DETERMINING PARKING REQUIREMENTS BY STUDY OF PARKING HABITS

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SYNOPSIS

The physical and economic structures of central business districts have been impaired because parking facilities have not been available in sufficient quantity and in a form acceptable to motorists. In order to plan for the parking of motor vehicles in a manner which will be acceptable and which will improve existing conditions, it is essential that the parking requirements of motorists be ascertained. Although attempts have been made to determine parking demands, most survey methods which have been used in the past have not produced factual data because they have been based upon opinion surveys which include hypothetical questions relative to the type of parking facility which would be used if it were available. This paper describes a new method which has been devised for determining parking requirements by means of a study of parking habits.

In this method, parking habits are evaluated by interviewing persons in dwellings selected by statistical sampling. Interview questions pertaining to parking and urban travel habits are included in this survey procedure developed by the Public Roads Administration in cooperation with respective state highway departments and various cities. Through the use of this survey procedure, it will be possible, for the first time to correlate parking habits with traffic volumes and traffic habits.

Statistical data summarized and analyzed in this paper are confined to those data collected in a survey recently completed in Savannah, Georgia. Similar surveys are now being conducted in other cities, but factual material is not available for analysis at this time.

The analyses of parking habits in Savannah are based upon tabulations pertaining to trip purpose, length of time parked, time of day when parked, kind of parking, time to travel from parking place to destination, distance fron parking place to destination, means of travel from parking place to destination, why parking space was used, and frequency of parking.

Parking requirements were developed through an analysis of the parking habits which were disclosed. These requirements should be considered if parking facilities are to be improved.

Although the analyses and conclusions reflect only the requirements of parkers in Savannah, the survey method described in this report is considered to be sound and may well be applied in other cities where parking problems exist. It is evident from the analyses that parking requirements cannot be reliably established until studies of parking habits reveal significant patterns relative to location, capacity, type, cost, and other parking characteristics.

Policies and procedures relating to the location, financing, design, construction, and operation of parking terminals may be adopted after careful consideration of the facts and figures relative to parking habits which may be collected through this new type of parking interview survey.

PARKING CONDITIONS IN CENTRAL BUSINESS DISTRICTS

Inadequacies of parking facilities in central business districts have adversely affected motorists, business organizations, property owners, and government. The mere existence of a quantity of parking spaces is not always a solution to the parking problem

because motorists have certain preferences which make some parking facilities acceptable while others are not even used. As a result, the lack of sufficient acceptable parking facilities in central business districts has been a factor in producing congestion and delays, encouraging decentralization, causing a reduction in business, and decreasing property tax revenues which are needed for governmental functions.

Central business districts developed in cities primarily because they offered accesibility to workers and shoppers who depended largely upon mass transit rail routes prior to the advent of free-wheel vehicles. A limited number of fixed routes served the cities until automobile and bus travel began to increase and street systems were improved and expanded. After that time the central districts became more accessible and many persons used their individual automobiles in traveling to and from the business areas to shop and work, or for recreation. However, the trend toward unlimited expansion of the central districts was stopped in many cities when the impact of added numbers of vehicles created unprecedented demands for street and parking facilities. Decentralization then became evident when merchants and business men decided to move their establishments or to open branch places of business in outlying areas, where they would be more accessible to motorists due to the availability of service streets and parking places.

Although steps have been taken to meet the added requirements for facilities to serve motor vehicle traffic in downtown areas, the supply still lags far behind the demand. Most street systems in the congested business districts were not designed to provide for the fluid movements of automobiles, trucks, busses, streetcars, and pedestrians. In addition to meeting the demands for movements of vehicles and pedestrians, these streets were used to provide storage space for the all-day and short-time parkers, and space for commercial vehicles to stand or stop while loading or unloading passengers or merchandise. Citizens, merchants, and governmental officials now recognize the existence of those two interrelated problems and the need for improving traffic conditions in the congested areas. Some expedients for improving traffic movements and the parking of vehicles have been adopted and others are being considered.

It is generally agreed that the primary purpose of streets is to provide space for the movement of vehicles; parking being a secondary consideration. Too, it is agreed that the parking problem cannot be solved "at the curb." Where traffic congestion is evident in a business district, and additional street capacity is needed, it probably would not be economically justifiable to widen streets by acquiring high-value land or removing large buildings. Other methods which may feasibly be utilized to expedite traffic flow include adopting special parking regulations and restrictions or complete removal of curb parking in the business area. If these methods are adopted, the all-day parkers will be forced to use curb parking spaces outside of the congested district or to park in lots or storage garages. The short-time parkers also would require additional off-street space. Before removing curb parking, therefore, it is essential that provision be made for adequate off-street parking facilities. Failure to do so adequately is one reason for decentralization.

Traffic congestion, block cruising, and double parking are still evident in many cities where the potentialities of off-street parking facilities are not being fully utilized. If parking requirements are to be satisfied, a balance between supply and demand for off-street and curb parking spaces must be established and the inefficient use of off-street facilities must be studied and evaluated in terms of parkers' requirements.

INVENTORY OF PARKING FACILITIES

The supply of available parking space, at the curb and off the street, can be ascertained by surveys. In such surveys, the space set aside for parking at the curb and the capacities of off-street parking lots and garages can be measured and, through field observations, the turn-over of vehicles can be recorded. Off-street parking terminals can be inventoried to indicate the supply of parking spaces in terms of location, design, operation, and other factors including services rendered and parking charges.

DETERMINATION OF PARKING REQUIREMENTS

The problem of measuring parkers' demands and requirements is much more difficult

than that of determining the supply of parking facilities. It is essential, however, that motorists' parking requirements be determined before plans are adopted for improving parking conditions. Several large stores have conducted travel habit and parking studies to ascertain the forms of transportation used by customers and to determine where persons who used automobiles parked their vehicles. A few cities have conducted similar studies by distributing questionnaires pertaining to motorists' parking habits and desires. The questions pertaining to the viewpoints of persons regarding whether or not they would use a particular kind of off-street parking terminal if it were available and how much they would pay for such use have not been found to be of much value. Opinion surveys of this character do not develop factual data pertaining to parkers' needs and they do not disclose (1) why persons choose respective parking places or (2) why they use particular forms of transportation. Answers to these two questions must be obtained, interpreted from a technical viewpoint, and used in the preparation of plans for meeting parkers' requirements as a part of the over-all plan for improving traffic conditions in metropolitan areas.

THE INTERVIEW METHOD OF DETERMINING PARKING HABITS

Traffic in urban areas may be segregated for analysis into local traffic which originates and terminates within the metropolitan area, external-local traffic which originates or terminates within the metropolitan area, and into external traffic which passes completely through the urban area. For purposes of determining urban travel and parking habits, interviews have been conducted in households distributed uniformly on a geographical basis throughout a metropolitan area. In some of the smaller cities, it has been found desirable to use a sample of 10 per cent of the city households. In some of the larger cities, it has been equally satisfactory to use a sample of 5 per cent of the households.[1] Briefly, the sample of dwellings has been selected from information shown on Sanborn maps, checked against and supplemented with information from Census statistics, city directories, public housing records, and building permit files. Dwellings have been selected by field inspection in areas not listed in other sources, in order that complete coverage of a metropolitan area may be assured.

Household interviews reveal the travel and parking habits of traffic originating or terminating, or both, within the city limits. Traffic counts are made at critical points in a metropolitan area to check the data expanded from the interviews. To obtain the travel habits of traffic entering the area, data are obtained by interviewing motor vehicle drivers at points where the principal routes enter the city. Through a study of the relation between the total volume of traffic at these points and the number of interviews, the interview data may be expanded to reflect total travel habits of the entering traffic. Similarly, within the metropolitan area, the relationship between the total interviews and the total number of households in the city permits the expansion of the dwelling interviews to a total population and traffic basis. The survey information obtained in dwelling interviews within a city and at external traffic stations is coded and punched on tabulation cards for mechanical sorting, tabulation, and analysis.

To obtain information about parking habits, the travel habit schedule of inquiries was expanded to include inquiries about parking. While some other parking survey methods are limited to those persons who park their vehicles in particular locations, the household interview method obtains parking information not only from those persons but also from all auto drivers regardless of where they park. Replies to questions relative to travel habits and vehicle use which would prevail if conditions were normal may be used to supplement factual data collected.

Travel surveys have been initiated in eighteen cities:

Atlanta	Memphis
Council Bluffs	Milwaukee
Denver	Nashville
Fort Wayne	New Orleans
Greenville, S. C.	Oklahoma City
Kansas City, Mo.	Omaha
Kansas City, Kans.	Savannah
Lincoln	Shreveport
Little Rock	Tulsa

As yet, the data obtained in these cities have not been summarized completely and, in many of them, the field work is still in progress.

[1] A discussion relative to the adequacy of sample size and the selection of a sample has been presented in a paper, "Origin and Destination Survey Techniques," by J. T. Lynch. See page 239.

PARKING INFORMATION OBTAINED BY THE INTERVIEW METHOD

The following inquiries indicate the scope of the parking information being obtained in the surveys for determining parking requirements:

1. Location of parking.
2. Duration of parking period.
3. Time of day when parked.
4. Kind of parking.
5. Amount paid and basis of rate paid.
6. Time to travel from parking place to destination.
7. Distance from parking place to destination.
8. Means of travel from parking place to destination.
9. Frequency of parking.
10. Reason for using the parking space.

Other information, such as trip purpose, occupation, and industry, obtained as part of the trip description can be used to supplement these items.

In some cities, the parking problem was considered to be of less importance than in others and fewer inquiries were made relative to parking. A complete schedule of information was obtained in Savannah and is now being obtained in Denver and in Nashville. Fairly complete parking information was obtained in Memphis and Kansas City. In the other cities, a few basic inquiries relative to location, duration, and kind of parking were all that were considered necessary at the time the interviews were made.

Inventory information relative to available parking facilities has been collected in a few cities to supplement data available from personal interviews. The inventories relate to location, type, capacity, ownership, operation, fees charged, and peak hours of use for respective parking facilities. Such information and the detailed parking study is limited to the downtown business area, where traffic and parking problems are most pronounced.

The interviews obtained in the metropolitan area surveys provide information relative to all types of trips. For the analysis of parking habits, however, it is more important to consider only the central business district since this is the area in which congestion warrants improvement of parking facilities. The trip information to be studied therefore is limited to auto trips with destinations in the central business district and to auto trips with "to" work, "to" shopping, or "to" other purposes. Return or "from" trips from this area, or trips with neither the origin or destination in the area, have no bearing on the parking habits of the traffic in the central businesss district.

ANALYSIS OF PARKING HABITS IN SAVANNAH, GEORGIA

Analysis of parking habits is limited. Savannah, the only city in which parking information obtained by the interview method has been summarized. Data can be added to this report from the surveys in other cities, either individually or collectively, for similar analyses in each city or for establishing patterns in parking practices as they become available.

Savannah, Chatham County, Georgia, has a population, according to the 1940 Census, of 95,996 persons and a registration list of 16,587 passenger cars. The metropolitan area, including the city of Savannah, has a population of 117,970 persons and a passenger car registration list for Chatham County of 20,007 vehicles.

The interviews obtained in Savannah when tabulated yielded an average weekday total of approximately 25,900 auto-driver trips to various destinations, limited to the several types of "to" trips. Of this group, approximately 5,200 trips were to the central business district and these represent 20 per cent of all such trips made in the metropolitan area. Ninety-eight per cent of these trips (5,100) terminated at a parking space. The remaining two per cent brought passengers to the district and no parking was involved.

The central business district in Savannah consists of approximately 48 blocks adjacent to the river front. There are approximately 1,300,000 sq. ft. of street area in this district of which 375,000 sq. ft. are used for parking purposes at the curb with a capacity of approximately 2100 cars. This curb parking space represents 29 per cent of the total street area in the central business district. A small area between the business district and the river has additional space for the free parking of 200 vehicles. These spaces cannot be considered a part of the central business district parking facilities since many persons who work in that area park there.

In the development of Savannah, few off-street parking facilities have been provided. An inventory of parking spaces in the central business district, made at the time of the survey, shows a total of 2562 spaces of which 2094 or 82 per cent, are at the curb and 468, or 18 per cent, are off the street. In this latter group, the spaces are about evenly distributed between parking lots and storage garages. Because of the relatively small number of off-street parking spaces, the limited number of interview replies relating to parking in those places does not permit detailed analyses of parking habits of persons using those off-street facilities.

Many detailed tabulations were compiled from the Savannah interviews. From these data on parked vehicles a few significant summaries are presented with a brief statement emphasizing the more obvious parking habits.

Trip Purpose

Forty-six per cent of all auto-driver trips to the central business district are to work, 25 per cent are for shopping, and 15 per cent are for the purpose of transacting business. These total 86 per cent of all auto-driver trips and produce the bulk of the parking problem.

Trip purpose	Per cent of trips
Work	45.8
Transact business	15.4
Recreation	8.2
Shopping, important	6.9
Shopping, incidental	18.8
Other	4.9
All trips	100.0

TABLE 1

Length of time parked	Per cent of trips			
	All trips	To work	For shopping	On business
Less than 30 minutes	6.4	0.0	12.6	20.3
30–59 minutes	17.2	6.0	33.1	29.6
1–2 hours	17.7	6.3	38.0	18.8
2–3 hours	14.9	5.6	15.0	15.6
3–6 hours	14.2	23.7	0.0	4.3
6–8 hours	4.9	7.0	1.3	6.6
8–10 hours	16.1	34.2	0.0	2.4
10 hours and over	8.6	17.2	0.0	2.4
All parking	100.0	100.0	100.0	100.0

Length of Time Parked

The distribution of all auto-driver trips according to length of time parked as given in Table 1 shows no large segregation in any one time period.

An analysis of the length of time parked for the important trip purposes shows: (1) Fifty-one per cent of the cars driven to work are parked 8 hours or more. (2) Forty-six per cent of the cars driven for shopping are parked for less than 1 hour and 84 per cent are parked less than 2 hours. (3) Fifty per cent of the cars used for business purposes during the day are parked for less than 1 hour and 69 per cent are parked for less than 2 hours.

A comparison of frequency of parking with the length of time parked shows that the infrequent parkers, in general, are the short-time parkers, less than 4 hours, whereas, the daily parkers who park 24 to 31 times a month, are the long-time parkers, 48 per cent parking 8 hours a day or more.

The expanded interviews show that there is a relation between the length of time parked and the time used in walking from parking place to destination. Where more time is spent in such travel, a larger percentage of the people park longer. This is also true with relation to distance walked from parking place to destination.

Time of Day when Parked

The bulk of the cars parked at the curb are parked in the morning hours between 8 a.m. and noon when 53 per cent of the trips to the central business district are made. There is an increase in the trips and resultant parking in the central business district in the evening hours between 6 and 8 p.m. The following summary shows the distribution for all vehicle trips to the central business district:

Time periods	Per cent of trips
Before 8 a.m.	7.7
8–9 a.m.	20.1
9–10 a.m.	15.5
10–12 a.m.	17.2
Noon–2 p.m.	8.4
2–4 p.m.	6.5
4–6 p.m.	7.7
6–8 p.m.	12.9
After 8 p.m.	4.0
Daily total	100.0

Kind of Parking

The expanded interview data reveal that of the 3,035 auto-driver trips, 73 per cent of the

cars were parked along the curbs in unrestricted zones, 14 per cent along curbs in restricted zones, 9 per cent in parking lots, 3 per cent in storage garages, and the remaining 1 per cent in other parking locations. Only 5 per cent of the auto drivers used pay facilities when parking in the central business district.

Kind of parking	Per cent of trips
Curb, unrestricted	72.8
Curb, restricted	13.9
Parking lot, free	6.9
Parking lot, pay	2.1
Garage, free	0.3
Garage, pay	2.6
Other	1.4
All kinds	100.0

Curb parking predominates for all trip purposes. It is significant that 82 per cent of the cars driven to work are parked at the curb and that 75 per cent of those driven on business trips during the day are parked at the curb; whereas for shopping, recreation, and other trips more than 95 per cent of the parking is at the curb.

Parking-lot and garage parkers are frequent parkers. Seventy-two per cent of those parking in parking lots do so 20–34 times a month and 100 per cent of those parking in garages do so 20–29 times a month.

Time to Travel from Parking Place to Destination

Forty-six per cent of the cars are parked close to the destination, presumably either at the curb or on the premises since the drivers of those cars reported less than one minute in traveling from the parking place to the destination. Only 7.6 per cent spend 10 minutes or more in traveling from parking places to destinations.

Time to travel from parking place to destination	Per cent of trips
Less than 1 min	46.1
1–4 min	28.9
5–9 min	17.4
10 min	5.2
Over 10 min	2.4
All trips	100.0

There is little or no significant difference in the time spent in traveling from parking places to destinations for persons making trips for different purposes. This, however, may not be true in other cities with larger business districts, more off-street parking facilities, and stricter enforcement of parking regulations.

Distance from Parking Place to Destination

Forty-six per cent of all auto drivers walked less than 100 ft. from the places where their cars were parked to their destinations. Twenty-eight per cent walked 100 to 500 ft.; 13 per cent, 500 to 1,000 ft.; 9 per cent, 1,000 to 2,000 ft.; and only 3 per cent walked 2,000 ft. or more.

Distance from parking place to destination	Per cent of trips
Less than 100 ft	46.5
100–499 ft	28.3
500–999 ft	13.4
1,000–1,999 ft	9.1
2,000 ft. and over	2.7
All trips	100.0

There is little difference between the distance walked by persons making trips for different purposes except that those trips of a recreational nature do show a slightly greater number walking distances of 2 blocks than do trips for other purposes.

Means of Travel from Parking Place to Destination

Walking was the only means of travel reported in traveling from parking places to destinations in Savannah.

Why Parking Space was Used

Information obtained in answer to the question "Why was parking space used?" did not disclose significant facts in Savannah. Seventy-nine per cent of all persons parking in the central business district reported that they parked where they did because it was close to their destination, 19 per cent because the space was free, and 2 per cent for other reasons. Replies to this inquiry in larger cities may reveal significant information not evident from the analysis of the Savannah data. Analyses of the answers to the other interview questions establish reasons for parking practices.

Frequency of Parking

The frequency with which persons parked their vehicles in the central business district is shown in the following summary:

Times per month	Per cent of trips
1	8.3
2–4	16.2
5–9	11.6
10–14	5.6
15–19	4.1
20–24	20.8
25–29	20.7
30–34	11.4
35 & over	1.3
All frequencies	100.0

The frequency 20–34 times per month, inclusive, includes the group which parked their vehicles daily depending on the number of days worked per month, which varies considerably between 24 and 31 times a month. This group includes 53 per cent of all the persons who parked their cars in the central business district.

Increased Traffic with Removal of Restrictions

An increase in persons driving to the central business district may be anticipated when restrictions in automobile travel are removed. In answer to the inquiry, "In making this trip if there were no wartime shortages or restrictions would you have made it as an auto driver?" 675 auto passengers and 1,220 bus and streetcar passengers answered yes. This would represent an increase in trips to the central business district of 63 per cent for which parking facilities must be provided. It is probable that the actual increase will be a little less. This was found to be the case in another city of similar size where analysis of car occupancy and local transit trends would produce an actual increase of 70 per cent of the increase indicated in the replies to a similar inquiry.

CONCLUSIONS

The analysis of parking habits discloses the following parking requirements in the central business district which must be considered if the parking facilities are to be improved:

1. *Trip purpose, Frequency of Parking, and Length of Time Parked*

Forty-six per cent of all auto-driver trips to the central business district are to work. Fifty-one per cent of the workers park 8 hours or longer, and 24 per cent park for 4 to 8 hours. Ninety-three per cent of all such workers park regularly in the same manner.

Twenty-six per cent of all auto-driver trips to the central business district are for shopping. Forty-six per cent of the shoppers park for less than one hour and 38 per cent park from 1 to 2 hours.

Fifteen per cent of all auto-driver trips to the central business district are for business purposes. Fifty per cent of the business trips are for less than one hour and 19 per cent are from 1 to 2 hours.

2. *Distance and Time to Travel from Parking Place to Destination*

Forty-six per cent of the cars driven to the central business district are parked within a one-minute walk, or within 100 ft., of the destination and 29 per cent within a 1- to 5-min. walk, or within 100 to 500 ft., of the destination.

3. *Kind of Parking and Fees Paid*

Seventy-three per cent of the cars were parked at curbs in unrestricted zones, 14 per cent along curbs in restricted zones, 9 per cent in parking lots, 3 per cent in storage garages, and the remaining one per cent in other facilities.

Since there is such a small number of spaces in off-street facilities in relation to the total number of spaces, and with no parking meters at the curb, there is little choice for parking. For this same reason, information relative to fees was not obtained in sufficient quantity for evaluation of parkers' ability and willingness to pay for parking facilities.

4. *Increased Traffic*

It is estimated that there will be an increase of not over 63 per cent in the number of auto-driver trips to the central business district and at least 45 per cent when wartime restrictions are removed.

5. *General Conclusions*

In addition to the specific requirements previously stated, consideration must be

given to the nature of the demands of particular generators of traffic such as stores, offices, and industrial and recreational units to properly locate, design, and operate new parking terminals or to improve existing parking locations.

COMMENT ON METHOD

It is realized that the success of this interview method is dependent upon the representativeness of the sample from which the information is drawn, as it is in any sampling procedure. Expanded trip data obtained from the interviews were in close agreement with traffic counts at control locations during peak traffic hours. During the midday and evening hours agreement was not so close. This should not affect questions relating to highway design since adequate design is primarily based on peak traffic. The peak in the demand for parking, however, occurs in the off-peak periods of traffic flow. Since data obtained for midday and evening hours cannot be used with the same assurance of accuracy as that obtained during peak traffic hours, the importance of obtaining this information on all trips is being emphasized in current surveys, particularly for those trips during off-peak hours for trip purposes other than work. Results from other cities should show improvement in method and data obtained.

ADDITIONAL INFORMATION NEEDED

The analyses and conclusions reflect only the requirements of parkers in Savannah. Although it is apparent that more data are desirable, the survey method described in this report is considered to be sound. The factual data which are available in Savannah can be applied to parking problems there, but specific parking requirements for that city, or in any city, cannot be reliably established until additional studies of parking habits reveal significant patterns relative to location, capacity, type, cost, and other characteristics.

It is realized that other methods of evaluating parking requirements are of value and should be considered in the development of parking facilities. When the opportunity presents itself the members of this Committee should consider various survey techniques and report on them when such survey methods are investigated. The household interview method of collecting data on parking habits, as referred to in this report, is a new means of providing necessary information properly related to traffic volumes so that governmental officials, interested civic groups, business organizations, and property owners can use it in the development of policies and procedures relating to the location, financing, design, construction, and operation of parking facilities. The activation of a parking program based on these facts and policies should aid in the improvement of business activity and in the stabilization of economic values in the central business districts.

DISCUSSION

MR. BURTON W. MARSH, *American Automobile Association:* Students of urban traffic problems generally agree that the parking problem cannot be solved at the curb—though maximum utilization should of course be made of curb space not needed for more important purposes. In many cities (excluding wartime variances) there has been a quite marked trend of reduction in number of curb parking spaces downtown available for daytime parking—the spaces being needed for loading, for fire protection, for traffic movement.

As curb parking capacity decreased, traffic increased. Yet while motor vehicles are a highly important part of the blood stream feeding the city heart, few communities are really "facing up" to their downtown parking and terminal needs—though there have been sporadic increases in off-street parking, mostly in far-from-attractive, haphazardly located "temporary" parking lots. Indeed it appears that community leaders for the most part have not become convinced that they must and can develop reasonable solutions.

One of the major jobs ahead is to convince such leaders so that they will organize for a city parking program based on the scientific factual approach.

There have not in the past been adequate facts—nor have there been worked out effective methods for obtaining and analyzing such

facts. The Hitchcock-Willier paper is a very encouraging indication that technicians are developing methods of study and analysis of needed data. More such methodology is needed.

Of course it will still be a long road from studies, facts, interpretations and recommendations to *action and completed projects.* But it will be much easier to get the final desired results when the needed facts are effectively presented and understood.

The Hitchcock-Willier paper refers to establishing a balance between supply and demand for downtown parking spaces. It must be recognized that "demand" is a variable. Demand varies with cost—there is relatively little demand for high-cost garage parking whereas conceivably a large subsidy could produce *apparent* rates so low that parking demand would increase greatly. Demand also varies with other factors, such as the customs, habits and attitudes of people. And these change—and can *be changed*, as our wartime experience indicates.

It is conceivable that demand for downtown parking space might be so great as to mean that too much of the downtown district would be devoted to car storage, too much of the tax dollar be required for highway facilities, and the city's mass transportation system might be affected seriously. Probably the public is too sensible to register such parking demands. This point still remains however—in a so complex concentration of population as a city, factors have to be considered and balanced—and the rule of reason must be applied to all demands, including parking. How much parking of each of the various types a downtown district should have, requires consideration of numerous other factors than present (or "deemed likely") parking habits of the people. Nonetheless analysis of transportation and parking practices is desirable and useful.

In the analysis of parking habits in Savannah, reference is made to "stricter enforcement of parking regulations." In appraising any curb parking facts it is essential that the caliber of enforcement be known. "Facts" resulting from analyses could easily be greatly different if enforcement were different. For example, distances from parking place to destination would be shorter with strict enforcement of short parking time-limits then where there was poor enforcement thereof. Hence, with all reports on such parking studies it would be desirable to include facts as to parking regulations and as to enforcement policies, methods and quality. In passing, it might be pointed out that no comprehensive downtown parking program can be and remain effective without a sound parking enforcement policy and one that is not frequently changed.

MR. DAVID R. LEVIN, *Public Roads Administration:* With respect to the analysis of parking habits in Savannah, population and registration figures are given for 1940. Presumably, the parking survey was done in 1944 and it would seem that population and registration figures for 1944 would be more significant. For example, population for the metropolitan area as of November 1, 1943 was approximately 150,000, a substantial increase over the 1940 figure. Since the survey figures are based on the expanded population, that might be the logical figure to use. Perhaps it might be difficult to obtain authoritative figures, but some estimates are available.

I realize that the paper deals primarily with a methodology of parking needs. There are a number of comments throughout the paper cautioning the reader that this is a pilot study, that the statistics given may not necessarily apply to other cities and are confined to Savannah itself, and that even then, there may be other related influences. Yet, a few questions remain unanswered in my mind. The questions I pose in no sense are intended to reflect on the adequacy or caliber of the paper, for both are very good.

One aspect that may influence the character of the answers to parking needs in Savannah and in other areas is the war influence. For example, it would be useful to know, of the total population in Savannah, what portion are war workers, and how is that percentage related to motorists penetrating the downtown area. War-induced activities which will cease after the war are likewise pertinent. It may be that careful analysis of these factors will disclose that there is no substantial change in the pattern of parking needs, after war-related influences are eliminated. If so, that fact in itself is important.

Some of the recent general city surveys have taken cognizance of this influence. Moses, in

his Portland, Oregon study, for example, ascertained that the population of the Portland metropolitan area increased by 120,000 since 1940, that about 45,000 war workers were recruited from peacetime occupations located in the Portland area before the war, of which about half were women, engaged in no gainful occupation before the war. Estimates are made of the portion who might reasonably remain in the area after the war, and so on.

These war influences, such as they are in a particular area, may or may not substantially change the 1944 pattern of parking needs. We might well inquire through our methodology, what such influences are and how they are likely to affect the final answers.

Let us take trip purpose, for example. For Savannah, 46 per cent of trips to the central business area are to work. Perhaps Savannah has no war industries downtown, so that percentage may not change substantially, except no doubt some of the normal work activities have been augmented and are war-induced, though this may be the result of full employment however achieved. But some of the other categories of trip purpose may be changed. After the war, there may be more shoppers as a result of women ceasing to work, etc. Recreational habits may be different too.

The paper seems to imply, though with some caution, that the parking pattern as evolved in this survey may be used in the provision of parking facilities in the central area of Savannah. Without resurvey, or some indication as to how this pattern may be altered after the war, these statistics may be misleading.

If surveys in a number of different cities both war-affected and others, reveal substantially an identical pattern, we probably won't need to worry much about possible changes. But if they do not, as they may not, we might need resurveys or more information. Obviously too, though a parking master plan be drawn up for a given area, the fulfillment of that plan will be piecemeal, and new needs as evidenced in successive surveys will most likely alter the original plan. It might be said too, that parking needs are so great and the facilities so meager to meet the demand, that we could probably go a long way in their provision without making too many mistakes. It is only after we have progressed to some considerable extent that we will need to be worried about too many refinements.

MR. F. W. LOVEJOY, *Joint Committee on Parking:* The paper prepared by Messrs. Hitchcock and Willier is interesting, especially the part describing the results already obtained in some cities by the household interview method developed by Public Roads Administration with advice from the Bureau of the Census. This method is designed for a study of the travel habits and eventual determination of the highway transportation requirements of populations in metropolitan areas, and as such is basically and outstandingly important.

Public Roads Administration's household interview method also obtains valuable data about parking customs and habits, as well as information about the potential, or probable subsequent demand for parking facilities by respondents. All of these data have great value but I am sure it will never be possible to reach final conclusions as to the locations, sizes, types of parking facilities, and rates to be charged for their use without considerable investigation along other lines.

My point is that what parkers of motor vehicles do today is one thing, but what they may want to do, or might be able to do with improved facilities, and can finally in any event do economically, may be something else again. The paper under discussion seeks to relate parking requirements to traffic volume, although fundamentally both traffic volume and parking facility requirements are generated by land uses.

To put it more concretely,—instead of relying upon a relationship between parking requirements and volume of traffic, parking should be correlated with such factors as square feet of office, department store, or manufacturing floor space, with the number of theatre or arena seats, with the dollar value of business done by department stores perhaps, with the guest capacity of hotels, with the employee concentration, with the number of customers, whichever is pertinent, and so on. Then it becomes really possible to provide parking facilities where they belong, and to study the economics of parking from the standpoint of the user who must finally pay the cost. It then also becomes feasible much more accurately to estimate parking demands

to be anticipated from new or future land uses.

I, therefore, still think it may often be desirable to go to such rich sources of information as the operator of the parked car and the customer in the department store, either by questionnaire or interview, for supplemental material with which to round out and interpret the data gathered in the household interview.

There are two sorts of parking demands;—one which is currently more or less satisfied, the other which is only potential and will not actually appear until parking facilities are available. But in solving the downtown parking problem of a large city it is not to be expected that parking facilities of sufficient capacity to accommodate all vehicles that might be driven downtown could ever be provided at a cost the vehicle operator would be willing to pay, for ultimately the vehicle operator must pay directly or indirectly for the highway transport (parking) facilities he uses.

In most large cities there is a certain desirable proportionate use of all forms of highway transportation facilities to obtain the best economies in the provision and subsequent operation of these facilities. So it is that the stabilization of urban shopping and business centers by construction of off-street parking facilities should contemplate parking rate structures that will get the desired results by attracting the short-time shopper, or business parker, while at the same time discouraging the all-day parker from occupying space unless he wants to pay well for the privilege.

There are many features of parking facilities, now beginning to be understood in their true coordination with the whole of highway transport, that would classify them as public utilities, hence regulable as such. The desirability of controlling parking rates in the public interest is one example, and there are others affecting the location and character of the parking facilities themselves.

In concluding might I suggest to the authors of the paper under discussion that the graphic presentation of much of the data they include would help in publicizing the results of the household interview method. Bar charts of in and out movements by time periods and curves of the net cumulation of parked cars are valuable too, when it comes to the determination of proper sizes for parking facilities and the probable daily turnover of space.