

existing streets, to ban parking and to institute one-way operation. Each interchange ramp connection, the street to which it discharges or from which it draws traffic, and the connecting streets serving the major generators of traffic, present separate problems. Satisfactory street traffic operation can be attained only through careful consideration of traffic volumes in relation to street and intersection capacities all the way between traffic generators and expressway ramps.

### STAGE CONSTRUCTION

"Stage construction" is construed as meaning the construction of an expressway to something less than the ultimate planned improvement but to a stage where the facility or a portion of it may be opened to and used by traffic. Excluded are stage construction practices such as the acquisition of rights-of-way, grading of the roadbed, or the construction of structures separately from and in advance of paving operations, since these operations do not produce a usable improvement.

Examples of stage construction include:

1. Placing a temporary rather than a permanent pavement.
2. Paving less than the ultimate width of roadway, or one roadway of an ultimate divided highway.
3. Deferral of construction of grade separations.
4. Deferral of construction of interchanges, or construction of less than the ultimate interchange, for example, building two ramps of a four-ramp plan.
5. Deferral of construction of service roads.
6. Deferral of landscaping, installation of lighting and other items not essential to a reasonably safe utilization of the improvement.
7. The progressive construction of an expressway by sections or units over a period of years. In this case a constructed section might be complete within its limits but it would constitute only one stage of the construction required to make available the benefits of the ultimate improvement.

Proposals for stage construction almost always stem from a need to stretch currently available funds so that traffic conditions may be improved as quickly as possible and prior to the time when the entire expressway can be financed. While this reason for constructing something less than a complete improvement may be a very good one and sometimes the only way to get a project started, a word of caution seems in order. Too ready acceptance of the need for improvising, by stage construction or otherwise, to overcome an apparent inability to finance an improvement, could well prolong beyond reason the time required to remedy the intolerable traffic conditions in urban areas. Without a doubt, it will be necessary (in general) to find additional amounts (and probably, new sources) of funds to meet and keep pace with highway requirements. There should be reluctance to employ stage construction for the purpose of side-stepping the critical issue of inadequate finances for overwhelming highway needs.

In case immediate construction of a complete improvement is determined to be impossible, consideration might well be given to the feasibility of initiating activity over the entire project as quickly as possible. This might be done by utilizing one or more of the first six stage construction techniques previously mentioned instead of the more generally-used method of progressive construction of an improvement by sections which are complete in themselves. Getting work underway throughout the length of the proposed expressway would establish and guarantee the route to be followed by the facility. It might avoid delays over rights-of-way. It also might do much to encourage and influence zoning or re-zoning and other city planning activities, and the efficient and non-conflicting location of industries, housing, and like developments in the urban area.

However, regardless of all other considerations, it must be kept in mind that the primary purpose of the improvement is to correct, or at least, relieve unsatisfactory traffic conditions on city streets. Therefore, it seems obligatory that the effects on those streets should

be considered carefully and should carry much weight when decisions regarding the nature and extent of stage construction proposals are to be made. A good stage-construction plan might produce relief quickly where needed most and result in a substantial measure of the desired improvement in traffic conditions being realized and enjoyed several years in advance of what would otherwise be possible. Also, a good plan for stage construction could provide a preview of things to come which might help materially with financing, rights-of-way acquisition or other problems. On the other hand, however, a bad plan could add to the distress on city streets and even endanger the entire proposal by presenting an unfavorable picture of the effects of expressway construction in an urban area.

The effect on city streets of stage construction of expressways will depend on the particular physical, economic and social conditions and traffic problems existing in the urban areas to be entered or traversed as well as on the nature and extent of each stage construction proposal. For this reason, no set rules for evaluating the effects of stage construction can be determined with the idea that they may be applied to all proposals which may be advanced. Each case will require intensive study, particularly of the capacities of existing streets (and their intersections), the loads on them, the probable effect of the proposal on those capacities and loads, and the potential advantages (or disadvantages) in service to traffic which will remain on or be diverted to each street (temporarily or permanently) as well as to that accommodated on the expressway.

One of the major problems encountered in planning urban expressway construction is that of providing for the collection and distribution of traffic by means of the connecting street network. This problem may be intensified when an expressway is constructed by stages. To assure that a stage construction plan is both worthwhile and workable, a complete analysis of traffic flows and travel habits seems essential. As a minimum, it is believed that answers to the following questions should be determined:

1. Which streets will be benefited by the stage construction proposal and to what extent?

2. Which streets will be required to carry heavier loads than at present and are they capable of doing so?

3. Will interchanges to be built as part of the stage construction plan have adequate capacities?

4. If it is planned to defer grade separations, what will be the effect on the expressway and city streets? Will they function with reasonable efficiency or will barriers be created at heavy cross-traffic streets which might nullify all other advantages?

5. If a project is to be constructed by sections, will a particular section, when completed, be effective in providing traffic relief in the area in which it is built? What will be the operational behavior at its end points and can controls be established which will permit traffic to traverse the remainder of the route with reasonable ease until the entire improvement is completed?

Once these questions and others suggested by them are answered, it will be possible to formulate a sound and efficient stage construction plan rather than be compelled to go ahead on a hit-or-miss basis set up mostly with an eye on available funds.

To summarize, it is recognized that stage construction may be necessary. If so, however, the plan to be followed should be based on comprehensive and comparative studies which will insure it is the best that can be devised, that it will better, not worsen, traffic conditions, and that no unworkable situations or traffic bottle-necks will be created by the temporarily curtailed construction program. Also, stage construction should be a last resort rather than the first "out" when funds are scarce.

#### PARKING AND TERMINAL FACILITIES

Parking and terminal facilities in urban areas include (a) curb spaces along the existing street system; (b) offstreet facilities such as public and private parking lots and garages; (c) parking facilities within commercial