The data derived from origin-destination surveys are, in effect, the program of requirements for the highway to be designed. This is true for an individual highway or a system of highways. It applies whether a new highway is to be built or an existing one improved.

The origin-destination survey, to describe it very generally, determines the unit of area in which traffic originates and the unit in which it has its destination. These units are arbitrary, depending on the nature of the results required. They may be villages, townships, or any other desirable subdivision of territory. The unit selected will depend on the locality in which the count is made and the purpose for which it is taken.

There are several methods of making such a count. Those made by the Cook County Highway Department used the method of recording the last four digits of license plate numbers successively through cordons of recording stations. This was done on especially prepared blanks. At stations with a large concentration of traffic, recording was done on dictaphones. The time, direction of travel, and type of vehicle were recorded. The data thus obtained were sorted and tabulated on key-punch machines. The cards were then run through the machines to give any required information. As required, volume of vehicular trips between origin and destination, time of movement from which peak hours can be derived, and breakdown of movements of trucks or passenger cars can be isolated.

All of us know of highways built in the wrong places, highways on which traffic does not warrant the expense of the improvement. From the data mentioned above, one of the pitfalls of highway design in regard to location may perhaps be eliminated: that is the error of locating new or improving old highways from the requirements of volume spot counts. The fallacy of this method is evident from the obvious fact that “traffic generally follows the line of least resistance.” Most motorists are not adverse to going over a roundabout route if time can be saved and discomfort and hazard avoided.

This operation of traffic over indirect routes may become so great that volume counts will indicate the necessity of widening or even the construction of a nearby parallel route. When this improvement is completed, more traffic is attracted, and the cycle becomes a vicious one. This leads to a haphazard system, especially in metropolitan areas. Therefore, in reference to location, it is a geometric axiom that a straight
line is the shortest distance between two points. The origin-destination data will locate the points through which the line is to be drawn.

**Two Types of Traffic**

Designers have long differentiated between two types of traffic—through-traffic and that bound for a local destination. This general knowledge has led to the construction of bypass routes around cities and villages. A sound basis on which to predicate this problem of design is to know from where vehicles originate, how many and when, and the point to which they are bound.

An instance to illustrate this condition is in the northwest corner of the State of Indiana where is found a great concentration of industry and population. Also a great amount of through-traffic is forced to travel through this district around the foot of Lake Michigan. Segregation of this total traffic into the volume which is local in character and that which is bound to a destination beyond the district is a true indication of the facilities required for each.

With the need for the highway established and its location determined, desirable information for the designer to possess is the number of vehicles which will use the road. Volume counts taken on existing unimproved roads between the points in question, or on parallel adjoining routes, are of no benefit in furnishing this knowledge. This is because volume counts do not segregate the traffic which will use the proposed highway from that which will continue over its present routes. However, the origin-destination survey provides this information, and it can be applied to determine the type of pavement required, the number of lanes and any special traffic facilities, the turning movements or grade separation necessary.

Frequently an unusual concentration of traffic occurs in the vicinity of industrial plants or recreational centers. Handling this traffic usually presents a specialized problem. In such cases, volume and population will not be an indication of the traffic facilities required. The origin-destination count is the true criterion.

**Express Highways**

In the design of express and limited access highways, one of the most troublesome problems is the correct location of grade separations and interchange points. It is well known to all traffic engineers that a new or improved highway rearranges the entire existing traffic pattern. Counts of existing volume before the improvement will not necessarily indicate the new pattern. However, the origin-destination
count of the vehicles in the general area will not be altered by new construction and the total usage will be changed only by the increase due to added attractiveness.

To illustrate, in the design of radial express highways in Cook County, the origin-destination count indicates a much greater volume of traffic bound toward the Central Business District of Chicago than to the area in the opposite direction. Since the conventional cloverleaf interchange provides equal connections for traffic bound in both directions on the express route, this type of connection was not generally used. Instead, a modified or semi-cloverleaf was designed, providing facilities for the major movement bound for the city. Only about one-third of this number of connecting ramps was found necessary for the minor movement bound away from Chicago.

Again, at the intersection of two express highways, traffic bound from an origin to its destination is required to change direction by 90 degrees. This turning movement was found to be the major one, and the traffic continuing through, insignificant in contrast. Rather than route the major movement over the adverse distance required by a cloverleaf, a high-speed directional type of ramp connection was designed.

With the knowledge gathered from the origin-destination count, the secondary roads which serve interchanges can be scrutinized for their capacity in handling the discharge of traffic from express routes. They then can be improved, if it is found necessary to do so.

The items enumerated above are especially valuable to the design engineer. However, origin-destination data are of great benefit to the traffic engineer in the signing of routes and the routing of traffic over existing facilities.

To conclude, highways originally were what the word implies—a high road to avoid bogs and low places. Some of them were built along animal trails and followed the most negotiable terrain. With the coming of the motor vehicle, these trails were improved and others laid down, usually on a hit-or-miss basis. Widening and improving the surface of these trails for modern high-speed traffic has not been a solution. It is obvious that in congested areas a new approach to highway design is imminent.

Under present conditions of rapidly shifting concentrations of industry and population, old patterns and requirements are fast becoming obsolete.

Origin-destination counts are, and will be, of the utmost importance in arriving at requirements for highways to be built in the future.