Selection, Classification, and Designation Of Major Street Systems

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Some years ago in Chicago, in an effort to clear up the confusion in street classification, the term "preferential" was chosen to describe those streets that were important traffic carriers. This was intended to replace a confusion of street classes such as through streets, arterial streets, state-aid streets, state primary, state secondary, and Federal aid. "Preferential" was further broken down into classes, not necessarily describing precise function but merely designating importance. In addition to the limited-access type the classes consisted of the following: Class I, denoting a carrier for principally through movement and which might be likened to the supplemental trunk highway; Class II, those streets carrying large volumes of through movement and also serving as collectors to a great extent; and Class III, streets serving basically as collectors but also as access streets. The balance of the streets were, of course, considered as the "access" system. We are the first to agree that this attempt at classification was less than perfect.

The classification of streets and highways into some logical set of systems is a necessary beginning to proper and efficient administration, financing, and operation of the road network. With respect to rural highways it is relatively easy to develop systems that have reasonably clear-cut characteristic uses. Further, it is fairly easy to assign political responsibility for each system. As streets and highways enter the limits of dense urban areas, the function becomes less clearly defined, as does the responsibility of planning, maintenance, and operation. Types of vehicle trips become quite mixed due to the higher density of land use. Even a limited-access expressway takes on a somewhat different character in a large city like Chicago.

It is generally agreed that streets and highways can best be classified in accord with their use. The main factor that will control the class of a street or highway will be the travel desires of the users and/or potential users. A class of street should not only reflect the desired use for today but that for the future. All roads and streets can be classified into four basic systems: expressways, arterials, collectors, and local streets.

In strictly rural areas, these basic systems require little refinement but the greater trip density of the city adds many problems.

Throughout the states there are a myriad of classification systems and combinations of systems. Imagine the problem of discussing a street that may be administered by a city but constructed by a county government. Or one that is maintained by a city, yet construction costs are split fifty-fifty between the state and the city. Further complicating the problem are through streets constructed and maintained by the city which connect to state routes at city limits.

Historically the urban street has been considered the responsibility of the city. However, the user source of funds has not been distributed on a fair basis for such arteries. This is notwithstanding the fact that one-third of all fatalities occur on city streets and while the urban system is only 14 percent of the total highway mileage, it carries 50 percent of the vehicle-miles of travel. Responsibility for this imbalance can be laid partly to the lack of a systematic classification plan. Inasmuch as the trend is toward designating more funds to city streets, a good street classification plan will soon become a necessity for all municipalities.

As stated previously, the complexity of urban travel makes it extremely difficult to arrive at a clear-cut classification of city streets. In Chicago, as well as other large cities, a street is normally placed within a certain system more from the standpoint of city planning considerations than actual use. Because of the high density of trip ends all streets will perform very similar service unless controlled by design.

The expressway with its many ramps in a city serves a trunk highway function. Although its service is not adulterated in giving access to property, it does perform as a collector to some extent because of its many ramps. The ordinary arterial street generally has only width, continuity, and signalization to give it distinction. It serves as a through carrier only because of these characteristics. A neighborhood street may be pressed into such service if an adjacent arterial becomes overloaded, particularly if it is also continuous.

Recognizing that arterial streets serve more than intercommunity traffic in that they must also act as collectors, steps should be taken to curtail materially their function as access streets. This means that there must be control of frontage, curb cuts and entrances of intersecting local streets.

The process of designating streets by class may be controlled by considerations other than just desire lines of current travel. The considerations that must necessarily control the selection of an arterial class street are therefore (a) character of the environment through which the street passes, (b) potential for widening to permit improved traffic service and improved environmental effect, (c) reduction in number of access points, (d) reduction in marginal interferences through frontage lane-use control, (e) reduction in pedestrian-vehicle conflict, and (f) reduction in intersection interferences.

A collector street can be selected as need of land-use needs dictate. In this case, great changes in design are not justified and only good traffic engineering need be considered. Through movement can be reduced by building discontinuity into these streets.

The beginning of a city's arterial network is generally the present grid system of major streets. To determine those streets that have the best possibility of being developed into properly functioning arterials will require extensive and careful study.

There are problems in developing the service standards and reconstruction schedules that are far more difficult to solve than those of estimating traffic demand. In determining the possibility of widening, it is necessary to consider the condition of frontage buildings and relocation problems, as well as the availability of money.

It must be pointed out that the improvement of a short street section will provide additional traffic capacity and efficiency for persons using this improved street section. However, it will provide limited benefit for those making longer trips.

In the early days of the preferential street planning process in Chicago, the grave difficulties encountered in improving surface streets over significant distances led to the conclusion that work should proceed on rebuilding streets to obtainable standards as the opportunity occurred. It was possible to improve intersections and short sections of street and to justify the improvement on the basis that traffic service was being materially improved for, at least, local trips.

It must be emphasized that widened roadways and/or traffic bypass routes must be developed for lengths of several miles if additional through traffic capacity and better traffic service are to be realized. Whether the state, Federal, or local government constructs these widened streets is not important at the moment. The relocation of businesses and homes to the degree necessary for major widening creates the most difficult problem.

Built-up cities are generally faced with the slow process of obtaining widened rights-of-way in conjunction with urban renewal unless major clearance of business street frontage becomes much easier, or unless means can be developed to route traffic onto nearby streets to bypass congested locations. There is a practical limit to the width of a surface street, to the availability of frontage property for widening, and to the availability of side streets of a kind that can handle heavy traffic. The development of high-capacity surface traffic carriers requires careful planning, good street design and considerable change in land use.

TABLE 1

EXAMPLES OF CITY STREET MILEAGE BREAKDOWN

Population of City	Percent of Total Mileage				
	Freeway	Arterial	CBD	Collector	Local
65,000	2	23	1	4	70
150,000	6	27	6	NA	61
950,000	1	32	4	NA	63

Source: Unpublished case studies.

TABLE 2

EXAMPLES OF CITY STREET MILEAGE BY CLASS OF STREET

Population	Freeway (%)	Arterial (%)	Other (%)
72,000	3	25	72
72,500	0	16	84
131,000	2	16	82
142,000	7	15	78
172,000	5	23	72
500,000	1	20	79
670,000	1	19	80
713,000	4	10	86
940,000	1	32	67

Source: Unpublished case studies.

A study of major city streets will show that more tools for rebuilding than we now have are necessary. A revolving fund could be established for the purchase of frontage or right-of-way as buildings are torn down and rebuilt. Much can also be accomplished by limiting curb access to frontage property. A means of accomplishing this control might be through zoning laws which would give building size or housing density bonuses if access to the structures is from side streets and/or alleys. This matter needs full and intelligent study soon.

There are many problems in developing an improved major street system from an existing street network. Answers are required to a number of questions. How can present streets be widened for any great distance within limits of available money? How can the relocation of businesses and homes be accomplished to the degree necessary to make any great progress toward widening? What is the maximum width of street that can be safely crossed by pedestrians and properly signalized for efficient traffic movement?

To accomplish a planned major street network, judgment must be exercised as to what the design of a surface street should be and how it should relate to the neighborhood through which it passes. Then, there should be an investigation of all major streets and a preliminary and realistic plan developed for each street section keeping in mind that traffic capacity over its length should be relatively uniform except, of course, near street ends. It is extremely important that all traffic estimates be related to a point in time so that traffic volume expansion for that same point in time can be used in testing the network.

MAJOR STREET DATA

Tables 1 and 2 illustrate percentages of street mileages by typical types of streets. The mileage used by streets for significant traffic movement excluding Central Business District (CBD) streets, ranges from 14 percent to 33 percent in these cities. When CBD mileage is included these values would range somewhat higher. These examples may be compared with the suggested mileage divisions shown in Table 3.

TABLE 3

SUGGESTED DIVISION OF STREET MILEAGES

Population of Metropolitan Areas	Percent of Total Mileage		
	Freeways	Arterial, CBD and Collector	Local
Under 25,000	—a	25 to 35	65 to 75
25,000 to 150,000	—a	20 to 30	70 to 80
150,000 to 500,000	2 to 4	20 to 25	75 to 80
Over 500,000	4 to 6	15 to 20	75 to 80

[a]Depends on through traffic needs.
Source: Table 8, page 47, Better Transportation for Your City, Public Service Adm., 1958.

The importance of major traffic streets from the safety standpoint is illustrated in Table 4. Regardless of city size, the principal accident problem is on these routes, and the emphasis, priorities and expenditure of funds should be directed at alleviation of these hazards. It is almost redundant to point out that practically all congestion and delay occurs on these routes.

The relative percentages of different accident types on major surface arterials, by general location, are shown in Table 5. In this case

TABLE 4
EXAMPLES OF ACCIDENTS RELATED TO STREET TYPE

Population of City	Percent of All Accidents		
	Freeways	Arterial	Local
65,000[a]	NA	80	20
3,000,000[b]	2	61	37

[a]Unpublished 5-yr study, Skokie, Illinois.
[b]One-yr study, Chicago, Illinois, CATS.

study, more than 40 percent of the major street accidents were found to occur at intersections of two major streets. Improvement priority for these major intersections is self-evident, since these locations also tend to be points of maximum major street congestion.

More than one-third of major street accidents were found to occur in midblock locations, with nearly equal distributions of parked car, driveway or other type accidents such as head-on and sideswipe. The value of parking prohibition, access control, adequate lane width and median separation in reduction of such accidents is discussed in subsequent papers.

TRUCK ROUTES

Among the more difficult tasks that a traffic engineer faces is the designation of truck routes. In a negative sense, trucks are sometimes restricted to certain routes or streets by posting prohibition signs on streets where trucks are not wanted. In a positive sense, it is possible to post the actual truck route and to prohibit them elsewhere. Merchandise delivery or pick-up is possible if the trucker uses the shortest route to (or from) the unrestricted truck route to (or from) the destination.

Posting truck routes could create legal problems. Landowners could claim damages for deterioration of property values. On the other hand, the system of prohibiting trucks in certain areas is costly. Chicago uses signs at the intersection of a residential street with a major street which read "Residential Street—Load Limit 5 Tons" or "Residential Street—Commercial Vehicles Prohibited." Two signs per half mile are generally sufficient in this case.

Generally speaking, the nature of a large urban center makes it difficult to prohibit trucks on very much of the arterial street system. However, there are parkways, boulevards and residential streets where it may be desirable to do so. It is important to relate city planning and street planning in such a way that street environment will reduce the deteriorating effect of truck traffic.

CONCLUSIONS

To provide a sound basis for determining traffic requirements streets and highways should be assigned to classes that reflect character of use. When logical systems based on function have been determined, administrative and financial responsibilities can be assigned in accord with the most effective level of government. In urban areas, function is considerably controlled by design of the street and character of the neighboring environment.

TABLE 5
PERCENT OF ARTERIAL STREET ACCIDENTS BY CONDITION

Condition	Type of Accident					
	Ped.	Parked Car	Driveway	Fixed Object	Other Veh. Acc.	Total
At intersections						
With major st.	0.7	0.3	0.6	1.6	40.0	43.2
With minor st.	1.0	0.7	0.2	0.7	19.0	21.6
Midblock	0.8	10.7	10.9	2.4	10.4	35.2
Total	2.5	11.7	11.7	4.7	69.4	100.0

Source: Unpublished 5-yr case study, Skokie, Illinois.

Chicago is now engaged in the process of developing and refining its street classification system. The study is predicated on the existing one-mile grid system of streets. Traffic carrying capacity is to be developed to the optimum level with due regard to environment and proper use of land. Major streets may be relocated or their design changed to permit better development of land. Connection of streets to major highways at the city limits will be recognized as an important consideration in the arterial designation.

Full use will be made of opportunities to rearrange land use which could come about by urban renewal procedures, both publicly and privately supported, and of demolition of structures by any legal means where their removal would improve adjacent properties to a sufficiently high degree.

It is imperative, therefore, that the selection, classification, and development of major streets be governed not only by traffic service needs but also with full recognition of the environment, effect on environment and possibilities of improving environment.

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