parallel route HOVs can be expected to divert into the HOV facility.

Latent Demand: Take the low and high estimates derived for primary diversion and increase by 20 and 60 percent respectively. The rule of thumb is that latent demand can represent up to two-thirds of the forecast use on a new HOV facility. This is the most significant factor affecting HOV demand on all projects offering meaningful travel timesavings.

Growth: Apply an appropriate local growth factor. This factor should be developed from the time the existing database was developed up to the first year the project would begin operation.

Capacity Improvement

An HOV lane should be considered whenever lane additions are being made to freeway segments that already have three or more mixed-flow lanes in one direction. In urbanized areas, commuter traffic often produces severe peaking, resulting in bottlenecks and stretches of congestion along the freeway. Unless other resources exist to adequately address this demand, HOV priority treatment should be considered. In applying HOV treatment, it is generally recognized that a lane addition is highly recommended, and that taking away a lane from mixed-flow traffic is not generally advisable. Taking away a lane, or lanes, should never create a condition in which the resulting improvement in level-of-service for HOVs is offset by a lower level-of-service or increased delays to mixed-flow traffic.

Borrowing a lane or lanes from the off-peak direction for contra flow treatment should be considered only if the existing peak/off-peak directional split during peak commuter periods is at least 65/35 and is forecast to be at least 60/40. Off-peak direction travel should be maintained at LOS D at a minimum and preferable LOS C.

Local Agency/Public Support

An HOV facility should be implemented only when the strategy is supported by local, regional, and state agencies. Many successful projects have multiple agency involvement in operations and maintenance and policy administration. Commitments and responsibilities for HOV implementation, promotions and operations should be shared, where appropriate, by local and state transportation agencies.

Enforcement

HOV lanes should be implemented only when resources and commitment exist for effective enforcement. The design of the HOV facility should consider enforcement activities, and input should be solicited from enforcement agencies during the planning and design process.

Enforcement is necessary to achieve acceptable levels of compliance and to render the HOV treatment effective. HOV lane usage can be an important determinant of public adherence to the HOV rules. Where an HOV lane is practically empty and the adjoining lanes are full, adherence to the HOV rules is low, and occupancy violations tend to be high, necessitating the need for a greater enforcement commitment. However, periodic enforcement will also be needed on HOV lanes that appear full and adequately used.

Cost Effectiveness

HOV lanes should be considered for implementation when they are cost effective. Cost effectiveness may be measured via benefit/cost analysis against other HOV approaches or other transit or highway approaches. Benefits are generally based on travel timesavings and person throughput, with spin-off benefits of lower operating costs and energy consumption. Costs mainly encompass construction, operation and maintenance.

Physical Characteristics

The existing roadway design characteristics often affect the feasibility of HOV lane implementation. Generally, the implementation of HOV lanes involves retrofitting existing designs in constrained environments. Trade-offs in desirable lateral clearances are usually required, at least in isolated segments where impediments would make the HOV improvement cost prohibitive. At a minimum, the HOV lane addition should result in no less than an 11-foot lane for the HOV and mixed-flow traffic, and this should not be a typical condition. HOV concepts include seven basic types of operation:

Lane Conversion: Conversion of a general-purpose lane for use as a high-occupancy vehicle (HOV) lane is frequently considered as an approach for increasing mobility. Some advocacy groups have endorsed this approach as a preferred way of encouraging modal shift to transit and ridesharing without the need for expensive and disruptive construction associated with roadway expansion.

Shoulder Conversion: Full-time shoulder conversion involves improving the shoulder for full-time HOV use. Part-time shoulder conversion involves designating the shoulder as an HOV lane during peak hours and returning the shoulder for emergency parking at all other times. In general, part-time shoulder conversion is no longer practiced because of a variety of inherent safety risks caused by driver confusion of when the lane can be traveled on.

Reversible Flow: One or more barrier separated lanes usually operating in one direction in the morning and the opposite direction in the evening

Two-way (also termed concurrent flow): One or more lane(s) operating in both directions of travel during portions of the day. The physical design can be either barrier-separated, buffer separated or non-separated from the adjacent mixed-flow lanes.

Contra Flow: Usually one lane that is borrowed from the off-peak direction mixed-flow lanes and converted to serve buses and possible other select HOVs.

Queue Bypasses: One or more short distance lanes operating in a concurrent flow fashion during a portion of the day. Examples include HOV lanes at ramp meters and isolated bottlenecks, and HOV lanes through toll plazas.

Exclusive Ramps: Every HOV design concept requires ingress/egress treatments (ramps) to facilitate specific congestion and distribution requirements. Dedicated ramps save users additional travel time, provide more effective transfer of mode functions, and aid in enforcement, incident handling, and improve the overall operating efficiency of an HOV facility.