

Provision of Bus Loading Facilities on Urban Freeways

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Express bus service on urban freeways generally can fill the present need for transit service between central business districts and outlying low-density residential areas where routing along city streets is undesirably slow and where a rapid transit line on an exclusive right-of-way cannot be sustained by passenger demand.

Where such bus service is to be operated, it may be necessary to construct loading facilities adjacent to or within the freeway right-of-way. The paper suggests circumstances under which such facilities might be necessary, and points out some primary design considerations. Prevailing administrative policies in many states regarding the responsibilities of providing bus loading facilities are summarized from responses to a survey. The California problems, resulting in the only legal requirement to consider construction of such facilities, are discussed.

- DISCUSSIONS of the need for integrated transportation networks are found more and more frequently in technical reports dealing with problems of transporting persons in urban areas. The reason for this is apparently a growing consensus that some kind of balance must be struck between the use of automobiles and the use of mass transit if urban traffic congestion and transport costs are to be kept within tolerable limits.

The present general concept of such integration includes the incorporation in limited-access grade-separated urban highways of whatever special facilities are required for the operation of high-speed mass transit. Views differ as to the kind of mass transit for which to provide. One view is that rail rapid transit installed in urban freeway median strips is needed to provide attractive high-capacity service. This type of facility is now operating in Chicago's Congress Street Expressway.

Another view holds that establishment of bus rapid transit routes on urban freeways may be a simpler and more easily attainable form of transport inte-

gration, able to meet the need for fast transit service between low-density residential areas and high-density business districts or employment centers.

The authors found in a nationwide study that intra-metropolitan bus services on freeways are steadily growing, and that they generally fill the present need for transit service between central business districts and outlying low-density residential areas where routing along city streets is undesirably slow and where a rapid transit line in an exclusive right-of-way cannot be sustained by passenger demand.

Attention was focused, therefore, on the problem of provision of loading facilities on urban freeways. This raises such questions as: Who determines whether bus stops are to be provided within freeway rights-of-way and, if they are, where will they be located, how will they be designed, and who will pay for constructing them? These questions arise because of divided responsibility for transport services. Historically, mass transit has been operated by a private company or a public agency at the local level and sustained by passengers' fares.

Highways, on the other hand, have been paid for from revenues derived from user taxes and have been planned, designed, constructed and maintained by state or local departments of public works. In more than half the states, constitutional provisions prohibit the use of highway-user revenues for non-highway purposes. Some state highway departments have held that such provisions prevent them from paying the cost of constructing bus stops for the use of local transit systems.

FREEWAY BUS ROUTE PATTERNS

From an analysis during 1957 and 1958 of the freeway bus services offered in nine major metropolitan areas of the United States, and of routes proposed for the future, two general types of route patterns may be identified.

The trunk-line type of service is similar to a rail rapid transit pattern. A trunk line operates on the freeway, making regular stops at intervals of perhaps $\frac{1}{2}$ to 1 mile. The stops permit access to the trunk line from adjacent areas and from intersecting transit routes of a feeder, crosstown, or local service character. In the downtown area, the route leaves the freeway to reach a terminal or to discharge and pick up at stops on city streets. At the outer end, the line may split into several branches, or a percentage of trips may be turned back short of the terminal to avoid operating at excess capacity in the area of light patronage. "Branching" has the advantage of providing through service to more passengers in the outlying area, and reducing the need for transferring; in fact, it utilizes the one principal advantage which bus service holds over rail service — greater flexibility of routing. It appears, therefore, to be preferable to the turn-back procedure, which, however, has operating advantages (quick adjustment of headways in the case of undue delays, accidents or breakdowns) and provides seating capacity for passengers boarding at intermediate points.

The individual routing between the central business district and outlying areas consists of service operated non-

stop between the fringe of the downtown area and the border of the outer area to be served. No stops are made on the freeway, and buses often continue non-stop fashion on city streets for some distances after leaving and before reaching the freeway. Scheduling is simply adjusted to traffic demands, and either branching or turning back of vehicles is usually not necessary. Again, the flexibility of the rubber-tired vehicle is used to full advantage, routes being inaugurated or adjusted with little or no alteration required in the right-of-way.

Each type of service pattern has some advantages. The trunk-line system permits short headways over the heavily patronized portion of the route. It serves passengers traveling from the central business district to intermediate areas along the route, and those traveling between these areas and the outer sections of the city. It simplifies downtown routing and requires only one set of bus stops for efficient loading. The layout of the entire transit network is likely to be more efficient, because transit lines in intermediate areas, required to provide local service in any case, act also as feeders to the trunk line, and need not be operated all the way downtown. An example of this, although the trunk line is on rails, is the Cleveland Transit System. Since inauguration of the "Rapid," a number of radial bus lines no longer operate all the way downtown, but terminate at transfer points on the rail line.

Among the principal disadvantages of the trunk-line pattern are the lower over-all speeds because of the stops required on the freeway, and the inconvenience caused passengers by requiring many of them to make transfers not required under the individual routing pattern.

For the individual routing pattern, the advantages and disadvantages are approximately reversed. This pattern provides extremely fast service, operating non-stop for long distances, and eliminates the need for transfers for many passengers. However, no service is provided by these routes to intermediate points either from downtown or from

the outer ends of the routes. Headways are longer. The network becomes complicated with more routes required; local service routes in intermediate areas must come downtown, or feed into trunk lines operating on city streets.

In the downtown area, the individual routing pattern may cause some difficulty in locating bus stops. Whereas one trunk line operating over one freeway requires only one set of stops (boarding passengers would usually take the first bus which comes along), a number of individual routes will require the sorting out of passengers, so that each one will board the right vehicle. This can be achieved by permitting only two or three routes to pick up at any one bus stop, and establishing extra sets of stops (perhaps on different streets) for additional routes. An alternative is the construction of a central off-street bus terminal. This, however, does not provide distribution throughout the downtown area as would a route looping through the central business district with several stops.

Of the two types of patterns, individual routing is the more common one found in the United States at present. It appears to be most suitable in areas of fairly low residential densities, and where routes are long (perhaps more than 10 miles in length). Low residential densities will generate insufficient traffic in the intermediate sections of the freeway route to warrant the establishment of stops. For long routes, the higher terminal-to-terminal speed will mean appreciable time savings, with correspondingly greater attractiveness of the service to through passengers.

The trunk-line system will probably find most applicability in densely developed areas, because more trips will be generated within walking distance of the freeway, and because crosstown transit routes will feed passengers to the trunk line in larger numbers. The trunk line will provide a transportation link between the intermediate and outer sections of the city, a traffic movement of considerable size where there is high residential or employment density in the intermediate areas. Should freeway ex-

press bus lines in areas of this type also be very long, the terminal-to-terminal speed can be improved by operating some express coaches, which will omit intermediate stops, especially during peak hours.

Suburban Areas

The routing problem is somewhat different in suburban areas, where urbanization is not yet continuous but is concentrated in a number of separate towns. Bus service into these areas was initially developed along the main highways leading into the central city. Often pioneered by inter-city carriers, service began in the form of a few additional runs on the suburban sections of long-distance routes. As the transit demands of the suburbs grew, service was increased and separated from the inter-city operations. Some branch lines were added to serve the larger towns located off the highway, while the original route often became the trunk line of the system.

Such a trunk line serves directly those towns which have developed on the highway. Passengers from the smaller off-highway communities, which cannot support a direct route into the center of the metropolitan area, must find their own way to the nearest point on the trunk route. The location of these small communities in relation to the main highway often prevents one bus route from serving each of them directly without adding intolerably to the route length and travel time. It is, therefore, likely that a trunk-line type of bus service will remain the only economically feasible method of supplying adequate transit service to outer suburbs.

NEED FOR BUS STOPS

Bus loading facilities on freeways will be needed where it is proposed to operate a trunk-line type of service. The location of each facility will depend almost entirely on local conditions: points of intersection with crosstown lines and feeder lines, location of major traffic generators adjacent to the freeway, and

of parking areas provided for passengers who use their cars between the bus route and the outer end of their journeys. Consistent with these needs, the spacing of the stops should be maintained at a high figure, perhaps one stop per mile. More frequent stops slow down the bus service, add to the construction and maintenance costs of the artery and to the operating costs of the buses, and detract from the safety of freeway operations by adding merging and diverging maneuvers.

Local conditions may warrant some freeway stops for the individual route pattern. Some transit passengers on radial lines may not wish to travel all the way into the central business district, but desire to transfer to a cross-town line which serves their place of employment outside the downtown area. Table 1 gives passenger volumes counted on express buses using the Harbor Freeway in Los Angeles. The maximum load point occurs more than 3.5 miles from the central business district; passenger volumes drop gradually as buses approach the downtown area. At two of the three pairs of bus stops in this section of route, most of the passengers leaving the inbound buses do so to transfer to crosstown transit lines (see Table 2). In the 9 months between the two surveys, use of these bus stops has increased at a more rapid rate than total passenger volumes on the freeway routes. The pattern for outbound buses is similar.

Studies of buses operating on the Hollywood Freeway in Los Angeles show a like pattern. On inbound buses more persons alight at freeway stops within

TABLE 1
PASSENGER VOLUMES ON EXPRESS BUSES
OPERATING INBOUND ON THE HARBOR
FREEWAY, LOS ANGELES

Location	Distance from edge of CBD (mi)	Inbound Passenger Volumes During Morning Peak Period		
		Jan. 1958	Oct. 1958	Incr. (%)
South of Vernon Ave. Between Vernon Ave. and Jefferson Blvd.	Over 3.5	2,177	2,452	12.6
Between Jefferson and Pico Blvds.	2.2-3.5	2,102	2,328	10.8
Between Pico Blvd. and edge of CBD	0.8-2.2	2,060	2,280	10.7
	Less than 0.8	1,860	1,972	6.0

3 miles of the downtown area than board them; however, the total use of the two pairs of stops studied on the Hollywood Freeway is somewhat less than of those on the Harbor Freeway routes. (Incidentally, the maximum number of bus passengers passing any point in the Los Angeles freeway system is near Alvarado St. on the Hollywood freeway; four bus routes carry about 2,370 inbound and 2,800 outbound passengers during the maximum hour, 750 inbound and 815 outbound passengers during the highest 15 min.)

A freeway bus stop may also be warranted if the freeway passes near an area of heavy employment (perhaps an industrial plant) to which passengers travel from the outlying area, or a residential area which generates heavy outbound traffic. The latter situation exists in Dallas: the Central Expressway passes through a district containing the homes of many domestic workers, whose employment is at the outskirts of the city. Buses make a stop in this area to pick up such workers outbound and discharge them inbound.

TABLE 2
PASSENGER ACTIVITY¹ AT TWO BUS STOPS ON HARBOR FREEWAY, LOS ANGELES

Location	Date	Number	Passengers Loading Freeway Buses	Approx. % Transferring	Passengers Boarding Freeway Buses	Approx. % Transferring
Vernon Ave.	Jan. 1958	113		Not Avail.	43	Not Avail.
	Oct. 1958	162		80	38	30
	(Change)	+ 43.4%	+ 43.4%	—	— 11.3%	—
Pico Blvd.	Jan. 1958	201		Not Avail.	1	—
	Oct. 1958	309		80	1	—
	(Change)	+ 53.7%	+ 53.7%	—	—	—

¹ Data for morning peak period, when only inbound buses operate.

Where the individual routing pattern of freeway buses is to be used, and where no special conditions such as described exist, no loading facilities will be required. As will be discussed later, it is often preferable to have trunk-line buses stop off the freeway, which may also eliminate the need for building the loading facilities as a part of the freeway.

On suburban trunk lines, if a freeway is built on the right-of-way of an existing highway, some provision for bus stops is usually a necessity. Fencing of the existing right-of-way cuts off access to existing stops. The transit needs of the area, however, demand continued service to many of these points. Such service must be operated on the freeway; often, no parallel highway is available (see Appendix). Bus stops should either be built into the interchange design or should be provided immediately adjacent to the interchange in such a manner that buses have no difficulty in reaching them. If service must also be provided to a point at which no freeway interchange is built, special bus platforms, connected by a pedestrian overpass or tunnel, may be necessary.

Where the freeway leaves the old highway alignment, the travel patterns of transit riders may indicate that the bus route should remain in the existing highway. For example, if a freeway bypasses the center of a suburban town by more than a few hundred yards, passengers who have had access to the bus route in the town center may be unwilling or unable to go to a less conveniently located stop, especially if no parking facilities are available there. The amount of traffic generated by the town will determine whether the bus route should leave the freeway to serve it and whether any bus stops on the freeway bypass will be required.

No factors have been developed to indicate the minimum use a potential freeway bus stop location would have to receive in order to justify its construction. Certainly, a small amount of use at a location where the buses could easily stop on a frontage road, or where passengers wishing to board or alight could

be rerouted via another stop, would indicate that no stop be built. In suburban areas, where geographical or highway design reasons make it difficult or impossible for buses to leave and re-enter the freeway, a stop may have to be built for small passenger demands.

At eight bus stops studied in the Los Angeles area, all located at a distance of from 0.8 to 3.5 miles from the edge of the downtown area, passenger movements ranged from 24 to 202 during the highest hour of the peak period.

On one freeway in a suburban area of California, bus stops have been used by commuters traveling in private cars to pick up or drop off members of their car pools. This use of bus stops is preferable to having cars stop on freeway shoulders for the same purpose and, if cars do not stop for more than a few seconds, does not detract materially from the primary purpose of the freeway stop. However, transit companies may have a valid objection to this practice if it becomes large in scale, or if it results in private cars picking up passengers who would otherwise be patrons of the transit company.

BUS STOP DESIGN

When the need for bus stops has been determined, it becomes necessary to design a suitable loading facility. It is, of course, hazardous for buses to stop in a running lane of a freeway. The three primary objectives to be sought are: the safety and efficiency of the bus operation in serving the stop, the safety and convenience of the passengers using the stop, and the least cost of providing the stop.

The safest and most efficient bus operation is obtained by providing a stop on a lane reserved exclusively for buses. This lane should parallel the freeway through lanes to avoid any excess mileage to be operated. It should be long enough to permit deceleration and acceleration wholly within the lane. The loading platform itself should be long enough to handle as many buses at a time as may reasonably be expected.

The safest and most convenient stop

from the point of view of the passengers is located immediately adjacent to the crosstown or feeder line, in the parking area which may be provided for private automobiles, in the shopping areas which may be near the freeway, or near the residences in the vicinity. It should be sheltered and such walking as is required should be easy and fairly level.

Short of providing no bus stop at all, the least expensive facility will minimize the need for additional right-of-way purchases, extension of structures to accommodate loading lanes and platforms, and special structures such as pedestrian ramps, stairways, and platforms. Inclusion of parking facilities would be immeical to the low cost objective.

These three factors often act in opposition to each other. For example, a stop alongside the running lanes of the freeway, although providing efficient bus operating characteristics, will involve either passenger inconvenience (long walking distances, or climbing stairs), or high cost (extra length of overpass or underpass at cross street), or both. An inexpensive arrangement, such as a stop at the cross-street level in a clover-leaf interchange, will add mileage and time to the express bus schedule; although it will be convenient for some passengers, others may have to walk across the entire interchange area to and from the far side of the freeway. A location convenient for the passenger, such as in an adjacent parking lot, may add even more time and mileage.

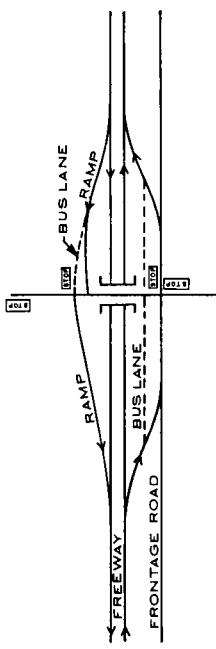
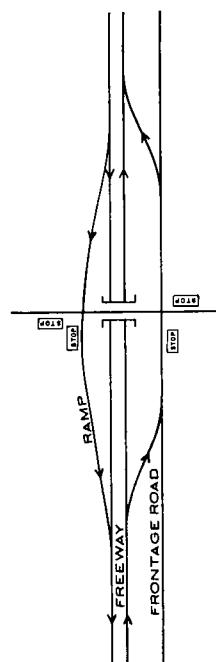
The American Association of State Highway Officials has expressed awareness of this design problem and has included a number of diagrams of proposed layouts of bus stops in their policy for urban freeways (1). Figure 1, based on this policy, shows possible layouts involving little or no expenditure for construction.

Several transit executives interviewed in this study expressed a preference for the type of arrangement shown in Figures 1A and 1B. At a diamond interchange little additional mileage or time is involved in bringing buses to the level of the cross street. Passengers trans-

ferring to a transit route on the cross street are saved the inconvenience of a long walk. However, some time may be lost by the bus while waiting for an opportunity to cross the intersecting street at grade. Where buses approach the cross street in an exclusive lane, the lane can be provided with a signal-actuating detector which assigns the right-of-way to the bus in a short time.

Where cloverleaf-type interchanges are used on a freeway, and a bus stop is to be installed, the problem is less easily solved. Figures 1C and 1D show two inexpensive layouts. However, it should be noted that in Figure 1C buses are required to follow a long and perhaps tortuous path through the interchange, whereas in Figure 1D passengers must walk some distance, generally involving a change in elevation of about 20 ft and, often, crossing of a freeway ramp at grade (see Fig. 2). A practical solution which minimizes both these objections is to provide a bus lane and platform immediately above or below the cross street; this will also be the most expensive solution, requiring a longer separation structure and stairways or ramps. Figure 3 shows such a facility, though not in a cloverleaf interchange. Figures 4 and 5 show other bus stop layouts in the Los Angeles area.

It is a common feature of all these designs that buses enter and leave the freeway running lanes via on and off ramps which are also used by general traffic. The establishment of bus stops does not increase the number of merging and diverging areas on the freeway running lanes. New points of conflict are created on the ramps, where traffic moves at a lower speed and the resulting hazard is not so great. Construction of bus lanes which diverge from and merge into freeway running lanes directly should be avoided if possible. If such a design is selected, the lane should be long enough to permit buses to leave and re-enter the running lane at the speed of freeway through traffic. Weaving conflicts at the ends of the bus lane may occur if it leaves the running lane soon after an



A - DIAMOND INTERCHANGE
Buses stop on frontage road or ramp, near or far side of cross street.

B - DIAMOND INTERCHANGE
Buses stop in exclusive lane at cross street level, near or far side of cross street.

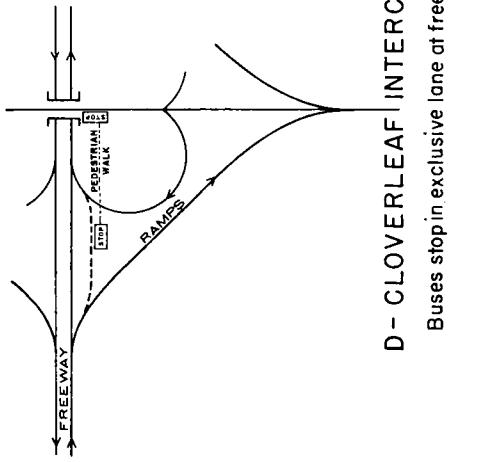
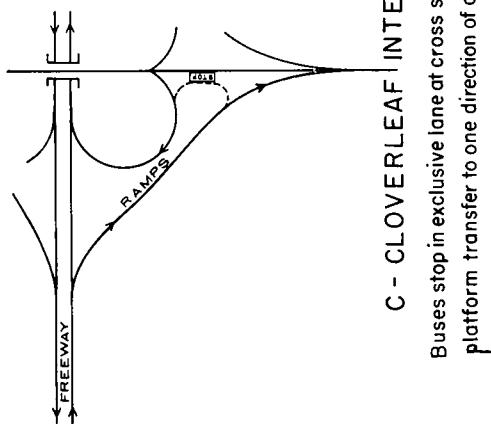


Figure 1. Layout of simple bus stops, based on AASHTO design policies.



Figure 2. Bus loading facilities at Alto Interchange on US 101 north of San Francisco. Bus stop arrangement is shown schematically in Figure 1D. Note pedestrian crosswalks crossing cloverleaf ramps at grade.



Figure 3. Bus stop on Harbor Freeway at Seventh St., Los Angeles. Note the two extra spans required for Seventh St. Bridge to pass over bus lanes.

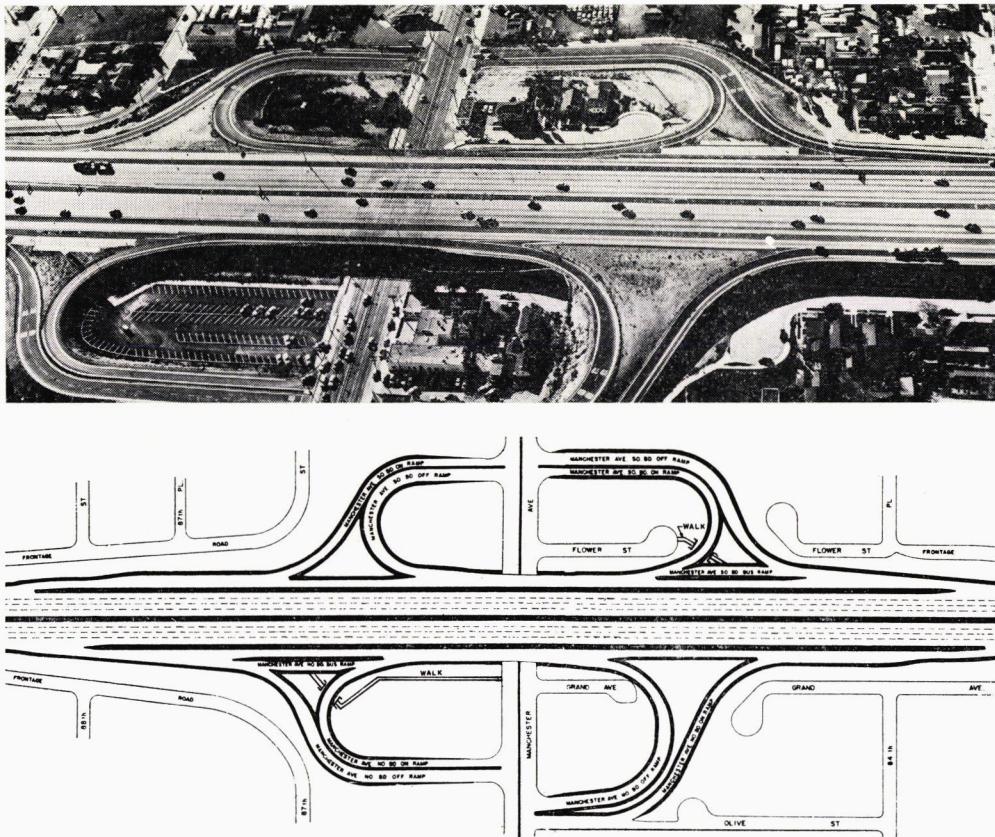


Figure 4. Bus loading facilities on Harbor Freeway at Manchester Ave., Los Angeles. Note tunnels for pedestrians under on-ramp curves. (Parking lot within the loop of lower left quadrant is a private facility operated by adjacent business and has no connection with freeway.)

on ramp, or re-enters it just ahead of an off ramp.

A few special bus stops have been built in the freeway median (notably one on the Hollywood Freeway in Los Angeles), with stairways connecting the platforms to the cross street. Although this minimizes conflicts between buses and traffic using on and off ramps, it requires buses to weave into the median lane to reach the stop, and to merge into it from the left when leaving the stop. This is a hazardous maneuver, because the median lane usually carries the highest-speed traffic. The danger is increased by the difficulty experienced by drivers of large vehicles when merging from the left. Traffic on the right of the bus is often not clearly visible. (Several

transit companies report that they do not install rear view mirrors on the right front corner of their buses, because such mirrors may injure passengers waiting at stops when the buses pull into the curb.)

An analysis of all the possibilities of geometric layout indicates that the types of stops illustrated in Figure 1 are probably the most appropriate for general use. On extremely heavy trunk lines (as the projected route on the Southwest Expressway in Chicago may develop to be) the extra expense of building bus stops immediately above or below the cross street may well be justified. Because it has been observed that passengers are reluctant to climb stairs to or from bus platforms, serious

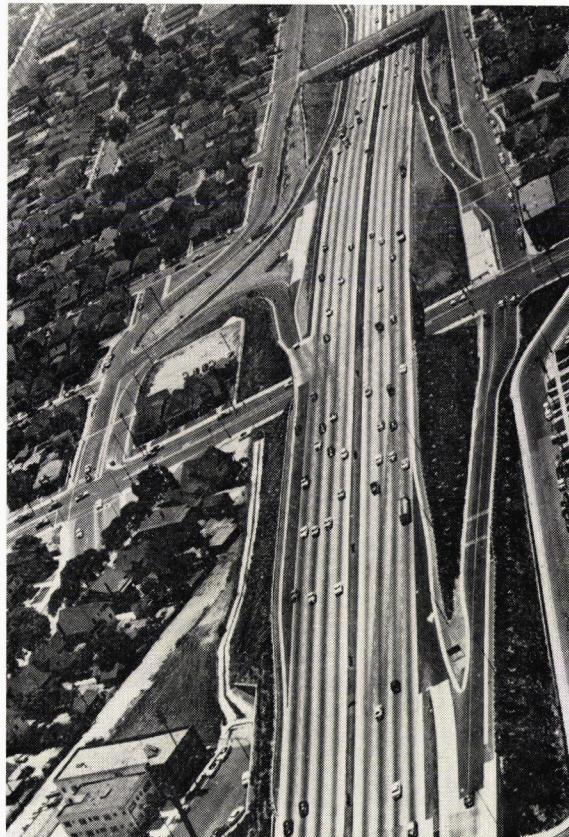


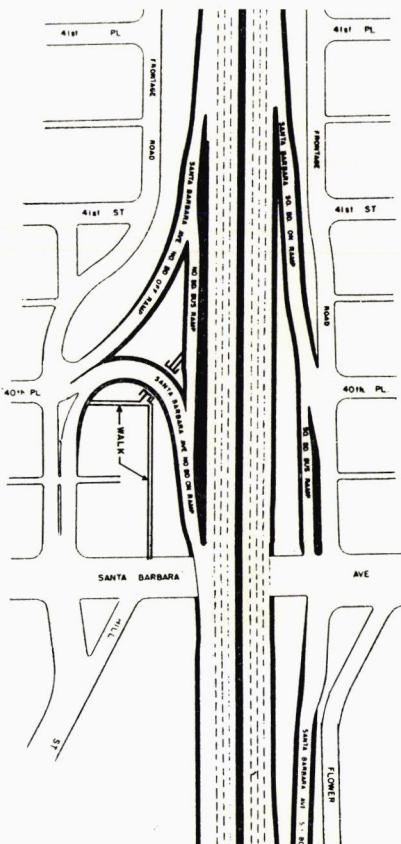
Figure 5. Bus loading facilities on Harbor Freeway at Santa Barbara Ave., Los Angeles, looking south. Note that southbound buses stop at cross street level; northbound buses stop at freeway level.

consideration should be given to providing escalators or moving ramps for their convenience. The additional first and maintenance costs should be weighed against the additional transit patronage induced by such installations.

The loading platforms should be designed to permit simultaneous loading or unloading of as many buses as may reasonably be expected to arrive at the same time. The lanes should be clearly marked for use by buses only. Pedestrian walks should be grade separated from freeway ramps, and fences should prevent pedestrians from crossing the running lanes. All these features are clearly shown in Figure 6. The absence of benches at stops causes some inconvenience to waiting passengers and has

produced adverse criticism of freeway bus service.

A study of certain interchange areas may show that the best solution is to provide no bus stop at all, but to require some or all buses to leave the freeway and stop near the point which passengers wish to reach. This may happen where stops are origins and destinations rather than transfer points. A transit riding analysis may indicate that the extra time and mileage required in looping off the freeway and driving to, say, a shopping center is well spent. Modern freeway interchanges cover large acreages, and the transit route may lose substantial patronage if passengers are required to cross this area to reach the bus stop. The same may be said in connection



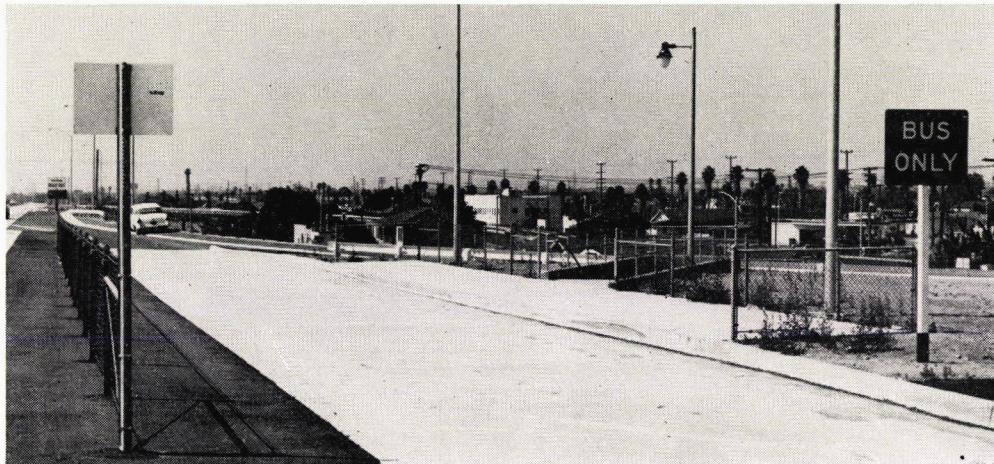


Figure 6. Typical bus loading facility constructed in Los Angeles area (Harbor Freeway, at Manchester Ave.)

with parking facilities. At present none of the cities covered in this study have parking facilities built integrally with freeway bus stops. However, it seems reasonable to expect that such facilities will be built (by either public or private agencies) in the future at some locations, where the private automobile is the preferred vehicle in feeder service to the bus line. In such cases, the bus stop must be so located that passengers will have as short a walk as possible from the parking area to the bus; or, where patronage is sufficiently high to warrant it, the bus might make a loop into the parking lot to pick up passengers.

PROVISION OF BUS STOPS

In all of the states there is a division of responsibility in the transportation field. Freeways are planned, located, financed and constructed by highway agencies; transit service is provided by local transit concerns, either publicly or privately owned; if privately owned, transit companies are usually regulated by a state commission and one or more local governments, all of whom have some voice in the type of service the company is to provide.

The problem of planning bus loading facilities arose with the start of urban freeway construction. In some states,

no facilities have yet been constructed, although transit service might be improved by them. Elsewhere, bus stops have been built by the state or the city without coordinating plans with the transit company, and such stops have never been used. A questionnaire was sent to highway departments of 27 states which contain large urban areas, to the District of Columbia and to the Province of Ontario, to gather information on the legal and financial responsibilities for providing bus stops. The information presented hereinafter is based on the 25 replies received, and on additional data pertaining to California. The California situation is unique, so will be discussed first.

California. The Streets and Highways Code of the State of California has authorized state construction of mass transportation facilities since 1947. Section 147 of the code, added in that year, reads:

147. The department is authorized and empowered to provide for, finance and construct such mass transportation facilities as are required for loading and unloading of passengers carried on motor coaches or buses operated by common carriers of passengers for hire in urban or suburban service.

Section 148, as added at the same time, provided that the State Department of Public Works could enter into

contracts with transportation concerns or political subdivisions for financing, constructing and use of such facilities, so that the state be reimbursed for its costs.

Under the provisions of this law, several bus stops, platforms and stairways were built in the Los Angeles area, the city reimbursing the state for the costs involved. The city, in turn, recovered its costs from the transit companies through user charges. The state, however, built no stops where reimbursement was not offered by another agency, maintaining that such expenditures might be construed to be unconstitutional. California's Constitution, Article XXVI, restricts expenditure of motor vehicle and fuel taxes to "highway purposes"; it was suggested that bus loading facilities might not be classified under this heading.

In 1953, the state converted an existing highway in the San Francisco Bay Area into a full freeway. As a result, the bus company providing commuter service on this route ceased to call at a stop where access to potential passengers had been cut off by new right-of-way fencing. The affected commuters appealed to the California Public Utilities Commission to force the bus company to provide service comparable to that offered prior to the fencing of the highway. The Commission ruled (2) that it would be "a step in the wrong direction" if it ordered the bus company to leave the freeway at this point to make a stop. (The interchange layout would have required considerable extra travel time and distance.) The Commission felt that the state should provide bus turnouts for most efficient bus transit operations. The full text of the Commission opinion is included in this report as an Appendix.

Partly as a result of this Commission opinion, and of hearings conducted by a subcommittee of the Assembly Interim Committee on Transportation and Commerce (3), Section 148 of the Streets and Highways Code was repealed, and the following new section added in 1957:

148. Upon a determination by the department that mass transportation fa-

cilities described in Section 147, with reference to a freeway, are in the public interest and that the cost is not disproportionate to the public benefits to be derived therefrom, such facilities shall be financed and constructed as are freeways. The general location of such facilities shall be designated by the department, after conferring with the common carriers proposing to utilize such facilities, with appropriate representatives of the Public Utilities Commission, and with appropriate officials of the local agencies concerned. Unless after such conferences the department determines that such facilities are justified and feasible from an engineering standpoint, the department shall, upon written request of the governing body of any such local agency, conduct a public hearing to determine the convenience and necessity therefor. The department shall determine the design for and shall construct the facilities pursuant to such determination. "Mass transportation facilities" as used in this section and in Section 147 shall not include stations, seating, or parking facilities. Nothing herein shall preclude cooperative agreements between the department and local agencies or common carriers for joint financing of such facilities.

Under the provisions of the amended Section 148, the state has proceeded to construct bus turnouts on additional locations in the Los Angeles area, and on several freeways in the San Francisco area, including the location which was subject to the Public Utilities Commission decision previously referred to.

The technical staff of the California Public Utilities Commission has continued to study the problem of providing bus loading facilities on freeways in urban and suburban areas, and has recently extended its concern to rural areas, where intercity carriers are unable to pick up passengers at their customary stops because of conversion of old highways into freeways. The thinking of these engineers was expressed in a report (4) analyzing the situation on Highway 24 east of Oakland:

Many freeways are being built in the State, which if properly used by buses will provide excellent bus rapid transit. . . . Bus stop facilities must be constructed if a satisfactory bus rapid transit system is to be provided. These facilities should include shelters, . . . parking areas for automobiles, and

sidewalks, ramps, and stairs so that passengers may easily reach the facilities. Buses must stop in a safe place with adequate acceleration and deceleration lanes. . . .

. . . Apparently bus rapid transit is the most economical form of rapid transit that can be operated in this area under present conditions. Each bus operating with full seats is equivalent to the operation of 26 automobiles, based on the assumption that each automobile carries 1.7 passengers during the commute period . . . It is estimated that in six years hence, at least 54 buses will be operated during the a.m. commute period, taking the place of approximately 1,400 automobiles. The elimination of the requirement to build additional freeway lanes for these automobiles should justify the expenditure required to construct bus stop facilities. It is quite probable that commute patronage will be accelerated over the present trend if a fast, convenient, comfortable bus service is provided over the freeway.

Other States. It appears from the answers received from other states, that only in California does the law make specific mention of and provision for the construction of bus loading facilities. The 24 states and one province responding* all indicated that no such reference can be found in their laws applicable to highway systems. Many of the states mentioned that urban freeway development has not yet advanced to the point where bus loading facilities have become a problem, and that therefore no policy has been formulated by their highway administrations. This is clearly evident from the summary in Table 3.

* Colorado, Connecticut, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York, Ohio, Oklahoma, Oregon, Rhode Island, Texas, Virginia, Washington, Wisconsin, and Ontario.

States counted in the first group are generally those in which the problem has not yet arisen, because of the limited amount of urban freeway construction under way — and, evidently, because no similar problems in rural areas have yet occurred. All five states in the second group have actually built some facilities. One of them acts on requests of municipalities or private corporations, one consults the Motor Bus Association of its area, and two actually participate only in financing, inasmuch as urban highway planning and construction in their areas is the responsibility of the municipalities. The fifth state did not mention on what basis the need for bus loading facilities is determined. There is only one freeway bus loading facility in all of the states in groups 3 and 4; this was built prior to adoption of the present policy. Frontage road curb stops, perhaps recessed, are provided by some of these states. In only one state listed in group 5 have bus loading facilities been built.

There appear, therefore, to be six states (not counting California) and a Canadian province in which bus loading facilities have been built in connection with controlled access highways; one of the states, however, has since adopted a policy against continuing with such construction. In all cases, the costs of design, construction and planning are a part of the expense of the entire highway project, the respective states paying the cost with possible participation of the federal government, the county and the city.

All states responding indicated that no agreements have been consummated with transit companies for joint financing of bus loading facilities.

TABLE 3
ANSWERS TO QUESTION: "HAS YOUR HIGHWAY DEPARTMENT ESTABLISHED A POLICY IN REGARD TO BUS LOADING FACILITIES?"

	No. of States
1. No policy established.....	9
2. No formal policy; state may build facilities.....	5
3. No formal policy; state does not plan to build facilities.....	3
4. Formal policy; state will not build facilities on freeway right-of-way.....	3
5. Formal policy; state will build facilities (see below)	
(a) State will build only if bus operator pays.....	1
(b) State will build where it determines need.....	2
(c) State will build where conference determines need.....	2
Total	25

The arrangement between the State of Illinois and the Chicago Transit Authority merits special mention. As freeway planning in the Chicago area progresses, each proposed route is submitted to the Transit Authority for study. The Authority determines whether a transit line along the route is warranted and, if so, requests the State to reserve a median of proper width for such operation. The extra cost involved in reserving the median—extra right-of-way, extra lengths of overpasses and underpasses, extra grading and drainage—are absorbed in the over-all highway project costs. The cost of converting the median into a transit artery—stations, stairs and platforms, also rails, signals and cars in the case of rail lines, buses in the case of bus routes—are borne by the transit authority. In view of this arrangement, the state does not plan to build any bus loading facilities for buses operating in the normal running lanes of freeways in the Chicago area.

SUMMARY

Intra-urban freeway express buses are operated in approximately half of the 40 major metropolitan areas of the United States, as determined from a questionnaire survey of the transit companies operating in these areas. The interest expressed by transit companies indicates that this type of service will be inaugurated in other areas as soon as freeways are constructed.

Service provided is predominantly of the individual-route type; that is, buses operate non-stop on the freeways and consequently do not provide service to intermediate points between outer terminals and downtown areas. The areas served at the outer ends of the routes are generally residential. Some are located only about 6 miles from the central business district; others are 30 to 40 miles from the CBD on suburban routes.

The need for and location of bus stops on existing and future freeways deserves careful analysis, based on transportation data of the region. Only where the trunk-line type of service is envisioned

(as in the proposed Southwest Expressway in Chicago) would an extensive system of loading facilities seem warranted in intermediate areas. Bus stops may be needed for individual-route type of operation within a few miles of the CBD to permit passengers to transfer to lines leading to employment areas outside the CBD, and at other special locations. In suburban areas, freeways are often built on the right-of-way of existing highways, and provisions must be made for existing bus routes to offer service at many of the stops made before the old highway was converted. Stops may be established outside the interchange area if the geometric layout allows buses convenient re-entry to the freeway, and if passengers do not have to walk excessive distances. Otherwise, bus stops should be built in the interchange area. At some locations, bus stops may also be necessary between interchanges. Perhaps more consideration should be given to providing parking lots and pick-up areas for private cars adjacent to freeway bus stops.

Only a few state highway agencies now cooperate in the provision of bus loading facilities. Whether there should be a greater amount of participation will depend on the needs of each metropolitan area. If the state does contemplate construction of such facilities, the transit company expected to utilize them should participate in the planning stages and should advise on the proposed locations and layouts of the stops. In California, consultation with common carriers and the Public Utilities Commission transportation engineers is now required by law. This procedure is intended to insure that all bus facilities incorporated into the design of a freeway will contribute to the effective transportation system of the urban area.

The development of freeway bus service should be integrated into the transportation planning of metropolitan areas. In many of these areas, no agency presently has the responsibility of coordinating and guiding the planning of highway and transit facilities. Such an agency could effectively evaluate the role that

freeway bus routes might play in the transportation system of the urban area.

REFERENCES

1. "A Policy on Arterial Highways in Urban Areas." AASHO, Washington, D. C. (1957).
2. State of California, Pub. Util. Comm., Decision No. 51027 (Jan. 25, 1955).
3. State of California, Assembly Interim Comm. Reports, 1953-55, Vol. 3, No. 2, "Problems of Rapid Transit." Sacramento (Jan. 31, 1955).
4. "Report on Bus Rapid Transit between Concord and Oakland-San Francisco." California Pub. Util. Comm. (June 17, 1957).

APPENDIX

Decision No. 51027

Case No. 5512

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Shoreview Community Association, a corporation, Complainant,
vs.
Pacific Greyhound Lines, a corporation, Defendant.

OPINION

This is a complaint proceeding brought by Shoreview Community Association, a corporation, against Pacific Greyhound Lines. The crux of the complaint is that:

On or about the 15th day of October, 1953, defendant commenced discontinuing the service (theretofore rendered by regular and scheduled stops in the City of San Mateo, California, along By-Pass U.S. Highway 101 between Peninsular Avenue and 9th Avenue) and that since the 15th day of October 1953, defendant has completely discontinued the service described.

The verified answer of the defendant sets forth, and the record shows, that on or about the dates of the discontinuance complained of, By-Pass U.S. Highway 101 (hereinafter called the freeway) was shut off from the contiguous residential area by fences so that access to the buses at points along the freeway where stops had been made previously was no longer possible, and further that no turnouts for the picking up and discharging of bus passengers were provided along that section of the freeway. The answer of defendant further sets forth that to have continued making stops on the paved portion of the freeway would have been in violation of Section 582 *et seq.* of the Vehicle Code and of General Order No. 98, Rules 12.36 and 12.37 of this Commission regarding safe and lawful operation of vehicles.

The complaint aspects of the case can readily be resolved in favor of the defendant on the above grounds. They are so resolved. However, the complaint contained an alternative prayer for an order "authorizing and directing defendant to supply a service which is comparable" to the service on the freeway which has been discontinued. To determine the propriety of giving relief under this alternative prayer, the Commission staff conducted an exhaustive investigation, such as would have been made had the proceeding been in the nature of an investigation on the Commission's own motion as to the adequacy of the service rendered by the defendant. Not only members of the staff, but the Commissioners themselves, carefully studied and considered the area involved by means of maps and aerial surveys, and by on-the-spot inspection after submission of this matter.

The Commission entertains no doubt as to its authority to order the defendant to depart from its presently authorized routes along the freeway, and to route its buses over service roads adjoining the freeway for the purpose of picking up and discharging passengers in the Shoreview area. Three alternative plans for rerouting were suggested by the staff. None of the three plans, however, was considered entirely satisfactory by the staff experts. None would be of any substantial benefit to that part of the Shoreview area which is rapidly developing in a southerly direction. None-the-less, the Commission is convinced that it has authority to require the defendant to change its routes in order to provide service under any of the three suggested plans.

The record supports a finding, which we hereby make, that the residents of the Shoreview

area are in need of adequate bus transportation to and from the San Francisco downtown area. Such transportation is now available to them only through the services of the defendant. And they can board and leave defendant's buses only at stops located to the west of the freeway, over an overpass, and at considerable distance from the Shoreview area. It may therefore be conceded, for purposes of this decision, that they are not now receiving service "comparable" to that which they received before the fencing of the freeway. Whether or not to order defendant to supply such "comparable" service is a question for decision by the Commission on the basis of the exercise of its sound discretion in view of all the factors involved.

Were the problem here involved an isolated one, the Commission might be disposed to afford a makeshift solution by an order requiring the defendant to depart from the freeway and serve the Shoreview area along the adjoining service roads. It is true that these roads are narrow, and the only available road on the east side of the freeway is winding and circuitous in part; so that the service could not, at best, be expeditious. It is also true that the routing of through buses over the service roads would slow down schedules and result in delay and inconvenience for through passengers. The Commission might, none-the-less, be disposed to issue such an order if it provided the best available solution to the problem here before us, and at the same time had no further and additional implications.

We are impressed, however, with the fact that the people of the State of California are engaged in a vast and long-range program under which great sums of money are being devoted to the construction of freeways in all parts of the State. We are firmly of the opinion that these freeways should be utilized to the fullest possible degree for the purpose of providing rapid transportation facilities not only for the drivers of private automobiles, but for the large numbers of people who rely on public means of transportation. We believe that the serious and growing problem of congestion on the streets in urban centers, caused by the extensive use of private automobiles, can best be solved by the provision of speedy comfortable, and convenient public transportation; and that bus service along the freeways is, at least for the foreseeable future, an indispensable part of the such public transportation system.

Rapid mass transportation by bus to and from urban centers can be developed only if proper turnouts for buses are provided at convenient locations along the freeways. Except for a few express runs, rapid bus service limited to non-stop operation between remote terminals is uneconomical and does not meet the needs of the bus-using public. On typical runs the buses must start with few passengers and depend on those who board along the route to provide a pay load sufficient to cover costs. They must depend on and serve also many customers who wish to disembark before reaching the end of the line. From the standpoint of both the operating company and the rate payers, it is just as important that speedy service be rendered between way points as between terminals.

Orders by this Commission requiring bus operators to depart from the freeways and follow devious routes in built-up areas for the purpose of picking up and discharging passengers, would delay the adoption of a sound program for the provision of such needed bus turnouts. Such orders would therefore work to the long-run detriment of the travelling public and the urban centers, by retarding the development of the needed rapid mass transportation facilities. The Commission does not believe that it would be a proper exercise of its discretion to accommodate the residents of Shoreview by the adoption of a policy that would work to the ultimate detriment of the travelling public and of urban centers throughout the State.

The City of San Mateo failed to get from the State Department of Public Works an agreement to build turnouts or other appropriate facilities for bus service along this freeway when said city entered into the contract with the State concerning the construction of the freeway. Municipalities should exert every effort to secure such an agreement when they enter into contracts for the construction of freeways.

Incidentally, it appears that, with relatively minor engineering changes, safe and adequate provision for bus stops could be made for both northbound and southbound buses in the vicinity of the Third Street overpass. We commend this possibility to the consideration of the City of San Mateo and the Department of Public Works for cooperative action.

There should be no legal obstacle to prevent the Department of Public Works, in its engineering plans for the freeways, from making adequate provision for bus turnouts. If the law needs clarification, or if the solution of this statewide problem would be expedited by a clear statement of legislative policy and intent, that is a matter for legislative action; and, in our opinion, it is a matter of such import that the Legislature could well devote attention to it at the current session.

For purposes of this decision, at any rate, it is the opinion of this Commission that to grant the alternative relief prayed for in the complaint would be a step in the wrong direction. It would imply that this Commission will require bus companies to operate uneconomically and inefficiently, at the expense of their rate payers and to the inconvenience of their through passengers, to compensate for the failure of public bodies to make those provisions in the planning of freeways which seem clearly to be indicated as necessary for the general public welfare in the development of mass rapid transit. Such an order would provide a makeshift

and unsatisfactory remedy for a specific situation, at the expense of sound long-range and statewide planning for an effective and efficient solution to a serious problem. Despite the possibility that such an order might be of a current benefit to the residents of Shoreview, we believe that it would not be consistent with our responsibility to consider and promote the over-all welfare of all areas of the State.

Therefore, and good cause appearing,

IT IS ORDERED that the relief sought by complainant in Case No. 5512 be and it is hereby denied.

The effective date of this order shall be twenty days after the date hereof.

Dated at Los Angeles, California, this 25th day of January 1955.