SOME TRAVEL AND PARKING HABITS OBSERVED IN PARKING STUDIES

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The direct interview type of parking study, initiated in 1945[1], has now been made in more than 40 cities[2]. Other types of parking studies have previously been made in some of these same cities and in other cities, but prior to the use of the direct interview type of study it had not been possible to make any reliable generalizations about parking characteristics or trends. Procedures, scope, and objectives had been so varied as to preclude the establishment of common bases for statistical comparisons.

Reports have been developed in 24 cities of this group[2]. Since the same procedures were used in each case, it has been possible for the first time to observe some relationships of parking habits, travel habits, and traffic volumes. For those cities where the time periods studied were not identical, data were adjusted to a common 8-hour basis (10 a.m. to 6 p.m.).

In some cases it has been suspected that the indicated relationships or trends might exist, and personal experience may make some of these observations appear obvious, but they do substantiate many points which previously have been largely a matter of opinion or conjecture. Furthermore, the fact that these data and these derivations fall into a pattern indicates that the basic approach to this research problem, that is, the procedural technique, is soundly conceived. Although the number of reports analyzed so far has not been large (only 24), it should be remembered that from the analysis of the first 24 origin-and-destination reports a pattern in the travel habits of traffic approaching cities of different sizes was apparent, a pattern which has not changed materially by the addition of data from nearly 50 more reports.

In these cities, with the knowledge that the basic volumetric data have been obtained with reasonable accuracy, specific locations and designs for additional facilities may be planned with assurance. The data on parking habits, when correlated with location, may be used to advantage in revising parking time restrictions. The data as a whole, with their clearly established trends, representing conditions in cities which have recognized the existence of a parking problem, may also be of value in making comparisons in other cities where comprehensive studies have not been made and where complete data are not available.

These series of summaries should not be considered as being exhaustive. They are some of the more obvious relations which initial analyses have developed. More analyses should be made and material from similar reports should be added to verify and strengthen analyses already made.

[1]Described in 1945 *Proceedings* of the Highway Research Board.
[2]List of cities is attached.

THE CENTRAL BUSINESS DISTRICT

Area and Population Relations in Cities in Six Different Population Groups

Population group (thousands)	Number of cities (1)	Avg. Population metropolitan area (2)	Central Business Dist. Area in Square Miles		Number of blocks[1] (5)
			Total (3)	Per 100,000 population (4)	
Less than 25	6	16,900	0.12	0.74	27
25 - 50	3	32,300	0.11	0.36	35
50 - 100	2	66,550	0.22	0.27	36
100 - 250	9	131,750	0.44	0.26	76
250 - 500	6	280,700	0.46	0.12	97
500 and over	2	663,650	0.54	0.05	134
	28				

[1]Block dimensions vary from 150 feet to 600 feet.

The Central Business District is not a legal entity or a clearly defined area. In setting up the limits of such a district for purposes of a parking study the following considerations were used:

1. The area where land occupancy is almost 100 percent
2. The area where land use is principally business
3. The area where curb parking is crowded
4. The area to which transit lines converge.

Even though different engineers established the limits of the different Central Business Districts, it is significant to note that the limits of the districts have been uniformly recognized. The trend in size is to be expected perhaps, but confirmation of this trend lends assurance to further analyses in these cities. Where studies have not been made comparisons should indicate if a particular Central Business District constitutes a problem area greater or less than the average for cities of this size.

AVAILABILITY OF PARKING SPACE

Curb and Off-street Spaces Available in the Central Business Districts of Cities in Six Population Groups

Population group (thousands)	Number of cities (1)	Number of Parking Spaces: Total (2)	Curb total (3)	Off-Street total (4)	Per 1,000 population: Curb (5)	Per 1,000 population: Total (6)
Less than 25	5	1,649	981	668	54	90
25 - 50	3	2,061	1,286	775	41	66
50 - 100	2	4,089	1,688	2,401	23	57
100 - 250	8	6,449	2,684	3,765	17	42
250 - 500	6	11,093	2,961	8,132	7	28
500 and over	2	10,185(1)	2,510	7,675	3	12
	26					

[1]Providence, a city of 253,500 population, has a metropolitan area population of 711,500 with several other fully developed but smaller independent business districts.

These trends, perhaps suspected, lend assurance (1) to the soundness in definition of the Central Business District, (2) to the use of the data for comparative purposes in cities where extensive studies have not been made, and (3) to the methods of the making of the study.

It may be expected that the supply of curb spaces for parking in the Central Business District will continue to decrease as cities grow. Curbs are limited in physical extent and as the downtown area grows vertically more curb space is restricted for services in connection with the buildings and for the movement of traffic. Offstreet facilities are not developed in a compensating manner. Cities of more than 257,000 population have less than one-third as many total parking spaces per 1,000 population as cities of less than 25,000 population.

USAGE OF PARKING SPACE

Number of Vehicles Parked in the Central Business Districts of Cities in Six Different Population Groups

Population group (thousands)	Number of cities	Number parked in 8 hours[1]		Maximum number parked[2]		Percent commercial	Parking ratio peak hour to Avg. hour
		Total	Per 1,000 pop.	Total	Per 1,000 pop.		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Less than 25	5	7,905	432	1,141	62	14	1.22
25 - 50	3	7,378	239	1,350	43	13	1.13
50 - 100	2	11,866	164	2,185	30	11	1.15
100 - 250	7	20,156	112	5,168	28	13	1.15
250 - 500	5	32,436	83	8,245	21	13	1.15
500 and over	2	29,957	34	9,564	11	13	1.11
	24						

[1]Adjusted, where necessary, to a common period, 10 a.m. - 6 p.m.
[2]At any time during the eight-hour period.

This is the volume of parking under present conditions. It does not indicate in any sense what trends would be if better traffic service and parking facilities were available.

The volume of parking in the eight-hour period and maximum number parked at any one time in the period increases with the size of the city. When the population of the city is considered, however, the volume of parking per 1,000 population shows that the Central Business Districts in the smaller cities are bigger generators of parking than are the larger cities.

The proportion of commercial vehicles parking in the Central Business District apparently does not vary in cities of different size. These are the vehicles picking up and delivering goods in the downtown area.

There does not seem to be any appreciable difference in the ratio of the volume of vehicles parked in the hour of peak parking usage and the hourly volume parked in the average hour of the business day.

USAGE OF PARKING SPACES

Comparison of Overtime Parking at Metered Curbs and at Unmetered but Restricted Curbs

Zones	Number of cities	Percent parking overtime[1]		Percent of space hours Used by violaters[2]		Used in excess[3]	
		Unmetered	Metered	Unmetered	Metered	Unmetered	Metered
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I All cities reporting							
All	18	29.2	-	53.1	-	35.4	-
All	10	-	15.3	-	35.2	-	19.4
II Cities with metered and unmetered spaces							
All	7	31.1	18.0	60.9	38.1	40.8	20.7
15 minute	1	59.6	59.4	89.0	87.2	76.4	60.0
30 minute	2	57.6	33.3	87.2	62.0	71.2	39.1
60 minute	5	33.4	17.3	67.3	40.3	47.3	22.3
90 minute	1	33.8	18.6	65.0	53.6	42.9	30.4
2 hour	3	22.8	11.2	50.3	28.3	26.7	12.0

[1]Percent of all curb parkers in zones indicated.
[2]Total usage including legal.
[3]Overtime usage only.

Group I includes some cities in which there were no parking maters and some time zone groups in other cities where there were no unmetered curbs. To present the data on a more nearly comparable basis Group II was analyzed. This group comprised only those cities where data were available in the same city and in the same time restriction class for both metered and unmetered but restricted spaces.

Data from each of seven cities, where curb parking was observed at both metered and unmetered but restricted spaces, indicate that violations in metered zones were less, both as to the numbers of parkers as well as length of usage of parking spaces.

This is also true when the data are segregated in time restriction groups. It is also apparent that the proportion of overtime parkers and overtime usage decreases as the length of the time restrictions increases. There is little difference in violations in metered and unmetered but restricted 15-minute zones. In unmetered 2-hour zones 22.8 percent of the parkers are overtime parkers and use 50.3 percent of the total time available of which almost 27 percent is overtime usage. In 2-hour metered zones eleven percent of the parkers exceeded time restrictions using 28 percent of the available time of which 12 percent of the time was in violation of restrictions.

PARKING SPACE SUPPLY AND DEMAND

The Usage of Space in the Entire Central Business District, and the Relation of Demand and Supply in the Core Area, in Cities of Six Population Groups

Population group (thousands)	Central Business District			Core[1]			
	Number of Cities	Present Usage space hours		Number of Cities	Space hours		Ratio demand to supply
		Number	Per 1,000 population		Demand[2]	Supply	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Less than 25	4	8,654	511	4	2,950	2,250	1.31
25 - 50	3	9,799	303	2	3,766	2,868	1.31
50 - 100	2	14,632	220	2	4,290	2,964	1.45
100 - 250	5	33,659	255	5	16,290	10,663	1.67
250 - 500	4	51,578	184	3	20,828	6,505	3.27
500 and over	2	65,846	99	2	28,590	6,649	4.67
	20			18			

[1]The core is that portion of the Central Business District where land values are generally highest, where in each block of several contiguous blocks, the demand for parking space in each exceeds the supply.

[2]Demand for space in core based on destinations of drivers who parked in the Central Business District.

This analysis applies only to those who park in the Central Business District. It does not include the "potential" demand of those who stayed away, did their shopping elsewhere.

The demand for parking space for those having destinations in the Central Business District shows a definite increase with the size of the city. On a per capita basis, however, the Central Business Districts in the smaller cities are greater traffic generators per 1,000 population than those in the larger cities.

For the Central Business District as a whole, supply of spaces is equal to the demand because the limits of the district are usually established to study the entire problem. Some of the central blocks in the district, however, create more demand than others and it is more than is available in the same blocks. The volume of this demand for spaces in the core increases in the larger cities whereas the supply, although increasing to cities of medium size, drops off in the larger cities where spaces in the core are sacrificed for other land uses.

TRAFFIC AND TRAVEL HABITS

Some Traffic Volumes and Ratios in the Central Business Districts of Cities in Six Population Groups

Population groups (thousands)	Number of Cities	8-hour volume inbound[1]	Avg. hour volume In & Out	Peak ½ hour vol. In & Out[2]	Ratio Peak to avg. hrs. In & Out	Volume per 1,000 pop. peak ½ hour	Vehicles passing thru C.B.D. - Percent[3] 8 hours	Peak ½ hr.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Less than 25	5	15,000	3,700	2,500	1.36	139	49	60
25 - 50	3	20,000	5,100	3,550	1.37	104	57	64
50 - 100	2	27,000	6,600	4,420	1.34	61	52	69
100 - 250	7	43,000	10,500	6,810	1.33	41	60	70
250 - 500	3	56,000	13,700	9,110	1.33	25	60	75
500 and over	2	72,000	17,600	12,000	1.34	14	58	91

[1] 8-hour period, 10 a.m. - 6 p.m. All vehicles.
[2] Peak ½ hour, for traffic movement generally between 5 and 6 p.m.
[3] Percent of vehicles entering the C.B.D.

The total 8-hour inbound volume, the average hourly volume in and out, and the peak one-half hour volume in and out of the Central Business District increase with the size of the city. When the population of the city is considered, however, the Central Business Districts of the smaller cities are bigger traffic generators per 1,000 population than are the larger cities.

The outbound 8-hour volume is almost equal to the inbound volume and the pattern with respect to population groups is the same.

Regardless of the size of the city, the ratio of peak-hour traffic and average hourly traffic in the 8-hour period is the same. Peak-hour volumes are about one-third again as large as the volumes during the average hour of the survey period.

The proportion passing through the Central Business District may more correctly be described as those who do not stop to park. It includes whatever "cruisers" there may be and those cars in service stations or in garages being serviced or repaired. These figures refer to vehicles entering the C.B.D. and not to vehicles leaving or to number of trips.

The proportion of traffic entering the Central Business Districts in the peak ½ hour of traffic movement (usually between 5 and 6 p.m.), which does not stop to park, increases as the size of the city increases. The development of employment centers in sections of the city, other than the Central Business District, creates a large movement of population twice a day going to and coming from work. Much of this movement is across town and through the district.

There does not seem to be much difference in the proportion of traffic passing through the Central Business District during the business day (10 a.m. to 6 p.m.) in cities of different population groups.

PARKING CHARACTERISTICS

Significant Data on Length of Time Parked and Distance Walked in Cities of Six Population Groups

Population group (thousands)	Number of Cities	Percent Parked		Percent Walking	
		Less than 30 Min.	4 hours and over	Less than 400 feet	800 feet and over
	(1)	(2)	(3)	(4)	(5)
Less than 25	5	56	8	69	9
25 - 50	3	53	10	78	5
50 - 100	2	52	10	77	7
100 - 250	5	46	14	65	14
250 - 500	2	34	20	63	19
500 and over	2	28[1]	25	46	30
	19				

[1]Estimated from different groupings of length of time parked.

These trends have been indicated in individual studies from time to time but this is the first time it has been possible to assemble the results of these studies in one summary.

The proportion of cars parked less than 30 minutes in the largest cities is only half of those parked for the same length of time in the smallest cities. The proportion parked four hours and over, however, is three times as large. The proportion parking less than 30 minutes decreases from 56 percent to 28 percent as the population of cities increases from less than 25,000 persons upwards to six- and eight-hundred thousand. The proportion parking four hours and over increases from 8 percent to 25 percent as population increases in the same population groupings.

Definite trends are apparent also in the distances people walk to their destinations after parking their cars. The lengths of blocks vary but generally speaking one block may be considered to be about 400 feet. In small cities three quarters of the people parking in the Central Business District park within one block of their destination. This proportion decreases to less than 50 percent in the largest cities.

The proportion walking more than 800 feet (2 blocks) is relatively small in the smaller cities, less than ten percent. In the largest cities, however, as many as 30 percent of the parkers walk more than 800 feet.

PARKING CHARACTERISTICS

Average Length of Time Parked for Each Purpose of Trip in Cities of Six Population Groups

Population group (thousands)	Number of Cities (1)	Average time parked for each trip purpose - Hours				
		Work (2)	Shopping (3)	Business (4)	Other (5)	All purposes (6)
Less than 25	5	3.1	0.7	0.7	1.1	1.1
25 - 50	3	2.9	0.7	0.8	0.9	1.3
50 - 100	2	3.3	0.8	0.7	0.9	1.3
100 - 250	5	4.0	0.9	1.0	1.5	1.7
250 - 500	3	4.5	1.4	1.2	1.5	1.8
500 and over	2	5.1	1.4	1.4	1.2	2.5
	20					

There are definite trends apparent for the average length of time parked for each trip purpose. Regardless of purpose the average length of time parked increases in the larger cities in comparison with that of the smaller cities.

There does not appear to be much difference in the length of time parked by shoppers or by those on business trips. In both instances the time parked increases with the size of the city.

Other trip purposes include meals, movies, doctors, dentists, social, and other recreational activities. There does not seem to be much difference in the length of time parked for these purposes in cities of different sizes.

CITIES IN WHICH DIRECT INTERVIEW TYPE PARKING STUDIES HAVE BEEN MADE

Footnote[2] for page 1. Direct interview type parking studies have been made in the following cities. Reports have been published for those indicated by (R). Populations shown are those for 1940, for the metropolitan area.

1945 (4)

Providence, R. I.	711,500 (R)	Denver, Colo.	384,400 (R)
Atlanta, Ga.	442,300 (R)	Pawtucket, R. I.	75,797 (R)

1946 (9)

Baltimore, Md.	1,046,700 (R)	Harrisburg, Pa.	173,400 (R)
Seattle, Wash.	452,600 (R)	Knoxville, Tenn.	151,800 (R)
Portland, Ore.	406,400	Walla Walla, Wash.	18,109
New Haven, Conn.	308,200 (R)	Portsmouth, N. H.	14,821 (R)
Nashville, Tenn.	241,800 (R)		

1947 (15)

Toledo, Ohio	341,700 (R)	Corpus Christi, Tex.	70,700 (R)
Honolulu, T. H.	245,000	Monroe, La.	28,309 (R)
Jacksonville, Fla.	195,600	Alexandria, La.	27,066 (R)
Chattanooga, Tenn.	193,200 (R)	Lake Charles, La.	21,207
Reading Pa.	175,300 (R)	Anderson, S. C.	19,424 (R)
Spokane, Wash.	141,400 (R)	Stevens Point, Wis.	15,777 (R)
Wichita, Kans.	127,300 (R)	Albert Lea, Minn.	12,200 (R)
Charlotte, N. C.	113,000 (R)		

1948 (17)

Cleveland, Ohio	1,215,000	Boise, Idaho	26,130
Allentown-Bethlehem,Pa.	325,142	Meadville, Pa.	18,919
Omaha, Nebr.	287,700	Huntington, Ind.	13,903
Richmond, Va.	245,700	Frankfort, Ind.	13,206
Muncie, Ind.	49,720	Columbus, Ind.	11,738
Lynchburg, Va.	44,541	Wabash, Ind.	9,653
Anderson, Ind.	41,572 (R)	Seymour, Ind.	8,620
Kokomo, Ind.	33,795	Decatur, Ind.	5,861
Easton, Pa.	33,589		

Total number of cities in which Direct Interview Type Parking Studies have been made - - - 45

DISCUSSION

Limitations to the paper by Mr. Burrage and Mr. Hitchcock.

Data are lacking on violations at the curb before meters were installed.